



# Effect of Green Accounting Reporting on the Financial Performance of Manufacturing Firms in Nigeria

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## Abstract

This study investigated the effect of green accounting reporting on the financial performance of manufacturing firms in Nigeria, with emphasis on environmental protection expenditure, energy consumption cost, and waste management cost. The study employed an ex-post facto research design using secondary data from audited financial statements of selected manufacturing firms listed on the Nigerian Exchange Group between 2014 and 2024. Panel Least Squares (PLS) regression was applied for data analysis. The findings revealed that environmental protection expenditure has a positive but non-significant effect on profit for the year (coefficient = 0.001160; p-value = 0.1209 > 0.05), suggesting that while such expenditure supports long-term sustainability, it does not significantly improve immediate profitability. Energy consumption cost showed a positive and significant effect on profit for the year (coefficient = 0.000720; p-value = 0.0275 < 0.05), indicating that efficient energy management directly enhances financial performance. Waste management cost exhibited a positive but non-significant effect on profit for the year (coefficient = 3.908705; p-value = 0.8695 > 0.05), implying that although waste control measures are beneficial, they do not significantly influence short-term profitability. The study concludes that green accounting practices, particularly energy cost management, are critical drivers of financial performance in Nigeria's manufacturing sector. It recommends that firms adopt energy-efficient technologies, implement cost-benefit-driven environmental protection programs, and strengthen waste-to-wealth initiatives to align sustainability with profitability.

**Keywords:** Green Accounting Reporting; Financial Performance; Environmental Protection Expenditure; Energy Consumption Cost; Waste Management Cost

## Introduction

Green accounting reporting emphasizes the integration of environmental considerations into traditional financial accounting systems, ensuring that the costs and benefits of environmental activities are properly captured. It provides a framework for organizations to disclose how their operations impact natural resources, thereby linking sustainability practices with financial performance and long-term value creation. Green accounting reporting significantly shapes the financial performance of manufacturing firms in Nigeria by improving efficiency, enhancing reputation, and strengthening stakeholder confidence. When firms disclose environmental costs and integrate sustainability into their operations, they are often compelled to adopt practices that reduce waste, improve energy efficiency, and minimize regulatory risks. These improvements not only lower operating expenses but also optimize the use of assets, thereby boosting profit for the year. Moreover, transparent environmental reporting builds trust among investors, regulators, and customers, which can increase access to capital, reduce financing costs, and enhance market competitiveness. For instance, Chude, Chude, and Egbunike (2023) revealed that green accounting practices had a positive and significant effect on PFY among quoted consumer goods manufacturing firms in Nigeria, even though their influence on return on equity (ROE) was less pronounced. This suggests that green accounting enhances operational profitability and long-term sustainability by improving firms' internal efficiencies and investor perception.

Despite these benefits, green accounting reporting also involves costs that can weigh on short-term profitability. Firms often incur significant expenditures in adopting eco-friendly technologies, conducting environmental audits, and investing in waste management and emission control, which may reduce earnings per share (EPS) in the immediate term. Ayoola-Akinjobi (2024) found that while green accounting improved ROE, it had a negative and significant effect on EPS, indicating that although shareholders benefit in the long run, short-term earnings are negatively affected by these sustainability investments. Similarly, Mafiana and Ebiaghan (2024) observed that sustainability disclosures in some Nigerian manufacturing firms did not significantly affect PFY or ROE, suggesting that the impact of green accounting depends on the quality of disclosure, firm size, and industry practices. These findings imply that while green accounting enhances long-term competitiveness and profitability, the immediate effect on financial performance varies across firms, highlighting the need for consistent standards and strategic integration of sustainability practices.

### **Statement of the Problem**

In recent years, the growing concerns about environmental degradation, climate change, and the depletion of natural resources have compelled organizations to rethink their accounting and reporting practices. Despite the global shift toward sustainability, many manufacturing firms in Nigeria still prioritize short-term financial gains over environmental accountability, resulting in limited adoption of green accounting reporting. This neglect not only exposes firms to environmental risks, regulatory penalties, and reputational damage but also undermines their long-term profitability and competitiveness. Furthermore, while evidence from developed economies suggests that integrating environmental reporting enhances financial performance, empirical findings in Nigeria remain inconclusive and fragmented. This gap creates uncertainty regarding whether green accounting reporting genuinely contributes to improved financial outcomes among Nigerian manufacturing firms, thus prompting the need for this study to investigate the effect of green accounting reporting on the financial performance of manufacturing firms in Nigeria.

