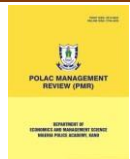




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GLOBAL ENERGY TRANSITION POLICIES AND DYNAMICS OF PETROLEUM SECTOR PERFORMANCE IN NIGERIA

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Abstract

The study investigates the impact of global energy transition policies on the dynamics of petroleum sector performance in Nigeria covering 1990 to 2025. Global Renewable Energy Consumption, Global Renewable Electricity Output, Global Fossil Fuel Import and Global Carbon Emission were used to proxy global energy transition policies while Crude oil production was used as a stand-in for petroleum sector in Nigeria. World Bank's World Development Index (WDI), is the major sources of data collection while the Augmented Dickey Fuller (ADF) Unit Root test and the Autoregressive Distributive Lag (ARDL) were used to test the variables and analyze the hypothesis. The empirical result found that global energy transition policies are correlated with oil export revenue according to the bound test. Further findings showed that global renewable energy consumption and global carbon emission are positive and significantly related with Crude oil production while global renewable electricity fossil fuel import reported a negative and insignificant relationship with Crude oil production. Hence, it was concluded that global energy transition policies had a significant impact on Crude oil production in Nigeria. It was therefore, recommended that the Federal Ministry of Petroleum Resources, the Nigerian National Petroleum Company Limited and the Nigerian Upstream Petroleum Regulatory Commission should prioritize investments in cleaner and more efficient oil production technologies.

Keywords: Global Renewable Energy Consumption, Global Renewable Electricity Output, Global Fossil Fuel Import, Global Carbon Emission, Crude Oil Production

1. Introduction

The global energy system is undergoing a profound structural transformation, driven by climate-change commitments, technological advancement, declining costs of renewable technologies, energy-security concerns and the growing adoption of policies aimed at reducing dependence on carbon-intensive fossil fuels. This transformation, commonly described as the global energy transition, has important implications for petroleum-dependent economies such as Nigeria, where crude oil and natural gas remain central to government revenue, foreign-exchange earnings and economic activity. Consequently, the interaction between global energy transition policies and the performance dynamics

of Nigeria's petroleum sector has become an important contemporary policy and research issue. Global energy transition policies refer broadly to the international and national policy measures designed to shift energy production and consumption from carbon-intensive fossil fuels towards cleaner, low-carbon and renewable energy sources through decarbonisation, renewable-energy deployment, energy efficiency, carbon-reduction measures, electrification and green investment. It is therefore imperative to note that policies can influence petroleum-sector performance through changes in global oil demand, investment flows, technological choices, oil prices and the competitiveness of fossil fuels. Liu et al. (2025), for instance, show that oil-price uncertainty

significantly affects the pace of renewable-energy transition, while Pata and Balcilar (2025) establish that climate-policy uncertainty influences renewable-energy consumption and that higher oil prices can encourage renewable-energy adoption.

This divergence reveals an important empirical gap. Existing Nigerian studies have largely concentrated either on the effect of domestic petroleum policies, particularly the Petroleum Industry Act and the Energy Transition Plan, or on the broader contribution of petroleum consumption to economic growth. Limited attention has been given to the dynamic effect of global energy transition policies on petroleum-sector performance in Nigeria, particularly when global transition pressures are considered as an external force affecting a petroleum-dependent economy. Moreover, much of the recent Nigerian evidence is qualitative or policy-oriented, leaving insufficient time-series econometric evidence on how changes in global energy-transition pressures translate into changes in petroleum-sector performance over time. It is against this background, this study is motivated by the need to provide empirical evidence on whether the accelerating global energy transition constitutes primarily a threat to Nigeria's petroleum-sector performance or whether appropriate policy and institutional adaptation can enhance the sector's resilience. By examining the dynamics of petroleum-sector performance in relation to global energy transition policies,

2. Literature Review

2.1 Conceptual Clarification

Global Energy Transition Policies

Global energy transition policies has become increasingly important in contemporary energy economics, environmental policy, and sustainable development literature due to the global commitment to achieving carbon neutrality and limiting climate change. These policies provide the institutional, regulatory, fiscal, and technological framework that guides countries in transitioning from fossil fuel-based energy systems to cleaner, renewable, and low-carbon energy sources. According to the International Energy Agency (2024), global energy transition policies refer to the

comprehensive set of government policies, regulatory frameworks, fiscal incentives, investment strategies, and technological measures designed to accelerate the transition from fossil fuel dependence towards clean, affordable, secure, and sustainable energy systems. The International Energy Agency emphasizes that these policies promote renewable energy deployment, energy efficiency improvements, electrification, clean technology innovation, and carbon emission reduction while ensuring energy security and economic competitiveness.

