African Journal of Social Sciences and Humanities Research
ISSN: 2689-5129
Volume 6, Issue 1, 2023 (pp. 34-48)
www.abjournals.org

RENEWABLE ENERGY CONSUMPTION AND ECONOMIC GROWTH IN NIGERIA

George Umeji*, Anthony O. Agu (Ph.D), Eberechukwu E. Eleanya,

Ezeh Matthew Chinedum (Ph.D), Okenyeka Onyema Nwabugwu (Ph.D)

and Mbadiwe Tochukwu Obumnene

[1]Department of Economics, Paul University Awka

Email: obichukwuumeji@gmail.com; Tel: 08037029916

[2]Department of Economics, Chukwuemeka Odumekwu Ojukwu University, Igbariam

Emai: aguagain@yahoo.com; Tel: 08033196231

[3]Department of Economics, Paul University Awka

Email: eleanyaebere@gmail.com; Tel: 08066472346

[4]Department of Economics, Dennis Osadebay University, Anwai, Asaba

Email: EZEH.Chinedum@dou.edu.ng; Tel: 08033812807

[5]Department of Economics, Paul University Awka

Email: onyemaokenye@gmail.com; Tel: 08039671534

[6]Department of Economics, Paul University Awka

Email: newstech2020@gmail.com; Tel: 08060345857

*Corresponding author

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

African Journal of Social Sciences and Humanities Research
ISSN: 2689-5129
Volume 6, Issue 1, 2023 (pp. 34-48)
www.abjournals.org

Cite this article:

George Umeji, Anthony O.A. , Eberechukwu E.E., Ezeh M.C., Okenyeka O.N., Mbadiwe T.O. (2023), Renewable Energy Consumption and Economic Growth in Nigeria. African Journal of Social Sciences and Humanities Research 6(1), 34-48. DOI: 10.52589/AJSSHR-BNHM472F

Manuscript History

Received: 29 Nov 2022

Accepted: 20 Dec 2022

Published: 23 Jan 2023

ABSTRACT: *The impact of renewable energy consumption on economic growth in Nigeria is aimed at establishing the relationship between renewable energy consumption and economic growth in Nigeria. The oil price volatility in the international oil market in the last decade has led to a substantial rise in the demand for renewable energy sources. Nevertheless, the provision of energy needed for growth and at the same time mitigating against its hazardous effects on the environment is a major world problem. The paper used secondary data from the World Bank data bank from 1990 to 2020 for its analysis. It used Toda-Yamamoto augmented granger causality test to test for the nature of the relationship between the two variables and Auto Regressive Distributed Lag (ARDL) bounds test to examine the impact of renewable energy consumption on economic growth. The study found a bi-directional relationship between the variables. The regression results also showed a significant positive impact of renewable energy consumption on economic growth. The work concluded that renewable energy consumption enhances economic growth in Nigeria. It therefore recommends that the government should encourage investments in the renewable energy sector by providing a conducive business environment and also create awareness on the importance of the use of renewable energy in the country.*

KEYWORDS: Renewable energy, Fossil fuel, Economic growth, Solar, Climate change, Biomass.

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

African Journal of Social Sciences and Humanities Research
ISSN: 2689-5129
Volume 6, Issue 1, 2023 (pp. 34-48)

www.abjournals.org

INTRODUCTION

Climate change is one of the world's major challenges today. It is in agreement with this that Imadojemu and Akinlosotu (2018) stated that the energy needed for growth has hazardous effects on the environment; as such, it should be seen as a major world problem. Pollutant emissions cause global temperatures to rise. This constitutes a problem to energy production and usage (Khobai & Le Roux, 2017). According to Okonkwo et al. (2021) and Maji, Sulaiman and Abdul-Rahim (2019), the carbon dioxide produced by burning fossil fuels contaminates the environment and is a major contributor to global warming and acid rain.

