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## Article

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## The Effect of Environmental Taxes on Environmental Accounting Disclosure of Nigerian Oil and Gas Companies

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### ABSTRACT

There is currently a lack of information about the contemporary and potential effects of environmental taxes on environmental accounting disclosure (EAD). This study, therefore, explores environmental taxes' impact on Nigerian oil and gas companies' disclosure of environmental accounting information. The study used auxiliary data by generating information on the outcome variable and the explanatory variable from the "Organization for Economic Cooperation and Development" (OECD) and yearly reports of the oil and gas corporations in Nigeria. The analysis included thirteen (13) companies as of December 31, 2021. Fixed-effects regression using Estimation using Driscoll and Kraay standard errors (DKSE) has been used in this study. The study revealed that an increase in total green taxes or transportation taxes will stimulate the disclosure of environmental accounting information by the oil and gas corporations in Nigeria. It is also documented that oil and gas companies that have high C2 intensity are less likely to disclose environmental accounting information. The study findings will be useful to the regulators and policymakers in Nigeria. This is because if the government enhances environmental taxes, it may inspire companies to enhance their environmental accounting procedures.

**Keywords:** Environmental Taxes, Environmental Accounting Disclosure, Carbon Intensity, Transportation Taxes

**JEL Classifications:** Q51, Q56, Q58

### 1. INTRODUCTION

Governments of many low-income countries are becoming increasingly interested in the potential role that environmental taxes could play in domestic revenue mobilization and environmental sustainability, but there is currently a lack of knowledge about the potential and effects of current taxes as well as the main administrative, technological, and political obstacles to their effective implementation, particularly in Africa. The rising relevance of environmental sustainability in today's society is reflected in the growing concern for EAD. It is a movement that pushes firms to move toward a more sustainable future and to

be more open about their environmental effects. EAD portrays the act of providing stakeholders with environmental accounting information as a responsibility to uphold environmental values (Chika, 2023). It is a crucial component of corporate social responsibility and enables decision-making among stakeholders. Furthermore, environmental reporting is becoming more important to governments and regulatory entities. To make sure that companies are responsible for their environmental effect, they are putting in place stronger rules and norms. Reporting on greenhouse gas emissions, water use, waste management, and other pertinent indicators are all part of this. For a number of reasons, companies are realizing more that they must report their environmental

accounting information. First, consumers and investors are becoming more conscious of the value of environmental sustainability. People are demanding greater openness as they become more aware of the effects that corporations have on the environment. Therefore, in order to provide the critical application of EAD in social, financial, and environmental development and to give an appropriate overview of the crucial issues and issues that need to be addressed, it is necessary to understand the factors that can affect the current and future status of EAD.

Recent best practices and literature have shown that environmental taxes sometimes called green taxes can have a favorable impact on the disclosure of environmental accounting (Liu et al., 2015; Zhang et al., 2021; Zhu et al., 2020). This is because governments encourage firms to be more open about their environmental effect by levying taxes on actions that hurt the environment. As corporations work to establish their dedication to sustainability and lower their tax liabilities, this may result in better disclosure standards. Environmental taxes may ultimately encourage companies to record their environmental performance truthfully, promoting increased responsibility and openness in environmental accounting (Liu et al., 2015; Zhang et al., 2021).

Oil and gas firms in Nigeria are becoming increasingly concerned about EAD (Ja'afar et al., 2021). Although the oil sector is important to Nigeria's economy, it also has a great impact on the environment. As a result, stakeholders are calling for greater responsibility and transparency from these companies in relation to their environmental activities. To address this issue, the Nigerian government has implemented rules and recommendations for environmental reporting in the oil and gas industry (Moses et al., 2019). For instance, the Department of Petroleum Resources (DPR) mandates that companies present yearly environmental reports outlining their environmental performance and adherence to environmental regulations. To achieve uniformity and comparability in environmental reporting across firms, standardized frameworks and criteria are required. Although efforts are being made to create these frameworks, more work has to be done in order to create a system that is reliable and widely used (Moses et al., 2019).