Conceptually, global energy transition policies comprise several complementary policy instruments. These include renewable energy targets, carbon taxes, emissions trading systems, fossil fuel subsidy reforms, renewable portfolio standards, feed-in tariffs, green finance initiatives, climate finance mechanisms, clean hydrogen strategies, electric vehicle incentives, battery storage development, smart electricity grids, energy efficiency regulations, research and development funding, and mandatory climate disclosure frameworks (UNEP, 2023; IEA, 2024). Globally, these policies have gained significant momentum following the adoption of the Paris Agreement in 2015, where nearly 200 countries committed to limiting global temperature increases to well below 2°C and pursuing efforts to limit warming to 1.5°C above pre-industrial levels (UNFCCC, 2015). Since then, many advanced and emerging economies have introduced ambitious net-zero emission strategies supported by renewable energy expansion, carbon pricing, green industrial policies, and clean energy investments. According to the International Energy Agency (2024), global investment in clean energy technologies exceeded US\$2 trillion in 2024, surpassing investments in fossil fuels for the first time in history, reflecting the increasing implementation of global energy transition policies.

Petroleum Sector Performance

Petroleum sector performance is a multidimensional concept that reflects the efficiency, productivity, profitability, and overall contribution of the petroleum industry to economic development. It assesses how effectively the upstream, midstream, and downstream segments of the oil and gas industry utilize available

resources to generate output, government revenue, foreign exchange earnings, employment opportunities, and economic value. tary perspectives. According to the Organization of the Petroleum Exporting Countries (OPEC, 2024), petroleum sector performance refers to the capacity of the oil and gas industry to sustainably explore, produce, refine, transport, and market petroleum resources while maintaining operational efficiency, investment attractiveness, market competitiveness, and long-term supply reliability. OPEC emphasizes that sector performance is reflected in production capacity, reserve replacement, investment inflows, technological advancement, and the industry's contribution to national economic growth. Similarly, the International Energy Agency (IEA, 2024) defines petroleum sector performance as the effectiveness of petroleum industry activities in ensuring adequate crude oil and natural gas production, refining capacity, energy supply security, investment efficiency, and financial returns within a changing global energy landscape. According to the IEA, the performance of the petroleum sector is increasingly assessed alongside environmental sustainability, operational resilience, and adaptability to the ongoing global energy transition.

2.2 Theoretical Literature Review

Sustainable Transition Theory

The Sustainable Transition Theory, was propounded by Geels (2002). The theory posits that when external pressures intensify and niche innovations become economically viable, the existing petroleum-based energy regime gradually weakens, thereby facilitating the transition towards a more sustainable energy system. Proponents, of the theory such as Geels (2002), Johan et al (2008), and Markard, et al (2012), argue that sustainability transitions are driven by technological innovation, supportive government policies, institutional reforms, market incentives, and collaboration among governments, industries, research institutions, and civil society.

Resource Dependence Theory

The Resource Dependence Theory was propounded by Pfeffer and Salancik (1978) to explain how organizations and economies depend on external resources for

survival, growth, and sustained performance. The theory argues that no organization or country is completely self-sufficient because critical resources such as finance, technology, raw materials, markets, and information are largely controlled by external actors. Consequently, organizations and nations must continuously adapt their strategies and policies to changes in their external environment in order to secure these resources and maintain competitiveness. They maintain that organizations that effectively manage external dependencies through strategic alliances, diversification, innovation, and institutional adaptation are more likely to achieve stability, competitiveness, and sustainable performance. In support of this position, Hillman, Withers, and Collins (2009) argue that Resource Dependence Theory provides a useful framework for understanding how organizations respond strategically to changes in external economic, political, and institutional environments in order to secure critical resources and improve organizational performance. The theory therefore provides a logical explanation of how external policy developments shape petroleum sector performance in an oil-dependent economy.

2.3 Empirical Review

Liu, et al (2025) examined the relationship between oil price uncertainty and renewable energy transition using a panel of 71 countries over the period 1980–2022. The study employed panel econometric techniques to investigate how oil price uncertainty influences renewable energy transition. The dependent variable was renewable energy transition (RET), measured using renewable energy production and renewable energy consumption. The independent variables included oil price uncertainty (OPU), human capital, green innovation, and resource abundance as moderating factors. The findings revealed that oil price uncertainty exhibited a significant non-linear (N-shaped) relationship with renewable energy transition. Human capital had a positive and significant moderating effect on renewable energy transition, while green innovation also positively and significantly strengthened the transition.

