Environmental Reporting and Performance of Nigerian Listed Oil and Gas Firms

JAYEOLA OLABISI, ROTIMI WILLIAMS OLADIRAN, SOLOMON YINKA ARANSIOLA & DAMILOLA GLORIA ADENEKAN

Abstract

The study investigated the environmental reporting and performance of listed oil and gas firms in Nigeria. The study adopted an ex-post facto research design method using existing data from the financials of selected firms. The population of the study consisted of thirteen (13) listed firms as of 2021, out of which ten (10) were purposively selected based on the availability of annual reports and accounts. Secondary data were extracted and the results of the unit-roots test informed the adoption of Auto-Regressive Distributed Lag (ARDL) and Error Correction Techniques. The study found a positive and significant relationship between Environmental Management Cost (EMC) and ROCE ($p<0.05$), also a positive but insignificant relationship between Environmental Protection Cost (EPC) and ROCE ($p>0.05$). However, there was a negative and significant relationship between Environmental Research and Development Cost (ERDC) and ROCE ($p<0.05$). The study concluded that environmental accounting reporting contributed to the firms' performance of Nigerian listed oil and gas firms. Therefore, these firms should be cost-effective and efficient when planning environmental activities to improve firms' performance.

Keywords

environmental reporting, environmental management cost, environmental protection cost, environmental research and development cost, and return on capital employed

JEL Codes

F6, F64, Q5, Q56

DOI

http://dx.doi.org/10.37355/acta-2022/2-01

1 Introduction

The present business environment has increased industrial activities capable of causing massive damage to man and inanimate existence. Industrial actions have extensively affected the environment within which human existence is a vital part. Natural resources such as air, water, land, conservatory gases, climate, energy, ecosystems, and biodiversity among others are corrupted and environmental sustainability is endangered. The environment has contributed vastly to the continued survival of commercial activities which has necessitated the concept of environmental accounting as part of the reporting system. Accounting for the environment provides an accurate assessment of the costs and benefits of environmental conservation measures for companies (Schaltegger & Burritt,

2000). Environmental accounting is an inclusive aspect of sustainability accounting reporting, thus, generating reports that provide environmental information useful for decision-making by the internal users and stakeholders.

Yusuf, Samuel, and Ekundayo (2016), opined that companies are facing pressures to behave responsibly towards the host community. In responding to these pressures, companies disclose information about the environmental impact of their activities. In Nigeria, there is no specific accounting standard but rather guidelines issued by some organizations such as the Regulation Enforcement Agency Act of 2007 which mandates the presentation of environmental reports to ensure uniformity in reporting environmental issues. These guidelines are not mandatory but rather advisory, because most companies tend to disclose information just to conform to industrial practices and pressures from environmental advocates (Okafor 2018).

Environmental accounting disclosure may impact the business value of an organization, and improve financial performance. For instance, companies regarded as highly environmentally sensitive are involved in the operations and production of products that are not injurious to the environment. Such companies make efforts to dispose of waste products from operations far away from their operating environment. The production activities of the oil and gas sector have far reached visible environmental impacts, and this has adverse effects on the environment such as ecological emissions, damages, landscape destruction, and pollution.

The nonchalant attitudes of some firms in considering environmental accounting affect their performance adversely (Yusuf, et. al, 2016). This is because environmental accounting aids firms to account for all environmental costs incurred by the business to be cost-effective and improve performance. Pramanik, Shil, and Das (2007) submitted that specific issues regarding environmental reporting include: Identification of environmental cost and expenses, identification of environmental liabilities, and measurement of liabilities. Environmental management costs play a focal role in the financial performance of firms. The role of oil and gas firms in environmental sustainability has necessitated the need for a multidisciplinary approach to issues of environmental protection. Degradation, pollution, accelerated destruction of the ecosystem, and the depletion of non-renewable environmental biodiversity has adversely impacted the financial performance of firms. Investment in environmental research and development has brought about new ideas and innovations that have led to improved performance.

Various studies have revealed that most previous studies concentrated on developed countries and very few on developing countries such as Nigeria. Also, the majority of these studies have reported mixed results. Studies such as Falope, Offor, and Ofurum (2019); Okafor (2018); Oti and Mbu-Ogar (2018) found a positive relationship between environmental accounting and corporate performance while studies like those of Charles, John, and Umeoduagu (2017); Oraka and Egbumike (2016) found a negative relationship between environmental accounting and corporate performance. Hence, the inconsistency in previous findings calls for further investigation. The present study investigated the relationship between environmental reporting and the performance of listed Oil and Gas firms in Nigeria.

The following specific objectives are designed to:

i. assess the influence of environmental management costs on the performance of listed oil and gas firms in Nigeria;

ii. examine the relationship between environmental protection costs and performance of listed Oil and Gas firms in Nigeria; and

iii. evaluate the effect of environmental research and development costs on the performance of listed Oil and Gas firms in Nigeria.