It is as a result of this challenge that renewable energy gained prominence. Scientists agree that fossil fuel is a major contributor to climate change and by extension a source of global warming due to its effect on greenhouse emissions. Renewable energy therefore provides a means of eradicating the effects of climate change by reducing the level of greenhouse emissions. Ajibade (2019) argued that increase in the use of energy from clean sources is necessitated by the destructive effect of greenhouse gas emissions on the atmosphere which is the major cause of climate change and also raises other environmental related concerns. According to Bhattachrya, Parameti, Ozturk and Bhattacharya (2016), the increased use of renewable energy globally has helped in providing solutions to climate change.

Renewable energy consumption is also made popular by the improvement in technology which reduced its cost of installation (Bowden & Payne, 2009). Apergies and Payne (2010a & 2010b) also noted that the oil price volatility in the international oil market in the last decade also led to the rise of renewable energy sources significantly. More so, the increased consumption of renewable energy has been made possible through government support making the source of renewable energy cost competitive (International Energy Agency, IEA, 2009).

Energy plays an important role in every sector of an economy. In the 21st century, it is one of the significant factors driving economic development (Okonkwo et al., 2021; Ekone & Amaghionyeodiwe, 2020). It is needed for the provision of certain basic human needs like cooking, lighting, communication, transportation, health care, etc. Renewable energy includes solar power, hydroelectric power, geothermal energy, biomass energy, wind power, and tidal power.

The use of fossil fuels significantly affects the environment through greenhouse gas emission. It is therefore imperative to address the energy needs and environmental consequences trade-offs through an energy source that is clean and sustainable. Besides, energy from clean sources apart from its environmental friendliness could mitigate against future hike of conventional fuels especially in less developed countries through energy portfolio diversification; it could also provide local economic opportunities that can lead to poverty reduction and economic growth. This study, therefore, will examine empirically the effect of renewable energy consumption on economic growth in Nigeria using secondary data from 1990 to 2020.

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

African Journal of Social Sciences and Humanities Research
ISSN: 2689-5129
Volume 6, Issue 1, 2023 (pp. 34-48)

www.abjournals.org

REVIEW OF RELATED LITERATURE

Conceptual Literature

Renewable Energy

Renewable energy is fast replacing fossil (dirty) fuels in power generation. This is as a result of the need to ameliorate the effect of fossil fuels on the climatic system, as the cost of installation of renewable energy has been reduced considerably due to innovation. Renewable energy is energy sourced from natural processes like water, wind and sunlight. It is either not exhaustible or it is replenishable. According to Shinn (2018), renewable energy which is also referred to as clean energy is a constant replenishable energy from natural sources or processes. For instance, though their availability may depend on time and weather, the sun does not cease to shine nor does the wind cease to blow. In duration, the renewable energy sources could be inexhaustible virtually but the amount of energy available per unit of time is limited.

Renewable energy is sourced from different sources; one of these sources include solar power which is a powerful source of energy that can be used in homes and businesses to provide light and heat. The sun possesses tremendous potential in providing human energy needs; photovoltaic cells made from silicon make it possible to collect this solar power. The sunlight is transformed into electricity by the cells and used to power any gadget. Others include wind power, hydroelectric power, biomass energy, geothermal energy and tidal power.

Economic Growth

The increase in capability and productivity of any country when measured in money terms is referred to as economic growth. Economic growth has been defined as an increased production of economic goods and services from one period of time to another (Chappelow, 2019). Economic growth is commonly measured in terms of the annual increase in aggregate market value of additional goods and services produced, using estimates such as GDP.

As a result of economic growth, more profits are created for businesses leading to rise in stock prices, availability of more capital for reinvestment, increased employment and higher income. There is also increased purchases which drive higher economic growth. This is the reason every country wants positive growth in its economy, making economic growth the most watched and coveted economic indicator.

Theoretical Literature

The Classical Theory of Economic Growth and Stagnation

This theory is a combined work of the 18th century English economists: Adam Smith, David Ricardo and Thomas Malthus during the industrial revolution in Great Britain. Growth in an economy was explained in terms of technological progress and growth in population. Capital accumulation or technical progress will increase for a while, but a fall in profit will prevent further accumulation of capital, and gradually the economy falls into a state of stagnation.