Pata and Balcilar (2025) investigated the influence of climate policy uncertainty and oil prices on renewable

energy in the United States using quarterly data covering 1985Q1–2022Q4. The study adopted the Nonlinear Autoregressive Distributed Lag (NARDL) approach. The dependent variable was modern renewable energy consumption, while the independent variables included climate policy uncertainty, oil prices, economic growth, and other macroeconomic control variables. The empirical findings indicated that climate policy uncertainty exerted a significant influence on renewable energy consumption, suggesting that changes in climate policy affect investment and deployment of renewable energy technologies. Oil prices showed a positive and significant relationship with renewable energy consumption, indicating that increases in oil prices encourage greater reliance on renewable energy. Economic growth was found to have a positive effect on renewable energy development.

Alola et al (2025) examined the effect of economic policy uncertainty on renewable energy transition in the Arctic Council countries (Sweden, the United States, Finland, Norway, Canada, Russia, and Denmark) covering the period 1998–2022. The study employed advanced panel regression techniques. The dependent variable was renewable energy transition, while the explanatory variables included economic policy uncertainty, resource richness, environmental technology, and environmental governance. The findings revealed that economic policy uncertainty negatively and significantly affected renewable energy transition, implying that higher uncertainty discourages clean energy investment. Resource richness also had a negative effect on renewable energy transition because resource-abundant economies remained dependent on conventional energy sources. Conversely, environmental technology exhibited a positive and significant relationship with renewable energy transition, while environmental governance also positively and significantly enhanced renewable energy development.

Pereira, et al (2025) examined the place of petroleum in Nigeria's energy transition. The study focused on Nigeria and covered the period 2021–2024. The study adopted a qualitative policy and documentary research approach using evidence from the Nigerian Energy Transition Plan, Petroleum Industry Act (PIA), and other energy

policy documents. The dependent variable was energy transition, while the explanatory variables included petroleum resources, natural gas development, renewable energy development, energy policies, climate change mitigation, and energy financing. The findings revealed that petroleum resources continue to exert a positive influence on Nigeria's economic development and energy security, while natural gas had a positive and significant effect on the country's energy transition because it serves as a transition fuel. The study further established that renewable energy development positively promotes sustainable energy transition, whereas inadequate financing negatively affects renewable energy investment and transition implementation.

Obele (2025) investigated the effect of government policy frameworks on the diversification from crude oil to alternative energy in Nigeria. The study covered the period 2021–2024 and adopted a descriptive survey research design. Data were analyzed using simple regression analysis. The dependent variable was diversification from crude oil to alternative energy, while the explanatory variables included the Energy Transition Plan (ETP), Petroleum Industry Act (PIA) 2021, Electricity Act 2023, National Renewable Energy and Energy Efficiency Policy (NREEEP), and NERC Mini-Grid Regulations. The findings revealed that the Energy Transition Plan had a positive and significant effect on investment in alternative energy, the Petroleum Industry Act (2021) positively and significantly improved petroleum sector governance and investment, the Electricity Act (2023) positively and significantly promoted renewable electricity development, the National Renewable Energy and Energy Efficiency Policy positively and significantly enhanced renewable energy generation, while the NERC Mini-Grid Regulations positively and significantly improved rural electrification and clean energy access.

Kagarura, yet al (2025) examined the paradox of oil abundance and fossil fuel consumption in Nigeria using quarterly data covering the period 1990–2024. The study employed the Autoregressive Integrated Moving Average (ARIMA) model to forecast fossil fuel energy consumption. The dependent variable was fossil fuel

energy consumption (% of total energy consumption), while the explanatory variables consisted of the autoregressive [AR(1)] and moving average [MA(4)] components of the ARIMA model. The findings revealed that AR(1) had a positive coefficient (0.870696), indicating strong persistence in fossil fuel consumption, whereas MA(4) had a negative and statistically significant coefficient (-0.999984), suggesting that previous shocks substantially dampened future fossil fuel consumption.

Mbohwa et al (2025) investigated decentralized energy transition in urban Nigeria with emphasis on hybrid renewable energy systems. The study covered Nigeria and utilized evidence from 2020–2025 through institutional and policy analysis. The dependent variable was urban energy transition, while the explanatory variables included hybrid renewable energy systems, institutional quality, policy implementation, electricity access, and renewable energy investment. The findings indicated that hybrid renewable energy systems positively enhanced electricity access and energy transition, renewable energy investment positively influenced sustainable electricity supply, while institutional barriers and weak policy implementation negatively affected the successful deployment of renewable energy systems.

Soltani (2025) investigated the symmetric and asymmetric impacts of oil price fluctuations on green energy transition in oil-exporting and oil-importing countries using panel data covering the period 2000–2020. The study adopted the Pooled Mean Group Autoregressive Distributed Lag (PMG-ARDL) estimation technique. The dependent variable was green energy transition, while the explanatory variables included oil prices, research and development (R&D) expenditure, GDP, and greenhouse gas (GHG) emissions. The findings indicated that oil price increases had a positive and significant effect on green energy transition, whereas oil price decreases had no significant effect. In addition, R&D expenditure positively and significantly enhanced green energy transition, while GDP and GHG emissions also exhibited positive and significant long-run relationships with green energy transition.

