

# Corporate Eco-efficiency and Financial Performance: Evidence from Guinness Nigeria Plc

Agu, Stephen Ikechukwu<sup>1</sup>; Dr. Okegbe, Theophilus Okonkwo<sup>2</sup>

<sup>1</sup>Ph.D Scholar, Department of Accountancy, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria

<sup>2</sup>Senior Lecturer, Department of Accountancy, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria

**Abstract:** - This study examines the interplay between corporate eco-efficiency and financial performance of Guinness Nigeria Plc. An ex –post facto research design approach was adopted for the study. Using a series data for the period of seven (7) years 2011 to 2017, Guinness Nigeria Plc was studied based on the firms' position as one largest brewing companies and one of the key players in the industry. Secondary data were obtained from the annual /sustainability reports of the company from 2011 to 2017 financial year. Three hypotheses were formulated and tested in the course of this study. Regression analysis by aid of SPSS v.21 was used to test for statistical significance and relationship between corporate eco-efficiency and financial performance. The results showed that there is significant positive relationship between energy efficiency and financial performance of Guinness Nigeria Plc. This study further revealed that there is a statistical significant and positive relationship between water utilization efficiency (WUE) and financial performance of Guinness Nigeria Plc. Finally, the result also established that there is a statistical positive and significant relationship between the Greenhouse Gas (GHG) emission management and financial performance of Guinness Nigeria Plc. Based on the findings, this study recommends among others; that the management of Brewers should improve energy efficiency by the use of gas-powered generators, economizers on its boilers and compressors. Brewers should consider the installation of water guns to reduce water flow rate, installation of flow meters for effective data capturing, monitoring & controls. The management of CO<sub>2</sub> emission in Brewery firms should accommodate among others; using less fossil fuel for energy and steam generation as well as increased application of solar-powered street lighting.

**Keywords:** Eco-efficiency, Sustainability reporting, financial performance, Guinness Nigeria Plc.

## I. INTRODUCTION

Guinness Nigeria Plc is a firm within the company-type that has high environmental sensitivity. It is one of the companies whose operation largely depends on water and energy. As a result, the operations impose some environmental challenges as energy consumption, water consumption, wastewater, solid waste and by-products and emissions to air remain environmental issues of concern in the brewing firms (Agu, Udeh, Nwafor, & Okolo, 2019). By these, pressures are exerted by the society (host community) on the organization to legitimize its operations by managing the societal interests, needs and demand.

However, due to the existence of scarcity of non-renewable sources, and problems related to the improper use

of renewable raw materials, a good strategic manager is left with no option than to strategize on developing new processes that could generate less waste or reused those produced in order to add greater value to the residue. These strategies therefore are referred to eco-efficiency strategies.

Eco-efficiency is defined "as the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impact and resource intensity throughout the life cycle, to a level at least in line with the earth's estimated carrying capacity (World Business Council for Sustainable Development, 2000). It can also be explained as the ratio of product or service value to its environmental impacts. The concept of eco-efficiency revolves on the fact that businesses using eco-efficiency principles are more profitable and competitive as they use less virgin resources, water and energy, generate less waste and pollution, improve production methods, develop new products or services and use or recycle existing materials (GSRC, 2016). Based on this concept, it is not arguable that corporate eco-efficiency is capable of influencing the financial performance of an organization.

Empirically, there is an increased awareness on environmental issues and its effects globally even though there exists paucity of empirical studies and evidence in scholarly articles (Agu, Udeh, Nwafor, & Okolo, 2019). Predicated on this, the study ascertains the relationship between corporate eco-efficiency and financial performance of Guinness Nigeria Plc with the keen interest to determining the direction existing between the independent variables- energy efficiency, water utilization, Green house Gas emission management and the dependents- Return on Asset (ROA) & Return on Equity of Guinness Nigeria Plc.

### *Objectives of the Study*

The main objective of this study is to ascertain the relationship between corporate eco-efficiency and financial performance of Guinness Nigeria Plc. However; the specific objectives are as follows:

- i. To evaluate the relationship between energy efficiency and financial performance of Guinness Nigeria Plc.
- ii. To determine the relationship between water utilization efficiency and financial performance of Guinness Nigeria Plc.

