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BLUE ECONOMY AND MACROECONOMIC VARIABLES IN NIGERIA

Wachukwu Elendu, PhD
Department of General Studies, Federal University of Techlonogy, Babura Jigawa State
Euwachukwu.gsu@futb.edu.ng
08037810760

Abstract

This Study investigated the impact of blue economy on macroeconomic variables in Nigeria spanning from 1991 to 2023. Fishery Production, Aquaculture Production, Marine Transportation, Maritime Tourism and Renewable Energy Consumption were used as a substitute for blue economy while real gross domestic product was used to capture macroeconomic variable. The Augmented Dickey Fuller Unit Root test and Auto-Regressive Distributive Lag were used to ensure the stationarity status of the variables and analyze the variables. Central Bank of Nigeria (CBN), statistical bulletin and World Banks world Development Indicators were the major source of data collection. The empirical result revealed that the blue economy is correlated with macroeconomic variables in the long-run according to the bound test. Further findings showed that fish production, aquaculture production, maritime tourism, and renewable energy consumption had a positive and significant relationship with real gross domestic product while marine transportation exact a negative but significant relationship with real gross domestic product. Hence it was concluded that the blue economy is a key driver to Nigeria economic progress. It was recommend that the Federal Ministry of Agriculture and Rural Development should enhance support for fish farmers through grants, subsidies and training programs on sustainable aquaculture practice**.**

Keywords: Fishery production, aquaculture production, marine transportation, maritime tourism, renewable energy consumption, macroeconomic variables

1. INTRODUCTION

Economic growth and stability remain the cornerstone of any nation's development aspirations. Nations across the globe strive to achieve sustainable growth by leveraging untapped resources and harnessing sectors that hold immense potential for economic transformation. In Nigeria, the drive to enhance development has often been constrained by structural economic challenges, including sluggish Gross Domestic Product growth, persistent unemployment, and high inflation rates. These issues not only hinder the country's ability to reach its full economic potential but also exacerbate poverty and inequality. Therefore, macroeconomic variables are measurable indicators used to assess the performance, structure, and health of an economy over time. They provide insights into economic trends, support policy decisions, and highlight areas requiring intervention. Among the most critical macroeconomic variables is gross domestic product (GDP). Therefore, Gross Domestic Product (GDP) refers to the monetary value of all goods and services produced within a country's borders over a specific period. It is an essential measure of economic output and growth. According to Osuala (2010), GDP encapsulates the health of an economy by indicating its productivity and growth trajectory.

It is imperative to note that gross domestic product is pivotal to economic planning and development. However, Nigeria's experience with these indicators has been less than optimal. For instance, Nigeria's GDP growth averaged only 2.5% annually from 2015 to 2022, according to the National Bureau of Statistics (NBS, 2022). Despite these challenges, the blue economy emerges as a transformative tool capable of addressing these macroeconomic issues and unlocking Nigeria's economic potential. The blue economy, as conceptualized by Adesina (2018), refers to the sustainable use of oceanic and coastal resources for economic growth, improved livelihoods, and ecosystem health. In alignment, Okonkwo and Ebere (2020) describe it as a strategic framework for integrating marine and aquatic resources into national development plans, while Opara (2022) emphasizes its role in fostering inclusive growth through ocean-related industries such as fisheries, tourism, and maritime transport. The importance of the blue economy to Nigeria cannot be overstated. With over 850 kilometers of coastline and access to the Atlantic Ocean, Nigeria possesses a wealth of marine resources that remain underutilized (NBS, 2022).