In their opinion, diminishing returns from population growth threaten economic growth due to the constant amount of land, as technological change can only temporarily check diminishing returns (Nafziger, 2016). This can only be resolved through accumulation of more capital. However, minimum profits and interest payments are required to maintain or increase capital

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

stock. As profits and interests per person decline and rents increase with population growth, there is a diminishing surplus available for the capitalist's capital accumulation (Kenton, 2021). This declining surplus reduces the inducement to accumulate capital. Expansion of the labour force leads to a decline in capital per worker or a decrease in worker productivity and income per capita; this indicates an eventual economic stagnation.

The Neoclassical Growth Theory

This theory was introduced by Robert Solow and Trevor Swan independently in 1956 as a response to the criticisms of classical theory. It is regarded as the neoclassical counter revolution or the Solow-Swan growth model. To them, capital, labor and technology are the driving force to economic growth. According to Banton (2020), the theory opines that equilibrium in the short-run results from labor and capital variation in the production process. As a result, technological change influences the economy significantly, and without which there will be no growth. Hence, labor, capital and technology are the major economic growth drivers.

Capital accumulation as it is used is the main focus of this theory; more so, productivity is determined by how labor and capital are combined. Technology helps boost labor productivity leading to increase in output. Therefore, the production function of the neoclassical growth theory is used to measure the growth and equilibrium of an economy, Y=Af(K,L) where Y is the economy's GDP, K is the share of capital, L describes the amount of unskilled labor in an economy, and A represents a determinant level of technology (Banton, 2020).

The author maintained that becausee of the relationship between technology and labor, the production function is rewritten as Y=f(K, AL). An increase in any of the inputs will increase GDP and hence, equilibrium of the economy. Conversely, if the three factors are not all equal, the returns of both unskilled labor and capital on an economy diminish, implying that increases in these two inputs have exponentially decreasing returns while technology is boundless in its contribution to growth and the resulting output it can produce.

The Endogenous Growth Theory

This theory was developed in the early 80s by Paul Romer and others in response to the criticisms of the neoclassical growth theory. The theory argues that economic growth depends on factors within the economy. Explicitly, it presumes that human capital development spurs economic growth through development of new technologies. Liberto (2020) claimed that the endogenous growth theory upholds that economic growth is basically the result of internal forces, rather than external ones; it argues that improvement in productivity can be tied directly to faster innovation and more investments in human capital from governments and private sector institutions.

The theory emphasized that economic growth is propelled by internal sources such as human capital development, innovation and capital accumulation rather than external sources. This is a contrasting opinion to the neoclassical view of what causes economic growth. The advocates believe that improvements in productivity can be tied directly to faster innovation and more investment in human capital (Liberto, 2020).

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

Empirical Review

Gershon and Emekalam (2021) in their paper sought to determine the key factors in renewable energy utilization in Nigeria using Toda-Yamamoto method. Their findings suggested a long-run relationship between renewable energy consumption and its determinants in Nigeria. The paper suggested policy induced increase in renewable energy production and consumption.

On the other hand, Li et al. (2021) aiming to establish the relationship between renewable energy sources and economic growth in South Asia Association for Regional Cooperation (SAARC) countries used data from 1995 to 2018. Applying fixed effects and panel vector error correction model analyzed the data on disintegrated renewable energy sources. The study found that wind, hydropower and geothermal all have a positive and significant effect on economic growth in the selected countries; with hydropower having the most impact.

Ekone and Amaghionyeodiwe (2020) investigated the renewable energy consumption effect on economic growth in Nigeria and also the direction of the causality, if any, between the two variables. They used data from 1990 to 2016. The paper found that there exists no significant positive impact of renewable energy consumption on economic growth in Nigeria. Besides, no causality exists between the variables. It suggested encouraging the use of renewable energy as a means to reduce domestic fossil fuel consumption.