- iii. To examine the relationship between greenhouse gas emission management and financial performance of Guinness Nigeria Plc.

*Research Questions*

This study aimed at providing answer to the following questions:

- a. To what extent does energy efficiency influences the financial performance of Guinness Nigeria Plc?
- b. To what extent does water utilization efficiency relate to financial performance of Guinness Nigeria Plc?
- c. What is the relationship between greenhouse gas emission management and financial performance of Guinness Nigeria Plc.?

*Research Hypotheses*

To achieve the above objectives, the following hypotheses are formulated and stated in null form for the research study:

- a. **H0** There is no significant relationship between energy efficiency and financial performance of Guinness Nigeria Plc.
- b. **H0** There is no significant relationship between water utilization efficiency and financial performance of Guinness Nigeria Plc.
- c. **H0** There is no significant relationship between greenhouse gas emission management and financial performance of Guinness Nigeria Plc

II. LITERATURE REVIEW

2.1 Conceptual Framework

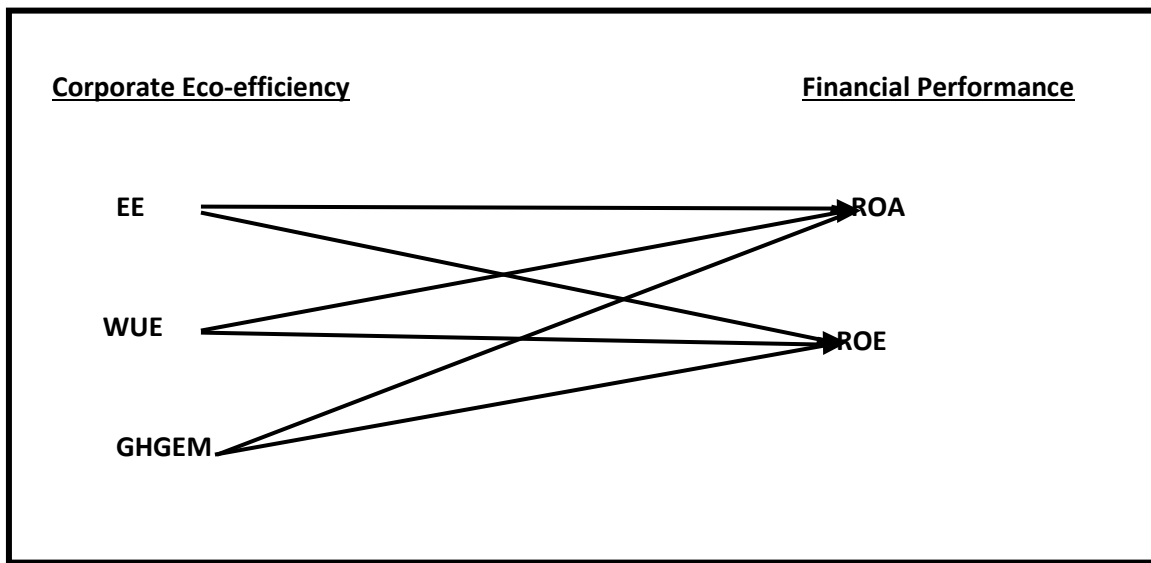


Fig. 2.1.1 Proposed Conceptual Framework

Source: *Researchers Desk (2019)*

The model attempts to depict the association and influence of the corporate eco-efficiency on financial performance. This is determine by ascertain the extent of relationship and effect of each of the proxies of corporate eco-efficiency (i.e, Energy efficiency(EE), water utilization efficiency(WUE) and greenhouse gas emission management(GHGEM) on each of the proxies of financial performance (i.e,Return on Asset(ROA) and Return on Equity (ROE).This study deduces that the overall effect exerted by the Energy efficiency(EE), water utilization efficiency(WUE) and greenhouse gas emission management(GHGEM) represents an aggregate influences on the Return on Asset and Return on Equity of Guinness Nigeria Plc.

