European Journal of Business and Management www.iiste.org
ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online) DOI: 10.7176/EJBM
Vol.11, No.20, 2019

Empirical Study on the Effect of Corporate Eco-Efficiency on the Profitability of Nigerian Breweries Plc

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Abstract
The study is carried out to empirically examine the effect of corporate eco-efficiency on the profitability of Nigerian Breweries plc. An ex –post facto research design approach was adopted for the study. The population of this study comprises of all the firms in brewery industry in Nigeria. Using a panel data for the period of ten (10) years 2008 to 2017, Nigerian Breweries plc was chosen as sample based on the firms' position as a pioneer, largest brewing company and key player in the industry. Secondary data were obtained from the annual /sustainability reports of the company from 2008 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 effect of the corporate eco-efficiency on the profitability. 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. Consequent upon the findings, this study recommends among others; that the managers of Brewers should improve in the management of the combined energy usage by the installation of economizers in boiler chimneys and other modern gas-enabled burners.They should also embark on local or national imp-active water balancing Program and construction of wastewater treatment plant in its various branches across Nigeria. The management of Brewers should consider using less fossil fuel for energy and steam generation as well as increased application of solar-powered street lighting to reduce CO_2 emission.
Keywords: Eco-efficiency, Sustainability reporting, profitability, Nigerian Breweries plc
DOI: 10.7176/EJBM/11-20-01
Publication date:July 31st 2019

1.1 Introduction

Nigerian Breweries plc is one of the brewers that largely depend on water and energy for its operations. In spite of significant technological improvements over the years, energy consumption, water consumption, wastewater, solid waste and by-products and emissions to air pose major environmental challenges in the brewing firms. As such, many factors, such as environmental policies, possible scarcity of non-renewable sources, and problems related to the improper use of renewable raw materials, leads to the development of new processes that could generate less waste or reused those produced in order to add greater value to the residue through eco-efficiency strategies.

The term "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). Eco-efficiency generates more value through technology and process changes whilst reducing resource use and environmental impact throughout the product or service's life. 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).

The relevance of corporate eco-efficiency cannot be over-emphasized since the concept is seen as a key part-of the solution for sustainability and global development. As a matter of relevance, managers may be willing to adopt the eco-efficiency but worried that the bulk of costs associated with eco-efficiency are likely to outweigh the financial benefits, which makes the adoption and application of eco-efficiency inconsistent with the principles of shareholder's wealth maximization. As result of bulk financial burden, managers are left with no option than to

devise means to mitigate their firm's environmental impact (Delmas 2012).

Again, the implementation of eco-efficiency is not an easy task to many profit oriented organizations as lack of an effective and accurate assessment of environmental and product system-value, quantification, interpretation, reporting and critical review possibly amount to serious challenge to the management of Brewers. These aspects of business management require highly skilled technical staff and consequential commitment for the industries. They essentially demand significant portions of a company's resources, whereas their potential financial benefits are mostly visible in the distant future.

Empirically, there is an increased awareness on environmental issues and its effects globally but its empirical studies and evidence are still scanty in scholarly articles. Few of the researches (Basuki,2015;Agata, Clasadontea, Carlo & Francesco,2013;Worrell,Galitsky & Martin,2014; Antonio, Pérez-Gómez, Rosa-González,& Libertad,2014; Milad, Norlena & Nor,2011; Olajire,2012) on eco-efficiency were carried out in developed economies. In Africa, there is paucity of literature on eco-efficiency. Predicated on these, the study examines empirically the effect of corporate eco-efficiency on the profitability of Nigerian Breweries plc with special focus on the effects of energy efficiency, water utilization and CO_2 emission management on Return on Asset (ROA) and Return on Equity of Nigerian Breweries plc.