In another study, Ahmed and Shimada (2019) also used a panel study for 30 countries (emerging and developing economies) in five different regions of the world to investigate the relationship between renewable energy consumption and economic growth. The study found a long-run significant relationship between the two variables in the selected South Asia, Asia and most West African countries but found that in Latin America and the Caribbean countries, no such relationship exists. However, economic growth depends on non-renewable energy consumption in these countries. The study proposed policy options for the selected countries.

Maji, Sulaiman and Abdul-Rahim (2019) in their own study used panel dynamic ordinary least squares (DOLS) to estimate the impact renewable energy has on economic growth using data from selected West African countries. Their findings suggested that renewable energy slows down economic growth in the tested countries due to the nature of the source of the renewable energy (wood biomass). The study recommended the adoption of cleaner technologies in West Africa and an increase in the share of other renewable energy components in the renewable energy mix.

Using Nigerian data from 1990 to 2017, Imandojemu and Akinlosotu (2018) examined the nature of the relationship between renewable energy consumption and economic growth. They analyzed the data using OLS, ADF and Philips Perron unit root test. The result suggested that renewable energy consumption exerts a positive and significant impact on economic growth in Nigeria and the existence of a unidirectional relationship from GDP to renewable energy consumption. They suggested increased investment on renewable energy technologies in the country.

Khobai and Le Roux (2017) examined the existence of a causal relationship between renewable energy consumption and economic growth in South Africa. Quarterly data from 1990 to 2014 was used in the analysis. The result showed that in the long run there is a unidirectional relationship from renewable energy consumption to economic growth while the causality

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

relationship flows from economic growth to renewable energy consumption in the short-run. The paper suggested effective public policy in the long-run.

Bhattacharya, Parameti, Ozturk and Bhattacharya (2016) used 38 most renewable energy consuming countries to analyze the effect of renewable energy consumption effect on economic growth using panel estimation techniques. The result of the study showed that in 57% of the countries tested, renewable energy consumption positively impacts economic growth. Increased investment in renewable energy was suggested by the study to aid low carbon emissions in the countries studied.

Renewable Energy Situation in Nigeria

Nigeria is rich in oil, so it is therefore not surprising that most of its energy needs are provided from non-renewable energy sources, especially crude oil. This overdependence on fossil fuel sources is one of the reasons the Nigerian energy sector is prone to shocks (Akuru & Okoro, 2014). The authors also hypothesized that the energy sector vulnerability is worsened by bad governance, climate change and widespread poverty making the system weak.

However, despite the role oil plays in the energy sector in Nigeria, there is still a high level of energy poverty in the country. Akuru and Okoro (2014) noted that 60% of the Nigerian population, which is about 80 million Nigerian, do not have access to electricity; and of the 40% with electricity access, less than half of them are in rural areas.

Generally, Nigeria electricity consumption per capita stood at about 100kWh which is very poor when compared with countries like China, Brazil and South Africa with 1379kWh, 1934kWh and 4,500kWh respectively (Akuru & Okoro, 2014). Less wonder at the level of poverty in the country as lack of access to electricity is a major cause of poverty in any economy. According to Adegbite (2021), Nigeria's highest electricity generation capacity is 5,300MW while daily power needs are 17,520MW. Citing the 2020 World Bank Doing Business report, the author continued that out of 190 countries Nigeria is ranked 171 in getting electricity which is very significant for the private sector.

Esan, Anthony and Obaseki (2019) postulated that the wellbeing of Nigerians, economic progress and the nation's overall growth is at serious risk due to the current situation of power supply in the country. In order to improve electricity supply and increase access to electricity by the people, the Nigerian Government in 2003 introduced renewable energy into the National Energy Policy and by 2006 it created the Renewable Energy Master Plan (REMP). It is expected that with the successful implementation of the plan, there will be enough solar power: wind, hydroelectricity and solar thermal to provide the equivalent of today's total grid capacity by 2025.