Therefore, it is expected that how oil and gas companies report their environmental accounting may be intensely impacted by environmental levies. These levies are designed to discourage behaviors that harm the environment and promote the use of more environmentally friendly corporate practices. Governments, for instance, charge carbon emissions in an effort to reduce greenhouse gas emissions and boost cleaner energy sources. Environmental taxes can also affect how the general public and investors feel about oil and gas companies (Mpofu, 2021; Shen and Li, 2019). Investors and stakeholders place a growing emphasis on environmental responsibility, and businesses that properly and thoroughly report their environmental effects may be given more favorable consideration. Increased investor confidence, easier access to cash, and a better reputation for oil and gas companies are all possible results of this. Overall, by offering financial incentives, enhancing public perception, and meeting investor expectations, green taxes might encourage oil and gas companies to improve

their EAD. Therefore, this study aimed to examine the potential influence of environmental taxes on EAD in Nigeria. It is crucial to comprehend this link for a number of reasons. It will help in determining how successful environmental taxes are as a tool for advancing environmental sustainability. Environmental taxes may be having a beneficial effect on behavior change if companies are more willing to report their environmental impact and implement sustainable practices as a result. Analyzing how environmental taxes affect EAD can reveal information about how compliant and transparent organizations are. Finally, there is currently a lack of knowledge about the potential and effects of current taxes as well as the primary administrative, technological, and political barriers to their effective implementation, particularly in Africa. Governments of many low-income countries are becoming more interested in the potential role that environmental taxes could play in domestic revenue mobilization and environmental sustainability. The study's conclusions will be helpful to Nigeria's regulators and policymakers as it might assist in identifying the efficacy of environmental regulations, the level of corporate accountability, and the progression towards reaching environmental sustainability goals.

The next sections of this paper deal with the literature, methodology results and interpretations, and finally conclusion and policy recommendations.

## 2. LITERATURE REVIEW

Environmental taxes consist of different components such as carbon taxes, transportation, resource taxes and energy taxes. Past literature for instance, Zhu et al. (2020) studied the link between carbon tax and EAD in China's power companies, the result of the analysis shows that carbon tax is significantly increasing EADs. Lin and Yang (2023) studied the influence of carbon tax and EAD using primary data collected from 2801 college students, which was analyzed using a multinomial logit model and found that carbon tax impacted significantly on EADs. Wang and He (2022) in China using provincial panel data for the period of 2008 – 2018, and the results of the analysis reveal a substantial impact of the carbon tax on EADs. Lin and Xu (2019) explored the impact of carbon tax on EADs in China. They found a negative significant impact of carbon tax on EADs. The study of Yan Wang and Yu (2021) on the influence of air pollution tax on EAD in China reveals an insignificant effect of air pollution tax on EAD. Zhang et al. (2021) examined the effect of carbon tax on EAD of both upstream and downstream manufacturing firms in China, the result of the analysis shows a positive relationship between carbon tax and EAD. (Liu et al., 2015) studied the influence of carbon tax and EAD of 201 companies in China using a modeling analysis method, and found a positive significant relationship between the carbon tax and EAD. Similarly, Zhao et al. (2019) investigated the influence of carbon tax on EAD from the real option theory perspective, and found carbon taxes can improve EAD. Fang et al. (2017) studied the impact of carbon tax on EAD using a genetic algorithm back propagation neural network as a tool of analysis, and the result reveals that carbon taxes improves EAD. In addition, Murray and Rivers (2015) examined the relationship between carbon tax in British using empirical and simulation

models, and the result shows that carbon taxes improves EAD. Wesseh and Lin (2018) explored the influence of carbon tax on EAD of manufacturing and power generating companies in China, the findings revealed that carbon tax reduced the EAD. Further, Song et al. (2021) examined the green tax and EAD of energy companies in China using provincial data from 2007 to 2017. Data envelopment analysis and spatial econometric model was used in analyzing the data, the result shows that green tax decreases EAD.

In addition, Shakkour et al. (2018) investigated the impact of green tax on EAD using the descriptive method of analysis as a technique of data analysis, and found that green tax is significantly increasing EAD. Luo and Tang, (2014) studied the relationship between carbon tax and EAD using 48 firms as a sample in Australia, the result reveals a negative relationship between carbon tax and EAD. Saraswati (2020) examined the effect of the carbon tax on EAD in Indonesia, the findings revealed that carbon tax can improve EAD. Freedman et al. (2012) studied the relationship between carbon tax and EAD in the UK and found that carbon tax improved EAD. Moreover, Pillay and Buys (2014) investigated the impact of the carbon tax on EAD of motor vehicle manufacturing firms in South Africa, and the findings indicate that carbon tax does not improve EAD. (Xu) studied the influence of carbon tax on EAD of 29 listed iron and steel industries in China from 2016 to 2020, and found that carbon tax does not significantly improve EAD. Stagliano (2017) examined the effect of carbon tax on EAD of companies in Spain from 2011 to 2012, the findings showing that carbon tax is significantly improving EAD. McLaughlin et al. (2019) examined the relationship between carbon tax and EAD in Scotland in 2018, the result reveals a positive significant impact of carbon tax on EAD.