Harnessing these resources has the potential to significantly boost GDP by diversifying the economy beyond oil, create millions of jobs through sustainable fishing and coastal tourism, and stabilize inflation by enhancing food security through marine agriculture. For example, studies have shown that Nigeria's fisheries industry, if fully developed, could contribute over $3 billion annually to GDP (Adeleke, 2020). Similarly, investments in maritime transport and port infrastructure could generate significant foreign exchange and reduce unemployment. By positioning the blue economy at the heart of economic planning, Nigeria can create a pathway to sustainable development while addressing critical macroeconomic challenges. Despite the importance of the blue economy, recent statistical data showed that the Nigerian economy has faced persistent challenges characterized by sluggish economic growth, rising unemployment, and high inflation. According to the National Bureau of Statistics (2023), Nigeria's GDP growth averaged a modest 2.5% annually between 2015 and 2022, while the unemployment rate reached an alarming 33.3% in Q4 2020. Concurrently, inflation has surged from 9.6% in 2015 to 21.8% by the end of 2022, contributing to worsening living conditions and widening economic inequality. While Nigeria is endowed with vast marine resources and an extensive coastline spanning over 850 kilometers, the blue economy—a vital sector capable of addressing these macroeconomic challenges—remains underutilized. It is against this background that this study seeks to answer the following questions. How has fishery production contributed to s macroeconomic variables (gross domestic product,) in Nigeria? To what extent has marine transport impacted macroeconomic variables (gross domestic product,) in Nigeria? How has aquaculture production contributed to macroeconomic variables (gross domestic product,) in Nigeria? To what extent has marine biodiversity conservation influenced macroeconomic variables (gross domestic product,) in Nigeria? To this end, this research investigates the impact of the blue economy on macroeconomic variable economic in Nigeria from 1991 and 2023. This timeframe captures significant economic transformations, including policy shifts, trade liberalization, and environmental sustainability efforts that have influenced Nigeria's maritime, fisheries, and coastal economic activities. The chosen period also allows for an extensive analysis of how blue economy sectors, such as fisheries, aquaculture, marine transport, and offshore energy, have contributed to key macroeconomic indicators such as GDP, employment, inflation, and trade balance.

2. LITERATURE REVIEW

Theoretical Literature

Ecological Economic Theory

The Ecological Economic Theory emerged in the 1980s through the works of scholars like Herman Daly (1977), Robert Costanza (1989), and Joan Martinez-Alier (2000), who sought to integrate ecological and economic principles. The theory emphasizes that the economy is a subsystem of the environment, relying on finite natural resources and ecosystem services. It calls for sustainable resource use, equitable distribution, and recognition of ecological limits to ensure long-term economic and environmental health. The theory posits that the natural environment has biophysical limits, and economic growth must operate within these boundaries to avoid environmental degradation and resource depletion. This principle stresses that the economy cannot grow indefinitely without accounting for the carrying capacity of ecosystems. It also assumes that environmental degradation has direct and indirect costs, which, if ignored, can undermine economic stability and societal well-being. Proponents of the theory argue that it provides a holistic framework for balancing economic and environmental objectives. They highlight the importance of valuing ecosystem services, adopting sustainable development practices, and transitioning to a circular economy to minimize waste and resource use. Critics, however, contend that the theory's emphasis on ecological constraints may hinder economic growth and industrial development, particularly in developing countries like Nigeria. Opponents also argue that the theory's focus on environmental sustainability may be difficult to reconcile with short-term economic goals.

The Theory is particularly relevant to a study on the blue economy and selected macroeconomic variables in Nigeria because it underscores the importance of sustainable resource management in marine-based sectors. Nigeria's blue economy, encompassing fisheries, coastal tourism, maritime transport, and aquaculture, depends on the health of its marine ecosystems. By applying the principles of ecological economics, Nigeria can ensure that economic activities in its blue economy do not exceed the ecological limits of its marine environment. This approach can help mitigate issues such as overfishing, marine pollution, and habitat destruction, ensuring that the blue economy contributes to macroeconomic growth while preserving ecological integrity for future generations. The theory provides a robust framework for integrating environmental sustainability into economic planning and policy design, aligning with global efforts to achieve sustainable development.

Blue Growth Theory

The Blue Growth Theory, popularized by the Food and Agriculture Organization (FAO) in 2012 and supported by scholars like Gunter Pauli, emphasizes the sustainable utilization of marine resources to drive economic growth, create jobs, and maintain ecosystem health. The theory holds that marine resources, though vast, are finite and must be managed sustainably to ensure long-term economic benefits without compromising the ecological balance. This principle addresses overexploitation, pollution, and biodiversity loss, ensuring that marine ecosystems remain viable contributors to economic development. Proponents of the theory argue that it aligns with global goals like the United Nations Sustainable Development Goals (SDGs), particularly Goal 14, by promoting sustainable fishing, marine renewable energy, and ocean tourism as pathways to economic prosperity. They believe that harnessing ocean resources responsibly can unlock significant contributions to GDP, employment, and poverty alleviation.