3. Methodology

3.1 Research Design and Method of Data Analysis

Ex-post factor research design was used in this study because the facts has been established and cannot be manipulated by the researcher. This paper also relied on secondary data sourced from World Banks World Development Index (WDI), on Global Renewable Energy Consumption, Global Renewable Electricity Output, Global Fossil Fuel Import and Global Carbon Emission as proxy for global energy transition policies while Crude oil production was used as a stand-in for petroleum sector in Nigeria. The Augmented Dickey Fuller (ADF) method was used in order to do the unit root test on the model that was developed. Taking into consideration the results of the ADF, the research used the Auto-regressive Distributive Lag (ARDL).

3.2 Model Specification

$$OER=f(REC, GFFD, GREI, GCE) \quad (1)$$

The mathematical model could be symbolically expressed as;

$$COP = \beta_0 + \beta_1 REC + \beta_2 GFFD + \beta_3 GREI + \beta_4 GCE \quad (2)$$

$$COP = \beta_0 + \beta_1 REC + \beta_2 GFFD + \beta_3 GREI + \beta_4 GCE + e \quad (3)$$

Where:

COP = Crude Oil Production, REC = Renewable Energy Consumption, GFFD = Global Fossil Fuel Demand, GREI = Global Renewable Energy Investment, GCE = Global Caron Emission, f = functional relationship β_0 = Intercept of relationship in the model/constant B_1 - B_4 = Coefficients of each independent or explanatory variable e = Stochastic or Error term.

3.3 Description of Variables in the Model

Crude Oil Production (COP): This refers to the process of extracting, processing, and bringing crude petroleum from underground reservoirs to the surface for further refining and commercial use. Crude oil production is used to proxy petroleum sector performance in Nigeria and is measured in billions of naira annually.

Global Renewable Energy Consumption (GREC): This is the total amount of energy consumed worldwide from renewable sources such as solar, wind,

hydroelectric, geothermal, and biomass. It reflects the pace of the global transition from fossil fuels to cleaner energy sources. An increase in global renewable energy consumption reduces global dependence on crude oil production and other fossil fuels. As more countries adopt renewable energy technologies, the demand for petroleum products declines, leading to lower international oil demand and prices. Consequently, oil-exporting countries such as Nigeria experience a reduction in oil export revenue. Therefore, this paper expect a negative relationship between global renewable energy consumption and oil export revenue. Global Renewable Energy Consumption was used to proxy Global Energy Transition Policy and was expressed as % of total final energy consumption. Hence, $\beta_1 < 0$

Global Renewable Electricity Output (GREO): This refers to the total quantity of electricity generated worldwide from renewable energy sources, including solar, wind, hydroelectric, geothermal, biomass, and marine energy. An increase in renewable electricity generation signifies greater substitution of fossil fuels with clean energy in electricity production. This reduces long-term global demand for petroleum and encourages the decarbonization of energy systems. Consequently, this study assumed that global renewable electricity output will be negatively related with oil export revenue. Global Renewable Electricity Output was used to proxy Global Energy Transition Policy and was measured in %. Thus $\beta_2 < 0$

Global Fossil Fuel Consumption (GFFC): This refers to the total amount of coal, crude oil, and natural gas consumed worldwide for energy production, industrial activities, transportation, and residential use. An increase in global fossil fuel consumption raises the global demand for crude oil and petroleum products. Higher demand often leads to increased international oil prices and export volumes, thereby increasing Nigeria's oil export revenue. Therefore, this study hypothesized that global fossil fuel consumption will be positively related with oil export revenue. Global fossil fuel consumption is used as a surrogate for global energy transition policy and would be measured in %. Hence, Thus $\beta_3 > 0$

Global Carbon Emission (GCE): This refer to the total amount of carbon dioxide (CO₂) and other greenhouse gases released into the atmosphere from human activities, particularly the combustion of fossil fuels and industrial processes. Higher global carbon emissions generally indicate greater fossil fuel consumption, especially crude oil, coal, and natural gas. Increased fossil fuel use raises global demand for petroleum products, thereby increasing Nigeria's oil export revenue. Consequently, this paper expected that global carbon emission would have a positive relationship with oil export revenue. Global carbon emission is measured is used to proxy global energy transition policy and is measured in %, therefore, s $\beta_4 > 0$