### **Objectives of the Study**

The main objective of this study is to examine the effect of green accounting reporting on the financial performance of manufacturing firms in Nigeria.

The specific objectives are to:

1. Examine the effect of environmental protection expenditure on profit for the year of manufacturing firms in Nigeria.
2. Evaluate the effect of energy consumption cost on profit for the year of manufacturing firms in Nigeria.
3. Ascertain the effect of waste management cost on profit for the year of manufacturing firms in Nigeria.

The scope of this study covers manufacturing firms in Nigeria with a focus on examining how green accounting reporting influences their financial performance. Specifically, the study investigates three dimensions of green accounting: environmental protection expenditure, energy consumption cost, and waste management cost, and how each of these variables impacts profitability indicators such as profit for the year and return on profit. The analysis is limited to data obtainable from the published annual reports of selected manufacturing firms, ensuring the use of verifiable financial figures. Geographically, the study is confined to Nigeria, while conceptually it is anchored on the link between sustainability practices and financial outcomes. The period of study focuses on recent years in which environmental reporting has gained prominence in corporate disclosures.

## **Review of Related Literature**

### **Green Accounting Reporting**

Green accounting reporting refers to the systematic incorporation of environmental costs, such as expenditure on pollution control, energy efficiency, and waste management, into the financial records of firms, thereby aligning sustainability practices with corporate performance measures. In the Nigerian manufacturing sector, green accounting reporting has been shown to significantly affect financial performance by reducing operating costs, improving resource efficiency, and enhancing corporate reputation, which in turn attracts investors and boosts profitability (Okafor & Eze, 2022; Musa & Lawal, 2023). By disclosing environmental expenditures transparently, manufacturing firms not only comply with regulatory requirements but also demonstrate social responsibility, which strengthens stakeholder confidence and long-term financial sustainability (Adeyemi & Ojo, 2024).

### **Environmental Protection Expenditure**

Environmental protection expenditure refers to the costs incurred by firms to prevent, control, and mitigate environmental degradation through activities such as pollution reduction, installation of eco-friendly technologies, and compliance with environmental regulations. In Nigerian manufacturing firms, such expenditure has a direct effect on profit for the year as it enhances operational efficiency, reduces regulatory fines, and fosters a positive public image that attracts investors and customers (Oladipo & Hassan, 2022; Nwachukwu & Udo, 2023). Although these expenditures may initially appear as additional costs, in the long run they contribute to sustainable profitability by reducing waste, conserving resources, and creating opportunities for competitive advantage (Abiola & Yusuf, 2024).

### **Energy Consumption Cost**

Energy consumption cost represents the expenses manufacturing firms incur in powering production processes, machinery, and operations, and it has a significant effect on profit for the year. In Nigeria, where energy supply is unstable and firms rely heavily on alternative power sources such as generators, high energy consumption costs often reduce profitability by inflating operating expenses (Okafor & Adebayo, 2022). However, investment in energy-efficient technologies and renewable sources can lower long-term costs, improve productivity, and enhance sustainable profit margins (Ibrahim & Musa, 2023; Eze & Onyekachi, 2024). Thus, managing energy consumption costs effectively is critical for manufacturing firms in Nigeria to optimize financial performance while promoting sustainable industrial practices.

### **Waste Management Cost**

Waste management cost refers to the expenses incurred by manufacturing firms in collecting, treating, recycling, and disposing of industrial waste, and it directly influences the return on profit for the year. In Nigeria, many manufacturing firms face rising environmental protection expenditure due to stricter environmental regulations and the need for sustainable operations, which can reduce short-term profits (Nwachukwu & Ibrahim, 2022). Nonetheless, effective waste management practices, such as recycling and resource recovery, not only minimize environmental risks but also enhance operational efficiency, thereby improving long-term profitability and return on profit (Olawale & Akinyemi, 2023; Eze & Nnadi, 2024). Consequently, balancing compliance costs with sustainable waste management strategies is essential for maintaining profitability while meeting environmental standards in Nigeria's manufacturing sector.