1.2 Objectives of the Study

The main objective of this study is to empirically examine the effect of corporate eco-efficiency on the profitability of Nigerian Breweries plc. However; the specific objectives are as follows:

i. To ascertain the effect of energy efficiency on the profitability of Nigerian Breweries plc.
ii. To determine the effect of water utilization efficiency on the profitability of Nigerian Breweries plc.
iii. To evaluate the effect of greenhouse gas emission management on the profitability of Nigerian Breweries plc

2.0 LITERATURE REVIEW

2.1.1 Corporate eco-efficiency

Corporate eco-efficiency suggests the sustainable development idea at a company level. To Agata, Maria, Carlo and Francesco (2013), eco-efficiency at this level is regard a part of sustainability development but does not include the third ethical dimension sustainable development, but only economy and ecology. Eco-efficiency is meant to reduce ecological effects by de-coupling resource use and environmental consequences leading to diminishing environmental impact (Mburu, Mandere & Gongera, 2016). Eco-efficiency philosophy came to the fore during the Rio Earth summit in 1992 as a business solution for a sustainable world. Emerging global phenomenon such as global warming, negative externalities, loss of diversity, diseases among others, have resulted into a coordinated global pressure to make countries to be more responsible to the environment. As part of the outcome of the summit, the World Business Council for Sustainable Development (WBCSD) defines eco-efficiency 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. It measures the entity's efficiency in the consumption of resource such water, energy etc in relation to the ability to produce economic value. Hansen & Mowen (2007) as cited by Basuki (2015) states that eco-efficiency increases efficiency by improving environmental performance through six stages, namely: a). Customer demand for cleaner products, b). Better employees and greater productivity, c). Lower cost of capital and lower insurance, d). Social benefits leading to improve image, e). Innovation and new opportunities, and f). Cost reduction and competitive advantage. They affirm that cost reduction and competitive advantage as the final goal, the company implemented eco-efficiency will be able to compete and have a competitive advantage because it has a lower cost compared with its competitors. To elaborate more on improving corporate eco-efficiency, The WBCSD as outlined in Basuki (2015) identified seven elements in which a business can improve its eco-efficiency: (1). Reduce material intensity; (2). Reduce energy intensity; (3). Reduce dispersion of toxic substances; (4). Enhance recyclability; (5). Maximize the use of renewable; (6). Extend product durability, and (7). Increase service intensity (Basuki,2015). By applying these seven elements, Firms can always maximize its efforts to achieving sustainable development.

By measurement, eco-efficiency is the ratio of the product or service value added, to the environmental influences generated by a firm. Corporate eco-efficiency is concerned with the management of environmental changes such as low carbon climate priorities, renewable energy systems, waste management and sustainable forest resource.

The environmental management system (EMS) provides the eco-efficient measures that enable industries to mitigate climate change. Committed firms to Environmental Management System are certified as they obtain an ISO 14001 certification. Nigerian Breweries plc is one of the companies that has developed EMS and obtained ISO 14001 certification (NBL Annual report and account, 2012). It practices eco-efficient management policies in all its operations with wholesome Compliance to all local legal requirements, international standards and Heineken

safety policies.

For the purpose of this study, corporate eco-efficiency has been measured by the efficiency in the use of energy, water and greenhouse gas emission management in Nigerian Breweries plc.

2.1.2 Energy Efficiency

Energy is a crucial and indispensible requirement for socio-economic development. It promotes economic growth. The energy system is oriented to provide energy services. Energy services are the desired and useful products, processes or indeed services that result from the use of energy, such as for lighting, provision of air-conditioned indoor climate, refrigerated storage, transportation, appropriate temperatures for cooking, industrial processes such as conversion of raw materials to final products. By definition, Abass (2012) has it this way; end-of pipe solutions can be expensive and inefficient while energy efficiency can often be an inexpensive opportunity to reduce criteria and other pollutant emissions. He added, Energy efficiency is achieved through the application of technology, such as insulation upgrades, compact fluorescent bulbs (CFLs), high-efficiency furnaces, and so forth (Abass, 2012). Ensuring efficient in process and production remains the key to realizing energy savings in a plant's operation. This begins with the collection or extraction of primary energy which is then converted into energy carriers suitable for various end-uses. These energy carriers are used in energy end-use technologies to provide the desired energy services. Energy efficiency is an important component of a company's environmental strategy geared towards reducing criteria and other pollutant emissions (Grossman, 2010; Jürgen, 2011). The methodology of the Green Brewery concept includes detailed energy balancing, calculation of minimal thermal energy demand, process optimization, heat integrations and finally the integration of renewable energy based on exegetic considerations (Muster- Slawitsch et al., 2011).