Besides, Gupta (2016) collected primary data in India which was analyzed using probit and tobit regression as a tool of analysis, and found that carbon tax is significantly improved EAD. Hájek et al. (2019) collected secondary data in Sweden, Finland, Denmark, Ireland, and Slovenia which was analyzed using panel multiple regression, and found that carbon tax is significantly improving EAD. Yasmeeen et al. (2023) collected secondary data in different countries of the world and analyzed using multiple regression as a technique of analysis, the result reveals a positive significant impact of green tax on EAD. Ofori et al. (2023) in their study, used secondary data from emerging economies from 2000 to 2020, which was analyzed using multiple regression and found that green taxes were significantly reducing EAD. Furthermore, Alola et al. (2023) used secondary data from France, Germany, Italy, and Spain from 1995 to 2020, which was analyzed using the method of moment quantile regression as a tool of analysis, and found that green levies were significantly increasing EAD. In a study by Abbas et al. (2023) secondary data was collected from 50 energy firms in China from 2012 to 2021 and found that green taxes have a substantial impact on EAD. Kiss and Popovics (2021) studied the influence of carbon tax on EAD in 2005 using some selected countries as the domain of the study, and found that carbon tax policies improved EAD significantly. Finally, Barragán-Beaud et al. (2018) collected secondary data from the Mexican electricity sector as a domain of the study and analyzed using model-based scenarios, and found that carbon tax is impacting significantly on

EAD. Jia et al. (2023) examined the relationship between carbon tax and EAD using sensitivity analysis in Nordic Countries, the result reveals evidence of a negative significant relationship between carbon tax and EAD. Freyre et al. (2020) used secondary data in Switzerland which was analyzed using regression and found evidence that carbon tax is improving EAD. In view of the foregoing, it is expected that companies are more inclined to reveal information about their environmental performance and impacts when they are subject to environmental taxes. The justification for this is that environmental taxes give businesses financial incentives to lessen their environmental impact and show their dedication to sustainability. In order to demonstrate their adherence to laws and their efforts toward environmental responsibility, companies may thus be more likely to publish information about their environmental policies, projects, and performance. Therefore, the study hypothesized that:

H<sub>1</sub>: Total environmental taxes promote the disclosure of environmental accounting information.

H<sub>2</sub>: Transportation taxes encourages oil and gas firms to disclose environmental accounting information.

### 3. METHODOLOGY

The study used auxiliary data. All the study's data, including information on the outcome variable and the explanatory variables, were sourced from the OECD and yearly reports and accounts of the oil and gas corporations in Nigeria. The analysis included thirteen oil and gas companies as of December 31, 2021. The research was done from 2014 to 2021. Fixed-effects regression using Estimation using Driscoll and Kraay standard errors (DKSE) has been used in this study. This is because there might have been repeated observations of societies or other firms over time. Thus, DKSE is a useful approach for estimating panel or longitudinal data (Abdulhamid and Sani, 2016; Nchofoung et al., 2023). It enables us to correct for time-specific effects and serial correlation and offers more precise standard error estimates thereby enhancing the reliability and validity of econometric analysis. In addition to the regression, descriptive statistics and correlation were also utilized. The goal of the study is to better understand how environmental taxes impact Nigerian oil and gas companies' use of environmental accounting. Table 1 contains the details of the study variables and their respective measurements.

#### 3.1. Independent and Dependent Variables

The explanatory variable in this study is the environmental taxes. Total environmental taxes often include a number of different elements designed to solve environmental problems and encourage sustainable behavior. These taxes include carbon taxes, energy taxes, pollution taxes, and natural resource taxes. Each form of tax targets a particular environmental problem and seeks to lessen its adverse effects. Transport taxes have been used in this study as a component of Carbon taxes. The dependent variable is the EAD proxied by the "Global Reporting Initiative" (GRI). The GRI framework assists organizations in transparently and consistently measuring and disclosing their sustainability performance. These include issues relating to governance, human rights, labor practices, environmental effects, product responsibility, and community involvement.