Conversely, opponents caution against the overemphasis on economic growth, suggesting it may lead to green washing and exploitation under the guise of sustainability. Critics also highlight the exclusion of local communities in some blue growth initiatives and argue that technological dependence could disadvantage developing nations like Nigeria. This Theory is relevant to the study because it provides a framework for understanding the role of marine resource management in influencing macroeconomic indicators such as GDP, employment, trade balance, and inflation. By integrating sustainable practices into the blue economy, Nigeria can enhance its contributions from fisheries, aquaculture, and maritime activities while addressing environmental challenges. The theory also underscores the importance of policy interventions and innovations in unlocking the full potential of Nigeria's aquatic resources, fostering economic growth while ensuring ecological sustainability.

Empirical Literature

Ahammed et al. (2024) examines how blue economy elements affect China's economic growth. The analysis of China's blue economy is conducted using secondary time-series data from 1980 to 2019. Fishing production includes aquaculture, agriculture, forestry, fishing, and fisheries. Trade and capital are used as the control variables. China's GDP per capita shows economic growth. An ARDL model is used to analyze the data. This study's ARDL shortrun model showed long-term variable cointegration. TFF, AFF, AP, capital, and trade have positive and significant effects on China's economic development. Additionally, Oyeduntan and Oshinubi (2024) studied how the Gross Domestic Product (GDP) of the maritime transport influences the Nigerian economy. To do this, we applied Simple Linear Regression (SLR), Support Vector Machine (SVM), Polynomial Regression Model (PRM), Generalized Additive Model (GAM) and Generalized Linear Mixed Model (GLMM) to model the relationship between the nations's Total GDP (TGDP) and the Maritime Transport GDP (MGDP) using a time series data of 20 years. The result showed that the MGDP is statistically significant to the Nigerian economy.

Similarly, Baafi (2024) investigate the impact of seaport efficiency on economic growth in Ghana over the period 2006–2020. Augmented Dickey–Fuller tests, autoregressive distributed lag (ARDL) modeling and Granger Causality, were applied to explore the intricate relationship between Seaport Efficiency and Economic Growth. The findings reveal a statistically significant and positive association between seaport efficiency and GDP, underscoring the crucial role of efficient seaport operations in actively stimulating economic growth. The Granger Causality Test solidifies seaport efficiency as a robust predictor of GDP fluctuations, emphasizing its significance in economic forecasting. Also, Gonese, et al. (2023) evaluates the effect of trade openness on unemployment in SADC from 1980 to 2019 using panel ARDL (pooled mean group—PMG) estimation techniques. The findings of the study show that trade openness and exports negatively impact unemployment, whereas imports positively affect unemployment in the long run. This suggests that while boosting exports and real trade, openness decreases unemployment, and imports increase job losses in the long run in the SADC region. This calls for more caution on trade openness regarding what to export and import when addressing regional unemployment reduction policies.

Accordingly, Adenigbo et al. (2023) analyses the effect of shipping trade on economic growth in Nigeria from 1970 to 2020. The cointegration test established a short- and long-term causality from import, export and exchange rates to GDP. The result showed that Nigeria's economic growth is import dependent and that, in the long run, import and exchange rates significantly affect GDP. The study further indicates that the present export volume does not significantly contribute to GDP growth. The results imply that building an economic system on an import-dominated trade system is not sustainable for future development. Consequently, Aria (2022)

investigates the impacts of measures of trade openness on the unemployment rate in an unbalanced panel context for the period 2006-2016. The analysis focuses on the 16 east, south, and Southeast Asian countries, which are highly ranked in terms of their trade openness: Philippines, Singapore, Vietnam, Thailand, Malaysia, Indonesia, Timor-laste, China, Hong Kong, Korea, Japan, India, Pakistan, Sri Lanka, Bangladesh, and Maldives. The results illustrate the negative relationship between trade openness and the unemployment rate. It has been found that trade openness reduces the unemployment rate significantly.