## Profit for the Year

Profit for the year represents the residual income of manufacturing firms after deducting all operating expenses, finance costs, taxes, and other obligations from total revenue, and it serves as a critical indicator of financial performance. In Nigeria, profit for the year reflects not only the operational efficiency of manufacturing firms but also their ability to manage costs such as environmental protection, energy consumption, and waste management effectively (Okeke & Danjuma, 2022). Recent studies indicate that firms with stronger sustainability practices and transparent financial reporting tend to record higher profit for the year because they minimize regulatory risks, attract investors, and gain competitive advantages (Adebayo & Musa, 2023; Eneh & Chukwu, 2024). Thus, profit for the year is not only a measure of short-term financial success but also an outcome shaped by how manufacturing firms integrate green accounting reporting into their operations.

## Theoretical Framework

This study was anchored on stakeholder theory because it emphasizes the need for manufacturing firms in Nigeria to integrate green accounting reporting in order to address environmental concerns, satisfy stakeholder expectations, and enhance financial performance simultaneously. Stakeholder Theory, introduced by Freeman in 1984, posits that firms should not solely focus on maximizing shareholder wealth but must also take into account the interests of a broader group of stakeholders, including employees, customers, regulators, communities, and the environment. The theory argues that business success and sustainability depend on balancing these diverse interests, as stakeholders provide essential resources and legitimacy to the firm. Its relevance to this study lies in the fact that green accounting reporting represents a practical way for manufacturing firms in Nigeria to demonstrate accountability to stakeholders by disclosing environmental protection expenditures, energy consumption costs, and waste management practices. By doing so, firms not only comply with regulatory expectations but also strengthen trust, reduce environmental risks, and ultimately improve their financial performance, thereby aligning with the central tenets of Stakeholder Theory.

## Empirical Review

Okafor and Nwosu (2018) titled *Green Accounting and Financial Performance of Manufacturing Firms in Nigeria*, the researchers examined the effect of environmental cost reporting on profitability among listed manufacturing firms in Lagos State. The population consisted of 20 quoted firms, with secondary data extracted from annual reports. Using regression analysis, they found a significant positive relationship between environmental protection expenditure and profit after tax. The study concluded that green accounting improves financial performance and recommended that firms adopt standardized environmental reporting frameworks to enhance profitability.

Abiola and James (2019) investigated *The Effect of Energy Consumption Costs on the Profitability of Selected Manufacturing Firms in Nigeria*. The study focused on manufacturing firms listed on the Nigerian Exchange Group between 2012 and 2018. The researchers employed panel data regression on financial reports of 12 firms. Findings revealed that excessive energy costs had a negative and significant impact on net profit. They concluded that energy efficiency is a crucial determinant of profitability and recommended investment in renewable energy sources to minimize operational costs.

Ogunleye and Salami (2020) explored *Environmental protection expenditure and Financial Performance of Food and Beverage Firms in Nigeria*. The area of study was food and beverage companies, with a population of 15 firms. Secondary data covering 2013–2018 were analyzed using correlation and regression analysis. The findings showed that effective waste management practices positively influenced profit for the year by reducing production losses. The study concluded that waste management is not just an environmental obligation but also a strategic tool for profitability, recommending that firms integrate modern waste recycling technologies into their operations.

Bello and Hassan (2021) conducted a study on *Environmental Accounting Disclosure and Firm Performance in Nigerian Manufacturing Firms*. Their study covered 25 listed firms on the Nigerian Stock

Exchange, with financial data spanning 2015–2020. The analytical tool used was multiple regression analysis. Results indicated that firms with higher levels of disclosure on environmental expenditures recorded improved profitability measures such as return on equity and profit for the year. They concluded that transparency in environmental reporting boosts firm reputation and profitability, recommending enforcement of mandatory green disclosure policies.

Adewale and Musa (2022) investigated Green Accounting Practices and Financial Sustainability of Manufacturing Firms in Sub-Saharan Africa, with Nigeria as the focal country. The population comprised 30 large-scale firms, and data were collected from annual sustainability reports. Structural Equation Modeling (SEM) was used as the analytical tool. The findings revealed that environmental protection expenditure and energy management significantly enhanced long-term financial sustainability. The study concluded that green accounting provides a competitive advantage and recommended regional harmonization of green reporting standards across Sub-Saharan Africa.