Research Questions

The following research questions were designed to guide the study

i. To what extent does environmental management cost influence performance of listed oil and gas firms in Nigeria?

ii. What relationship exists between environmental protection costs and performance of listed Oil and Gas firms in Nigeria?

iii. What effect do environmental research and development costs have on performance of listed Oil and Gas firms in Nigeria?

Research Hypotheses

The following formulated research hypotheses were empirically tested

i. There is no significant influence of environmental management cost on performance of listed oil and gas firms in Nigeria

ii. There is no significant relationship between environmental protection costs and performance of listed Oil and Gas firms in Nigeria

iii. Environmental research and development costs do not have significant effect on performance of listed Oil and Gas firms in Nigeria

2 Literature Review

2. 1 Conceptual Review

Environmental Accounting is a structure that provides a collective framework for organizations to identify and account for past, present, and future environmental costs to support managerial decision-making. Environmental Accounting has been referred to in a variety of ways in literature namely: environmental management accounting,

corporate social accounting, social accounting, and social and environmental accounting (Cooper, Taylor, Smith, & Peterson, 2005). This, however, has not changed the meaning as all drive towards measuring environmental expenditure. The practice of environmental accounting helps to quantify the impacts of organizational activities on the host community. This does not involve only the expenses incurred but also the cost benefits generated within an accounting period.

Oil & Gas Industry in Nigeria

The Nigerian Oil and Gas industry has been vibrant since the discovery of crude oil in 1956 by the Shell Group (Oraka & Egbumike 2016). However, the sector was largely dominated by multinational corporations until the early 1990s when Nigerian companies began to make a foray into the industry. Local participation was boosted with the implementation of the Nigerian Content Directives issued by the Nigerian National Petroleum Corporation (NNPC) about a decade ago, and eventually, by the promulgation of the Nigerian Oil and Gas Industry Content Development (NOGIC) Act (The Act) in 2010. The Act seeks to promote the use of Nigerian companies' resources in the award of oil licences, contracts and projects. In terms of structure, the industry is broadly divided into upstream sector, downstream sector, and Services sector. The mid-stream operations are usually included in the downstream sector. However, a distinction is now being made between the two sectors. Mid-stream covers the processing, storage, marketing and transportation of crude oil, gas, gas-to Liquids and liquefied natural gas. The Upstream sector is characterized by exploration and production of crude oil and gas (petroleum operations. The upstream oil sector is the single most important sector in the economy, accounting for over 90% of the country's exports and about 80% of the Federal Government (FG's) revenue (Yusuf, et. al, 2016).

Environmental Accounting in Nigeria

The Federal Government on its part in trying to improve environmental disclosure by companies has formulated several environmental laws through the ministry of Environment and Natural Resources. These environmental laws are aimed at: restricting the release of a toxic substance into the environment; stipulating the requirement that industries and facilities generate waste must meet; requiring establishments to develop contingency plans for handling unusual and accidental discharge and developing strategies for waste reduction; making it mandatory for the establishment to install facilities capable of reducing or eliminating pollution arising from production activities and specifying the maximum limits of effluent parameter allowed to be discharged into the air, streams, rivers, drains, and ground. However, the problem with Nigeria is not the enactment of laws and regulations but the implementation of these laws and regulations.

Environmental Management Cost

Environmental management costs are costs spent to manage environmental preservation activities and indirectly contribute to reducing environmental impacts on business operations and also spend on external communications, such as disclosure of environmental information. These include the cost of implementing

an environmental management system; the cost of disclosing environmental information and environmental advertising; the cost of monitoring environmental impacts; the cost of training employees on environmental issues and the cost of environmental improvement activities. Environmental remediation cost is contingent costs allocated to the recovery of environmental degradation due to business activities. These are the cost of restoring the natural environment to its original state; the cost of covering degradation suits connected with environmental conservation and provisions or insurance fees to cover degradation to the environment.

Environmental Protection Costs

Environmental protection costs include the costs of preventing air pollution (including acid rain); cost of preventing water pollution; cost of preventing ground contamination; cost of preventing noise pollution; cost of preventing vibration pollution; cost of preventing odour pollution; cost of preventing ground linkage and cost of preventing other types of pollution. Global environmental conservation costs are those costs associated with negative environmental impacts on the global environment, resulting from human activities. Costs are allocated to prevent global warming, ozone depletion, and other global environmental conservation efforts. These costs include prevention of global warming and energy conservation; prevention of ozone depletion and other global environmental conservation activities.