Fratila et al. (2021) assess the impact of maritime transport, related investment, and air pollution on economic growth within 20 countries of the European Union, using eight panel data regression models from 2007 to 2018. The results confirm that maritime transport, air pollutants (NOx and SO2) from maritime transport, and investment in maritime port infrastructure are indeed positively correlated with economic growth. Again, Majed and Imran (2020) examine the influence of the blue economy factors on the economic growth of the South Asian Association for Regional Cooperation (SAARC) countries. Secondary data from 1995 to 2018 have been used for the analysis of eight countries. The contributing factors that measure the fishing production are total aquaculture production, total fisheries production and agriculture, forestry and fishing. Trade and the rate of inflation are used as control variables. Using the feasible generalized least square technique. It was found that the blue economy factors play a statistically significant role in the economic growth of SAARC countries and contribute to the achievement of Goal 14 of the United Nations' sustainable development goals: to conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Kim and Kim (2019) examines the influence of these selection factors; service provision area, price competitiveness, corporate image, service expertise, and sales support, on transaction continuity through customers' perceived service value and satisfaction. Based on an online survey with those in the Korean marine transportation industry, this study conducted statistical analyses using structural equation modeling. Based on relevant previous studies, the current study constructed a total of 55 survey questions. Finally, 213 questionnaires were collected. Among the five selection factors, corporate image did not affect perceived service value, and price competitiveness was still the most important factor. However, service expertise and sales support were found to be more important factors than regional factors. In order to maintain transaction continuity, shipping companies should also strive to improve their service quality to their customers. In particular, service quality strategies focused on time and regional factors should develop to strategies with the key factors for the changed business environment.

Similarly, Igbodo (2018) explores the performance of the maritime subsector and economic growth in Nigeria, 1995 – 2015. The findings showed that there is a positive relationship between indicators of maritime subsector performance and indicators of economic growth in Nigeria. The findings further showed that Nigeria can rely on the maritime subsector to grow economically if the subsector is fully exploited. Therefore, Awad-Warrad (2018) evaluate the theoretical relationship between unemployment and some key macroeconomic determinants including among others trade openness policy and real economic growth for Arab countries. The study utilizes a cross time series sample coving the period 1990-2015 for seven selected Arab countries. The study estimated the unemployment model using panel WLS. The study provides evidence of large and significant impact of trade openness on unemployment rates in the selected Arab countries when taken as one pooled group. On the other hand, as expected real economic growth affected favorably unemployment rates in this group of countries.

Gaps and Value Addition

This research critically examines existing studies on the blue economy and its relationship with key macroeconomic variables, uncovering conflicting and contradictory findings. For instance, studies by Ahmed et al. (2024), Oyeduntan and Oshinobi (2024), Baafi (2024), Adenigbo et al. (2023), Fraitila et al. (2021), Majed and Imrim (2020), Kian and Kim (2018), and Avad-Warad (2018) highlight a positive and significant impact of blue economy components—such as fishing, forestry, and marine transport—on gross domestic product (GDP). In contrast, research by Gonese et al. (2023), Aria (2022), Anjum and Pervab (2016), Nweka et al. (2015), and Igberi and Ogunnyi (2013) suggests that trade openness, particularly within marine transport, has a more pronounced influence on unemployment. Moreover, previous studies have primarily focused on fishing, forestry, and marine transport as proxies for the blue economy, neglecting crucial aspects such as marine biodiversity conservation and its macroeconomic implications. Additionally, while GDP and unemployment have been widely examined, inflation—a critical macroeconomic indicator—has been largely overlooked. This gap in the literature underscores the need for a more comprehensive approach, warranting further investigation to provide a holistic understanding of the blue economy's impact on macroeconomic stability.

3. METHODOLOGY

This study essentially relied on secondary data which was gotten from Central Bank of Nigeria (CBN), and World Banks World Development Indicators, (WDI), 1991 to 2023. Fishery Production, Aquaculture Production, Marine Transportation, Maritime Tourism and Renewable Energy Consumption were used as a substitute for blue economy. The variables were adopted to capture the blue economy because they drive sustainable marine-based economic activities. Fisheries and aquaculture support food security and employment, contributing 3% to Nigeria's GDP (NBS, 2022). Marine transportation handles over 90% of Nigeria's trade (NIMASA, 2021), while maritime tourism boosts coastal economies. Renewable energy enhances sustainability and energy security. These sectors capture the Blue Economy's impact on growth, employment, and environmental sustainability while real gross domestic product was used to capture macroeconomic variable. The formulated model was subjected to unit root test using Augmented Dickey Fuller (ADF) approach. Based on the outcome of the ADF, the study employed both the Auto-regressive Distributive Lag (ARDL) Model,

Model Specification

The model of this study is based on the modification of Ahammed et al (2024) when investigating the impact of blue economy factors on the sustainable economic growth of China. Their model was;

$$EG = f(TFF, AFF, AP, CAPITAL, TRADE) \quad (1)$$

Where:

EG = GDP per capita

TFF = Total fisheries production, AFF = Agriculture, forestry, and fishing, value added, AP = Aquaculture production, TRADE = Trade, CAPITAL = Gross capital formation

Therefore, to achieve the objective of this study, the researcher modified the model by introducing marine biodiversity conservation (MBC). The new expanded model is thus stated functionally as follows;

$$RGDP = f(FPD, AQP, MTS, MTT, REC) \quad (2)$$

Stated mathematically as follows;

$$RGDP = \beta o+\beta_1 FPD+\beta_2 AQP+\beta_3 MTS +\beta_3 MTT + \beta_5 REC \quad (3)$$

And stated econometrically as follows;

$$RGDP = \beta o+\beta_1 FPD+\beta_2 AQP+\beta_3 MTS +\beta_3 4MTT+\beta_3 REC +\mu \quad (4)$$

Where:

RGDP = Real Gross Domestic Product, FPD = Fishery Production, MTS = Marine Transport AQP = Aquaculture Production, MTT = Maritime Tourism, REC= Renewable Energy Consumption, μ = Error term, βo= Constant, $\beta 1$-$\beta 5$ =Estimated Parameters

Apriori Expectation: $\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$ and $\beta 5 > 0$,

4. Result and Discussion

Table 1: Unit Root Test on Blue Economy and Real Gross Domestic Product Model

The Augmented Dickey Fuller (ADF) unit root test is use to establish the stationarity of the time series data used in the study. The results in table 1 are shown below:

Variables	Levels		First Difference		Order of Integration	P-value
	ADF Statistics	5% Critical Value	ADF Statistics	5% Critical Value		
LRGDP	-5.253015	-2.957110			I(0)	0.0001
LFPD	-1.634987	-2.960411	-2.987745	-2.960411	I(1)	0.0020
LAQP	-1.232547	-2.967767	-3.937042	-2.967767	I(1)	0.0016
LMTS	-1.884534	-2.971853	-6.313348	-2.971853	I(1)	0.0000
REC	0.060377	-2.957110	-5.488012	-2.960411	I(1)	0.0001
MTT	-4.991534	-2.957110			I(0)	0.0003

Source: ***Author Computation 2025***** Level of significance at 5%

This study employs the Augmented Dickey-Fuller (ADF) unit root tests to check the order of integration of the variables and the results are presented in Table 1 The results of Augmented Dickey-Fuller (ADF) showed that the variables are integrated in different order or a combination of I(0) and I(1) series. The ADF result revealed that LRGDP, and MTT were stationary at levels 1(0) while, LFPD, LAQP, LMTS and REC, are stationary after first differencing 1(1). This condition makes the Autoregressive Distributive Lag (ARDL) Bounds test approach to co-integration appropriate for investigating the long-run relationship among these variables.

Co-integration Test

Table 2 ARDL Bound Test

Test Statistics	Value	K
F-statistics	**18.848763**	**5**

Significance	I (0)	1(1)
10%	2.57	3.85
5%	3.1	4.6
1%	4.5	6.3

Source: Authors computation 2025

From table 2 the bound test result indicates that there exist long run relationships amongst the variables as the F-statistic value of 18.848763 exceeds both the lower and upper bound critical values. Thus, we reject the null hypotheses of no long run relationship and accept the alternative hypothesis of a long-run relationship. This means that there is a long-run relationship between the blue economy and macroeconomic variables in Nigeria.

Table 3: ARDL Long-run Result (Dependent Variable =LRGDP)

Variables	Coefficient	Std. error	t-Statistic	Prob-Value
LFPD	0.670560	0.115948	5.783275	0.0000
LAQP	0.622251	0.075501	8.241661	0.0000
LMTS	-0.421668	0.317523	-1.327993	0.1978
MTT	0.020450	0.020273	1.008729	0.3241
REC	-0.026195	0.005775	-4.535707	0.0002

Source: Authors computation 2025

Table 3 of the Autoregressive Distributive Lag (ARDL) long-run result suggest a positive +0.670560 relationship between the logarithm value of fishery production (LFPD) and the log of real gross domestic product (LRGDP) as a proxy for macroeconomic variables. This means that the blue economy via fishery production drives economic growth by increasing output, creating jobs, generating income, and supporting food security. Astonishingly the p-value of 0.0000 suggests that there is a statistically significant correlation among the fishery production (FPD) and real gross domestic product (RGDP) Investigation of the log value of aquaculture production (LAQP) advocates a positive correlation of +0.622251 with real gross domestic product (RGDP). The findings reveal that a 1-unit increase in the log value of aquaculture production (LAQP) will result to about 0.62% rise in the log value of real gross domestic product (LRGDP). This implies that aquaculture production contributes to economic growth by increasing food supply, creating employment and generating income. Also, according to the p-value of 0.0000 indicates a statistically significant correlation among the aquaculture production and real gross domestic product.