**Table 1: Variable measurement**

Variable name	Acronym	Variable measurement	Source of measurement
Environmental accounting disclosure	ENAD	Global Reporting Initiative (GRI)	(Bala et al., 2023; Ja'afar et al., 2021)
Firm Size	FS	Natural log of firm assets	(Bala et al., 2020; Shaheen et al., 2023)
Big four auditors	BIG 4	1 for the company audited by the Big four auditors and zero for the company audited by non-Big four auditors.	(Bala et al., 2022; Shaheen et al., 2023)
Carbon Dioxide Intensity	C2 INT	kg per kg of oil equivalent energy use	Data-World Bank
Total Environmental Taxes	ENV TAX	Green tax revenue as % of GDP ("All tax bases (sources from energy, transport pollution, and resources taxes")	OECD-Data
Transport taxes	TRATA X	Total transport taxes as % of GDP	OECD-Data

### 3.2. Control Variables

The study control for firm size as larger companies may have greater resources and capacity to put in place thorough environmental accounting procedures. They could have specialized teams or departments that are concerned with environmental reporting and transparency. Greater scrutiny from stakeholders, such as investors and regulatory organizations, may also force larger businesses to provide more information about their environmental effects. The study also controls for Big 4 auditors because-EAD may be influenced by the Big 4 auditors, which include the audit giant (Deloitte, PricewaterhouseCoopers (PwC), Ernst & Young (EY), and KPMG). These auditing companies are crucial in giving a company's financial statements and other disclosures, such as environmental accounting information, confidence, and credibility. Furthermore, the Big 4 auditors may improve the veracity and openness of the provided information by carrying out independent audits and offering assurance on EADs. For businesses looking to gain the trust of stakeholders like investors, clients, and regulatory agencies, this can be especially crucial. Finally, we control for CO<sub>2</sub> intensity. This is because companies may show their dedication to tracking and minimizing their carbon impact by revealing their CO<sub>2</sub> intensity. Investors, clients, and regulatory organizations may find this information beneficial as they become more concerned with how well businesses are doing in terms of the environment. Additionally, revealing CO<sub>2</sub> intensity can promote accountability and openness. It enables stakeholders to gauge an organization's progress in lowering its carbon emissions over time and measure how well it performs in terms of the environment in relation to its operations.

### 3.3. Estimation Model

To examine the study's hypotheses, the following model was adopted.

$$ENAD_{it} = \beta_{0it} + \beta_1 FSIZ E_{it} + \beta_2 BIG4_{it} + \beta_3 C2INT_{it} + \beta_4 ENV TAX_{it} + \beta_5 TRATA X_{it} + \epsilon_{it}$$

Where ENAD = EAD proxied by the Global Environmental Index, FSIZ E = firm size, BIG4 = Big four auditors, C2INT = carbon dioxide intensity, ENV TAX = total environmental taxes, = TRATA X = transport taxes,  $\epsilon$  = error terms, it = company/time, and  $\beta_1 - \beta_5$  = slopes of the explanatory variables.

## 4. RESULTS AND DISCUSSION

### 4.1. Descriptive Statistics of Data

Table 2 depicts the descriptive statistics of the study data. ENAD showed an average of 435. This suggests that almost 44% of the

**Table 2: Descriptive statistics**

Variable	Obs.	Mean	Standard deviation	Minimum	Maximum
ENAD	208	0.435	0.149	0.211	0.808
FSIZE	208	27.180	21.239	4.045	38.828
C2INT	208	0.493	0.028	0.454	0.533
BIG4	208	0.952	0.214	0.000	1.000
ENV TAX	208	0.087	0.126	0.000	0.320
TRATA X	208	0.015	0.005	0.010	0.020

firms complied with the "Global Environmental Index" checklist. FSIZE had an average value of 27.180 with a minimum and maximum of 4.045 and 38.82 respectively. C2INT revealed a mean of 0.493 with a minimum and maximum of 0.028 and 0.533 respectively. BIG4 had an average of 0.952. This suggests that 95% of the sampled companies were audited by the Big 4 auditors. The GRENTX represented an average of 0.087% of the country's GDP with a minimum and maximum of 0.00% and 0.320%, respectively. TRATA X ranged from a minimum of 0.010% to a maximum of 0.020%, with an average of 0.015%.

### 4.2. Correlation

The results of the correlation are shown in Table 3. Table 3 shows that FSIZE, BIG4, ENV TAX, and TRATA X have positive associations with ENAD. C2INT and ENAD, on the other hand, have a negative relationship with each other. All of the explanatory variables' correlations fall within the usual range and are not excessive. As a result, it implies that the model may not be connected to the problems with multicollinearity.