The Table 1 below shows the renewable energy share in primary energy consumption in Nigeria between 2000 to 2018.

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

Table 1: Share of Renewable Energy in Primary Energy Consumption in Nigeria: 2000-2018.

Year	Share of Renewable Energy in %
2000	80.6
2001	79.7
2002	80
2003	78.7
2004	80.1
2005	78.3
2006	80.5
2007	82.4
2008	81.5
2009	84.3
2010	77.1
2011	73.9
2012	77.3
2013	76.2
2014	74.4
2015	77.2
2016	76.8
2017	77.3
2018	75.4

Source: *Jaganmoha (2021)*

RESEARCH METHODS

Theoretical Framework

The model for this study is based on the Endogenous Growth Theory. Based on the theoretical framework and reviewed literature, we use the traditional inputs of labor and capital along with renewable energy consumption and foreign direct investment as a control variable to test for the relationship between economic growth and renewable energy consumption. This study did not disintegrate renewable energy into different types for lack of data on the different forms in Nigeria.

The function is stated as follows:

Y = f (CAP, LABF, REC, FDI) - - - - - - - - - - - - - - - - - (1)

Where:

Y = Real GDP

CAP = Gross Capital Formation

LABF = Labour force

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

REC = Renewable Energy Consumption

FDI = Foreign Direct Investment

Model Specification

The econometric function of equation 1 will therefore be specified as

$Y = \alpha_0 + \alpha_1 CAP + \alpha_2 LABF + \alpha_3 REC + \alpha_4 FDI + \mu$ - - - - - - - - - - - (2)

All the other variables are still as earlier defined, however, α_0 = constant term, α_1- α_4 are coefficients while μ is the error term.

Applying logarithms to equation 2 in order to standardize it we obtain a new equation:

$InY = \alpha_0 + \alpha_1 InCAP + \alpha_2 InLABF + \alpha_3 InREC + \alpha_4 InFDI + \mu$ - - - - - - - - - - - (3)

Sources of Data

The data used in this study are secondary data sourced from The World Bank data bank (data.worldbank.org).

RESULT PRESENTATION

Result Presentation

Pre-test results are presented in this section, which includes unit root test and cointegration test. Also presented in this section is the Toda-Yamamoto granger causality test.

Table 2: Toda-Yamamoto Granger Causality Test

Dependent variable: GDP

Excluded	Chi-sq	df	Prob.
REC	5.792224	2	0.0452
All	5.792224	2	0.0452

Dependent variable: REC

Excluded	Chi-sq	Df	Prob.

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

GDP	5.879281	2	0.0429
All	5.879281	2	0.0429

Source: *Author's computation using E-view 9.1*

The result in Table 2 shows that there is a bi-directional relationship between GDP and renewable energy consumption (REC) since the Chi-sq is statistically significant at 5% level. This means that GDP granger causes REC and REC granger causes GDP.

Table 3: Augmented Dickey-Fuller (ADF) Unit Root Test

Variable	ADF	Integration	Significant
GDP	-4.729952	I(1)	5%
GCF	-4.016254	I(1)	5%
TLABF	-4.066635	I(0)	5%
FDI	-5.107193	I(1)	5%
REC	-5.838994	I(1)	5%

Source: *Author's computation using E-view 9.1*

Unit root test hypothesis and decision rule:

H_0: the variables have unit root (not stationary)

H_1: the variables have no unit root (stationary)

Decision rule: reject H_0 if ADF is greater than critical value in absolute terms at chosen level of significance.

From unit root test hypothesis and decision rule, it is obvious that the variables are fractionally stationary at order I(1) and I(0), we therefore reject H_0 across all the variables and conclude that the variables are not purely I(1) or purely I(0) rather stationary of I(1) and I(0). Since the variables are stationary at I(1) and I(0), this study therefore adopts ARDL bounds testing co-integration developed by Pesaran, Shin and Smith (2001).