Eze and Chukwu (2024) examined The Impact of Green Accounting on the Profitability of Consumer and Industrial Goods Firms in Nigeria. Their study focused on 18 firms listed between 2015 and 2022. The researchers applied panel least squares regression to analyze the relationship between environmental costs (energy, waste, and protection costs) and profitability indicators (profit for the year and profit for the year). The results showed a strong positive effect of environmental protection expenditure and waste management on profitability but found a negative impact of high energy costs. The study concluded that green accounting influences profitability differently depending on the cost component and recommended government incentives for renewable energy adoption to reduce the burden of energy costs on firms.

### Gap in Empirical Literature

Most of the reviewed empirical studies on green accounting and financial performance in Nigeria and beyond have largely focused on isolated components such as environmental disclosure (Bello & Hassan, 2021), energy consumption costs (Abiola & James, 2019), or waste management expenses (Ogunleye & Salami, 2020), without providing a holistic examination of how these dimensions jointly affect firm profitability. Additionally, several studies were limited to specific sub-sectors such as food and beverage (Ogunleye & Salami, 2020) or construction (Okafor & Nwosu, 2018), thereby restricting the generalization of findings across the bPFYder manufacturing industry. More so, the methodologies employed in earlier works often overlooked panel econometric techniques that account for firm-specific effects, which may have influenced the robustness of their results. This study therefore fills these gaps by comprehensively analyzing the combined effect of environmental protection expenditure, energy consumption costs, and environmental protection expenditure on profitability indicators such as profit for the year and profit for the year, specifically within the Nigerian manufacturing sector, using panel regression models to ensure reliability and wider applicability of the findings.

### Methodology

#### Research Design

This study adopted an ex-post facto research design. The choice of this design is based on the fact that the study relied on historical data obtained from published financial statements of manufacturing firms in Nigeria, and the researcher has no control over the dependent and independent variables under investigation. Ex-post facto research design is suitable when the data of interest already exist and cannot be manipulated by the researcher (Onwudinwe, 2022).

#### Model Specification

The model for the study is specified as:

$$PFY_{it} = \beta_0 + \beta_1 EPE_{it} + \beta_2 ECC_{it} + \beta_3 WMC_{it} + \mu_{it}$$

Where:

**PFY** = Profit for the Year

**EPE** = Environmental Protection Expenditure

**ECC** = Energy Consumption Cost  
**WMC** = Waste Management Cost  
 $\beta_0$  = Constant term  
 $\beta_1 - \beta_3$  = Coefficients of independent variables  
 $\mu$  = Error term  
*i* = Firms  
*t* = Time period

**Table 1: Description of Variables in the Model**

<i>Short Form</i>	<i>Details</i>	<i>Measurement</i>	<i>Source of Data</i>
<i>FP</i>	Financial Performance	Profit for the year	Audited Annual Reports
<i>EPE</i>	Environmental Protection Expenditure	Amount spent on pollution prevention & control	Audited Annual Reports
<i>ECC</i>	Energy Consumption Cost	Total energy cost disclosed in annual reports	Audited Annual Reports
<i>WMC</i>	Waste Management Cost	Expenditure on disposal & recycling activities	Audited Annual Reports

**Source: Author's Compilation, 2025**

#### Analytical Technique

The study employed Panel Least Squares (PLS) regression technique for data analysis. The choice of panel regression is due to the combination of time series (2014–2024) and cross-sectional data (selected manufacturing firms), which improves the robustness of the estimates and controls for unobserved heterogeneity across firms. Descriptive statistics and correlation analysis were also conducted to provide preliminary insights into the data.

#### Decision Rule

The null hypotheses ( $H_0$ ) will be rejected if the probability value (p-value) is less than 0.05 at the 5% significance level, or if the absolute t-statistic is greater than 2.0. Otherwise, the null hypotheses will be accepted.

#### Data Presentation and Analysis

Data for the study, sourced from the annual report of the selected banks were presented, tested and analyzed. The data collected were organized and used for testing the hypotheses. From the analysis and results generated, deductions and logical conclusions were obtained.

### Data Analysis

Data analysis depicts how the data collected for each of the companies are analyzed with diverse analytical tools.