2.1.1 Brief Eco-efficiency profile of Guinness Nigeria Plc

GUINNESS is the second largest brewer in Nigeria after Nigeria Breweries Plc. The company started production in Nigeria following the establishment of the first brewing plant in Lagos outside the British Isles In 1963. In 1965, Guinness Nigeria was listed on the Nigerian Stock Exchange. With consistent growth of Guinness Stout and Harp Lager beer in the Nigerian market, GUINNESS has expanded its brewing plant from just one in Lagos to a total of four across Lagos (Ogba and Ikeja), Benin and Aba in Abia state. The Company expanded its brewing capacity in Benin and Ogba in 2011 to meet the growing demand of its consumers ((Equity research, 2014).

In the bid to maintain its corporate citizenship and become environmentally friendly to the society, GUINNESS

improvement in the management of the combined energy was sustained by the use of gas-powered generators across its sites. The Guinness sustainability report (2016) affirms that gas powered generators have significantly lower CO2 emissions compared to diesel powered ones. Again the firm’s commitment to improving energy efficiency was sustained by installation of waste heat boilers on its generators and also the use of economizers on its boilers and compressors. By these initiatives, energy efficiency improved with 10% decrease in combined energy consumption from 2011 to 2013. From 2013 to 2014 the total relative energy consumption however reduced from 2.71 mj/l to 2.69 mj/l (1% decrease). In 2015, it further reduced the total relative energy consumption to 2.54mj/l+ (6% decrease). In 2016 however, the total relative energy consumption increased to 2.62mj/l+ (3% increase) and finally, in 2017, the firm recorded 7% decrease.

The efficiency in water consumption in this company was sustained through the installation of water guns to reduce water flow rate, installation of flow meters for effective data capturing, monitoring & controls and various water recovery projects that have improved the efficiency of company’s machines. As a result, over the period under review, Guinness Nigeria plc has consistently improved on water efficiency, and reduced the absolute water withdrawals. However, the relative water consumption improved from 8.62hl/hl in 2011

to 7.80hl/hl in 2012 (11% decrease).In 2013, there was 16% decrease, then from 6.73hl/hl in 2013 to 5.56hl/hl in 2014 (21% decrease), and 5.18hl/hl in 2015 (7% decrease). From 2015 to 2016, the relative water consumption also improved from 5.18hl/hl+ to 4.97 hl/hl+ (5% decrease).In 2017,the water consumption improved with 8% decrease.

As a result of the sustained improvement in the management of combined energy consumption,the Guinness Nigeria Plc recorded a progressive reduction in the CO2 emission (except in 2016).The total relative CO2 emissions reduced through 2011, 2012 and 2013 from 148.65kgCo2/hl to 143.54kgCo2/l in 2014 (4% decrease). In 2015, the emission dropped further to 136.71kgCo2/hl+ (5% decrease). In 2016 however, CO2 emission increased to 143.32kgCo2/hl+ (5% increase) and later in 2017 dropped to 128.41 kgCo2/hl.

Figure 2.1.2 depicts the progress Guinness Nigeria Plc has recorded on adoption and practices of eco-efficiency strategies in the management of water, energy and Greenhouse gases. There is significant improvement on eco-efficiency policy of this company since 2011 baseline year. Specifically within the period under review (2011 to 2017) energy use reduced by 21%, carbon dioxide emission fell by 32% and a significant reduction of total water utilized by 87%.

**Figure 2.1.2** Guinness Nigeria Plc eco-efficiency for the year 2011-2017

	Combined energy consume	Total water use	Specific Greenhouse Gas Emission	Profit after taxes(PAT)	Total asset(TA)	Total equity(TE)
	Millijoule/Hectoliter (mj/hl)	Hectoliter/Hectoliter (hl/hl)	Kg CO <sub>2</sub> eq/hl	N’000	N’000	N’000
2011	2.97	8.62	169.12	17927934	92175032	40283492
2012	2.99	7.80	163.18	14671195	102534172	40352504
2013	2.71	6.73	148.65	11863726	88822002	46039111
2014	2.69	5.56	143.54	9573480	132328273	45061717
2015	2.54	5.18	136.71	7794899	122246632	48341376
2016	2.62	4.97	143.32	2015886	136992444	41660605
2017	2.46	4.62	128.41	1923720	146038216	42943015

**Source:** Guinness Nigeria Plc Sustainability reports from 2011-2017; Equity Research report, 2018.

**2.2 Theoretical Review**

Theories that have direct bearing to eco-efficiency are Stakeholder theory, New Institutional Theory and Legitimacy Theory but considering the purpose of this study, this research work is anchored on Legitimacy theory.