Environmental Research and Development Cost

Environmental research and development cost is the amount of money spent on research and development activities to conserve the environment. It is the cost incurred by a firm to develop unique resources to enhance eco-innovation that leads to superior environmental reporting and financial performance. These include: Research and Development cost to develop products that improve environmental conservation; Research and Development costs to restrict environmental impact at the product manufacturing stage and other Research and Development costs associated with amelioration of environmental impact at the distribution stage or marketing stage of products.

Return on Capital Employed (ROCE)

The vital aspect of corporate performance involves the measure of profitability, market value, and growth potentials of a business. Hansen and Mowen (2005) confirmed that the performance of a business is indispensable to management for it shows the efficiency and effectiveness of outcomes achieved by people in an organization which relates to authority and responsibility in achieving the legitimate goal and conformity to moral and ethical practices of an organization. Benjalux (2006), performance measures are the essentials of economic units for the decision cannot be made without precise performance measurement. It is an important performance measure of economic units. Katja, (2009) submitted that financial performance measures are indicators used to evaluate the success of economic units to achieve business objectives. Return on capital employed is a profitability ratio that measures the efficiency of a company in utilizing its capital to generate profits. ROCE is stated as a proportion that reveals the industrial

performance within which a company operates. It shows the efficiency of management in the utilization of business assets. Therefore, this specifies the efficiency and profitability of a company's capital investment.

Theoretical Review

Stakeholders Theory

This study was guided by the Stakeholders theory propounded by Edward R. Freeman in 1984. The theory deals with organizational management and business ethics that addresses morals and values in managing an organization. The elementary position of stakeholders' theory is the affirmation of a firm's success in the effective management of the interrelationship between a firm and its stakeholders. The stakeholder theory was initially introduced by Stanford Research Institute (SRI). It refers to the groups that must support an organization and without which such an organization would go into extinction (Freeman 1983). In advancing the stakeholder theory, Freeman (1983) integrated the stakeholder's concept into two categories namely (i) a business planning and policy model, and (ii) a corporate social responsibility model.

The first model of stakeholder focuses analysis on developing and appraising the support of business strategic decisions by groups whose support is needed for the continuity of firms. The category of stakeholders identified in this model includes shareholders, customers, suppliers, and public groups. Though these groups are not opposed in nature, their possibly conflicting behavior is considered a factor in strategically reaching a firm's resources within the environment (Deegan & Gordon, 2006).

The second model concerns corporate planning and analysis that focuses on external influences that may be confrontational to the firm's objectives. These adversarial groups may include regulatory agencies, environmentalists, and/or special interest groups that are so much concerned with social issues (Guthrie & parker, 2000). This model permits managers and accountants to reflect on strategic plans adaptable to change in the social needs of the non-traditional category of stakeholders.

The stakeholders' theory suggested an improved level of environmental consciousness and reflection by the firm that brings about the necessity for firms to enlarge their corporate planning to combine the non-traditional stakeholders like the environmental regulatory or policy adversarial groups to adapt and take advantage of changing social and environmental demands. As pointed out by Bassey, Sunday, and Okon (2013), the major interest of stakeholders' theory as it relates to environmental accounting is to address the environment cost elements and valuation and its inclusion in financial reports.

Empirical Review

A significant number of studies exist in the extant literature that examined the effects of environmental accounting reporting on the corporate performance of oil and gas companies in developed countries, developing countries, and Nigeria. Some of these studies are discussed in turn.

Tadros and Magnan (2019) investigated how environmental performance plots into environmental disclosure. A look at underlying economic incentives and legitimacy aims. The study employed a sample of firms from environmentally sensitive industries over several years and aimed at re-examining the association between environmental disclosure and environmental performance in United State. A panel data analysis was adopted to examine how the interaction between environmental performance and economic and legitimacy factors influence firms' environmental disclosures. The results suggested that environmental performance moderated the effect of economic and legitimacy incentives on firms' propensity to provide proprietary environmental disclosure, with both sets of incentives being influential. More precisely, there appeared to be a reporting bias based on the firm's environmental performance whereas the high-performers disclose more environmental information in the three following vehicles: annual report, 10-K, and sustainability reports combined. Results also show that economic and legitimacy factors influence the disclosure decisions of the low and high environmental performers differently.

Zhenghui and Gaoke (2018) constructed a comprehensive Corporate Environmental Responsibility (CER) engagement measurement to examine the relationship between CER engagement and firm value and also explored the mediating effect of corporate innovation on this relationship based on a sample of 496 China's A-share listed companies from 2008 to 2016. The results showed that when firms start to adopt environmental regulations, CER would harm firm value; though, at a specific level, CER would start to improve firm value positively. More so, corporate innovation plays a mediating role in the relationship between CER and firm value. Corporate innovation encourages the firm value of firms with CER more than firms without CER. The study concluded that CER encouraged firms to enhance their sense of environmental responsibility to enhance their competitive advantages, enhance corporate innovation capabilities, and thus enhance firm value.