2.1.3 Water Utilization

Water is a very substantial ingredient of beer, composing of 90 to 95 percent of beer by mass (Abass, 2012).The relevance of water was not only limited to brewing firms; Sakalker, (2012) sees it as a prerequisite resource for organizations across the globe. The continued access to clean water is central to effective functioning and sustainability of businesses especially in the manufacturing sector. This is because the sector relies on water for operations or productions and utilized in almost every stage of the brewing process. Water consumption for modern breweries generally ranges from 0.4 to 1 m3/hL of beer produced (Hannover, 2002). The water consumption varies depending on the type of beer, the number of beer brands, the size of brews, the existence of a bottle washer, how the beer is packaged and pasteurized, the age of the installation, the system used for cleaning and the type of equipment used. The brewing industry is one of the largest industrial users of water. In spite of significant technological improvements over the years, water consumption, wastewater, among other environmental concerns remain major environmental challenges in the brewing firms.

2.1.4 Greenhouse gas

A greenhouse gas is any gas in the atmosphere which absorbs and re-emits heat, and thereby keeps the planet's atmosphere warmer than it otherwise would be (American Chemical Society,2019) .The main GHGs in the Earth's atmosphere are water vapour, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O) and ozone. GHGs occur naturally in the Earth's atmosphere, but human activities, such as the burning of fossil fuels, are increasing the levels of GHG's in the atmosphere, causing global warming and climate change. This study specifically concentrated carbon dioxide (CO2) aspect of the greenhouse gas.

2.1.5 Profitability

Profitability identifies the difference between the revenues realized from the same of output and the expenses associated with consumption of inputs. The ultimate objective of every firm is to maximize the firm's profitability as it's the determinant of the firm's bottom line. Profitability ratios are important measurement of a firm's overall efficiency and performance, the ratios are categorized into two indicators; margins and return. As a measure of margin, profitability ratios show the percentage expression of profit over the firm's turnover whereas the profitability ratios that show return represent the firm's ability to measure the overall efficiency of the firm in generating return for its shareholders. This study uses return on assets (ROA) and Return on Equity (ROE) to surrogate the profitability of Nigerian Breweries plc. The Return on Assets ratio is an important profitability ratio because it measures the efficiency with which the firm is managing its investment in assets and using them to generate profit. ROA is calculated as Net income /Total Assets expressed as a percentage. On the other hand, the Return on equity ratio is another proxy and an important measure to profitability because it measures the efficiency with which the firm is managing its equity in relation to profit generation. ROE is determined as Net income /Shareholder's equity expressed as a percentage.

2.1.6 Brief Eco-efficiency profile of Nigerian Breweries plc

Nigerian Breweries (NB) was incorporated in 1946. Its first bottle of beer, STAR Lager, rolled off the bottling lines of its Lagos brewery in June 1949. The beer maker which has over 6 decades history of operations in the Nigerian brewing space sustained the position of both the pioneer and largest brewing company in the country. A subsidiary of Heineken N.V, one of the top four Brewing giants in the world. Hence, Heineken's stake in NB is strategic to its business priorities of capturing opportunities in Africa and its growth drive into emerging economies

(EMs) with a 55% beer volume in EMs vs. 45% in developed markets (Equity research,2014).

In Nigerian Breweries plc, the improvement in the management of the combined energy was sustained by the installation of economizers in boiler chimneys and installation of several modern gas-enabled burners.

The efficiency in water consumption in this company was sustained through the water balancing programme project which its activities include provision of boreholes for communities, harvesting of rain water as well as the provision of green areas via beautification programmes to enhance water conservation to ensure sustainability. In this course, the brewer constructed and donated solar powered boreholes to communities in Kaduna and Ibadan in pursuance of the firm's water balancing Program. The Company constructed of a wastewater treatment plant in various branches across Nigeria. With the aid of wastewater treatment plant, the firm embarked on phased implementation of biogas re-use at its boilers. Consequent upon these implemented strategies, specific water consumption decreased by 12% from 5.0hl/hl in 2013 to 4.4 hl/hl in 2014. This is a 32% reduction compared with 2008, the baseline year. Water consumption continued reducing progressively through to 2017. Nigerian Breweries plc achieve this good progress in reducing water consumption through minimizing leakages, reducing waste, reusing treated wastewater for gardening, good housekeeping and in the toilets and more importantly training for colleagues in water scarce locations on how to develop a Source Water Protection Plan (NBplc Sustainability report,2017). The company also had a provision for supplementing water sourcing through harvesting rain water for non production purposes (Equity research, 2018).