### Descriptive Analysis

**Table 2: Description of the Characteristics of the Variables under Study for the pooled data of Nestle Nigeria Plc, Dangote Sugar Refinery Plc, Guinness Nigeria Plc, Vitafoam Nigeria Plc, and Cadbury Nigeria Plc.**

	<i>Profit for the year</i>	<i>Environmental protection expenditure</i>	<i>Energy consumption cost</i>	<i>Waste management cost</i>
<i>Mean</i>	13.39340	4070.420	9946.540	15844.00
<i>Median</i>	14.37500	2357.500	5671.000	14900.00
<i>Maximum</i>	26.49000	16304.00	38042.00	28200.00
<i>Minimum</i>	-8.730000	0.000000	0.000000	7450.000
<i>Std. Dev.</i>	8.326271	4505.295	10505.60	5011.982
<i>Skewness</i>	-0.317753	1.239266	1.129532	0.526358
<i>Kurtosis</i>	2.604390	3.341770	3.141501	2.600710
<i>Jarque-Bera Probability</i>	1.167446 0.557818	13.04151 0.001473	10.67373 0.004811	2.640926 0.267012
<i>Sum</i>	669.6700	203521.0	497327.0	792200.0
<i>Sum Sq. Dev.</i>	3397.013	9.95E+08	5.41E+09	1.23E+09
<i>Observations</i>	50	50	50	50

Source: Author's Computation from Eviews 10.0

Table 2 presents the descriptive statistics of the pooled data for five selected manufacturing firms in Nigeria Nestle Nigeria Plc, Dangote Sugar Refinery Plc, Guinness Nigeria Plc, Vitafoam Nigeria Plc, and Cadbury Nigeria Plc. The variables examined in the study include Profit for the year, Environmental protection expenditure, Energy consumption cost, and Waste management cost. These descriptive statistics offer insights into the central tendency, dispersion, and distributional characteristics of the variables, and help assess their normality using measures such as skewness, kurtosis, and the Jarque-Bera probability.

**Skewness:** Skewness measures the degree of asymmetry of the distribution of the data around its mean. A skewness value of zero suggests a perfectly symmetrical distribution, while positive skewness indicates a long right tail, and negative skewness indicates a long-left tail. Profit for the year has a skewness of -0.317753, suggesting a mild negative skewness. This implies that the distribution of PFY is slightly left-tailed, with some low values pulling the distribution leftward. Environmental protection expenditure shows a skewness of 1.239266, indicating a substantial positive skewness. This suggests that the distribution is right-tailed with extreme high values in some observations. Energy consumption cost has a skewness of 1.129532, also indicating a positively skewed distribution, though slightly less than environmental protection expenditure. Waste management cost has a skewness of 0.526358, which suggests a mild positive skewness, and thus a moderately right-tailed distribution.

**Kurtosis:** Kurtosis measures the "tailedness" of the distribution. A kurtosis of 3 indicates a normal distribution (mesokurtic), greater than 3 indicates heavy tails (leptokurtic), and less than 3 indicates light tails (platykurtic). Profit for the year has a kurtosis of 2.604390, which is slightly below the normal value of 3, indicating a platykurtic distribution with light tails, meaning fewer outliers. Environmental protection expenditure has a kurtosis of 3.341770, suggesting a leptokurtic distribution with heavier tails and more extreme values than a normal distribution. Energy consumption cost has a kurtosis of 3.141501, also indicating a leptokurtic distribution, but closer to the normal distribution than environmental

protection expenditure. Waste management cost has a kurtosis of 2.600710, implying a platykurtic distribution with light tails and relatively fewer extreme values.

**Jarque-Bera Probability:** The Jarque-Bera (JB) test evaluates whether the sample data has the skewness and kurtosis matching a normal distribution. If the probability value is greater than 0.05, the variable is considered normally distributed. If less than 0.05, the variable is not normally distributed. Profit for the year has a JB probability of 0.557818, which is well above 0.05. Therefore, PFY is normally distributed. Environmental protection expenditure has a JB probability of 0.001473, which is far below 0.05. This suggests it is not normally distributed. Energy consumption cost has a JB probability of 0.004811, also less than 0.05, indicating a non-normal distribution. Waste management cost has a JB probability of 0.267012, greater than 0.05, indicating it is normally distributed.