### 4.3. Regression Results

The Driscoll and Kraay standard errors (DKSE) results of the total green taxes (ENV TAX), transport taxes (TRATA X), and EAD (ENAD) are shown in Table 4. The table showed that ENV TAX has a positive, significant impact on ENAD. The beta coefficient of 0.112 and the p-value of 0.009 reveal this. Thus, it suggests that a rise in ENV TAX will result in an increase in the disclosure of environmental accounting information. This is in line with the study's first hypothesis (H1), which postulated that total environmental taxes promote the disclosure of environmental accounting information. The result is consistent with the findings of (Zhang et al., 2021; Zhu et al., 2020) who found a positive significant link between environmental taxes and environmental accounting information.

This implies that accountability and openness of businesses' environmental activities can both be improved through

**Table 3: Correlation**

Variable	ENAD	FSIZE	C2INT	BIG4	ENVTAX	TRATAX
ENAD	1					
FSIZE	0.146*	1				
C2INT	-0.008	0.037	1			
BIG4	0.253***	0.150*	-0.002	1		
ENVTAX	0.148*	0.059	-0.638***	0.072	1	
TRATAX	0.015	-0.037	0.781***	-0.045	-0.554***	1

Statistical significance levels at 1% and 10% are shown by (\*\*\*) and (\*) respectively

**Table 4: DKSE model**

Variable	Coefficient	Standard Error	t	P>t
FSIZE	0.001	0.001	1.100	0.292
C2INT	-0.643	0.207	-3.110***	0.009
BIG4	0.169	0.030	5.630***	0.000
ENVTAX	0.112	0.036	3.110***	0.009
TRATAX	2.822	1.341	2.100*	0.057
CONS	0.138	0.082	1.690	0.118
F-Stat.	15.970			
F-Sig.	0.000			
R <sup>2</sup>	0.0308			
Het. Test	0.014			
VIF (Mean)	1.860			
Serial Corr.	0.000			

Statistical significance levels at 1% and 10% are shown by (\*\*\*) and (\*) respectively.

**Table 5: PCSE Model**

Variable	Coef.	Std. Err.	t	P>t
FSIZE	0.001	0.000	1.480	0.139
C2INT	-0.643	0.338	-1.900*	0.057
BIG4	0.169	0.045	3.740***	0.000
ENVTAX	0.112	0.055	2.030**	0.042
TRATAX	2.822	1.585	1.780*	0.075
CONS	0.138	0.152	0.910	0.363
Wald chi <sup>2</sup>	34.05			
F-Sig.	0.000			
R <sup>2</sup>	0.109			
Het. Test	0.014			
VIF (Mean)	1.860			
Serial Corr.	0.000			

Statistical significance levels at 1%, 5%, and 10% are shown by (\*\*\*), (\*\*) and (\*), respectively

environmental levies. Companies may be compelled to disclose certain environmental metrics or give thorough information on their emissions, waste management, or resource usage when they are subject to environmental levies. A company's environmental performance can be evaluated by stakeholders, such as investors, clients, and regulatory agencies, who can then use this information to make choices. Additionally, Table 4 demonstrates that transport taxes (TRATAX) have a favorable, impact on ENAD. The beta coefficient of 2.822 and the P-value of 0.057 indicate this. Therefore, it implies that raising transportation taxes will also promote environmental accounting information disclosure. This is in line with the study's second hypothesis (H2), which postulated that transportation taxes encourages oil and gas firms to disclose environmental accounting information. The results are in line with the findings of (Lin and Xu, 2019; Zhao et al., 2019; Zhu et al., 2020) who found a positive significant connection between carbon taxes and environmental accounting information. This further suggests that transport taxes as components of carbon taxes can have a direct impact on a company's financial results. Thus, companies could be encouraged to reveal their environmental accounting information in order to show that they are making an effort to lower emissions and cut back on their tax obligations.