4. Results and Discussion

4.1 Empirical Data Analysis

Table 1: Descriptive Statistics

	COP	GREC	GREO	GFFI	GCE
Mean	3449.544	17.65028	21.48917	58.04722	11.46944
Median	3969.900	17.34500	19.72000	80.30000	11.25000
Maximum	8879.000	19.74000	28.01000	82.60000	13.60000
Minimum	71.90000	16.54000	17.81000	0.000000	7.700000
Std. Dev.	2573.012	1.044672	3.545994	36.62635	1.666102
Skewness	0.136576	1.179693	0.883058	-0.973703	-0.567877
Kurtosis	1.915109	3.001000	2.802270	2.968806	2.542591
Jarque-Bera	1.877402	8.353950	5.633308	7.283631	2.248742
Probability	0.391136	0.015345	0.059806	0.026205	0.324857
Sum	124183.6	635.4100	773.6100	2089.700	412.9000
Sum Sq. Dev.	2.32E+08	38.19690	440.0925	46952.13	97.15639
Observations	36	36	36	36	36

Source: E-view 13 Output

Table 1 presents the descriptive statistics for the variables used in the study, namely Crude Oil Production (COP), Global Renewable Energy Consumption (GREC), Global Renewable Electricity Output (GREO), Global Fossil Fuel Import (GFFI), and Global Carbon Dioxide Emission (GCE), using 36 annual observations covering the study period. The mean values indicate the average level of each variable over the study period. Crude Oil Production (COP) recorded the highest average value of 3449.544 billion naira, reflecting the substantial contribution of oil exports to Nigeria's economy during the period under review. The average Global Renewable Energy Consumption (GREC) stood at 17.6503%, suggesting that renewable energy constituted a relatively small but gradually increasing share of total global final energy consumption. Similarly, Global Renewable Electricity Output (GREO) recorded a mean value of 21.4892%, indicating that renewable sources accounted for approximately one-fifth of global electricity generation on average. Global Fossil Fuel Import (GFFI) had an average value of 58.0472%, implying that fossil fuels remained the dominant source of imported energy worldwide.

In contrast, Global Carbon Dioxide Emission (GCE) recorded a mean value of 11.4694 MtCO₂e, representing the average global carbon emission level over the sample period. The median values of 3969.900, 17.3450, 19.7200, 80.3000, and 11.2500 for COP, GREC, GREO, GFFI, and GCE, respectively, indicate that the central tendency of the variables is generally close to their respective means, although slight differences suggest the presence of moderate asymmetry in some of the distributions. The maximum and minimum values reveal the extent of variation within the dataset. COP ranged from 71.900 billion naira to 8879.000 billion naira, reflecting substantial fluctuations in Nigeria's oil export earnings over the study period. GREC varied between 16.540% and 19.740%, indicating relatively stable growth in global renewable energy consumption. GREO ranged from 17.810% to 28.010%, suggesting gradual expansion in renewable electricity generation. GFFI exhibited the widest range, varying from 0.000% to 82.600%, indicating considerable changes in global fossil fuel import dependence across the study period. Likewise, GCE ranged between 7.700 MtCO₂e and

13.600 MtCO₂e, reflecting moderate fluctuations in global carbon emissions.

The distributional properties of the variables are further examined using skewness, kurtosis, and the Jarque–Bera (JB) normality test. The skewness statistics show that COP (0.1366), GREC (1.1797), and GREO (0.8831) are positively skewed, indicating that their distributions possess longer right tails with relatively higher observations occurring less frequently than lower observations. Conversely, GFFI (−0.9737) and GCE (−0.5679) are negatively skewed, implying that their distributions have longer left tails with relatively lower observations occurring less frequently. The kurtosis values reveal that COP (1.9151), GREO (2.8023), GFFI (2.9688), and GCE (2.5426) are platykurtic, indicating flatter distributions than the normal distribution, while GREC recorded a kurtosis of 3.0010, which is approximately equal to the normal benchmark of three, suggesting a mesokurtic distribution.

The Jarque–Bera statistics and their associated probability values provide evidence on the normality of the variables. COP (JB = 1.8774, $p = 0.3911$), GREO (JB = 5.6333, $p = 0.0598$), and GCE (JB = 2.2487, $p = 0.3249$) have probability values greater than the 5 percent level of significance, indicating that the null hypothesis of normal distribution cannot be rejected for these variables. However, GREC (JB = 8.3540, $p = 0.0153$) and GFFI (JB = 7.2836, $p = 0.0262$) have probability values less than 0.05, indicating departures from normality. In summary, although two variables exhibit non-normal distributions, the majority of the variables satisfy the normality assumption. Moreover, since the subsequent unit root analysis using the Augmented Dickey–Fuller (ADF) test does not require strict normality of the variables, the descriptive statistics confirm that the dataset possesses acceptable statistical properties and is suitable for proceeding with the unit root test and subsequent econometric analysis.