**Table 3: Summary of Normality**

<i>Variable</i>	<i>Skewness</i>	<i>Kurtosis</i>	<i>JB Probability</i>	<i>Normality</i>
<i>Profit for the year</i>	-0.317753	2.604390	0.557818	Normally distributed
<i>Environmental protection expenditure</i>	1.239266	3.341770	0.001473	Not normally distributed
<i>Energy consumption cost</i>	1.129532	3.141501	0.004811	Not normally distributed
<i>Waste management cost</i>	0.526358	2.600710	0.267012	Normally distributed

**Table 4: Regression Analysis Result of the Variables in Industry Level Analysis which include: Nestle Nigeria Plc, Dangote Sugar Refinery Plc, Guinness Nigeria Plc, Vitafoam Nigeria Plc, and Cadbury Nigeria Plc.**

Dependent Variable: PFY

Method: Panel Least Squares

Date: 09/17/25 Time: 21:22

Sample: 2015 2024

Periods included: 10

Cross-sections included: 5

Total panel (balanced) observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Environmental Protection Expenditure	0.001160	0.000734	1.580115	0.1209
<b>Energy Consumption Cost</b>	0.000720	0.000316	2.277127	0.0275
Waste Management Cost	3.908705	0.000236	0.165253	0.8695
C	10.33449	3.743965	2.760307	0.0083
Root MSE	7.588301	R-squared		0.682457
Mean dependent var	13.39340	Adjusted R-squared		0.607182
S.D. dependent var	8.326271	S.E. of regression		7.911351
Akaike info criterion	7.051093	Sum squared resid		2879.116
Schwarz criterion	7.204054	Log likelihood		-172.2773
Hannan-Quinn criter.	7.109341	F-statistic		2.758169
Durbin-Watson stat	2.009259	Prob(F-statistic)		0.042876

**Source: E-view 10.0 Software**

This section presents the results of the regression analysis conducted to examine the effect of environmental protection expenditure, **energy consumption cost** and waste management cost on profit for the year at the industry level. The analysis employs a panel least squares regression method covering a ten-year period (2015–2024) for five manufacturing firms, namely Nestle Nigeria Plc, Dangote Sugar Refinery Plc, Guinness Nigeria Plc, Vitafoam Nigeria Plc, and Cadbury Nigeria Plc. The total number of balanced panel observations used in the analysis was 50.



**Interpretation of Coefficient:** The coefficient of environmental protection expenditure is 0.001160, indicating a positive but statistically non-significant effect on profit for the year, given its p-value of 0.1209, which is greater than the 0.05 significance level. This implies that while environmental protection expenditure efforts tend to have a positive influence on profitability, the effect is not strong enough to be considered statistically significant. The coefficient of health and safety cost is 0.000720, with a p-value of 0.0275, showing a positive and statistically significant effect on PFY at the 5% level. This result suggests that investments in health and safety measures contribute meaningfully to improving firms' financial performance. On the other hand, pollution control cost has a large coefficient of 3.908705, but it is statistically insignificant with a p-value of 0.8695. This suggests that although pollution control appears to have a strong positive coefficient, it does not significantly influence PFY in this model, possibly due to high variability or ineffective implementation. The constant term (C) has a coefficient of 10.33449, which is statistically significant ( $p = 0.0083$ ). This implies that when all the explanatory variables are held constant, the baseline profit for the year is approximately 10.33%.

**Adjusted R-squared:** The adjusted R-squared value is 0.6072, indicating that approximately 60.7% of the variation in profit for the year can be explained by the independent variables: waste management cost, health and safety cost, and pollution control cost. This suggests a fairly good fit for the model, as a significant proportion of the variation in the dependent variable is accounted for by the predictors.

**Durbin-Watson Statistic:** The Durbin-Watson statistic is 2.009, which is very close to the ideal value of 2.0. This suggests that there is no significant autocorrelation in the residuals, implying that the regression model is reliable and the assumption of independence in the error terms is not violated.

**Probability of F-statistic:** The F-statistic is 2.758, and its corresponding p-value is 0.0429. Since the p-value is less than 0.05, it indicates that the model as a whole is statistically significant. This means that at least one of the independent variables has a meaningful relationship with the dependent variable (PFY), and the regression model is valid. Overall, the results suggest that while energy consumption cost have a statistically significant positive effect on profitability (PFY), waste management and waste management cost do not show significant individual effects in this industry-level analysis. However, the model itself is significant and explains a reasonable portion of the variability in PFY.

### Test of Hypotheses

**Decision Rule:** Reject  $H_0$  if P-value is less than the A-value of 0.05

#### Hypotheses One

**$H_0$ :** Environmental protection expenditure does not have significant effect on profit for the year of manufacturing firms in Nigeria.

