

Petroleum Tax, Environment Quality and Economic Development in Nigeria

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Abstract

This study determined the effect of petroleum tax and environment quality on economic development, proxied by Real Gross Domestic Product, in Nigeria. The study covered a period of thirty-five years (1990 to 2024) and proxied petroleum tax and environment quality by hydrocarbon tax, petroleum profit tax, company income tax, charges on gas flared, and carbon emission. The study made use of time series data, sourced mainly from the Central Bank of Nigeria (CBN) Statistical Bulletin, National Bureau of Statistics (NBS) reports, and World Bank Development Indicators (WDI). The major technique of data analysis adopted was the Autoregressive Distributed Lag (ARDL) approach. The findings showed that hydrocarbon tax, petroleum profit tax, company income tax, and charges on gas flared have a positive and significant effect on Real Gross Domestic Product in Nigeria in both the short run and long run, while carbon emission has a negative and significant effect on Real Gross Domestic Product in the long run. Premised on the findings, the study concluded that petroleum tax plays a significant and vital role in enhancing economic development in Nigeria, while environmental degradation, proxied by carbon emission, contributes negatively to economic growth. The study recommended, among others, that government should strengthen hydrocarbon tax administration and ensure full compliance by oil-producing firms. More importantly, revenues generated from hydrocarbon taxes should be transparently channeled into productive sectors such as infrastructure, education, and healthcare, as this will further amplify its positive developmental impact. Effective monitoring by agencies such as the Federal Inland Revenue Service will ensure leakages are minimized and developmental outcomes are maximized.

1.0 Introduction

The taxation of petroleum activities has become a central focus of fiscal and development research because of the sector's outsized role in many resource-rich economies. Petroleum taxation encompasses a variety of levies, such as petroleum profit tax, company income tax on oil firms, hydrocarbon taxes, and charges on gas flaring, that governments use to mobilize revenue from oil exploitation. Scholars have increasingly examined this area due to the dual pressures of maximizing state revenue while mitigating the socio-economic and environmental costs of petroleum production. Studies across Africa and beyond have highlighted the tension between revenue generation and developmental outcomes, revealing that petroleum taxes can both support public investment and interact with economic volatility in global oil markets (Momah et al., 2025; Okoro, 2025). At its core, petroleum tax refers to government levies imposed on the profits, operations, and outputs of firms engaged in the extraction, production, and sale of petroleum resources. In many oil-producing countries, petroleum profit tax (PPT) is a key component, applied to the taxable profits of oil companies operating within national

jurisdictions (Etale & Bingilar, 2016). Other petroleum taxes may include company income tax (CIT) specific to oil operations, hydrocarbon duties on extracted volumes, and environmental charges such as penalties for gas flaring. Collectively, these instruments aim to ensure that a portion of the wealth generated by non-renewable resources accrues to the state for financing public goods, reducing fiscal deficits, and transferring benefits to the citizenry (Onyi-Ogelle & Okundaye, 2025). The taxation of petroleum activities can yield significant positive effects on economic development, particularly in resource-rich countries like Nigeria where oil and gas dominate export earnings and government revenue. Petroleum taxes such as petroleum profit tax, company income tax on oil firms, hydrocarbon tax, and charges on gas flaring provide a critical source of public funds that governments can allocate to priority development areas. For example, revenue from petroleum taxation can be used to finance infrastructure projects, improve social services, and support poverty reduction programs, all of which contribute to enhanced human welfare and long-term productivity (Etale & Bingilar, 2016). By increasing fiscal capacity, petroleum tax revenue enables the state to invest in public goods and build durable institutions, which supports sustainable economic growth and helps reduce dependence on external borrowing (Momah, Okoro & Adebayo, 2025). When effectively managed and transparently deployed, petroleum tax revenues are associated with improvements in gross domestic product (GDP) and broader developmental outcomes, highlighting the role of petroleum taxation in expanding national productive capacity (Idris & Bawa, 2023). On the other hand, environmental quality plays a crucial role in fostering sustainable economic development by ensuring the availability of clean air, water, and soil, which are essential inputs for productive activities. High environmental quality reduces health-related costs by lowering the incidence of pollution-induced diseases, thereby improving labour productivity, while a healthy environment also attracts both domestic and foreign investment in sectors such as agriculture, tourism, and manufacturing (Dasgupta, 2022; World Bank, 2020). Contrarily, environmental degradation has profound implications for public health, which in turn affects economic productivity, as pollution of air, water, and soil leads to respiratory diseases, waterborne illnesses, lost productivity, and increased healthcare expenditures (Ajudua, 2023).