The emphasis of Nigerian Breweries plc on achieving efficiency in the management of CO_2 emission was on using less fossil fuel for energy and steam generation as well as increased application of solar-powered street lighting. By this, the firm executed CO_2 emission reduction initiatives and used compressed natural gas to generate 30% of electricity used by the brewery in Enugu in place of LPFO/diesel (NBplc Sustainability report, 2017).

Figure1 depicted the progress Nigerian Breweries plc has recorded in becoming an eco efficient company consequent upon the adopted eco-efficiency strategies on the management of water, energy and Greenhouse gases. There is significant improvement eco-efficiency policy of this company since 2008 baseline year. Specifically within the period under review (2008 to 2017) energy use reduced by 63%, carbon dioxide emission fell by 70% and a significant reduction of total water utilized by 71%. In the same period, the after tax profit in increased by 28%.

	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_2eq/hl	N'000	N'000	N'000
2008	208.7	7.00	19.5	25,700,593	104,412,640	32,229,181
2009	207.1	6.80	20.4	27,910,091	106,987,883	46,570,094
2010	146.6	5.70	18.1	30,332118	114,389,432	50,172,162
2011	137.1	5.20	16.2	38,050,756	235,701,196	77,778,909
2012	152.5	5.62	16.6	38,042,714	253,633,629	93,447,892
2013	125.1	4.68	13.2	43,080,349	252,759,633	112,359,185
2014	111.9	4.42	12.2	42,520,253	349,229,163	171,882,830
2015	81.7	2.34	7.60	38,049,518	356,218,676	172,233,465
2016	80.1	2.13	6.90	28,396,777	367,146,468	165,805,542
2017	77.7	2.02	5.80	33,009,292	382,228,093	178,150,934

Figure1. Nigeria Breweries Plc eco-efficiency for the year 2008-2017
Source: NBPlc Sustainability reports from 2008-2017; Equity Research report, 2018.

2.2 Theoretical framework

This study is anchored on the stakeholder theory in order to explain the value creation of business entity on other stakeholders other than the shareholders. Stakeholder theory was championed by Lan Mitroff in his book "Stakeholders of the organizational mind" published in 1983 in San Francisco but popularized in 1984 by Edward Freeman. Freeman defines stakeholder as "any group or individual who can affect or is affected by the achievement of the organization's objectives". Stakeholders theory revolves on the fact that organizational survival and success is dependent on satisfying both its economic (profit maximization) and non-economic (corporate social performance) objectives by meeting the needs of the company's various stakeholders. This implies corporations have a social responsibility beyond making a profit. Friedman (2006) cited in Aondoakaa (2015) states that the organization itself should be thought of as grouping of stakeholders and the purpose of the organization should be to manage their interests, needs and viewpoints. Stakeholder theory is based on the entity's ability to prioritize and accommodate within its risk appetite the interests of the individuals and groups who will be affected by the

company's actions by identifying their legitimate claims on the business actions, the responsibilities and obligations they can justifiably impose on a particular company. The effectiveness of a company towards the management of these stakeholder's concerns explains how eco-effective and efficient the company is. Management should endeavour in its ecological friendliness to consider and engage not only shareholders, employees and clients, but also suppliers, public authorities, local community/nation and civil society in general, financial partners etc. in the future managerial decision making process and that serves as the pillar of a more comprehensive corporate strategy.

2.3 Empirical review

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 effect of corporate eco-efficiency on the financial performance of Nigerian Breweries plc.

3.0 METHODOLOGY

This study adopted ex-post facto research design, used time series data generated from the sustainability reports and annual reports & accounts of Nigerian Breweries (NB) plc which covered a period of ten (10) years (2008-2017) for panel analysis. The selection was based on the firms' position as a pioneer, largest brewing company and key player in the industry as put forward by Equity Research Report (2014). This paper concentrated on the sustainability reports and annual reports & accounts of NBplc over the years with special focus on data for energy efficiency (mj/hl), water utilization (hl/hl), Greenhouse Gases management (Kg CO_2eq/hl), Return on Asset and Return on Equity. Linear regression analysis was performed to analyze the relationship between corporate eco-efficiency and profitability of the firm. The model specified below estimates the relationship:

PROF = f (CE)……. (1)

ROA= β0 + β1EE + β2 WU + β3GHGM + ε ---------- (2)

ROE = β0 + β1EE + β2 WU + β3GHGM + ε ---------- (3)

Where:

1. PROF. =Profitability proxied by ROA & ROE.
2. CE = Corporate Eco-efficiency surrogated by EE, WU & 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. WU = water utilization, derived as Total water use (Figure 1)
7. GHGM = Greenhouse Gas Management, derived as Specific Greenhouse Gas Emission.
8. *β0* is the intercept of the population regression line.