Legitimacy theory can be traced to the study of Sethi (1975) who states that corporate social responsibility is that corporate behaviour that aligns with prevailing social norms, values and expectations (Swaen, 2002). The concept of social contract holds that the activities of business organizations should comply with social expectations. In the absence of this compliance, society will withdraw the organizations’ right to continue its operations. Business organizations operate within

the boundary set by rules, regulations and societal norms. Where there is any perceived threat to the business as a result of violation of any rule and societal norm, sustainability disclosures which among others include eco-efficiency strategies are released by the companies. This implies that businesses that are prone to legitimacy problems tend to disclose more information in order to satisfy the public about their sustainability performance (Guo and Zhao, 2011).

Legitimacy theory posits that business organizations disclose their sustainability initiatives to legitimize their operations. The businesses that are prone to sustainability issues also report more information to minimize criticism from the host community, address stakeholder expectations, build reputation and ultimately attract capital (Faisal *et al.*,

2012). Guo and Zhao (2011) on legitimacy theory identify a number of threats to legitimacy namely negative events and media exposure. According to Dobbs and Van Staden (2011), business organizations seek ‘legitimacy’ from important stakeholders by ensuring that their value system is in alignment with the values of the society that hosts the operations of the business. Sethi (1975) also discloses that legitimization is characterized by changes in the internal decision-making, changes in the perception of the external environment, and accountability mechanisms of the business organization. With legitimacy theory, corporate eco-efficiency strategies and disclosures (mandatory/voluntary) are ways through which businesses can show that they support certain societal expectations which among others include health and safeguard of their natural resources.

2.3 Empirical review

Agu, Udeh, Nwafor, and Okolo, (2019) empirically examined the effect of corporate eco-efficiency on the profitability of Nigerian Breweries plc. The study adopted ex – post facto research design. Using regression analysis on a panel data for the period of ten (10) years 2008 to 2017, the results showed that there is positive significant effect of energy efficiency on the profitability of Nigerian Breweries plc. This study further revealed that there is a statistical positive and significant effect of the water utilization (WU) efficiency on the profitability of Nigerian Breweries plc. Finally, the result also established that there is a statistical positive and significant relationship between the Greenhouse Gas (GHG) emission management and the profitability of Nigerian Breweries plc.

A related research report carried out in USA by Worrell, Galitsky and Martin (2014) examined energy efficiency opportunities in the Brewery Industry breweries. The study provides specific primary energy savings for each energy efficiency measure based on case studies that have implemented the measures, as well as references to technical literature. Based on this, it was found that major brewing companies have and will continue to spend capital on cost effective measures that do not impact the quality of the beer and there is need to assess implementation of selected technologies at individual breweries.

A related work by Basuki (2015) was carried out to provide an exploratory study on Eco-Efficiency and Sustainable Development as Efforts to Produce Environmentally Friendly Product. The research methodology used was Yin’s non positivist exploratory case study research in PT. Semen Indonesia. The results showed that although the company has already understood and implemented eco-efficiency, and other environmental friendly program, such as Japanese 5’ S (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke mean Tidiness, Orderliness, Cleanliness, Standardization, and Discipline); Triple Bottom Line (Profit, People and Planet), and other programs.

Milad, Norlena and Nor (2011) discussed on the relationship between the corporate environmental performance and the eco-efficiency concept. The study was based on an extensive review of the related literature for the purpose of justification of using eco-efficiency concept as proxy of corporate environmental performance. The paper concluded that the eco-efficiency concept incorporates the main environmental performance indicators such as clean production, pollution prevention, and waste minimization.

Another report from Spain by Antonio, Pérez-Gómez, Rosa-González, and Libertad (2014) evaluated Eco-Efficiency in the light of Environmental Performance and Economic Performance. The study used the distribution-free approach to provide empirical evidence in relation to the eco-efficiency paradigm by studying the relation between environmental performance and economic performance in 199 companies from mineral manufacturing industry in Spain between 2004 and 2007. The empirical analysis showed that the results are consistent with the paradigm of eco-efficiency.