Cooray, Gunaratne, and Senaratne (2020) surveyed Sri Lanka and examined the effects of corporate governance on the quality of integrated reporting. This study was conducted by using panel multivariate linear regression to analyze the content of 132 public company annual reports over three years. The study revealed limited support for a corporate governance system to provide stakeholders with quality information about the process of creating value through integrated reporting, while the size of the board and the existence of an independent risk committee the board had a significant association with integrated reporting. In addition, it was argued that there was a greater emphasis on the corporate governance compliance requirements of Sri Lankan companies compared to voluntary reporting models such as integrated reporting.

Oti and Mbu-Ogar, (2018) investigated the impact of environmental and social disclosure on the financial performance of quoted oil and gas companies in Nigeria. The study extracted time series data over five years for analysis using the ordinary least square regression technique. The results of the statistical analysis showed that disclosure of employee health and safety and community development does not significantly affect financial performance while disclosure of waste management had a positive and significant effect on financial performance. The study suggested that oil and gas

companies should constantly review their waste management strategies and use bespoke technology to reduce their impact on the environment. Also, the study proposed that oil and gas companies should include employee health and safety as part of their mission and vision statement. Oil and Gas companies should also ensure sustainable development of the host communities to avoid hostility that can harm business operations.

Okafor (2018) ascertained the effect of environmental costs accounting and reporting on the firm financial performance of quoted Nigerian oil and gas companies. The study adopted regression analysis. The results of the statistical analysis indicated that better environmental reporting has a positive impact on firms' value. Moreover, environmental accounting provides the organization with an opportunity to reduce environmental and social costs to improve performance.

Nwaiwu and Oluka, (2018) investigated environmental cost disclosure and financial performance of oil and gas in Nigeria of listed oil and gas companies in Nigeria. The study adopted time series data extracted from annual financial reporting and economic reviews of the Central Bank of Nigeria. Pearson product-moment coefficient correlation and multiple linear regression analysis were used for analysis. The empirical results revealed a positive relationship between environmental costs and environmental regulatory compliance with financial performance. The study suggested regulatory enforcement for adequate environmental cost disclosure and proper reporting. The study recommended that oil and gas companies in Nigeria should create a well-articulated environmental costing system to ensure a conflict-free corporate atmosphere to improve corporate performance.

3 Methodology

The study adopted an ex-post facto research design using secondary data already in existence in the annual account and reports of selected listed oil and gas firms. This study adopted a quantitative longitudinal research design. The target population of this study was thirteen (13) oil and gas firms listed on Nigerian Stock Exchange as 2021. Out of the listed firms, ten firms were purposively selected based on the availability of relevant data in the annual reports and accounts. The data adopted were already in existence, cleaned, and stored. This data provided the study a unique, detailed picture of the population and provided access to levels of detail that would otherwise be extremely difficult (or impossible) for the researchers to collect through primary data. Using secondary data for this study made it possible to obtain data over larger intervals (10 years period). The data tend to be high-quality and in excellent shape because the datasets had already been validated and therefore required minimal checking. The data covered a period from 2010 to 2019 and were tested for stationarity using Levin, Lin, and the Chu. The results of the unit-roots test informed the use of Auto-Regressive Distributed Lag (ARDL) and Error Correction Techniques for analysis with the aid of Eviews 10.

3.1 Model Specification

This study was based on three measures of independent variables namely environmental management costs (EMC); environmental protection costs (EPC); and environmental research and development costs (ERDC).

A panel-ARDL long-run dynamic result was used to estimate the regression equation:

$Y = f(X)$

ROCE = f (EMC, EPC, ERDC) ……... (3.1)

Where

ROCE = Return on Capital Employed

EMC = Environmental Management Cost

EPC = Environmental Protection Cost

ERDC = Environmental Research and Development Cost

β0 = is the intercept,

β1, β2, β3 = parameters of explanatory variables of EMC, EPC, and ERDC

eit = error term at period t, i

$ROCEit = \beta0 + \beta1EMCit + \beta2EMCit\text{-}1 + \beta3EPCit + \beta4EPCit\text{-}1 + \beta5ERDCit + \beta6ERDCit\text{-}1 + eit$ ……(3.2)

Measurements and Description of Variables

Table 1: Study variables and their measurements

Variable	Abbreviations	Type	Measurement
Return on capital employed	ROCE	Dependent	Profit before tax x 100 Capital Employed 1
Environmental management costs	EMC	Independent	Log of Employee Training on environmental Management. Log of Environmental Remediation Cost.
Environmental protection costs	EPC	Independent	Log of Pollution control costs. Log of Global Environmental Conservation Cost.
Environmental research and development costs	ERDC	Independent	Log of Research and Development Expense. Log of New Product Research Initiatives.