9. ε is the error term

4.0 RESULTS AND DISCUSSION

Regression results

Hypothesis one

H0: There is no significant effect of energy efficiency on the profitability of Nigerian Breweries plc.

Table 1: Regression Analysis showing the effect of energy efficiency on the Returns on Asset of Nigerian Breweries plc.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.009	.034		-.256	.804
	EE	.001	.000	.885	5.381	.001

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 Nigerian Breweries plc.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.130	.081		-1.601	.148
	EE	.004	.001	.928	7.029	.000

a. Dependent Variable: ROE

Source: SPSS 21 Output, 2019

From the regression analysis, Table 1 indicates that there is a positive (t-statistics, 5.381) and significant (p-value 0.001) effect of energy efficiency (EE) on the Return on Assets (ROA) of Nigerian Breweries plc.This positive effect implies that an increase in energy efficiency will tend to increase the rate of return on Assets, vice versa by 0.885. Based on this test, the energy efficiency (EE) has a positive significant effect on the Return on Assets of Nigerian Breweries plc.

On the other hand, Table 2 also shows positive (t-statistics, 7.029) and significant (p-value 0.000) relationship between energy efficiency (EE) and the Return on Equity (ROE) of Nigerian Breweries plc. This positive effect implies that an increase in energy efficiency will tend to increase the rate of return on Equity, vice versa by 0.928. Based on this test, the energy efficiency (EE) has a positive significant effect on the Return on Equity of Nigerian Breweries plc.

In general; alternative hypothesis (H_1) accepted since p-values (0.001 and 0.000) are less than a-value (0.05) i.e, there is positive significant effect of energy efficiency on the profitability of Nigerian Breweries plc.

Hypothesis Two

There is no significant effect of water utilization efficiency on the profitability of Nigerian Breweries plc.

Table 3: Regression Analysis showing the effect of water utilization on the Returns on Asset of Nigerian Breweries plc.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.009	.030		.286	.782
	WU	.034	.006	.892	5.572	.001

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 Nigerian Breweries plc.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.066	.080		-.826	.433
	WU	.104	.016	.915	6.403	.000

a. Dependent Variable: ROE

Source: SPSS 21 Output, 2019

From the regression analysis Table 3 indicates that there is a positive (t-statistics, 5.572) and significant (p-

value 0.001) effect of water utilization (WU) on the Return on Assets (ROA) of Nigerian Breweries plc.This positive effect implies that an increase in water utilization will tend to increase the level of return on Assets, vice versa by 0.892. Based on this test, the water utilization (WU) has a positive significant effect on the Return on Assets of Nigerian Breweries plc.

In similar vein, Table 4 also shows positive (t-statistics, 6.403) and significant (p-value 0.000) effect of water utilization (WU) on the Return on Equity (ROE) of Nigerian Breweries plc. This positive effect implies that an increase in water utilization (WU) efficiency will lead to increase in return on Equity, vice versa by 0.915. By this, the water utilization (WU) efficiency has a positive significant effect on the Return on Equity of Nigerian Breweries plc.

In sum; alternative hypothesis (H_1) also accepted since p-values (0.001 and 0.000) are less than a-value (0.05) i.e, there is a statistical positive and significant effect of the water utilization (WU) efficiency on the profitability of Nigerian Breweries plc.