4.2 Unit Root Test

A unit root test known as the Augmented Dickey Fuller (ADF) test was used in the research project to determine the order of integration of the variables that were being investigated. This was done in order to pick the proper approach and prevent false regression.

Table 2: Unit Root Test Using Augmented Dickey Fuller (ADF)

Variables	Levels		First Difference		Order of Integration	P-value
	T. Statistics	5% Critical Value	T. Statistics	5% Critical Value		
LCOP	-2.436504	-2.948404	-5.477647	-2.951125	I(1)	0.0001
GREC	-0.294730	-2.948404	-4.230046	-2.951125	I(1)	0.0022
GREO	-1.331252	-2.948404	-3.995414	-2.951125	I(1)	0.0040
GFFI	-0.276312	-2.948404	-4.501254	-2.951125	I(1)	0.0010
LGCE	-2.973267	-2.948404			I(0)	0.0051

Source: Extracts from E-view 13. * Level of significance at 5%

We examined all of the research variables using Augmented Dickey Fuller (ADF) tests to see whether they were stationary or non-stationary series, following the guidelines provided by table. 2. At the initial difference I(1), the stationarity test indicated that LCOP, GREC, GFE and LGFFI, stationary, whereas LGCE is stationary at the level I(0). The variables show either mixed-order integration or stationarity of level and initial differences when we analyse their stationarity. The Autoregressive Distributive Lag (ARDL) technique was

used to analyse the data. Both the first difference (I(1)) and the stationary at level I(0) may be handled by this method. The ARDL test is the most appropriate analytical technique to utilise since it looks at the relationship between the independent and dependent variables in terms of both short-term and long-term trends.

4.3 Co-integration Test

Table 3: ARDL Bound Test

Test Statistics	Value	K
F-statistics	7.210134	4
Significance	I (0)	1(1)
10%	2.75	3.99
5%	3.35	4.77
1%	4.76	6.67

Source: Authors computation 2026

From table 3 the bound test result indicates that there exist long run relationships amongst the variables as the F-statistic value of 7.210134 exceeds both the lower and upper bound critical values. Thus, we reject the null hypotheses of no long run relationship and accept its alternative. This means that there is a long-run

relationship between Global Energy Transition Policies and Performance of Petroleum Sector in Nigeria.

4.4 Short and Long-Run Estimation Results for the Model

The results of the short and long-run dynamics association of the model are presented in table 4 below

Table 4: ARDL Short and Long-run Result for the Model

Variable	Short Run Coefficient			
	Coefficient	Std. Error	t-Statistics	Prob
D(GREC)	-0.886032	0.304623	-2.908619	0.0015
D(GREO(-1))	0.459471	0.186484	2.463863	0.0080
D(GFFI)	0.014279	0.004930	2.896504	0.0092

D(LGCE)	0.584669	0.634181	2.496658	0.0219
ECM(-1)	-0.391901	0.141561	-2.768426	0.0122
Long Run Coefficient				
Variable	Coefficient	Std. Error	t-Statistics	Prob
GREC(-1)	0.062957	0.051464	3.059876	0.0007
GREO(-1)	-0.166875	0.343598	-0.485671	0.6309
GFFI(-1)	-0.002447	0.019886	-0.123066	0.9029
LGCE(-1)	0.310991	0.105938	2.935599	0.0065
C	-0.553848	0.207619	-2.667620	0.0152
Adj R² = 0.411245, F-statistics = 2.719383 (0.023424), DW = 2.344813				

Source: Authors computation using E-view 13 2026

The coefficient estimate for the error correction term, ECM (-1) has a negative value and is significant at the 0.05 level. It suggests that the model will reach long-run equilibrium at a rate of 0.39% every year. This means that a yearly adjustment speed of 0.39% may fix the mistake from the previous year. The independent variables (GREC, GREO, GFFI & LGCE) explain 41% of the total variance in the dependent variable (LCOP), according to the adjusted R-Square (R²) value. As a whole, the model is noteworthy since the F-statistic is significant at the 5% level of significance. Without serial correlation, the model would not work, according to the Durbin-Watson statistics of 2.344813 which is close to 2.