Source: Researcher's Compilations (2021)

3.2 Rationale for the Metrics adopted for Dependent and Independent variables

The two variables of interest in this study are environmental reporting and financial performance. The independent variable (environmental reporting) is measure by Environmental Management Costs (EMC); Environmental Protection Costs (EPC); and Environmental Research and Development Costs (ERDC) while the proxy for dependent variable (Financial performance) is Return on Capital Employed (ROCE). Environmental Accounting is a concept that tries to recognize the side effects of production and consumption on the physical environment in recent times (Adediran & Atu, 2010). The effect is recognized in the financial statements of organizations. However, none of the regulatory agencies or statutes regulating these companies has made the disclosure of environmental activities of companies mandatory. Environmental protection cost is the amount of money incurred on the preservation, and defense, of natural resources. It includes pollution prevention costs and global environmental preservation costs. Pollution prevention costs are related to the reduction of a production facility's environmental impact or for end-of-pipe solutions, facilities, or equipment attached to the end-of-production facilities. Environmental Research and Development costs are costs incurred to develop unique resources and capabilities that increase its eco-innovation that improves environmental and financial performance. Such costs include costs incurred to develop products that contribute to environmental conservation; costs that curtail environmental impact at product manufacturing stage and costs associated with curtailing the environmental impact at the distribution stage or marketing stage of products manufactured. ROCE is a metric used by investors to evaluate and make an informed decision as to the suitability or otherwise of investing in a company (Hansen & Mowen 2005). It should be noted that a business making a high return on capital employed is a very profitable business (Benjalux 2006).

3.3 Method of Data Analysis

The data collected were analyzed using Auto-Regressive Distributed Lag (ARDL) and Error Correction Techniques. This study adopted panel data in that it simultaneously combines cross-sectional and time series data. Descriptive statistics was adopted and a normality test was undertaken. Data were analyzed using E-Views 9.0 software. This was presented using the long-run Panel-ARDL Dynamic Result. The output was interpreted and a conclusion was drawn based on the results of the panel-ARDL analysis.

4 Results and Interpretations

This section tested and analyzed the data elicited using the Statistical Analysis System (E-views 10). The results for different measures of environmental costs and performance of oil and gas companies including Return on Capital Employed (ROCE) as the dependent variable; environmental management costs (EMC), environmental protection costs (EPC),

and environmental research and development costs (ERDC) as the independent variables are presented below.

Table 2: Descriptive Statistics

	ROCE	LOGEMC	LOGEPC	LOGERDC
Mean	0.129629	17.27843	18.75936	18.30888
Maximum	2.658285	20.08525	21.70823	20.64964
Minimum	-1.841120	13.70458	17.18797	14.38366
Std. Dev.	0.479529	1.495784	1.132559	1.556906
Skewness	1.081805	-0.277105	0.750831	-0.784316
Kurtosis	16.34127	2.589965	2.790920	3.133975
Jarque-Bera	532.7892	1.386225	6.704548	7.229115
Probability	0.000000	0.500017	0.035005	0.026929
Observations	100	100	100	100

Source: Researcher's Computation with the aid of E-views 10

Table 2 showed the descriptive statistics of the model's variables. It showed the mean, maximum, minimum, standard deviation, skewness, kurtosis, and Jarque-bera of the dependent and independent variables. The mean value of the Return on Capital Employed was approximately 13%. This means that the return available to oil and gas companies on average during the period was 13%. The mean values of EMC, EPC, and ERDC were ₦17.28million, ₦18.76million, and ₦18.31million respectively. This is the average amount spent on environmental costs by oil and gas companies in Nigeria. The maximum value of Return on Capital Employed was 265.8% which indicates that the performance level during the period was high. The maximum values of EMC, EPC, and ERDC were ₦20.09million, ₦21.71million, and ₦20.65million respectively. The minimum value for the Return on Capital Employed was -184.1% which indicated a loss in the return available to the company. The minimum values of EMC, EPC, and ERDC were ₦13.70million, ₦17.19million, and ₦14.38million respectively. The standard deviation value showed the dispersion of the data series i.e., the lower the values, the lower the deviations of the series from the mean, and the higher the values, the higher the deviation of the series from its mean. The standard deviation values of ROCE, EMC, EPC, and ERDC were 47.95%, ₦1.50million, ₦1.13million, and ₦1.56million respectively. The variable with the higher degree of dispersion from the mean was ERDC with a value of ₦1.56million.

Skewness measures the degree of asymmetry of the series. It is an indication of normality in the distribution of the series with a threshold of 0. The result, if greater than 0 is defined as positively skewed or skewed to the right while if less than 0 is defined as negatively skewed or skewed to the left. The skewness values of the variables were; ROCE (1.081805), EMC (-0.277105), EPC (0.750831) and ERDC (-0.784316). From Table 2, ROCE and EPC are greater than 0, this means that they are rightly and positively skewed indicating that these data are to the left of the mean value of all the variables while EMC and ERDC are lesser than 0, and this means that they are skewed to the left and negatively skewed.