Hypothesis Three

There is no significant effect of Greenhouse Gas emission management on the profitability of Nigerian Breweries plc

Table 5: Regression Analysis showing the effect of Greenhouse Gas emission management on the Returns on Asset of Nigerian Breweries plc.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.001	.028		.021	.984
	GHGM	.012	.002	.913	6.333	.000

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 Nigerian Breweries plc

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.080	.081		-.988	.352
	GHGM	.036	.006	.917	6.493	.000

a. Dependent Variable: ROE

Source: SPSS 21 Output, 2019

The regression analysis Table 5 shows that there is a positive (t-statistics, 6.333) and significant (p-value 0.000) effect of Greenhouse Gas (GHG) emission management on the Return on Assets (ROA) of Nigerian Breweries plc.This positive effect implies that an increase in water utilization will tend to increase the level of return on Assets, vice versa by 0.913. Based on this test, the Greenhouse Gas (GHG) emission management has a positive significant effect on the Return on Assets of Nigerian Breweries plc.

Again, Table 6 also indicates a positive (t-statistics, 6.493) and significant (p-value 0.000) effect of Greenhouse Gas (GHG) emission management on the Return on Equity (ROE) of Nigerian Breweries plc. This positive effect implies that an increase in Greenhouse Gas (GHG) emission management will lead to increase in return on Equity, vice versa by 0.917.As such; the Greenhouse Gas (GHG) emission management has a positive significant effect on the Return on Equity of Nigerian Breweries plc.

Summarily; alternative hypothesis (H_1) also accepted since p-values (0.000) is less than a-value (0.05) i.e, there is a statistical positive and significant relationship between the Greenhouse Gas (GHG) emission management and the profitability of Nigerian Breweries plc.

Table 7: Model summary of the Energy Efficiency (EE), water utilization (WU) 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	.925[a]	.856	.785	.03288	.856	11.936	3	6	.006	2.473

a. Predictors: (Constant), GHGM, EE, WU

b. Dependent Variable: ROA

Source: SPSS 21 Output, 2019

From table 7, R^2 measures the percentage of Return on Assets (ROA) that could be explained by changes in independent variables, Energy Efficiency (EE), water utilization (WU) and Greenhouse Gas (GHG) emission

management. In this case, Adjusted R^2 is 0.785 (78.5%). This implies that about 78.5% 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 21.5% could be attributed to other factors capable of effecting changes in return on assets of Nigerian Breweries plc. Also, In this case, the Durbin-Watson statistic is 2.473. This indicates the absence of autocorrelation in the data series.

Table 8: Model summary of the Energy Efficiency (EE), water utilization (WU) 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	
1	.937[a]	.878	.817	.09029	.878	14.373	3	6	.004	2.802

a. Predictors: (Constant), GHGM, EE, WU
b. Dependent Variable: ROE

Source: SPSS 21 Output, 2019

From table 8, R^2 measures the percentage of Return on Equity (ROE) that could be explained by changes in independent variables, Energy Efficiency (EE), water utilization (WU) and Greenhouse Gas (GHG) emission management. In this case, Adjusted R^2 is 0.817 (81.7%). This implies that about 81.7% 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 18.3% could be attributed to other factors capable of effecting changes in return on assets of Nigerian Breweries plc. Also, In this case, the Durbin-Watson statistic is 2.802. This indicates the absence of autocorrelation in the data series.

5.0 Conclusion and Recommendations

5.1 Conclusion

This study considered three hypotheses. In the first hypothesis, it was established that there is statistical positive significant effect of energy efficiency on the profitability of Nigerian Breweries plc.This implies that the effective management of the brewers combined energy is central to the improved profit level of the brewery industry. The research outcome of Worrell, Galitsky and Martin (2014) was in consonance with this finding.

Again, it has also been affirmed that there is a statistical positive and significant relationship between the water utilization (WU) efficiency and the profitability of Nigerian Breweries plc.This implies that the efficiency of the brewer in the use of water significantly and positively influences the profitability of brewery firm.

Finally, this study reliably affirms that there exists a statistical positive and significant relationship between the Greenhouse Gas (GHG) emission management and the profitability of Nigerian Breweries plc.This therefore defines the indispensability of CO_2 emission management to increasing profit in Brewery industry.

5.2 Recommendations

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

a. The management Brewers should improve in the management of the combined energy usage by the installation of economizers in boiler chimneys and other modern gas-enabled burners.
b. The management of brewers should embark on local or national imp-active water balancing Program and construction of wastewater treatment plant in its various branches across Nigeria.
c. The management of CO_2 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 has to intensify further the implementation of energy, emission control and water efficiency programmes.

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