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

Table 4: ARDL Bounds Test (Co-integration)

Test Statistic	Value	K
F-statistic	2.364151	4
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Source: *Author's Compilation with E-view 9.*

Since F-statistic (2.36) is less than the lower bounds at all significant levels, we therefore reject H_1 and conclude that the variables are not co-integrated. If two or more variables are not co-integrated, it means that there is no long-run or equilibrium relationship between the variables.

ANALYSIS OF RESULT

The regression result for this study is presented below.

Table 5: Regression Result for the Model

Variable	Coefficient	Std. Error	t- statistics	Prob
C	-46.29569	34.32024	-3.348932	0.1899
LOG (GCF)	-0.127618	0.058845	-2.168716	0.0402
LOG (TLABF)	0.443290	0.186623	2.375326	0.0259
LOG (REC)	0.393531	0.371290	2.159904	0.0297
LOG (FDI)	0.069166	0.590263	2.117178	0.0377
LOG (GDP-1)	-0.494499	0.159208	-3.106005	0.0048

Source: *Author's computation using E-view 9*

R- Squared 0.626122

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

Adjusted R- squared 0.506564

F – Statistics 3.564151

Prob (F- statistics) 0.014964

Durbin- Watson Stat 2.29798

Interpretation of the Result

The R^2 which is the coefficient of determination or the measure of goodness of fit shows the degree of variation in the dependent variables. The closer R^2 is to 100%, the better fit of the model. From our regression result, R^2 is 0.63. This implies that the independent variables can explain about 63% of the variation in the dependent variable, leaving the remaining 37% which would be accounted for by other variables outside the model.

The F-statistics measures the overall significance of the explanatory parameter. From the result in Table 5, our computed value of F- statistics is 3.564151; while the probability is 0.014964. Since the probability of the F-statistics in the computed output is less than the desired 0.05 level of significance, we therefore conclude that our regression model fits the data better than the intercept.

The a priori criteria which is determined by the existing economic theories indicate the signs and magnitude of the economic parameter under regression. In Table 5, the gross capital formation has a negative sign contradicting its a priori expectations. Its value of -0.127618 implies that a unit increase in gross capital formation decreases gross domestic product by 12%. Labor force has a positive sign, with its value as 0.443290 implies that a unit increase in the labor force will increase gross domestic product by 44% conforming to our a priori expectation. Renewable energy consumption has positive sign and the coefficient is 0.393531 implying that a unit increase in renewable energy consumption will increase Gross Domestic Product by 39% conforming to the economic a priori expectations. Foreign Direct Investment with a coefficient of 0.069166 is positive which shows that a unit increase in FDI will increase GDP by 6% in conformity with a priori expectations.

The t-statistic measures the statistical significance of the individual parameters in the model. From our regression analysis all the variables, labor force, renewable energy consumption, gross capital formation and foreign direct investment appear to be statistically significant at 5% level of significance. It therefore follows that they have a significant impact on gross domestic product.

The Durbin Watson statistic is used to test for the presence or otherwise of autocorrelation in our model. When the value of DW is closer or a little bit above 2, it means the absence of autocorrelation among the explanatory parameters (Koutsoyiannis, 1997). From the regression result as shown in table 5, the Durbin Watson statistics is 2.3, which satisfies the above condition; hence, the absence of autocorrelation among the explanatory variables.

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

African Journal of Social Sciences and Humanities Research
ISSN: 2689-5129
Volume 6, Issue 1, 2023 (pp. 34-48)

www.abjournals.org

DISCUSSION OF FINDINGS

This study objectively examined the impact of renewable energy consumption and economic growth in Nigeria. Specifically, it was to determine if there is a causal relationship between renewable energy consumption and economic growth in Nigeria and also to examine the effect of renewable energy consumption on GDP in Nigeria from 1990 to 2020. Statistical pre-tests were carried out on the data set, which include, ADF unit root test, co-integration test and the Toda-Yamamoto test to capture the objectives of the study.