Statement of the Problem

The Nigerian economy is heavily reliant on the petroleum sector, which serves as the primary source of government revenue, foreign exchange earnings, and employment generation. A significant portion of this revenue is derived from petroleum taxes, including petroleum profit tax (PPT), company income tax (CIT) on oil firms, hydrocarbon taxes, and charges on gas flaring. These fiscal measures are intended to ensure that the exploitation of oil resources contributes to national development. However, the operational activities associated with petroleum extraction and production have consistently posed significant threats to environmental quality. Oil spills, gas flaring, and carbon emissions have caused considerable ecological damage, particularly in the Niger Delta region, raising critical concerns about whether petroleum tax revenues are translating into sustainable economic development or whether they are offset by environmental costs. Gas flaring, a common practice in Nigeria's petroleum industry, exemplifies the conflict between economic activity and environmental sustainability; despite charges imposed on oil companies for flaring, enforcement remains weak, and the practice continues to release large quantities of greenhouse gases, contributing to climate change and local air pollution. Similarly, petroleum profit tax and company income tax, while essential for generating government revenue, have complex implications for economic growth: high tax rates may discourage investment in cleaner production technologies, while low tax revenues may limit the government's ability to fund environmental protection and public infrastructure projects, creating a paradox in which petroleum taxation,

intended to support economic development, may indirectly contribute to environmental degradation that hampers the very development it is meant to facilitate.

However, the dynamic relationship between petroleum taxes, environmental quality, and economic development in Nigeria remains insufficiently explored, creating uncertainty in policy design and implementation. Additionally, existing empirical studies often focus separately on either petroleum taxation or environmental impacts, with limited research addressing their combined effect on economic development, particularly Real Gross Domestic Product. This gap in literature makes it difficult to understand how petroleum tax policies and environmental quality interact to influence macroeconomic indicators such as gross domestic product. Policymakers, therefore, face challenges in designing strategies that balance revenue generation, corporate compliance, environmental sustainability, and socio-economic advancement. It is against this identified problem and gap that this study seeks to examine the effect of petroleum tax and environment quality on Real Gross Domestic Product in Nigeria. The specific objectives of the study are to analyze the effect of hydrocarbon tax on Real Gross Domestic Product in Nigeria; to determine the effect of petroleum profit tax on Real Gross Domestic Product in Nigeria; to ascertain the effect of company income tax on Real Gross Domestic Product in Nigeria; to examine the effect of charges on gas flared on Real Gross Domestic Product in Nigeria; and to ascertain the effect of carbon emission on Real Gross Domestic Product in Nigeria.

2.0 Literature Review

Theoretical Framework

The theories adopted in this study include the following:

a. Benefits Theory of Taxation

The Benefits Theory of Taxation was propounded by Erik Lindahl in 1919. The theory posits that taxes should be levied on individuals and entities in proportion to the benefits they receive from public goods and services, such that the cost of government-provided services is distributed among taxpayers based on the extent to which they benefit from these services. Applied to the petroleum sector, the Benefits Theory of Taxation provides a theoretical rationale for petroleum profit tax, company income tax, hydrocarbon tax, and charges on gas flared: oil and gas companies, having extracted substantial benefit from the exploitation of the nation's non-renewable petroleum resources and from the public infrastructure, security, and regulatory environment that supports their operations, are correspondingly expected to remit a proportionate share of their profits and operational proceeds back to the state in the form of petroleum taxes. These revenues, in turn, finance the roads, power infrastructure, healthcare, and education systems from which the broader economy, including the petroleum sector itself, continues to benefit, thereby creating a fiscal cycle through which petroleum taxation supports Real Gross Domestic Product growth. Although the theory has drawbacks, notably the practical difficulty of precisely measuring the benefit each taxpayer derives from government services, it remains a useful framework for understanding why petroleum tax revenue, when properly administered and transparently deployed into productive public investment, is theorised to enhance rather than hinder economic development (Gbato, 2017).

b. Environmental Kuznets Curve (EKC) Hypothesis

The Environmental Kuznets Curve (EKC) hypothesis is an economic theory that suggests there is an inverted U-shaped relationship between environmental degradation and economic development. Named after economist Simon Kuznets, who proposed a similar relationship between income inequality and economic development, the EKC hypothesis posits that environmental degradation initially worsens as economies industrialize and incomes rise but eventually improves once a certain level of economic development is reached, as growing

incomes make societies more willing and able to afford cleaner energy and stricter environmental regulation. The pioneer work proposing the inverted-U shape of the EKC came from Grossman and Krueger (1991), and the idea has become one of the stylised facts of environmental and resource economics, although it remains contested on both theoretical and empirical grounds (Stern, 2003; Cole & Neumayer, 2005). As employed by David Stern (2003), the functional relationship can be expressed as $\ln(E/P)_t = \alpha + \gamma t + \beta_1 \ln(GDP/P)_t + \beta_2 (\ln(GDP/P))_t^2 + \epsilon_t$, where E is emissions, P is population, and t is the time subscript. In the context of this study, the EKC hypothesis provides the theoretical lens for understanding the relationship between carbon emission, a proxy for environmental degradation arising largely from petroleum extraction and gas flaring, and Real Gross Domestic Product in Nigeria, while also underpinning the rationale for charges on gas flared as a fiscal instrument intended to discourage environmentally harmful practices and support the transition toward a growth trajectory in which environmental quality improves alongside rising national income.