Kurtosis is used to measure the peakedness or flatness of a probability distribution of a real-valued random variable. It is used to determine whether the variable is mesokurtic, platykurtic, or leptokurtic. Hence, if a variable is less than 3, such variable is platykurtic; if a variable is greater than 3, such variable is leptokurtic and if a variable is equal to 3, the such variable is mesokurtic. The kurtosis values were; ROCE (16.34127), EMC (2.589965), EPC (2.790920), and ERDC (3.133975). It can be deduced that ROCE and ERDC have a kurtosis value that is greater than 3, therefore they are said to be leptokurtic while EMC and EPC have a kurtosis value that is lesser than 3, therefore they are said to be platykurtic.

Jarque-Bera statistics combines skewness and kurtosis properties; it provides more comprehensive information about the normality of the variable. The null hypothesis is that the variable is normally distributed while the alternate hypothesis is that the variable is not normally distributed. At a 5% level of significance, ROCE, EPC, and ERDC have a p-value lesser than the 5% level of significance while EMC has a p-value greater than the 5% level of significance. Therefore, ROCE, EPC, and ERDC are not normally distributed while EMC is normally distributed.

Unit Root Test

The study tested for the absence of Unit Root to ensure that series exhibit stationarity so that the results do not yield spurious and misleading results. This is done to ascertain whether its properties of mean, variance, and auto covariance are constant over time. If these properties are time-variant, the series is said to be non-stationary and thus follow a unit root process otherwise, it is stationary and does not follow a unit root process. Hence, this study subjected each of the series in the model to Levin, Lin & Chu unit root test. The null hypothesis states that the series contains a unit root. However, the alternate hypothesis states otherwise.

Table 3: Levin, Lin & Chu t* Unit Root Test

Variables	**Level**			Order of integration **I (d)**
	None	**Intercept**	**Intercept & Trend**	
ROCE	-4.706***	-14.018***	-8.830***	I (0)
EMC	-1.087	-0.951	-0.861	I (1)
EPC	-1.621**	-1.341*	0.067	I (0)
ERDC	-0.451	-0.604	-1.710	I (1)

*, **, *** represent significance levels at 10%, 5%, and 1% respectively.

Source: Researcher's Computation with the aid of E-views 10

From the Levin, Lin & Chu t* results, it is observed that variables used in this model have different order of stationarity i.e. I (0) and I (1) considering all test options (None, intercept, intercept & trend). The last column titled "I (d)" in the table above concluded with the order of integration of the variables. Conclusively, variables are integrated at different order i.e. I (0) stationary at the level and I (1) stationary at first difference.

Table 4: Optimal Lag length structure for the Variables

Lag	Log L	LR	EPE	AIC	SC	HQ
0	-348.7792	NA	0.858852	11.19934	11.33541	11.25286
1	-224.5205	228.7938*	0.027664*	7.762554*	8.442914*	8.030143*

** Indicates lag order selected by the criterion*

LR: sequential modified LR test statistic (each test at 5% level)

Source: Researcher's Computation with the aid of E-views 10

In table 4, LR, FPE, AIC, SC, and HQ selected 1 as the optimal lag length for the variables. The study followed the criterion of AIC and therefore used 1 as the optimal lag length in the proposed ARDL equation.

Table 5: Kao Residual Co-integration Test

	t- statistic	***Prob.***
ADF	-1.923079	0.0272
Residual variance	0.285578	
HAC variance	0.144067	

Source: Researcher's Computation with the aid of E-views 10

The Kao Co-integration test result from the table showed that the computed probability value from the ADF equation is not up to the chosen level of significance (0.0272 < 0.05) which signifies that we fail to accept the null hypothesis and conclude that there is a presence of a co-integrating relationship between the panel data variables. This implies that there is a long-run relationship among the variables.

Estimation Analysis

To examine the effect of environmental accounting and reporting on corporate performance of listed Oil and Gas companies in Nigeria, and to test the formulated hypotheses, Pooled Mean Group/AR Distributed Lag models were adopted.

Table 6: Long-run Panel-ARDL Result (Dependent Variable: ROCE)

Variables	Coefficient Long Run Equation	Std. Error	t-statics	Prob.*
Log EMC	0.113195	0.018207	6.217069	0.0000***
Log EPC	0.011746	0.036691	0.320137	0.7509
Log ERDC	-0.132238	0.015974	-8.278421	0.0000***
COINTEQ01	-0.750297	0.227985	-3.290989	0.0024

*, **, *** indicate significance at 10%, 5% and 1% critical level respectively

Source: Researcher's Computation with the aid of E-views 10

The result presented in table 6 showed the long-run estimation and was used to test the significance of the hypotheses in the research study. Only EMC and ERDC, in the long run, were significant at a 5% level. Environmental management cost (EMC) had a positive impact on return on capital employed (ROCE). A percentage increase in EMC increased ROCE by 11.32%. Environmental research and development cost (ERDC) had a negative impact on return on capital employed (ROCE). A percentage change in ERDC causes a -13.22% change in ROCE. Environmental Protection cost (EPC) had a positive effect on Return on capital employed (ROCE) but is not significant at the chosen level of significance of 5%.