From the empirical review, there is no doubt that there exists paucity of literature and empirical evidences on eco-efficiency. The research gap here is based on the fact that these few reviewed work concentrated in elaborating on the concept of Eco-efficiency literary and paid little or no attention on the analytical view of the concept. This paper did not only provide more literature on the concept of eco-efficiency but also used ex-post facto research design to provide empirical evidences on the nexus between corporate eco-efficiency and the financial performance of Guinness Nigeria Plc.

III. METHODOLOGY

This study adopted ex-post facto research design, used time series data generated from the sustainability reports and annual reports & accounts of Guinness Nigeria Plc which covered a period of seven (7) years (2011-2017) for panel analysis. The selection was based on the firms’ position as one largest brewing companies and one of the key players in the industry as put forward by Equity Research Report (2014). This paper concentrated on the sustainability reports and annual reports & accounts of Guinness Nigeria Plc over the years with special focus on data for energy efficiency (mj/hl), water utilization (hl/hl), Greenhouse Gases management (Kg CO<sub>2</sub>eq/hl), Return on Asset and Return on Equity. Linear regression analysis was performed to analyze the relationship between corporate eco-efficiency and financial performance of the firm. The model specified below estimates the relationship:

$$\text{Fin Perf.} = f(\text{CE}) \dots \dots \dots (1)$$

$$\text{ROA} = \beta_0 + \beta_1 \text{EE} + \beta_2 \text{WUE} + \beta_3 \text{GHGM} + \varepsilon \dots \dots \dots (2)$$

$$\text{ROE} = \beta_0 + \beta_1 \text{EE} + \beta_2 \text{WUE} + \beta_3 \text{GHGM} + \varepsilon \dots \dots \dots (3)$$

Where:

1. Fin Perf.. proxied by ROA & ROE.

2. CE = Corporate Eco-efficiency surrogated by EE, WUE & GHGM.
3. ROA= Returns on asset obtained as a ratio profit after tax to total assets of the firm
4. ROE= Returns on equity derived as a ratio profit after tax to total equity of the firm
5. EE = Energy Efficiency, derived as Combined energy consume per annum (Figure 1)
6. WUE = water utilization efficiency, derived as Total water use (Figure 1)
7. GHGM = Greenhouse Gas Management, derived as Specific Greenhouse Gas Emission.

8.  $\beta_0$  is the intercept of the population regression line.
9.  $\epsilon$  is the error term

IV. RESULTS AND DISCUSSION

Regression results

Hypothesis one

**H0:** There is no significant relationship between energy efficiency and financial performance of Guinness Nigeria Plc.

**Table 1:** Regression Analysis showing the effect of energy efficiency on the Returns on Asset of Guinness Nigeria Plc

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.712	.200		-3.565	.016
	EE	.003	.001	.874	4.029	.010
a. Dependent Variable: ROA Source: SPSS 21 Output, 2019						

**Table 2:** Regression Analysis showing the effect of energy efficiency on the Returns on equity of Guinness Nigeria Plc

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	-1.635	.358		-4.561	.006
	EE	.007	.001	.918	5.184	.004
a. Dependent Variable: ROE						

Source: SPSS 21 Output, 2019

From the regression analysis, Table 1 indicates that there is a significant (p-value 0.010) and positive (t-statistics, 4.029) relationship between energy efficiency (EE) and the Return on Assets (ROA) of Guinness Nigeria Plc. This positive association implies that an increase in energy efficiency will tend to increase the rate of return on Assets, vice versa by 0.874. Based on this test, the energy efficiency (EE) has a significant positive with the Return on Assets of Guinness Nigeria Plc.

On the other hand, Table 2 also shows significant (p-value 0.004) and positive (t-statistics, 5.184) correlation between energy efficiency (EE) and the Return on Equity (ROE) of Guinness Nigeria Plc. This positive correlation indicates that an increase in energy efficiency will tend to increase the rate of return on Equity, vice versa by 0.918.

Based on this test, the energy efficiency (EE) has a significant positive association with the Return on Equity of Guinness Nigeria Plc.

In general; alternative hypothesis ( $H_1$ ) accepted since p-values (0.010 and 0.004) are less than a-value

(0.05) i.e, There is significant positive relationship between energy efficiency and financial performance of Guinness Nigeria Plc.