Furthermore, the log value of marine transportation (LMTS) suggest a negative correlation of -0.421668 with the log value of real gross domestic product (LRGDP) as a surrogate to macroeconomic variables. This suggest that a unit increase in marine transport will result to about 0.42% decline in the log value of real gross domestic product (LRGDP). This implies that an increase in marine transport is associated with inefficiencies, high operational costs or structural challenges that hinder economic expansion. Consequently, the negative impact of marine transportation on gross domestic product might be due to port congestion, high costs, security threats, and inefficiencies which hinder trade and investment. Conversely, the p-value of 0.1978 signpost that there is no meaningful statistical connection among marine transport and real gross domestic product. Moreover, the value of maritime tourism (MTT) suggest a positive correlation of +0.020450 with the log value of real gross domestic product (LRGDP) as a stand-in for macroeconomic variables. This suggest that a unit increase in maritime transport will result to about 0.02% increase in the log value of real gross domestic product (LRGDP). Conversely, the p-value of 0.3241 signpost that while maritime tourism has the potential to contribute to economic growth, its impact remains weak or negligible Finally, the value of renewable energy consumption (REC) suggest a negative correlation of -0.026195 with the log value of real gross domestic product (LRGDP) as a stand-in for macroeconomic variables. This suggest that a unit increase in renewable energy consumption will result to about 0.03% decrease in the log value of real gross domestic product (LRGDP). This might be due to high initial investment costs, inadequate infrastructure, policy inconsistencies, and slow adoption rates. Conversely, the p-value of 0.0002 signpost that there is a substantial relationship between renewable energy consumption and real gross domestic product.

Table 4: ARDL Short-run Result (Dependent Variable =LRGDP)

Variable	Coefficient	Std. Error	t-Statistics	Prob
C	-0.264924	0.029549	-15.03945	0.0000
D(LFPD)	0.199308	0.058168	3.426418	0.0065
D(LFPD(-1)	-0.237765	0.065336	-3.639109	0.0045
D(LFPD(-2)	-0.145959	0.050711	-2.878259	0.0164
D(LAQP)	0.449323	0.045338	9.910522	0.0000
D(LAQP(-1)	-0.123144	0.042636	-2.888267	0.0162
D(LAQP-2)	-0.109172	0.051773	-2.108684	0.0612
D(LMTS)	-0.211330	0.101259	-2.087032	0.0634
D(LMTS(-1)	-0.410650	0.088286	-4.651334	0.0009
D(LMTS(-2)	-0.145284	0.076909	-1.889043	0.0882
D(MTT)	0.009656	0.004151	2.326120	0.0423
D(MTT(-1)	0.002972	0.003726	0.797668	0.4436
D(MTT(-2)	0.000527	0.003822	0.137826	0.8931
D(REC)	-0.002018	0.000592	-3.408322	0.0067
D(REC(-1)	0.012828	0.001159	11.06438	0.0000

D(REC(-2)	0.006374	0.000724	8.798773	0.0000
Ecm (-1)*	-0.745795	0.049589	-8.965674	0.0000

Adj R^2 = 0.862236, F-statistics = 42.40541 (0.000000), DW = 2.821239

Source: Authors computation 2025

The coefficient estimate for the error correction component, ECM (-1), is unfavorable but statistically significant below the 0.05 threshold. This suggests that the equation would achieve equilibrium in the long run with 0.75% annual. According to this, the error from the previous year might be fixed with a yearly adjustment rate of 0.75%. The independent variables (LFPD, LAQP, LMTS, MTT, & REC) account for 86% of the overall variation as indicated by the adjusted R-Square (R2) for the dependent variable (LRGDP). The F-statistic is 5% significant, which makes the equation notable overall. The Durbin-Watson statistics of 2.821239, which is near to 2, indicate that the model would not work without serial correlation.