Table 3 displays the model's short-and long run outcome. The value of global renewable electricity output (GREO), the value of global fossil fuel import (GFFI) reported a negative but insignificant relationship with

the log value of Crude Oil Production (CLOP), and the logarithm value of global carbon emission (LGCE) had a positive and significant relationship with the log value of Crude Oil Production (LCOP), while the value of global renewable energy consumption (GREC) had a negative but significant relationship with the log value of Crude Oil Production (LCOP) in the short run. Equally, table 3, shows that the outcome of the long-run result that the value of global renewable energy consumption (GREC) and the logarithm value of global carbon emission (LGCE) had a positive and significant relationship with the log value of Crude Oil Production (LCOP), while global renewable electricity output (GREO) and global fossil fuel import (GFFI) reported a negative but insignificant relationship with the log value of oil export revenue (LOER), in the long-run

4.5 Diagnostic Test

Table 5: Ramsey Reset Test, Serial Correlation LM Test and Homoscedasticity Test Results

	F-Statistic	Prob-Value
Ramsey Reset Test	0.849076	0.4101
Breusch-Godfrey Serial Correlation LM Test	3.207900	0.0737
Breusch-Pagan-Godfrey Heteroskedasticity Test	1.557763	0.1968

Source: Authors computation 2026

From Table 5, the results of the diagnostic test shows that the linearity test using Ramsey Reset test indicates that the f-statistic (0.849076) with computed p-value of 0.4101 which is greater than 5 percent (0.05) critical value, hence the study reject the null hypothesis and conclude that the model is correctly specified. The result of the Serial or Autocorrelation Test using Breusch-Godfrey Serial Correlation LM Test shows

that the f-statistic is 3.207900, with a Chi-Square probability value is 0.0737. This indicates that the probability value of about 7 percent (0.0737) is greater than 5 percent (0.05) critical value; hence the study confirms no serial correlation in the model. The result of the heteroscedasticity test using Breusch-Pagan-Godfrey test shows that the f-statistic is 1.557763 with a Chi-Square probability value of 0.1968 The result

suggests that there is no evidence of heteroskedasticity in the model since the probability Chi-square value is more than 5 percent ($P > 0.05$). So, residuals do have

constant variance which is desirable in regression meaning that residuals are Homoscedastic.

Figure 1: Normality Test

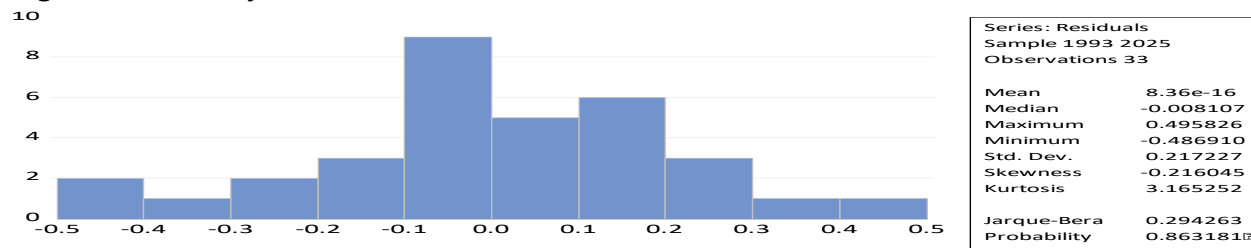


Figure 1, shows summary of the normality test with Jarque-Bera value of 0.294263 and a corresponding probability value of 0.863183 more than 0.05 level of significance, indicating that the residuals are normally distributed

Figure 2: Stability Test

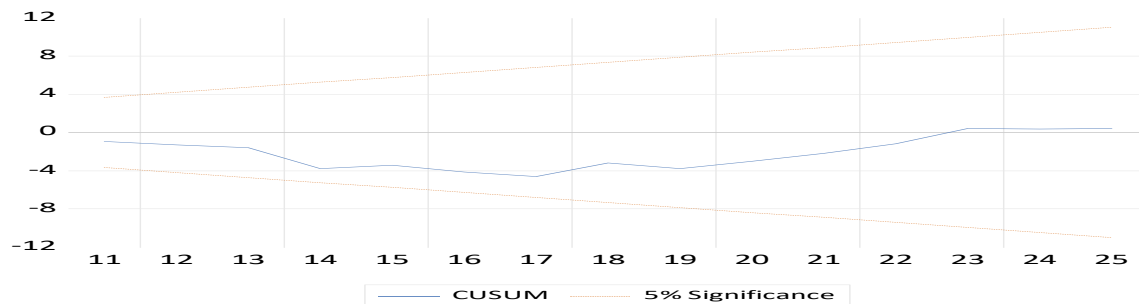


Figure 2 shows summary of the stability test, the result showed that the model is stable. This is evident to the fact that the blue line is in-between the two red (-5 & +5) or less than 0.05 level of significance.

4.6 Discussion of Findings

Global Energy Transition Policies and Performance of Petroleum Sector in Nigeria.

Global Renewable Energy Consumption and Crude Oil Production in Nigeria.