The ARDL bounds test (co-integration) showed that there exists a long run relationship between the variables in Nigeria. The Toda-Yamamoto test also showed the existence of a bi-directional causal relationship between GDP and REC. The individual test statistics revealed that economically REC, FDI, and TLABF assumed a positive linear relationship with GDP; confirming the a priori expectation of the respective variables with the dependent variable. However, GCF does not conform to economic a priori expectations of its relationship with the dependent variable.

Statistically, the t-test result shows all the variables are statistically significant at 5% level of significance, in explaining the variation in GDP given the fact that their respective p-value is less than 0.05. The F-statistic, which shows the overall performance of the model, suggests that all the independent variables are together statistically significant in explaining the total change in GDP. That means they are all important variables to be taken into consideration while determining or explaining the changes in GDP. The coefficient of determination (R^2) shows that 63% of the total variation in GDP has been jointly explained by the independent variables while only 37% is explained by exogenous variables.

The findings of this study despite its different approach is in agreement with the findings in Imadojemu and Akinlosotu (2018), Bhattacharya, Parameti, Ozturk and Bhattacharya (2016) and Li et al. (2021) who observed a significant positive impact of REC on economic growth. It however differs with the findings of Ekone and Amaghionyeodiwe (2020) and Maji, Sulaiman and Abdul-Rahim (2019) who observed that there exists no significant positive relationship between REC and economic growth. This discrepancy could be as a result of differences in study approach, scope of study and choice of variables.

CONCLUSION

This study, aimed at determining the causal relationship between renewable energy consumption and economic growth and the impact of renewable energy consumption on economic growth in Nigeria, used secondary data from 1990 to 2020. The empirical result showed that renewable energy consumption has a bi-directional relationship with economic growth. This means that renewable energy consumption leads to economic growth and economic growth in turn leads to renewable energy consumption. Besides, renewable energy consumption has a significant positive impact on economic growth, meaning that the adoption of the use of renewable energy in Nigeria will lead to growth in the Nigerian economy.

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

RECOMMENDATIONS

Based on the findings and conclusion of this study, it is recommended that:

- The government should encourage the use of renewable energy in the country in order to reduce the domestic use of fossil fuel. This will help in the reduction of CO_2 emissions that causes climate change, besides encouraging economic growth as renewable energy consumption enhances growth,
- There is a need for the development of a robust waste management system in the country as waste has the potential for energy generation to drive the economy.
- The government should support and encourage investments in the renewable energy sector in the country as well as providing a conducive business environment for them. This will make renewable energy affordable and accessible to the people.
- The citizenry should also be made to understand the importance of domestic using renewable energy in the country.

REFERENCES

… https://www.twi-global.com/technical-knowledge/faqs/renewable-energy.
Adegbite, T. (2021). Where's Nigeria headed with renewable energy? www.thisdayonline.com
Ahmed, M. M. & Shimada, K. (2019). The effect of renewable energy consumption on sustainable economic development: Evidence from emerging and developing economies. *Energies* 12, 2954.
Ajibade, A. A. (2019). National strategies to promote renewable energy development within Nigeria. *Afe Babalola University Journal of Sustainable Development, Law and Policy* 10(1).
Akuru, U. B. & Okoro, O. I. (2014). Renewable energy investment in Nigeria: A review of the renewable energy master plan. *Journal of Energy South Africa* 25, 3.
Apergis, N. & Payne, J. E. (2010a). Renewable energy consumption and economic growth: Evidence from a panel of OECD countries. *Energy Policies 38(1);656-660.*
Apergis, N. & Payne, J. E. (2010b). Renewable energy consumption and growth in Eurasia. *Energy Economics* 32(6); 1392-1397.
Banton, C. (2020). Neoclassical growth theory. https://www.investopedia.com/term/n/neoclassical-growth-theory.asp
Bhattacharya, M., Parameti, S. R., Ozturk, I., & Bhattacharya, S. (2016). The effect of renewable energy consumption on economic growth: Evidence from top 38 countries. *Applied Energy* 162; 733-741.
Bowden, N. & Payne, J. E. (2009). The causal relationship between US renewable energy consumption and real output: A disaggregated analysis. *Journal of Policy Modeling* 31(2); 180-188.
Chappelow, J. (2019). Economic growth definition. https://www.investopedia.com/terms/economicgrowth.asp

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F

Ekone, F. A. and Amaghionyeodiwe, L. (2020). Renewable energy consumption and economic growth in Nigeria: Any causal relationship? *The Business and Management Review* 11(1); (59-76.)