Empirical Review

Momah, Akintoye and Ogbebor (2025) examined the effect of oil tax revenue on economic growth in Nigeria between 1986 and 2022 using Autoregressive Distributed Lag modelling. The results indicated that oil tax revenue significantly drives economic growth in Nigeria, with a positive coefficient of 0.1966, meaning that an increase in oil tax revenue leads to a proportional increase in long-run real GDP, and recommended that government enhance the efficiency of oil tax revenue collection by addressing tax evasion and ensuring revenues are properly utilised for national development projects.

Alhassan, Musa and Mahmud (2024) examined the impact of petroleum profit tax on economic growth in Nigeria using time series data on real gross domestic product, petroleum profit tax, non-oil tax revenue, and governance. Employing cointegration and fully modified ordinary least squares, the study revealed the existence of a long-run relationship between petroleum profit tax and economic growth, with petroleum profit tax impacting positively on economic growth at a statistically significant level, while non-oil tax revenue impacted negatively on economic growth in Nigeria. Osasu and Henry (2022) examined how Nigeria's economic growth was affected by petroleum profit tax, gathering data over a twenty-two-year period (1994 to 2015) from the National Bureau of Statistics and the CBN Annual Statistical Bulletin, and employing the ordinary least squares statistical method. The analysis found that Nigeria's economic growth is positively and significantly impacted by petroleum profit tax.

Iriabiji, Elhomun and Kolawole (2022) examined the impact of petroleum profit tax on national income, gross domestic product, and per capita income in Nigeria using an ex post facto design, linear regression, and correlation analysis. Contrary to expectation, the findings showed that petroleum profit tax has negative and insignificant effects on Gross Domestic Product, National Income, and Per Capita Income. Akadakpo and Akogo (2022) examined the impact of company income tax on corporate performance using data from twelve listed firms on the Nigerian Stock Exchange spanning 2011 to 2020 and regression analysis. The findings revealed that company income tax has a positive and significant effect on profit after tax and returns on equity, and recommended tax incentives and positive tax reforms to encourage business activities that support economic growth. Gideon, Kolawole and Samson (2021) examined how Nigeria's economic growth was affected by oil revenue over the period 1981-2018 using the ARDL approach, ARDL bound test for cointegration, and the Augmented Dickey Fuller unit root test. Contrary to the majority of studies, it was discovered that there was an inverse relationship between petroleum profit tax and GDP growth over both the short and long term, and the study recommended that government create suitable policies for the better and wiser use of oil income.

Yahaya and Bakare (2018) evaluated the effect of petroleum profit tax and company income tax on Nigerian economic growth using the Fully Modified Least Square Regression Technique over a 34-year period (1981-2014). It was found that petroleum profit tax and company income tax have a positive and significant impact on gross domestic product in Nigeria, with an Adjusted R-squared of 87.6%, and the study recommended that government transparently and judiciously account for revenue generated through petroleum profit tax by investing in infrastructural facilities. Ibanichuka, Akani and Ikebujo (2018) investigated the effect of tax revenue on the economic development of Nigeria for the period 1995-2015, examining whether tax revenue, represented by Value Added Tax, Company Income Tax, and Customs and Excise Duties, could affect economic development proxied by the Human Development Index. Using multiple regression analysis, the findings revealed that revenues collected by the federal government through Company Income Tax, VAT, and Customs and Excise Duties have a positive relationship with the Human Development Index. Onakoya and Afintinni (2019) investigated the cointegration relationship between tax revenue and economic growth in Nigeria from 1980 to 2016 using the Engle-Granger Cointegration test and the Vector Error Correction Model. Findings indicated that a long-run relationship existed between taxation and economic growth in Nigeria, with a significant positive relationship at the 5% level of significance between Petroleum Income Tax, Company Income Tax, and economic growth. Ogbonna and Appah (2012) investigated the effects of petroleum income on the Nigerian economy for the period 2000 to 2009 using gross domestic product, per capita income, and inflation as the explained variables, and oil revenue and petroleum profit tax/royalties as explanatory variables. The results showed that petroleum profit tax/royalties has a positive and significant relationship with GDP and per capita income, leading the study to conclude that petroleum income had positively and significantly impacted the Nigerian economy.

Osayande and Akunoma (2024) investigated the link between economic growth and carbon emission in Nigeria and Ghana over the period 1980-2021 within the Environmental Kuznets Curve framework, employing the ECM Auto Regressive Distributed Lag estimation technique. The results showed no evidence validating the EKC in either country, as economic growth activities were found to increase carbon emission in Nigeria in both the short and long run, worsening environmental degradation. Ajeigbe and Ganda (2024) examined the impact of carbon emissions and the directional causality between carbon emissions, environmental quality, financial development, and economic growth using data from 65 economies from 2010 to 2021, applying fully modified ordinary least squares and dynamic ordinary least squares approaches. The findings revealed that the estimated coefficients of carbon emissions were negative and significant across the model, proving that increased carbon emissions are detrimental to environmental quality and economic growth, and the study recommended environmental taxes and carbon emission taxes as tools for improving sustainability and economic performance. Hammayo and Kamal (2023) investigated the relationship between carbon footprint and economic growth in Nigeria and Ghana over the period 1990 to 2020, employing fully modified least square and panel dynamic least square techniques. The findings revealed that greenhouse gas emissions and renewable energy consumption have a significant negative effect on economic growth in Nigeria and Ghana, and the study recommended a carbon pricing law implemented through tax policy to reduce adverse greenhouse gas emissions and support economic growth.