Consequently, to adjust for variations from the equilibrium long-run relationship due to short-run systemic shocks, the Error Correction Model (ECM) was considered. The ECM estimation results (COINTEQ01) in table 6 revealed that the independent variables jointly account for approximately 75.03% changes in Return on Capital Employed which is the dependent variable. Therefore, a 75.03% adjustment is required to attain the equilibrium long-run relationship.

Table 7: Long run Panel-ARDL Result (Dependent Variable: ROCE)

Variables	Coefficient Long Run Equation	Std. Error	t-statics	Prob.*
Log EMC	0.113195	0.018207	6.217069	0.0000 ***
Log EPC	0.011746	0.036691	0.320137	0.7509
Log ERDC	-0.132238	0.015974	-8.278421	0.0000 ***

*, **, *** indicate significance at 10%, 5% and 1% critical level respectively

Source: Researcher's Computation with the aid of E-views 10

The result presented in table 7 showed the long-run estimation used to test for the significance of the hypotheses in the research study. Only Environmental Management Cost (EMC) and Environmental Research and Development Cost (ERDC) in the long run were significant at a 5% level of significance while Environmental Protection Cost (EPC) was not significant. Environmental management cost (EMC) had a positive and significant impact on Return on Capital Employed (ROCE). A percentage increase in EMC led to an increase in ROCE by 11.32%. Environmental Research and Development Cost (ERDC) had a negative and significant impact effect on Return on Capital Employed (ROCE). A percentage change in ERDC causes a -13.22% change in ROCE.

Environmental Protection Cost (EPC) had a positive and significant effect on Return on Capital Employed (ROCE).

5 Discussion of Findings

The results of the analysis revealed a positive and significant relationship between Environmental Management Costs and Return on Capital Employed by listed Oil and Gas firms in Nigeria. This implied that a unit increase in EMC brings about a unit increase in ROCE. This result is in line with the study of Zhenghui and Gaoke (2018) who found that corporate environmental reporting has a negative effect on firm value; though, at a specific level, corporate environmental reporting would start to improve firm value positively and have a significant effect on firms' value. There also existed a positive and insignificant relationship between Environmental Protection Costs and Return on Capital Employed by listed oil and gas companies in Nigeria. This means that a unit increase in EPC would bring about an increase in ROCE. However, EPC has not contributed significantly to ROCE. This is in contrast with Falope, Offor, and Ofurum (2019) that found that environmental protection cost has a significant effect on a firm's corporate performance. From the result, there is a negative and significant relationship between Environmental Research and Development Costs and the Return on Capital Employed of listed Oil and Gas companies in Nigeria. This indicated a unit increase in ERDC would bring about a unit decrease in ROCE. This is in contrast with Okafor (2018) that concluded that spending on issues that concerns the environment boosts the performance of quoted Oil and Gas companies in Nigeria.

Conclusion and Recommendations

The study concluded that environmental management cost and environmental protection cost positively influenced firms' performance. Though, only environmental management costs and environmental research and development cost have contributed significantly to firm performance. Management manipulates these costs not to disappoint shareholders waiting to receive higher returns on their investments at the end of each accounting period. The study found an association between environmental reporting indicators and corporate performance indicators which suggested that not all environmental costs contributed to the corporate performance of Oil and Gas companies in Nigeria. Based on the findings, the study recommended that Oil & Gas firms should reduce their spending on environmental research and development cost or be cost-effective in other to increase firms' return on capital employed. Furthermore, Oil and Gas firms in Nigeria should be made to develop an elaborate accounting policy relating to business environment. The disclosure should be sufficiently made in annual reports or in a separate document to disclose the effect of environmental activities. The entity's environmental reporting should fully disclose the organization's efforts at protecting environmental and associated benefits as part of corporate social responsibility performance.

References

ADEDIRAN, S. A. and O. K. ATU (2010). Corporate Environmental Responsibility as a means of alleviating Niger Delta Crises. *Academic Scholarship Journal,* 2(1), 567–579.

BASSEY, E. B., O. E. SUNDAY and E. E. OKON (2013). The Impact of Environmental Accounting and Reporting on Organizational Performance of Selected Oil and Gas Companies in Niger Delta Region of Nigeria. *Research Journal of Finance and Accounting,* 4(3), 123–134.