Table 4 shows the short-term result of the model. In the current year, the log value of fishery production (LFPD) revealed a positive value of +0.199308 during which the log coefficient of real gross domestic product (LRGDP) was employed as a stand-in for macroeconomic variables in Nigeria. Consequently, the log coefficients of fishery production (LFPD), is associated with about 0.20% increase in the log coefficient of real gross domestic product (LRGDP) in Nigeria. Fishery Production and real gross domestic product value correlate statistically (p=0.0065,). This result was predicted by theories of economics. The value of real gross domestic product is probably going to increase in reaction to a spike in the value of fishery production. Using the log value of real gross domestic product (LRGDP) across Nigeria during the current, year, the log value of aquaculture production (LAQP) have a positive value of +0.449323. If the log value of aquaculture production (LAQP) rises to a single unit, the log coefficient for real gross domestic product (LRGDP), would increase by about 0.45%,. Based on the p-value of 0.0000, it can be concluded that the coefficient of aquaculture production (AQP) is significantly related to the real gross domestic product. Theories of economics justify this outcome. The projected conclusion is that the real gross domestic product rises in reaction to a surge in aquaculture production.

As a substitute for macroeconomic variables in Nigeria in the previous year, the logarithm coefficient of real gross domestic product (LRGDP) have a negative value of -0.410650. If the log value of marine transport (LMTS) rises by a unit, the log coefficient of real gross domestic product (LRGDP), would decline by about 0.41%, According to the P-value of 0.0009, it can be concluded that the log value of marine transport (LMTS) is significantly related to the log value of real gross domestic product. This result is not supported by economic theory. It is anticipated that the coefficient of real gross domestic product increases in response to an increase in marine transport.

As a stand-in for macroeconomic variables in Nigeria in the current year, the log coefficient of real gross domestic product (LRGDP) have a positive value of +0.009656. If the value of maritime tourism (MTT) rises by a unit, the log coefficient of real gross domestic product (LRGDP), would increase by about 0.0009%, According to the P-value of 0.0000, it can be concluded that the coefficient of interest rate (INR) is significantly related to the real gross domestic product. This result is supported by economic theory. It is anticipated that the coefficient of real gross domestic product increases in response to an increase in maritime tourism. Finally, using the log value of real gross domestic product (RGDP) in the previous and second year in Nigeria, the coefficient of renewable energy consumption (REC) have a positive

value of +0.012828 and +0.006374.This means that If the value of renewable energy consumption rises by a unit in Nigeria, the log value of real gross domestic product (LRGDP), would correspondingly rise by approximately 0.01% and 0.006% depending on the 0.0000 p-value. Thus, it may be said that the coefficient of renewable energy consumption (REC) is significantly related to the log value of real gross domestic product. Economic theory encourage this outcome. The anticipated result is that the coefficient of real gross domestic product rises in response to an increase in renewable energy consumption.

Diagnostic Test

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

	F-Statistic	**Prob-Value**
Ramsey Reset Test	1.497161	0.2883
Breusch-Godfrey Serial Correlation LM Test	1.097311	0.4389
Breusch-Pagan-Godfrey Heteroskedasticity Test	2.834348	0.1400

Source: Authors computation 2025

From Table 5, the results of the diagnostic test shows that the linearity test using Ramsey Reset test indicates that the f-statistic (1.497161) with computed p-value of 0.2883 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 1.097311, with a Chi-Square probability value is 0.4389 This indicates that the probability value of about 43 percent (0.4389) 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-Pegan-Godfrey test shows that the f-statistic is 2.834348 with a Chi-Square probability value of 0.1400. 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.

4.2 Discussion of Findings

(i) Fishery Production and Real Gross Domestic Product in Nigeria

The regression analysis using the Auto-Regressive Distributive Lag (ARDL) method showed that fishery production t (FPD) has a positive association with real gross domestic product (RGDP) both in the long-run and short-run. It does support economic theory. It was expected that increased fishery production will enhance real gross domestic product. This suggest that increased fishery production drives economic growth by increasing output, creating jobs, generating income, and supporting food security. Also, the result from the p-value shows that fishery production (FPD) has a statistically significant impact on real gross domestic product. Therefore, the analysis concludes that the null hypothesis that RGDP and FPD are not significantly related is incorrect. Earlier studies conducted by Majed and Imran (2020) agrees with this study.

(ii) Aquaculture Production and Real Gross Domestic Product in Nigeria.