Inference drawn from the long-run using the Auto-Regressive Distributed Lag (ARDL) model revealed that global renewable energy consumption (GREC) had a positive (+0.062957) relationship with the value of crude oil production (COP). The positive relationship between global renewable energy consumption (GREC) and the value of crude oil production (COP). do not agrees with a priori. It was expected that an increase in global renewable energy consumption reduces global dependence on crude oil and other fossil fuels. As more countries adopt renewable energy technologies, the demand for petroleum products declines, leading to

lower international oil demand and prices. However, the p -value of (0.0007) indicates that global renewable energy consumption (GREC) had a significant relationship with crude oil production (COP).. This means that the null hypothesis which state that there is no significant relationship between global renewable energy consumption (GREC) and oil export revenue (OER) is rejected.

Global Electricity Output and Crude Oil Production in Nigeria.

Insinuation drawn from the long-run using the Auto-Regressive Distributed Lag (ARDL) model revealed that global renewable electricity output (GREO) had a negative (-0.166875) relationship with the value of crude oil production (COP).. The negative relationship between global renewable electricity output (GREO) and the value of crude oil production (COP). agrees with a priori. It was expected that an increase in renewable

electricity generation signifies greater substitution of fossil fuels with clean energy in electricity production. This reduces long-term global demand for petroleum and encourages the decarbonization of energy systems. However, the p -value of (0.6309) indicates that global renewable electricity output (GREO) had an insignificant relationship with oil crude oil production (COP). This means that the null hypothesis which state that there is no significant relationship between global renewable electricity output (GREO) and crude oil production (COP). is accepted.

Global Fossil Fuel Import and Crude Oil Production in Nigeria.

Suggestion drawn from the long-run using the Auto-Regressive Distributed Lag (ARDL) model revealed that global fossil fuel import (GFFI) had a negative (-0.002447) relationship with the value of crude oil production (COP). The negative relationship between global fossil fuel import (GFFI) and the value of crude oil production (COP). agrees with a priori. It was expected that higher demand often leads to increased international oil prices and export volumes, thereby increasing Nigeria's oil export revenue. However, the p -value of (0.9029) indicates that global fossil fuel import (GFFI) had an insignificant relationship with crude oil production (COP).. This means that the null hypothesis which state that there is no significant relationship between global fossil fuel import (GFFI) and crude oil production (COP). is accepted.

Global Carbon Emission and Crude Oil Production in Nigeria.

Inference drawn from the long-run using the Auto-Regressive Distributed Lag (ARDL) model revealed that global carbon emission (GCE) had a positive (+0.310991) relationship with the value of crude oil production (COP). The positive relationship between global carbon emission (GCE) and the value of crude oil production (COP). agrees with a priori. It was expected that higher global carbon emissions generally indicate greater fossil fuel consumption, especially crude oil, coal, and natural gas. Increased fossil fuel use raises global demand for petroleum products, thereby

increasing Nigeria's oil export revenue. However, the p -value of (0.0065) indicates that global carbon emission (GCE) had a significant relationship with crude oil production (COP). This means that the null hypothesis which state that there is no significant relationship between global carbon emission (GCE) and crude oil production (COP). is rejected.

5. Conclusion and Recommendations

The study investigated the impact of global energy transition policies on performance of petroleum sector in Nigeria suggest that global renewable energy consumption and global carbon emission are positive and significantly related with crude oil production while global renewable electricity fossil fuel import reported a negative and insignificant relationship with crude oil production Hence, it was concluded that global energy transition policies had a significant impact on oil export revenue in Nigeria

Based on the conclusion and recommendation, the study recommends:

- i. The Federal Ministry of Petroleum Resources, the Nigerian National Petroleum Company Limited and the Nigerian Upstream Petroleum Regulatory Commission should prioritize investments in cleaner and more efficient oil production technologies.
- ii. Also, the Federal Ministry of Environment and the National Council on Climate Change should strengthen environmental regulations and promote low-carbon oil production practices. These institutions should enforce stricter emission control measures, encourage carbon capture and storage technologies, and reduce gas flaring to ensure that Nigeria continues to benefit from oil exports while meeting its international climate obligations.
- iii. Additionally, the Federal Ministry of Industry, Trade and Investment in collaboration with the Nigerian Export Promotion Council should intensify efforts toward export diversification and market expansion. These agencies should develop policies that promote non-oil exports, expand access to new international markets, and

reduce Nigeria's dependence on crude oil as the primary source of export earnings.

iv. Finally, the Federal Ministry of Power and the Rural Electrification Agency should accelerate investments in renewable electricity infrastructure and energy

diversification. These agencies should promote solar, wind, hydroelectric, and other renewable energy projects through incentives, public-private partnerships, and increased funding to prepare Nigeria for a future with lower dependence on fossil fuel exports while ensuring sustainable economic growth.

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