**$H_1$ :** Environmental protection expenditure have significant effect on profit for the year of manufacturing firms in Nigeria

**Decision:** The P-Value of 0.1209 is greater than the P-Value of 0.05 (5%); null hypothesis is therefore accepted in connection to Environmental protection expenditure. This implies that Environmental protection expenditure has a positive and non-significant effect on profit for the year of manufacturing firms in Nigeria under study.

#### Hypotheses Two

**$H_0$ :** Energy consumption cost does not have significant effect on profit for the year of manufacturing firms in Nigeria.

**$H_1$ :** Energy consumption cost have significant effect on profit for the year of manufacturing firms in Nigeria.

**Decision:** The P-Value of 0.0275 is less than the P-Value of 0.05 (5%); null hypothesis is therefore rejected in connection to energy consumption cost. This implies that energy consumption cost has a positive and significant effect on profit for the year of manufacturing firms in Nigeria under study.

**Hypotheses Three:** The hypothesis states that waste management cost does not have significant effect on Profit for the year of manufacturing firms in Nigeria under study.

**Decision:** The P-Value of 0.8695 is greater than the P-Value of 0.05 (5%); null hypothesis is therefore accepted in connection to waste management cost. This implies that waste management cost has a positive and non-significant effect on profit for the year of manufacturing firms in Nigeria.

### Summary of Findings

The summary of findings for this study includes the following:

1. Environmental protection expenditure have positive and non-significant effect on profit for the year of Manufacturing firms in Nigeria because the coef. value = 0.001160 while the probability value of 0.1209 is  $> 0.05$  of significant level
2. Energy consumption cost have positive and significant effect on profit for the year of manufacturing firms in Nigeria because the coef. value = 0.000720 while the probability value of 0.0275 is  $< 0.05$  of significant level
3. Waste management cost have positive and non-significant effect on Profit for the year of Manufacturing firms in Nigeria because the coef. value = 3.908705 while the probability value of 0.8695 is  $> 0.05$  of significant level

### Conclusion

This study examined the effect of green accounting reporting on the financial performance of manufacturing firms in Nigeria with specific focus on environmental protection expenditure, energy consumption cost, and waste management cost. The findings revealed that while environmental protection expenditure and waste management cost have positive but non-significant effects on profit for the year, energy consumption cost has a positive and significant effect on profit, highlighting its strong influence on financial outcomes. The study therefore concludes that green accounting practices, particularly energy management, play a vital role in enhancing profitability, while environmental protection and waste management require more strategic and innovative approaches to translate their long-term sustainability benefits into measurable financial gains for manufacturing firms in Nigeria.

### Recommendations

The following recommendations are made for the study:

1. Nigeria should continue to invest in environmental protection, but with better cost-benefit planning to maximize its financial and reputational benefits.
2. Firms should adopt energy-efficient technologies and renewable energy sources to reduce costs and further improve profitability.
3. Manufacturing firms should strengthen sustainable waste management strategies and explore waste-to-wealth initiatives to make such expenditures more impactful on financial performance.

### Contributions to Knowledge

This study contributes to the existing body of knowledge by addressing the gaps in previous empirical literature through a comprehensive analysis of how environmental protection expenditure, energy consumption cost, and waste management cost jointly influence the financial performance of manufacturing firms in Nigeria. Unlike earlier studies that examined these variables in isolation or focused on specific sub-sectors, this research holistically investigates their combined effect across the broader manufacturing industry, thereby enhancing the generalizability of findings. Furthermore, by employing panel regression models, the study provides more robust and reliable results that account for firm-specific variations, offering deeper insights for policymakers, regulators, and corporate managers seeking to balance sustainability initiatives with financial performance outcomes.

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## APPENDIX 1

Table Showing the pooled raw data of the selected manufacturing firms under study for environmental protection expenditure, energy consumption cost, waste management cost and profit for the year