Adetunji and Olusola (2023) examined the effect of carbon emissions on inclusive growth in Nigeria using annual time series data for the period 1970 to 2022, anchored on the Environmental Kuznets Curve and employing the Autoregressive Distributed Lag Model. The findings showed that carbon emissions were negatively related to inclusive growth in Nigeria in the long run, although the short-run effect was positive but insignificant, and recommended that policymakers prioritize strategies that curtail carbon emissions without compromising

economic development. Ogbonna, Ojeaburu and Ehilegbu (2021) investigated the relationship between carbon emission and economic growth in Nigeria for the period 1981-2018, using carbon dioxide as the proxy for carbon emission and gross domestic product as the proxy for economic growth, employing dynamic ordinary least squares and bivariate Granger causality tests. The results showed an inverse relationship between carbon emission and gross domestic product, and the study concluded that there is an insignificant and negative relationship between carbon emission and Gross Domestic Product, recommending that emissions not connected to industrial and consumer production should be taxed and discouraged.

3.0 Methodology

Ex-post facto research design was employed in this study to investigate the relationship between petroleum tax, environment quality, and Real Gross Domestic Product in Nigeria. The study relied on secondary time series data from the Central Bank of Nigeria (CBN) Statistical Bulletin, National Bureau of Statistics (NBS) reports, and World Bank Development Indicators (WDI), spanning from 1990 to 2024, indicating thirty-five (35) years of sample observations.

Model Specification

The analytical framework of this study was hinged on the Environmental Kuznets Curve (EKC) Hypothesis, which provides a theoretical framework that best explains the effect of petroleum tax and environmental factors on economic development in Nigeria. To effectively capture the impact of petroleum tax and environment quality on Real Gross Domestic Product in Nigeria, in line with the research objectives, the study adopted an econometric model built on the work of Yahaya and Bakare (2018), with slight modifications to incorporate all the variables of this study. The functional form of the proposed model is as follows:

$$RGDP = f(HDT, PPT, CIT, CGF, CO_2) \quad (3.1)$$

The mathematical form of the proposed model is as follows:

$$RGDP = \beta_0 + \beta_1 HDT + \beta_2 PPT + \beta_3 CIT + \beta_4 CGF + \beta_5 CO_2 \quad (3.2)$$

The econometric form of the proposed model is as follows:

$$RGDP = \beta_0 + \beta_1 HDT + \beta_2 PPT + \beta_3 CIT + \beta_4 CGF + \beta_5 CO_2 + u_t \quad (3.3)$$

A Priori Expectation: $\beta_1, \beta_2, \beta_3, \beta_4 > 0; \beta_5 < 0$.

RGDP = Real Gross Domestic Product, HDT = Hydrocarbon Tax, PPT = Petroleum Profit Tax, CIT = Company Income Tax, CGF = Charges on Gas Flared, CO₂ = Carbon Emission, β_0 = Regression intercept, $\beta_1 - \beta_5$ = Slopes of the respective parameters, u = Error term, f = Functional notation.

Method of Data Analysis

The data analysis technique employed in this study was the Autoregressive Distributed Lag (ARDL) technique. This is because the result of the unit root test generated mixed order of integration, that is, I(0) and I(1), among the variables, thereby necessitating the use of the ARDL bounds testing approach to cointegration and estimation.

4.0 Data Analysis and Discussion of Findings

Descriptive Analysis

The descriptive statistics for the study variables are summarized in Table 4.1:

Table 4.1: Descriptive Statistics

	RGDP	HDT	PPT	CIT	CGF	CO ₂
Mean	46718.55	1204.426	7509.102	1896.417	1317.618	46.03814
Median	43837.39	1157.810	4762.400	860.3500	1507.604	46.94300
Maximum	80607.14	3201.300	29003.59	10398.10	1906.743	54.46400
Minimum	21680.20	24.60000	71.89000	9.930000	508.5310	33.15300

Std. Dev.	21252.74	1052.575	8347.014	2484.045	470.0584	5.576530
Skewness	0.134238	0.372593	1.106713	1.854852	-0.410701	-0.380671
Kurtosis	1.397912	1.837321	3.053784	6.235603	1.703000	2.490748
Jarque-Bera	3.848197	2.781222	7.148969	35.33693	3.437159	1.223510
Probability	0.146007	0.248923	0.028030	0.000000	0.179321	0.542398
Observations	35	35	35	35	35	35

Source: Authors' Computation, 2026.