Looking at the control variables, the Table 3 depicts that C2 intensity (C2INT) has a negative significant influence on ENAD. This may be a result of the fact that high carbon intensity indicates that a firm relies extensively on carbon-intensive processes or activities, including the use of fossil fuels or inefficient manufacturing techniques. Involved parties, including investors, clients, and the general public, who are growing more concerned about climate change and environmental sustainability, may have negative impressions as a result of the disclosure of this information. Furthermore, because governments and regulatory organizations are putting increasingly stringent environmental

policies and carbon pricing systems into place, revealing high carbon intensity may draw regulatory attention and result in potential fines. Companies may be concerned about the financial repercussions of non-compliance or have to make costly emission reduction investments. Big 4 auditors (BIG4) have a positive significant influence on ENAD. This could be because the Big 4 auditors have in-depth knowledge and experience in auditing and evaluating the reliability and correctness of both financial and non-financial information. They may assist firms in establishing sound reporting frameworks, identifying crucial environmental performance indicators, and ensuring compliance with pertinent laws and standards when it comes to EAD.

#### 4.4. Additional Analysis

Additional analysis was conducted by this study to confirm the first results and ensure the accuracy and robustness of the outcomes. Thus, we can verify the consistency and correctness of the study findings by carrying out various sorts of analysis or by employing other statistical techniques. In view of the foregoing, the study re-examines the main results using panel-corrected standard error (PCSE). This is because, for linear cross-sectional time series models with either OLS or Prais-Winsten regression-estimated parameters, panel-corrected standard error (PCSE) estimates are provided (Ikpesu et al., 2019). Standard errors and variance-covariance estimates are computed using the PCSE algorithm, which by default assumes that the disturbances are heteroskedastic and contemporaneously correlated across panels. The results of the PCSE model are shown in Table 5. It is observed from Table 5 that both the coefficients and p-values of the PCSE model are similar to those in the main model. Therefore, the study findings are robust and insensitive to alternative estimation.

**Table 6: GMM Model**

Variable	Coef.	Std. Err.	z	P>z
FSIZE	-0.735	0.627	-1.170	0.241
C2INT	-0.526	1.143	-0.460	0.645
BIG4	3.406	1.972	1.730*	0.084
ENVTAX	0.943	0.496	1.900*	0.057
TRATAX	0.457	0.238	1.920*	0.055
_CONS	1.440	0.835	1.720*	0.085
Wald $\chi^2$	47302.24			
Prob. of $\chi^2$	0.000			
AR I: Prob.	0.049			
AR II: Prob.	0.426			
Prob. of Sargan	0.324			
Prob. of Hansen	0.543			
Obs.	187			

Statistical significance levels at 10% are shown by (\*)

In addition, we re-examined the main model using the Generalized Method of Moments (GMM). Previous studies suggested that GMM is a useful approach that takes into consideration several sources of endogeneity, undetected heterogeneity, simultaneity, as well as dynamic endogeneity (Bala et al., 2022; Shaheen et al., 2023). In light of the aforementioned, we used the GMM approach to reevaluate our main model. The GMM results are shown in Table 6. The Table shows that the coefficient signs and significant levels of the GMM results are consistent with the primary findings. Therefore, it may be said that the study is not susceptible to endogeneity, misspecification, undetected heterogeneity, simultaneity, or dynamic endogeneity.

## 5. CONCLUSION AND IMPLICATIONS

There is currently a lack of knowledge about the potential and effects of current taxes on EAD particularly in Africa. Thus, governments of many low-income countries are becoming increasingly interested in the potential role that environmental taxes could play in domestic revenue mobilization and environmental sustainability. This study, therefore, explores environmental taxes' impact on Nigerian oil and gas companies' disclosure of environmental accounting information. The study concluded that accountability and openness of companies' environmental activities can both be improved through environmental taxes. Therefore, Nigerian government might raise the rate of green taxes to compel companies to implement more sustainable practices and invest in green technologies. More so, EAD practices might be given priority by companies as a result of environmental taxation since it is consistent with their financial goals, legal obligations, and stakeholder expectations. The study also documented that companies may be compelled to disclose certain environmental metrics or give thorough information on their emissions, waste management, or resource usage when they are subject to environmental levies. Therefore, it is earnest to mention that transportation-related activities, particularly those that use fossil fuels, have an influence on the environment in terms of greenhouse gas emissions and other factors. In order to encourage companies to lessen their environmental effect and promote sustainable practices, governments should enhance taxes on transportation-related activities, such as fuel taxes or carbon taxes. The study findings will be useful to the regulators and policymakers in

Nigeria. This is because if the government enhances environmental taxes, it may inspire companies to enhance their environmental accounting procedures. It may also compel companies to put more effective processes in place for gathering and disclosing environmental data, assuring the truthfulness and accuracy of their disclosures. It may also encourage companies to appropriately report and account for their environmental effect. It encourages openness, responsibility, and sustainability, which is advantageous to the companies and their stakeholders.