Hypothesis Two

**H0** There is no significant relationship between water utilization efficiency and financial performance of Guinness Nigeria Plc.



**Table 3:** Regression Analysis showing the effect of water utilization on the Returns on Asset of Guinness Nigeria Plc

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.178	.031		-5.762	.002
	WUE	.043	.005	.970	8.922	.000
a. Dependent Variable: ROA						
Source: SPSS 21 Output, 2019						

**Table 4:** Regression Analysis showing the effect of water utilization on the Returns on equity of Guinness Nigeria Plc

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	-.372	.068		-5.442	.003
	WUE	.095	.011	.970	8.870	.000
a. Dependent Variable: ROE						

Source: SPSS 21 Output, 2019

From the regression analysis Table 3 indicates that there is a significant (p-value 0.000) and positive (t-statistics, 8.922) relationship between water utilization efficiency (WUE) and the Return on Assets (ROA) of Guinness Nigeria Plc. This positive direction implies that an increase in water utilization will tend to increase the level of return on Assets, vice versa by 0.970. Based on this test, there is significant positive relationship between the water utilization efficiency (WUE) and the Return on Assets of Guinness Nigeria Plc.

In similar vein, Table 4 also shows significant (p-value 0.000) and positive (t-statistics, 8.870) association between water utilization efficiency (WUE) and the Return on Equity of Guinness Nigeria Plc. This positive association implies that an increase in water utilization efficiency (WUE)

will lead to increase in return on Equity, vice versa by 0.970. By this, the water utilization efficiency (WUE) has a significant positive association with the Return on Equity of Guinness Nigeria Plc.

In sum; alternative hypothesis ( $H_1$ ) also accepted since p-values (0.000 and 0.000) are less than a-value (0.05) i.e, there is a statistical significant and positive relationship between water utilization efficiency (WUE) and financial performance of Guinness Nigeria Plc.

#### Hypothesis Three

**H<sub>0</sub>** There is no significant relationship between greenhouse gas emission management and financial performance of Guinness Nigeria Plc

**Table 5:** Regression Analysis showing the effect of Greenhouse Gas emission management on the Returns on Asset of Guinness Nigeria Plc

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.543	.141		-3.854	.012
	GHGEM	.004	.001	.896	4.516	.006
a. Dependent Variable: ROA						

Source: SPSS 21 Output, 2019

**Table 6:** Regression Analysis showing the effect of Greenhouse Gas emission management on the Returns on Equity of Guinness Nigeria Plc

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	-1.209	.276		-4.378	.007
	GHGEM	.010	.002	.918	5.192	.003
a. Dependent Variable: ROE						

Source: SPSS 21 Output, 2019

The regression analysis Table 5 shows that there is a significant (p-value 0.006) and positive (t-statistics, 4.516) relationship between Greenhouse Gas (GHG) emission management and Return on Assets (ROA) of Guinness Nigeria Plc. This positive relationship implies that an increase in Greenhouse Gas emission management will tend to increase the level of return on Assets, vice versa by 0.896. Based on this test, the Greenhouse Gas (GHG) emission management has a positive significant relationship with the Return on Assets of Guinness Nigeria Plc.

Again, Table 6 also indicates a positive (t-statistics, 5.192) and significant (p-value 0.003) relationship between Greenhouse Gas (GHG) emission management and Return on

Equity (ROE) of Guinness Nigeria Plc. This positive relationship implies that an increase in Greenhouse Gas (GHG) emission management will lead to increase in return on Equity, vice versa by 0.918. As such; the Greenhouse Gas (GHG) emission management has a positive significant relationship with the Return on Equity of Guinness Nigeria Plc.

Summarily; alternative hypothesis (H<sub>1</sub>) also accepted since p-values (0.006, 0.003) are less than a-value (0.05) i.e, there is a statistical positive and significant relationship between the Greenhouse Gas (GHG) emission management and financial performance of Guinness Nigeria Plc

Table 7: Model summary of the Energy Efficiency (EE), water utilization efficiency (WUE) and Greenhouse Gas (GHG) emission management on Return on Assets (ROA)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.981	.962	.925	.01880	.962	25.591	3	3	.012	.855
a. Predictors: (Constant), GHGEM, WUE, EE										
b. Dependent Variable: ROA										