Esan, O. C., Anthony, E. J., & Obaseki, O. S. (2019). Utilization of renewable energy for improved power generation in Nigeria. *Journal of Physics: Conference series,* 1299012026.

Gershon, O. & Emekalam, P. (2021). Determinants of renewable energy consumption in Nigeria: A Toda Yamamoto approach. *International Conference on Energy and Sustainable Environment IOP Conference Series: Earth and Environment Science* 665.

Gujarati, D. N. (2004). Basic econometrics (4th. Ed.). The McGraw-Hill, New York.

Imandojemu, K. & Akinlosotu, N. T. (2018). Renewable energy consumption and economic growth in Nigeria: A co-integration and granger causality approach. *CBN Bullion* 42(2); 50-67.

International Energy Agency (2009). World energy outlook 2009, OECD/IEA, Paris. https://doi.org/10.1787/weo-2009-en.

Jaganmohan, M. (2021). Nigeria's share of energy consumed from renewables 1990-2018. https://www.statista.com/statistics/246084/share-of-renewable-energy-ofenergy-consumed-in-nigeria/.

Kenton, W. (2021). Classical growth theory. https://www.investopedia.com/terms/c/classical-growth-theory.asp

Khobai, H. & Le Roux, P. (2017). Does renewable energy consumption drive economic growth: Evidence from Granger- causality technique. *MPRA Paper* 82464.

Koutsoyiannis, A. (1997). Theory of econometrics. Macmillan, London.

Li, Q., Cherian, J., Shabbir, M. S., Sial, M. S., Li, J., Mester, I., & Badulescu, A. (2021). Exploring the relationship between renewable energy sources and economic growth. The case of SAARC countries. *Energies, 14, (520)*.

Liberto, D. (2020). Endogenous growth theory definition. https://www.inestopedia.com/terms/e/endogenousgrowththeory.asp.

Maji, I. K., Sulaiman, C. & Abdul- Rahim, A. S. (2019). Renewable energy consumption and economic growth nexus: A fresh evidence from West Africa. *Energy Reports* 5; (384-392).

Nafziger, E. W. (2006). Economic development (4th ed.). Cambridge, New York.

Nkoro, E., Ikue-John, N. & Joshua, G. I. (2019). Energy consumption and economic growth in Nigeria: A revisit of the energy-growth debate. *Business Review of Social Sciences* 1(2); 01-09.

Okonkwo, C. C., Edoziuno, F. O., Adediran, A. A., Ibitogbe, E. M., Mahamood, R. & Akinlabi, E. T. (2021). Renewable energy in Nigeria: Potentials and challenges. *Journal of Southwest Jiaotong University* 56(3); 528-539.

Oyedepo, S. O. (2012). Energy and sustainable development in Nigeria: the way forward. *Energy, Sustainability and Society* 2(15); 1-17.

Pesaran, M. H., Shin, Y. & Smith, R. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics,* 16; 289-326. https://doi.org/10.1002/jae.616.

Petchko, K. (2018). How to write economics and public policy. Elsevier. https://doi.org/10.1016/c2016-0-04062-7.

Shin, L. (2018). Renewable Energy: The clean facts. www.nrdc.org/stories/renewable-energy-clean-facts.

World Bank. www.data.worldbank.org.

Article DOI: 10.52589/AJSSHR-BNHM472F
DOI URL: https://doi.org/10.52589/AJSSHR-BNHM472F