## REFERENCES

- Abbas, J., Wang, L., Belgacem, S.B., Pawar, P.S., Najam, H., Abbas, J. (2023), Investment in renewable energy and electricity output: Role of green finance, environmental tax, and geopolitical risk: Empirical evidence from China. *Energy*, 269, 126683.
- Abdulhamid, A., Sani, I. (2016), Preliminary phytochemical screening and antimicrobial activity of aqueous and methanolic leave extracts of *Balanites aegyptiaca* (L.). *International Journal of Pharma and Bio Sciences*, 3(1), 1-7.
- Alola, A.A., Muoneke, O.B., Okere, K.I., Obekpa, H.O. (2023), Analysing the co-benefit of environmental tax amidst clean energy development in Europe's largest agrarian economies. *Journal of Environmental Management*, 326, 116748.
- Bala, H., Ahmad, W., Khatoon, G., Karaye, A.B. (2022), Audit firm attributes and income smoothing: The moderating influence of audit committee accounting expertise. *Cogent Business and Management*, 9(1), 2127194.
- Bala, H., Amran, N.A., Shaari, H. (2020), Audit committee attributes and cosmetic accounting in Nigeria: The moderating effect of audit price. *Managerial Auditing Journal*, 35(2), 177-206.
- Bala, H., Shaheen, R., Khatoon, G., Belgacem, S.B., Shafiu, R.M. (2023), Corporate Board Attributes and EAD of Oil and Gas Firms in Nigeria. In: Paper Presented at the IOP Conference Series: Earth and Environmental Science.
- Barragán-Beaud, C., Pizarro-Alonso, A., Xylia, M., Syri, S., Silveira, S. (2018), Carbon tax or emissions trading? An analysis of economic and political feasibility of policy mechanisms for greenhouse gas emissions reduction in the Mexican power sector. *Energy Policy*, 122, 287-299.
- Chika, A.C. (2023), EAD and market value of listed food and beverages companies in Nigeria. *Journal of Accounting and Financial Management*, 9(6), 65-79.
- Fang, G., Tian, L., Fu, M., Sun, M., Du, R., Liu, M. (2017), Investigating carbon tax pilot in YRD urban agglomerations-analysis of a novel ESER system with carbon tax constraints and its application. *Applied Energy*, 194, 635-647.
- Freedman, M., Freedman, O., Stagliano, A. (2012), Greenhouse gas disclosures: Evidence from the EU response to Kyoto. *International Journal of Critical Accounting*, 4(3), 237-264.
- Freyre, A., Klink, S., Patel, M.K. (2020), Carbon tax and energy programs for buildings: Rivals or allies? *Energy Policy*, 139, 111218.
- Gupta, M. (2016), Willingness to pay for carbon tax: A study of Indian road passenger transport. *Transport Policy*, 45, 46-54.
- Hájek, M., Zimmermannová, J., Helman, K., Rozenský, L. (2019), Analysis of carbon tax efficiency in energy industries of selected EU countries. *Energy Policy*, 134, 110955.
- Ikpesu, F., Vincent, O., Dakare, O. (2019), Growth effect of trade and investment in Sub-Saharan Africa countries: Empirical insight from panel corrected standard error (PCSE) technique. *Cogent Economics and Finance*, 7, 1607127.
- Ja'afar, Y., Bala, H., Lawal, A.M. (2021), Determinants of corporate