A positive association between aquaculture production (AQP) and real gross domestic product (RGDP) was inferred in the short -run using regression analysis. It is consistent with economic theory that aquaculture production has a positive connection with real gross domestic product (RGDP). The sustained positive impact implies that aquaculture production play a critical role in economic transformation by driving structural changes, increasing productivity, and reducing reliance on oil revenue. Aquaculture production (AQP) has a statistically significant impact on real gross domestic product (RGDP), according to the p-value of the finding. Therefore, the analysis concludes that the null hypothesis that aquaculture production (AQP) and real gross domestic product (RGDP) have no significant link is incorrect.

(iii) Marine Transportation and Real Gross Domestic Product in Nigeria.

A negative association between marine transport (MTS)) and real gross domestic product (RGDP) was inferred in the short -run using regression analysis. It is not consistent with economic theory that marine transportation has a negative connection with real gross domestic product (RGDP). The negative impact implies that marine transportation play a critical role in economic transformation by driving structural changes, increasing productivity, and reducing reliance on oil revenue. Marine Transportation (MTS) has a statistically significant impact on real gross domestic product (RGDP), according to the p-value of the finding. Therefore, the analysis concludes that the null hypothesis that marine transportation (MTS) and real gross domestic product (RGDP) have no significant link is incorrect. Previous study by Igbodo (2018) supports the findings of this study.

(iv) Maritime Tourism and Real Gross Domestic Product in Nigeria.

A positive association between maritime tourism (MTT) and real gross domestic product (RGDP) was inferred in the short -run using regression analysis. It is consistent with economic theory that maritime tourism has a positive connection with real gross domestic product (RGDP). The sustained positive impact implies that maritime tourism play a critical role in economic transformation by driving structural changes, increasing productivity, and reducing reliance on oil revenue. Maritime Tourism (MTT) has a statistically significant impact on real gross domestic product (RGDP), according to the p-value of the finding. Therefore, the analysis concludes that the null hypothesis that maritime tourism (MTT) and real gross domestic product (RGDP) have no significant link is incorrect. The study conducted by Igberi, and Ogunniyi (2013) are in line with this outcome of this study.

(v) Renewable Energy Consumption and Real Gross Domestic Product in Nigeria.

A positive association between renewable energy consumption (REC) and real gross domestic product (RGDP) was inferred in the short -run using regression analysis. It is consistent with economic theory that renewable energy consumption has a positive connection with real gross domestic product (RGDP). The sustained positive impact implies that renewable energy consumption play a critical role in economic transformation by driving structural changes, increasing productivity, and reducing reliance on oil revenue. Renewable Energy Consumption (REC) has a statistically significant impact on real gross domestic product (RGDP), according to the p-value of the finding. Therefore, the analysis concludes that the null hypothesis that renewables energy consumption (REC) and real gross domestic product (RGDP) have no significant link is incorrect.

5.1 Conclusion

This research utilised the Augmented Dickey fuller unit root (ADF), Auto-Regressive Distributive Lag (ARDL) bound test Model to explore the impact of non-oil export on economic development in Nigeria for 33 observation (1991 to 2023). Fishery Production, Aquaculture Production, Marine Transportation, Maritime Tourism, and Renewable Energy Consumption, were used to proxy the explanatory variables while real gross domestic product was used as a stand-in for the dependent variable.

Based on the findings, it is therefore concluded that Fishery Production, Aquaculture Production, Marine Transportation, Maritime Tourism, and Renewable Energy Consumption had a positive and significant relationship with real gross domestic product. It is therefore concluded that the blue economy is a key sector e that drives the Nigerian economy

5.2 Recommendations

Based on the findings, the following recommendations have been made;

1. The Federal Ministry of Agriculture and Rural Development should enhance support for fish farmers through grants, subsidies and training programs on sustainable aquaculture practice.
2. The Central Bank of Nigeria (CBN) should expand access to low-interest credit facilities for aquaculture businesses under its aqua-cultural intervention programs.
3. The Federal Ministry of Transport should invest in modernizing port infrastructure, reducing congestion and improving logistic to enhance efficiency.
4. Federal Ministry of Tourism, Arts, and Culture should develop comprehensive policies to promote Nigeria’s coastal tourism potential, improve destination marketing, and attract both domestic and international tourist.
5. Finally, Federal Ministry of Power should implement policies that incentivize investment in renewable energy projects, including solar, wind, and hydroelectricity power to enhance energy access and reliability.

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