Table 4.1 presents the descriptive statistics of the variables used in examining the effect of petroleum tax and environmental quality on Real Gross Domestic Product in Nigeria from 1990 to 2024. Real Gross Domestic Product recorded an average value of N46,718.55 billion, with a maximum of N80,607.14 billion and a minimum of N21,680.20 billion, suggesting a substantial increase in economic activity over time; the Jarque-Bera probability value of 0.146007 indicates that RGDP was normally distributed. Hydrocarbon tax recorded a mean value of N1,204.426 billion, ranging from N24.60 billion to N3,201.30 billion, and was normally distributed (probability = 0.248923). Petroleum Profit Tax had a mean value of N7,509.102 billion, with a maximum of N29,003.59 billion and a minimum of N71.89 billion, though its Jarque-Bera probability value of 0.028030 indicates that it was not normally distributed. Company income tax recorded a mean value of N1,896.417 billion, ranging from N9.93 billion to N10,398.10 billion, and was also not normally distributed (probability = 0.000000). Charges on gas flared recorded an average value of N1,317.618 billion, with a maximum of N1,906.743 billion and a minimum of N508.531 billion, and was normally distributed (probability = 0.179321). Lastly, carbon emission recorded a mean value of 46.03814 metric tons, with a maximum of 54.46400 and a minimum of 33.15300, and was normally distributed (probability = 0.542398). Overall, the descriptive statistics suggest that most variables were suitable for further econometric analysis.

Unit Root Test

The results of the Augmented Dickey-Fuller test are presented in Table 4.2 below:

Table 4.2: Augmented Dickey-Fuller (ADF) Test Results

Variables	Level	5% Critical	1st Diff.	5% Critical	I(d)	Stationary @
$\ln RGDP_t$	-0.694385	-2.954021	-3.041335**	- 3.041335	I(1)	1st Difference
$\ln HDT_t$	-1.265621	-2.957110	- 5.754094***	- 2.957110	I(1)	1st Difference
$\ln PPT_t$	-1.702129	-2.951125	- 6.233637***	- 2.957110	I(1)	1st Difference
$\ln CIT_t$	- 3.667798***	-2.951125	-	-	I(0)	Level
$\ln CGF_t$	-4.340235	-2.954021	-	-	I(0)	Level
$\ln CO2_t$	-1.092252	-2.951125	- 3.088408***	- 2.951125	I(1)	1st Difference

Note: *, **, and *** denote significance at 10%, 5% and 1%, respectively.

Source: Authors' Computation, 2026.

Table 4.2 presents the ADF unit root test results for Real Gross Domestic Product, hydrocarbon tax, petroleum profit tax, company income tax, charges on gas flared, and carbon emission. The results reveal a mixed order of integration among the variables. Company income tax and charges on gas flared were found to be stationary at level, indicating they are integrated of order zero [i.e., I(0)]. On the other hand, Real Gross Domestic Product, hydrocarbon tax, petroleum profit tax, and carbon emission were non-stationary at level but became stationary

after first differencing, indicating they are integrated of order one [i.e., I(1)]. The presence of mixed integration order justifies the use of an Autoregressive Distributed Lag (ARDL) modelling approach for subsequent estimation.

Multicollinearity Test

Table 4.3: Correlation Matrix

	$\ln RGDP_t$	$\ln HDT_t$	$\ln PPT_t$	$\ln CIT_t$	$\ln CGF_t$
$\ln RGDP_t$	1				
$\ln HDT_t$	0.351904	1			
$\ln PPT_t$	0.221621	0.231241	1		
$\ln CIT_t$	0.036733	0.409460	0.345017	1	
$\ln CGF_t$	-0.412819	0.097358	-0.444393	-0.349671	1

Source: Authors' Computation, 2026.

Table 4.3 presents the correlation matrix used to detect multicollinearity among hydrocarbon tax, petroleum profit tax, company income tax, charges on gas flared, and carbon emission. The pairwise correlation coefficients are generally low to moderate, with the highest observed between charges on gas flared and petroleum profit tax (0.409460), and between carbon emission and company income tax (-0.444393). Since none of the correlations among the independent variables exceeds the conventional 0.80 threshold, the result confirms the absence of multicollinearity, thereby validating the simultaneous inclusion of these variables in the estimation of the Real Gross Domestic Product model.

ARDL Bounds Cointegration Test

Table 4.4: ARDL Bounds Cointegration Test

Significant Level	I(0) Bound	I(1) Bound	Hypothesis	F-Statistics
10%	2.08	3	H0: There is long run relationship	13.98963***
5%	2.39	3.38		
2.5%	2.7	3.73		
1%	3.06	4.15		
F _{RGDP} (RGDP/HDT, PPT, CIT, CGF, CO2)				K
= 5				

Source: Authors' Computation, 2026.