Source: SPSS 21 Output, 2019

From table 7, R<sup>2</sup> measures the percentage of Return on Assets (ROA) that could be explained by changes in independent variables, Energy Efficiency (EE), water utilization efficiency (WUE) and Greenhouse Gas (GHG) emission management. In this case, Adjusted R<sup>2</sup> is 0.925 (92.5%). This implies that about 92.5% of variation in return on asset could be explained by the effect of independent

variables, Energy Efficiency (EE), water utilization (WU) and Greenhouse Gas (GHG) emission management while about 7.5% could be attributed to other factors capable of effecting changes in return on assets of Guinness Nigeria Plc. Also, In this case, the Durbin-Watson statistic is 0.855. This indicates the absence of autocorrelation in the data series.

Table 8: Model summary of the Energy Efficiency (EE), water utilization efficiency (WUE) and Greenhouse Gas (GHG) emission management on Return on Equity (ROE)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
2	.973	.947	.895	.04894	.947	17.969	3	3	.020	1.431
a. Predictors: (Constant), GHGEM, WUE, EE										
b. Dependent Variable: ROE										

Source: SPSS 21 Output, 2019

From table 8, R<sup>2</sup> measures the percentage of Return on Equity (ROE) that could be explained by changes in independent variables, Energy Efficiency (EE), water utilization efficiency (WUE) and Greenhouse Gas (GHG) emission management. In this case, Adjusted R<sup>2</sup> is 0.895 (89.5%). This implies that about 89.5% of variation in return on asset could be explained by the effect of independent variables, Energy Efficiency (EE), water utilization (WU) and Greenhouse Gas (GHG) emission management while about 10.5% could be attributed to other factors capable of effecting changes in return on assets of Guinness Nigeria Plc. Also, In

this case, the Durbin-Watson statistic is 1.431. This indicates the absence of autocorrelation in the data series.

## V. FINDINGS, CONCLUSION AND RECOMMENDATIONS

### 5.1 Findings

The following findings were made concerning the relationship between corporate eco-efficiency and financial performance of Guinness Nigeria Plc:

- a. There is significant positive relationship between energy efficiency and financial performance of Guinness Nigeria Plc.
- b. There is a statistical significant and positive relationship between water utilization efficiency (WUE) and financial performance of Guinness Nigeria Plc.
- c. There is a statistical positive and significant relationship between the Greenhouse Gas (GHG) emission management and financial performance of Guinness Nigeria Plc.

### 5.2 Conclusion

This study tested three hypotheses. In the first hypothesis, it was established that there is statistical significant positive relationship between energy efficiency and financial performance of Guinness Nigeria Plc. This explains that the improved financial performance cannot be witnessed without significant contribution arising the efficiency in the use of combined energy in Guinness Nigeria Plc. This finding was in consonance with Agu, Udeh, Nwafor, & Okolo (2019) and Worrell, Galitsky and Martin (2014).

With the outcome of the test of the hypothesis two, it is not arguable that there exists a statistical significant and positive relationship between water utilization efficiency (WUE) and financial performance of Guinness Nigeria Plc. This justifies the enormous relevance of water utilization efficiency to improve financial performance of Guinness Nigeria Plc. This agrees with the research report of Agu, Udeh, Nwafor, & Okolo (2019).

Finally, hypothesis three affirms that there is a statistical positive and significant relationship between the Greenhouse Gas (GHG) emission management and financial performance of Guinness Nigeria Plc. This defines the indispensability of Greenhouse Gas (GHG) emission management in improving financial performance of Guinness Nigeria Plc. The finding was also in line with Agu, Udeh, Nwafor, & Okolo, (2019).

### 5.3 Recommendations

Based on the findings of this study, the researcher recommends that:

- a. The management of Brewers should improve energy efficiency by the use of gas-powered generators, economizers on its boilers and compressors..
- b. In term of water consumption efficiency, Brewers should consider the installation of water guns to reduce water flow rate, installation of flow meters for effective data capturing, monitoring & controls.
- c. The management of CO<sub>2</sub> emission in Brewery firms should accommodate among others; using less fossil fuel for energy and steam generation as well as increased application of solar-powered street lighting.

- d. The government should enforce the practice the legal structures on environmental concerns in all the companies in Nigeria.

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