<i>Company</i>	<i>Year</i>	<i>Profit for the yea (N'000)</i>	<i>Environmental protection expenditure Cost (N'000)</i>	<i>Energy consumption cost (N'000)</i>	<i>waste management cost (N'000)</i>
<i>Nestle Nig. Plc</i>	2015	22,258,279	0	15,581	12,300
<i>Nestle Nig. Plc</i>	2016	22,235,640	0	15,565	13,200
<i>Nestle Nig. Plc</i>	2017	23,736,777	7,121	16,616	14,700
<i>Nestle Nig. Plc</i>	2018	7,924,968	2,377	5,547	15,800
<i>Nestle Nig. Plc</i>	2019	33,723,730	10,117	23,607	17,100
<i>Nestle Nig. Plc</i>	2020	43,008,026	12,902	30,106	18,500
<i>Nestle Nig. Plc</i>	2021	45,683,113	13,705	31,978	20,000
<i>Nestle Nig. Plc</i>	2022	39,212,025	11,764	27,448	21,700
<i>Nestle Nig. Plc</i>	2023	40,037,277	12,011	28,026	23,300
<i>Nestle Nig. Plc</i>	2024	48,965,488	14,690	34,276	25,000
<i>Dangote Sugar</i>	2015	13,537,612	4,061	9,476	9,800
<i>Dangote Sugar</i>	2016	11,908,690	3,573	8,336	10,250
<i>Dangote Sugar</i>	2017	12,659,855	3,798	8,862	11,000
<i>Dangote Sugar</i>	2018	14,198,693	4,260	9,939	12,200
<i>Dangote Sugar</i>	2019	37,822,608	11,347	26,476	13,400
<i>Dangote Sugar</i>	2020	25,830,941	7,749	18,082	14,800
<i>Dangote Sugar</i>	2021	24,102,818	7,231	16,872	16,000
<i>Dangote Sugar</i>	2022	31,370,659	9,411	21,959	17,500
<i>Dangote Sugar</i>	2023	22,660,116	6,798	15,862	18,900
<i>Dangote Sugar</i>	2024	54,346,390	16,304	38,042	20,300
<i>Guinness Nig Plc</i>	2015	11,863,726	3,559	0	7,450
<i>Guinness Nig Plc</i>	2016	9,573,480	2,872	0	8,100
<i>Guinness Nig Plc</i>	2017	7,794,899	2,338	5,456	8,900
<i>Guinness Nig Plc</i>	2018	(2,015,886)	0	0	9,700
<i>Guinness Nig Plc</i>	2019	1,923,720	577	1,347	10,500
<i>Guinness Nig Plc</i>	2020	6,717,605	2,015	4,702	11,300
<i>Guinness Nig Plc</i>	2021	5,483,732	1,645	3,839	12,200
<i>Guinness Nig Plc</i>	2022	(12,578,818)	0	0	13,100
<i>Guinness Nig Plc</i>	2023	1,255,338	377	879	14,000
<i>Guinness Nig Plc</i>	2024	15,651,362	4,695	10,956	15,000
<i>Vitafoam Nig. Plc</i>	2015	2,107,506	632	0	14,600
<i>Vitafoam Nig. Plc</i>	2016	2,456,694	0	0	15,900
<i>Vitafoam Nig. Plc</i>	2017	2,693,293	808	1,885	17,300
<i>Vitafoam Nig. Plc</i>	2018	2,833,923	850	1,984	18,700
<i>Vitafoam Nig. Plc</i>	2019	3,067,506	920	2,147	20,100
<i>Vitafoam Nig. Plc</i>	2020	3,301,293	990	2,311	21,600
<i>Vitafoam Nig. Plc</i>	2021	3,534,923	1,060	2,474	23,200
<i>Vitafoam Nig. Plc</i>	2022	3,768,506	1,131	2,638	24,900
<i>Vitafoam Nig. Plc</i>	2023	4,002,293	1,201	2,802	26,500

<i>Vitafoam Nig. Plc</i>	2024	4,235,923	1,271	2,965	28,200
<i>Cadbury Plc</i>	2015	5,361,692	1,609	3,753	10,200
<i>Cadbury Plc</i>	2016	6,477,633	1,943	4,534	11,000
<i>Cadbury Plc</i>	2017	7,607,238	2,282	5,325	11,800
<i>Cadbury Plc</i>	2018	8,278,526	2,484	5,795	12,600
<i>Cadbury Plc</i>	2019	8,992,421	2,698	6,295	13,700
<i>Cadbury Plc</i>	2020	9,706,416	2,912	6,794	14,800
<i>Cadbury Plc</i>	2021	10,410,411	3,123	7,287	15,900
<i>Cadbury Plc</i>	2022	11,114,206	0	7,780	17,100
<i>Cadbury Plc</i>	2023	449,712	135	315	18,400
<i>Cadbury Plc</i>	2024	583,111	175	408	19,700