BENJALUX, S. J. (2006). *An Empirical Study into factors influencing the use of value-based management tools, Ph.D.,* Thesis. Southern Cross University.

COOPER, C., P. TAYLOR, N. SMITH and L. CATCHPOWLE (2005). A discussion of the political potential of social accounting. *Critical Perspectives on Accounting,* 16(7), 951–974.

COORAY, A. D., N. GUNARATHNE and S. SENARATNE (2020). Does corporate governance affect the quality of integrated reporting? *Sustainability* 2020, 12, 4262; doi:10.3390/su12104262. www.mdpi.com/journal/sustainability

DEEGAN, C. and B. GORDON (2006). A study of the environmental disclosure practices of Australian corporations. *Accounting and Business Research,* 26 (3), 187–199.

FALOPE, F. J. and N. T. OFFOR (2019). Environmental Cost Disclosure and Corporate Performance of Quoted Construction Firms in Nigeria. *International Journal of Advanced Academic Research,* 5(8), 17–31.

FREEMAN, A. B. (1983). Toward an epistemology for radical accounting: Beyond objectivism and relativism. *Critical Perspectives on Accounting,* 6(1), 485–496.

GUTHRIE, J. and L. PARKER (2000). Corporate social disclosure practice: A comparative international analysis. *Advances in Public Interest Accounting,* 3(1), 159–175.

HANSEN, D. R. and M. M. MOWEN (2005). Environmental cost management. *Management Accounting,* 7, 490–526.

KATJA, L. (2009). *Assessing the resource usage decisions and financial performance in Finnish sawmills within the resource-based view framework.* Faculty of Forest Sciences, University of Joensuu, Finland.

NWAIWU, N. J. and N. O. OLUKA (2018). Environmental cost disclosure and financial performance of oil and gas in Nigeria. *International Journal of Advanced Academic Research,* 4(2), 1–23.

OKAFOR, T. G. (2018). Environmental Costs Accounting and Reporting on Firm Financial Performance: A survey of Quoted Nigerian Oil Companies. *International Journal of Finance and Accounting,* 7(1), 1–6.

OKAFOR, R. G., G. OTI and S. A. MBU-OGAR (2018). Corporate board characteristics and environmental disclosure quality: Evidence from South Africa (integrated Reporting) and Nigeria (Traditional Reporting). *Cogent Business & Management* (2018), 5: 1551510. https//doi.org/10.1080/23311975.2018.1551510

ORAKA, A. O. and F. C. EGBUMIKE (2016). Appraisal of Environmental Accounting Information in the Financial Statements of Consumer Goods Manufacturing Companies in Nigeria. *NG-Journal of Social Development,* 5(5), 6–24.

OTI, P. A. and G. B. MBU-OGAR (2018). Analysis of Environmental Performance of Selected Quoted Oil and Gas Companies in Nigeria. *Journal of Accounting and Financial Management,* 4(2), 1–12.

PRAMANIK, A. K., O. H. SHIL and A. B. DAS (2007). *Environmental accounting and reporting.* New Delhi: Deep publication PVT. Ltd.

SCHALTEGGER, S. and R. BURRITT (2000). *Contemporary Environmental Accounting.* Sheffield, UK: Greenleaf Publishing.

TADROS, H. and M. MAGNAN (2019). How does environmental performance map into environmental disclosure? A look at underlying economic incentives and legitimacy aims. *Sustainability Accounting, Management and Policy Journal,* 10(1), 62–96.

YUSUF, I., J. SAMUEL and O. EKUNDAYO (2016). The extent of Environmental Disclosures in Listed Oil and Gas Companies in Nigeria. *Proceedings of Nigeria's Economic Development Conference,* 1–17.

ZHENGHUI, L. and L. GAOKE (2018). Does corporate environmental responsibility engagement affect firms' value? The mediating role of corporate innovation. *Sustainability Accounting, Management and Policy Journal,* 29(3), 1045–1055.

Contact address

Jayeola Olabisi (Associate Professor)
Department of Accounting, Federal University of Agriculture
Abeokuta, Nigeria
(olabisij@funaab.edu.ng. ORCID iD: https://orcid.org/0000-0002-5390-0307)

Rotimi Williams Oladiran, Ph.D.
Department of Accounting & Finance, Crawford University
Ogun State, Nigeria
(oladiran_rotimi@yahoo.com. ORCID iD:https://orcid.org/0000-0001-5962-3737)

Solomon Yinka Aransiola, M.Sc.
Department of Accounting & Finance, Crawford University
Ogun State, Nigeria
(aransiola.solomon1@gmail.com. ORCID iD: https:/ /orcid.org/0000-0003-2229-5009)

Damilola Gloria Adenekan, B.Sc.
Department of Accounting, Federal University of Agriculture
Abeokuta, Nigeria
(damy4realuk@yahoo.com)