Table 4.4 shows that the computed F-statistic of 13.98963 is higher than the upper bound I(1) critical value of 3.38 at the 5% significance level. This provides evidence to reject the null hypothesis of no cointegration, confirming that there is a long-run relationship among Real Gross Domestic Product, hydrocarbon tax, petroleum profit tax, company income tax, charges on gas flared, and carbon emission. The confirmation of long-run dynamics necessitated the estimation of the extent of the relationship through the Autoregressive Distributed Lag (ARDL) model.

Autoregressive Distributive Lag (ARDL) Long-Run and Short-Run Dynamics

The long-run and short-run dynamic effect of petroleum tax and environment quality on Real Gross Domestic Product was estimated using the ARDL method. The results are presented in Table 4.5:

Table 4.5: ARDL Long-Run and Short-Run Estimation Results

Dependent Variable = $\ln RGDP$				
Selected Model: ARDL(3, 3, 3, 3, 1, 2)				
ARDL Long-Run Results				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
$\ln HDT_t$	0.193142	0.022266	8.674298	0.0000
$\ln PPT_t$	0.326300	0.052068	6.266810	0.0001
$\ln CIT_t$	0.406550	0.041471	9.803190	0.0000
$\ln CGF_t$	0.120420	0.028755	4.187817	0.0015
$\ln CO2_t$	-0.379864	0.136929	-2.774165	0.0181
C	8.909675	0.539196	16.52400	0.0000
EC = LOG(RGDP) - (0.1931*LOG(HDT) + 0.3263*LOG(PPT) + 0.4065*LOG(CIT) + 0.1204*LOG(CGF) -0.3799*LOG(CO2) + 8.9097)				
ARDL Short-Run Results				
$D(\ln RGDP_{t-1})$	-0.053922	0.079776	-0.675925	0.5130
$D(\ln RGDP_{t-2})$	-0.280832	0.089666	-3.131987	0.0095
$D(\ln HDT_t)$	0.025984	0.006663	3.899732	0.0025
$D(\ln HDT_{t-1})$	-0.042604	0.008147	-5.229074	0.0003
$D(\ln HDT_{t-2})$	-0.034078	0.008434	-4.040606	0.0019
$D(\ln PPT_t)$	0.087483	0.011790	7.420118	0.0000
$D(\ln PPT_{t-1})$	0.067784	0.012732	5.323771	0.0002
$D(\ln PPT_{t-2})$	0.034562	0.010525	3.283919	0.0073
$D(\ln CIT_t)$	0.213875	0.022833	9.367027	0.0000
$D(\ln CIT_{t-1})$	-0.122621	0.019310	-6.350081	0.0001
$D(\ln CIT_{t-2})$	-0.056567	0.021284	-2.657698	0.0223
$D(\ln CGF_t)$	0.016972	0.013809	1.229046	0.2447
$D(\ln CO2_t)$	-0.056162	0.018148	-3.094705	0.0102
$D(\ln CO2_{t-1})$	-0.084580	0.023543	-3.592576	0.0042
CointEq(-1)*	-0.496500	0.040359	-12.30213	0.0000
Adjusted $R^2 = 0.924853$				
Durbin-Watson stat = 2.819054				

Source: Authors' Computation, 2026.

Interpretation of Long-Run and Short-Run ARDL Model Results

Hydrocarbon Tax (HDT) and Real Gross Domestic Product (RGDP)

The long-run estimates of the ARDL model revealed that hydrocarbon tax has a positive and significant relationship with Real Gross Domestic Product in Nigeria, evidenced by the positive coefficient value (0.193142) and its p-value (0.0000), which is less than 0.05. This implies that an increase in hydrocarbon tax by a unit will lead to a 0.193142 increase in Real Gross Domestic Product in the long run. The short-run estimates also revealed a positive and significant relationship, with a coefficient value of 0.025984 and a p-value of 0.0025, implying that an increase in hydrocarbon tax by a unit will lead to a 0.025984 increase in Real Gross Domestic Product in the short run.

Petroleum Profit Tax (PPT) and Real Gross Domestic Product (RGDP)

The results of the long-run estimates revealed that petroleum profit tax has a positive and significant long-run relationship with Real Gross Domestic Product in Nigeria, evidenced by the positive coefficient value (0.326300) and its p-value (0.0001). This implies that an increase

in petroleum profit tax by a unit will lead to a 0.326300 increase in Real Gross Domestic Product in the long run. The short-run estimates also revealed a significant positive relationship, with a coefficient value of 0.087483 and a p-value of 0.0000, implying that an increase in petroleum profit tax by a unit will lead to a 0.087483 increase in Real Gross Domestic Product in the short run.

Company Income Tax (CIT) and Real Gross Domestic Product (RGDP)

The results of the long-run estimates revealed that company income tax has a significant positive long-run relationship with Real Gross Domestic Product in Nigeria, evidenced by the positive coefficient value (0.406550) and its p-value (0.0000). This implies that an increase in company income tax by one unit will lead to a 0.406550 increase in Real Gross Domestic Product in the long run. The short-run estimates also revealed a significant positive relationship, with a coefficient value of 0.213875 and a p-value of 0.0000, implying that an increase in company income tax by one unit will lead to a 0.213875 increase in Real Gross Domestic Product in the short run.