- EAD of oil and gas firms in Nigeria. *Global Business Management Review*, 13(1), 16-36.
- Jia, Z., Lin, B., Liu, X. (2023), Rethinking the equity and efficiency of carbon tax: A novel perspective. *Applied Energy*, 346, 121347.
- Kiss, T., Popovics, S. (2021), Evaluation on the effectiveness of energy policies-evidence from the carbon reductions in 25 countries. *Renewable and Sustainable Energy Reviews*, 149, 111348.
- Lin, B., Xu, M. (2019), Exploring the green total factor productivity of China's metallurgical industry under carbon tax: A perspective on factor substitution. *Journal of Cleaner Production*, 233, 1322-1333.
- Lin, B., Yang, M. (2023), Choosing the right policy: Factors influencing the preferences of consumption-side personal carbon reduction policies. *Journal of Environmental Management*, 326, 116706.
- Liu, X., Wang, C., Niu, D., Suk, S., Bao, C. (2015), An analysis of company choice preference to carbon tax policy in China. *Journal of Cleaner Production*, 103, 393-400.
- Luo, L., Tang, Q. (2014), Carbon tax, corporate carbon profile and financial return. *Pacific Accounting Review*, 26(3), 351-373.
- McLaughlin, C., Elamer, A.A., Glen, T., AlHares, A., Gaber, H.R. (2019), Accounting society's acceptability of carbon taxes: Expectations and reality. *Energy Policy*, 131, 302-311.
- Moses, O., Michael, E.E., Dabel-Moses, J.N. (2019), A review of environmental management and reporting regulations in Nigeria. In: *Environmental Reporting and Management in Africa*. Bingley: Emerald Group Publishing. p159-182.
- Mpofu, F.Y.S. (2021), Informal sector taxation and enforcement in African countries: How plausible and achievable are the motives behind? *A Critical Literature Review*. *Open Economics*, 4(1), 72-97.
- Murray, B., Rivers, N. (2015), British Columbia's revenue-neutral carbon tax: A review of the latest "grand experiment" in environmental policy. *Energy Policy*, 86, 674-683.
- Nchofoung, T.N., Fotio, H.K., Miamo, C.W. (2023), Green taxation and renewable energy technologies adoption: A global evidence. *Renewable Energy Focus*, 44, 334-343.
- Ofori, E.K., Li, J., Gyamfi, B.A., Opoku-Mensah, E., Zhang, J. (2023), Green industrial transition: Leveraging environmental innovation and environmental tax to achieve carbon neutrality. Expanding on STRIPAT model. *Journal of Environmental Management*, 343, 118121.
- Pillay, S., Buys, P. (2014), The impact of carbon tax on financial and sustainability reporting in South Africa: The case of motor vehicle manufactures. *International Business and Economics Research Journal*, 13(4), 823-832.
- Saraswati, E. (2020), Carbon accounting, disclosure and measurement: A systematic literature review. *The International Journal of Accounting and Business Society*, 28(2), 17-44.
- Shaheen, R., Luo, Q., Bala, H. (2023), Female CEO succession and corporate social disclosure in China: Unveiling the significance of ownership status and firm performance. *Environmental Science and Pollution Research*, 30(6), 14223-14239.
- Shakkour, A., Alaodat, H., Alqisi, E., Alghazawi, A. (2018), The role of environmental accounting in sustainable development empirical study. *Journal of Applied Finance and Banking*, 8(1), 71-87.
- Shen, B., Li, Q. (2019), Green technology adoption in textile supply chains with environmental taxes: Production, pricing, and competition. *IFAC-PapersOnLine*, 52(13), 379-384.
- Song, M., Xie, Q., Shen, Z. (2021), Impact of green credit on high-efficiency utilization of energy in China considering environmental constraints. *Energy Policy*, 153, 112267.
- Stagliano, A. (2017), Carbon trading reporting: The case of Spanish companies. *International Advances in Economic Research*, 23(2), 231-243.
- Wang, Y., He, L. (2022), Can China's carbon emissions trading scheme promote balanced green development? A consideration of efficiency and fairness. *Journal of Cleaner Production*, 367, 132916.
- Wang, Y., Yu, L. (2021), Can the current environmental tax rate promote green technology innovation?-evidence from China's resource-based industries. *Journal of Cleaner Production*, 278, 123443.
- Wesseh, P.K Jr., Lin, B. (2018), Optimal carbon taxes for China and implications for power generation, welfare, and the environment. *Energy Policy*, 118, 1-8.
- Xu, H. (2022), Research on environmental accounting information disclosure of steel industry based on double carbon target. *Accounting and Corporate Management*, 4(6), 50-56.
- Yasmeen, R., Zhang, X., Tao, R., Shah, W.U.H. (2023), The impact of green technology, environmental tax and natural resources on energy efficiency and productivity: Perspective of OECD Rule of Law. *Energy Reports*, 9, 1308-1319.
- Zhang, H., Li, P., Zheng, H., Zhang, Y. (2021), Impact of carbon tax on enterprise operation and production strategy for low-carbon products in a co-opetition supply chain. *Journal of Cleaner Production*, 287, 125058.
- Zhao, X., Yao, J., Sun, C., Pan, W. (2019), Impacts of carbon tax and tradable permits on wind power investment in China. *Renewable Energy*, 135, 1386-1399.
- Zhu, N., Bu, Y., Jin, M., Mbroh, N. (2020), Green financial behavior and green development strategy of Chinese power companies in the context of carbon tax. *Journal of Cleaner Production*, 245, 118908.