Charges on Gas Flared (CGF) and Real Gross Domestic Product (RGDP)

The results of the long-run estimates revealed that charges on gas flared has a significant positive long-run relationship with Real Gross Domestic Product in Nigeria, evidenced by the positive coefficient value (0.120420) and its p-value (0.0015). This implies that an increase in charges on gas flared by one unit will lead to a 0.120420 increase in Real Gross Domestic Product in the long run. The short-run estimates, however, revealed a non-significant positive relationship, with a coefficient value of 0.016972 and a p-value of 0.2447, which is greater than 0.05.

Carbon Emission (CO₂) and Real Gross Domestic Product (RGDP)

The results of the long-run estimates revealed that carbon emission has a significant negative long-run relationship with Real Gross Domestic Product in Nigeria, evidenced by the negative coefficient value (-0.379864) and its p-value (0.0181), which is less than 0.05. This implies that an increase in carbon emission by one unit will lead to a 0.379864 decrease in Real Gross Domestic Product in the long run. The short-run estimates also revealed a significant negative relationship, with a coefficient value of -0.056162 and a p-value of 0.0102, implying that an increase in carbon emission by one unit will lead to a 0.056162 decrease in Real Gross Domestic Product in the short run.

Interpretation of CointEq(-1) Result

The estimated error correction coefficient of -0.496500 (with a p-value of 0.0000) is highly significant, has the correct sign, and implies a fairly high speed of adjustment to equilibrium after a shock. This implies that approximately 50% of disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year.

Interpretation of Adjusted R-Squared (Adj. R²) and Durbin-Watson Statistic

The Adjusted R-squared value of 0.924853 indicates that the estimated model is well fitted, as the systematic changes in the explanatory variables (hydrocarbon tax, petroleum profit tax, company income tax, charges on gas flared, and carbon emission) explain approximately 92 percent of the variation in Real Gross Domestic Product, while the remaining 8% is explained by other factors outside the model. The Durbin-Watson statistic of 2.819054, being greater than 2, indicates the absence of serial autocorrelation in the model.

Post-Estimation Tests

Table 4.6: Post-Estimation Test Results

Test	Null Hypothesis (H ₀)	Test Type	F-stat.	Prob.
Normality Test	Normal distribution exists	Jarque-Bera Test	0.074273	0.9635
Serial Correlation Test	Serial correlation does not exist	Breusch-Godfrey LM Test	1.702967	0.0809
Heteroscedasticity Test	Homoscedasticity exists	Breusch-Pagan-Godfrey	1.684664	0.1877
Functional Form Test	Model is stable	Ramsey RESET	0.943070	0.3544

Source: Authors' Computation, 2026.

The Jarque-Bera normality test result shows a probability value of 0.9635, which is greater than 0.05, implying that the model's residuals are normally distributed. The Breusch-Godfrey Serial Correlation LM test result shows a probability value of 0.0809, greater than 0.05, implying the model has no serial correlation problem. The Breusch-Pagan-Godfrey heteroscedasticity test result shows a probability value of 0.1877, greater than 0.05, implying the model exhibits homoscedasticity. Lastly, the Ramsey RESET test result shows a probability value of 0.3544, greater than 0.05, implying the model is correctly specified. Overall, the post-estimation diagnostic results confirm that the estimated ARDL model for Real Gross Domestic Product is statistically sound, stable, and reliable for policy analysis and inference.

Discussion of Findings

This study has empirically analyzed the time series data sourced to determine the effect of petroleum tax and environment quality on Real Gross Domestic Product in Nigeria from 1990 to 2024, using the Autoregressive Distributed Lag (ARDL) estimation technique and the E-Views 12 statistical package. The findings obtained from the analysis are discussed as follows: The findings of this study reveal that hydrocarbon tax has a positive and significant effect on Real Gross Domestic Product in Nigeria in both the short run and long run. This implies that hydrocarbon taxation serves as an effective fiscal instrument that boosts national output, suggesting that revenue generated from hydrocarbon taxation is likely being channelled into productive sectors of the economy. This finding aligns with the Benefits Theory of Taxation's premise that petroleum-related tax revenue, when properly administered, is reinvested into public goods that support economic output. Similarly, petroleum profit tax was found to have a positive and significant effect on Real Gross Domestic Product in both the short run and long run, indicating that petroleum taxation remains a major driver of economic development in Nigeria. This finding supports Momah, Akintoye and Ogbebor (2025), who reported that oil tax revenue significantly drives economic growth in Nigeria, and Osasu and Henry (2022), who found that petroleum profit tax positively and significantly impacts Nigeria's economic growth, as well as Alhassan, Musa and Mahmud (2024) and Yahaya and Bakare (2018), who similarly found positive and significant long-run relationships between petroleum profit tax and economic growth. However, the finding contrasts with Iriabiji, Elhomun and Kolawole (2022), who found that petroleum profit tax has negative and insignificant effects on GDP, and with Gideon, Kolawole and Samson (2021), who reported an inverse relationship between petroleum profit tax and GDP growth, a divergence that may reflect differences in the study period, the efficiency of tax administration, and the extent to which petroleum tax revenue was channelled into productive investment across different periods of Nigeria's fiscal history.

Also, company income tax was found to have a positive and significant effect on Real Gross Domestic Product in both the short run and long run, suggesting that corporate taxation

contributes meaningfully to economic development by expanding government's revenue base and its capacity to invest in infrastructure. This finding is consistent with Akadakpo and Akogo (2022), who found that company income tax has a positive and significant effect on corporate performance, with Yahaya and Bakare (2018), who established that company income tax contributes significantly to economic growth in Nigeria, and with Onakoya and Afintinni (2019) and Ibanichuka, Akani and Ikebujo (2018), both of whom found positive relationships between company income tax and economic development indicators in Nigeria. In addition, charges on gas flared were found to have a positive and significant effect on Real Gross Domestic Product in the long run, though the short-run effect, while positive, was not statistically significant. This indicates that environmental regulatory charges targeting gas flaring activities contribute to economic development over time, supporting the broader environmental taxation argument that pollution-control instruments can generate a double dividend of environmental improvement and economic growth, as underscored by Ajeigbe and Ganda (2024), who recommended environmental and carbon emission taxes as tools for improving sustainability and economic performance.

However, carbon emission was found to have a negative and significant effect on Real Gross Domestic Product in Nigeria in both the short run and long run. This implies that rising environmental degradation, proxied by carbon emission, exerts an adverse effect on aggregate economic output, consistent with the Environmental Kuznets Curve Hypothesis' recognition that environmental degradation can undermine productivity and growth when emissions are not adequately managed. This finding aligns with Ajeigbe and Ganda (2024) and Hammayo and Kamal (2023), both of whom found that carbon emissions and greenhouse gas emissions exert a significant negative effect on economic growth, and with Adetunji and Olusola (2023), who found that carbon emissions are negatively related to inclusive growth in Nigeria in the long run. The finding also aligns with Osayande and Akunoma (2024), who found no evidence of the EKC's inverted-U relationship in Nigeria, with economic growth activities instead worsening carbon emission both in the short and long run, reinforcing the concern that Nigeria's growth trajectory has yet to reach the turning point at which rising income translates into improved environmental quality. However, the finding contrasts somewhat with Ogbonna, Ojeaburu and Ehilegbu (2021), who found an insignificant negative relationship between carbon emission and GDP in Nigeria, a divergence that may reflect differences in study period and estimation technique. Taken together, these findings imply that while petroleum tax instruments, hydrocarbon tax, petroleum profit tax, company income tax, and charges on gas flared, have consistently supported Real Gross Domestic Product growth in Nigeria, the environmental cost of petroleum-related economic activity, proxied by carbon emission, continues to exert a significant drag on that same growth, underscoring the need for stronger environmental governance alongside continued petroleum tax administration reforms.

5.0 Conclusion and Recommendations

Conclusion

This study empirically examined the effect of petroleum tax and environment quality on Real Gross Domestic Product in Nigeria. The findings of the study indicated that hydrocarbon tax, petroleum profit tax, company income tax, and charges on gas flared have a positive and significant effect on Real Gross Domestic Product in Nigeria in both the short run and long run, while carbon emission has a negative and significant effect on Real Gross Domestic Product in both the short run and long run. Premised on the findings, the study concluded that petroleum tax plays a significant and vital role in enhancing economic development in Nigeria, while environmental degradation, proxied by carbon emission, contributes negatively to economic growth in Nigeria.

Recommendations

The following recommendations are proffered based on the findings of this study:

- i. Government should strengthen hydrocarbon tax administration and ensure full compliance by oil-producing firms. More importantly, revenues generated from hydrocarbon taxes should be transparently channeled into productive sectors such as infrastructure, education, and healthcare, as this will further amplify its positive developmental impact. Effective monitoring by agencies such as the Federal Inland Revenue Service will ensure leakages are minimized and developmental outcomes are maximized.
- ii. The Federal Inland Revenue Service and relevant petroleum sector regulators should sustain and strengthen the administration of petroleum profit tax and company income tax on oil and gas firms, given their consistently positive and significant contribution to Real Gross Domestic Product, while ensuring that the tax burden does not become so onerous as to discourage continued investment in the sector.
- iii. Government should enforce stricter compliance with charges on gas flared and consider periodically reviewing the charge rate upward, since the positive long-run effect of these charges on Real Gross Domestic Product suggests that a stronger fiscal disincentive against flaring can simultaneously improve environmental outcomes and generate additional development revenue.
- iv. Given the significant negative effect of carbon emission on Real Gross Domestic Product, government should intensify environmental regulation and climate governance frameworks, including stricter enforcement of gas flare-out policies, investment in cleaner production technologies, and the adoption of carbon pricing mechanisms, to curb the environmental degradation associated with petroleum sector activities.

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