Economic Insights – Trends and Challenges	Vol.XI(LXXIV) No. 3/2022	1 - 9

Energy Sustainability and Human Welfare in Nigeria: Implications for Sustainable Development

Dolapo Akindele-Sotunbo[1], Johnson Ifeanyi Okoh[2],Wahid Damilola Olanipekun[3], Timothy Ayomitunde Aderemi[4*]

[1] Department of Estate Management, Bells University of Technology, km. 8, Idiroko Road, Benja Village, P.M.B. 1015, Ota, Nigeria
e-mail: akindele@live.co.uk

[2] Department of Financial Studies National Open University of Nigeria, 91, Cadastral Zone, University Village, Nnamdi Azikiwe Express Way, Jabi, Abuja, Nigeria
e-mail: jokoh@noun.edu.ng

[3] College of Management and Information Technology, American International University, West Africa, Plot No. 1152, AU Highway, Brusubi, Gambia
e-mail: W.olanipekun@aiu.edu.gm

[4] Department of Economics, Accounting and Finance, Bells University of Technology, km. 8, Idiroko Road, Benja Village, P.M.B. 1015, Ota, Nigeria
e-mail: aderemi.timothy@gmail.com

DOI: 10.51865/EITC.2022.03.01

Abstract

Despite the high propensity of energy usage in driving the economic activities, the issues of global climate change and global warming which pose enormous threats to human welfare have motivated the growing need for energy sustainability globally. In the light of the above, the Sustainable Development Goal (SDG 7) advocates for the usage of energy from cleaner sources. Meanwhile, impact of energy usage on human welfare has largely been the issue of concern among the scholars in Nigeria. Against this backdrop, this study examined energy sustainability and human welfare in Nigeria. Consequently, data was collected from secondary sources, and analyzed within the framework of Fully Modified Ordinary Least Squares (FMOLS) and Granger causality test. The summary of the principal findings in this is enunciated as follows; energy sustainability and life expectancy had a positive and significant relationship in Nigeria. Government expenditures on health had both negative and insignificant relationship with life expectancy in Nigeria. Also, there was a unidirectional causality flowing from life expectancy to electricity consumption from hydroelectric sources in Nigeria. Furthermore, one way feedback flows from government expenditure on health to life expectancy. From these findings, this study recommends that Nigeria would want to achieve the Sustainable Development Goals one (1) - promoting good life for the people, and seven (7) - affordable and clean energy simultaneously before the SDGs timeline elapses in 2030, the Nigerian policymakers and all stakeholders should be aggressively involved in energy sustainability movement in the country.

Keywords: *energy sustainability; human welfare; life expectancy; SDGs; Nigeria*.

JEL Classification: *Q20; Q28; Q43*.

* Corresponding author

Introduction

One of the commodities that has extreme demand in the global economy is energy, and as such, its contribution in guaranting nation building and development in all countries of the world cannot be undermined (Nwokoye *et al.* 2017; Sambo *et al*. 2012; Oyedepo, 2012). Meanwhile, deficiency in energy supply constitutes one of the major bottlenecks confronting the Nigerian economy in the recent time. This reinforces the inability of the supply of energy especially electricity to be at the equilibrium with that of the consumers' demand due to the fact the supply of electricity has been in the state of comatose in Nigeria resulting in poor economic performance of the country. (Nwachukwu, Ezedinma, & Jiburum, 2014). Another striking factor that raises concern for the sustainability of energy in Nigeria is perpetual rising in population of the country. Nigeria has over 200 million people relying on about 4,000 megawatts of electricity (World Bank, 2019). The huge shortfall in energy availability in Nigeria is likely to create unfavorable environment for businesses to thrive because industrialization and wealth creation depend on massive energy consumption.

However, despite the high propensity of energy usage in driving the economic activities, the issues of global climate change and global warming which pose enormous threats to human welfare have motivated the growing need for energy sustainability globally, and Nigeria to be specific (United Nations, 2020; Alege *et al.* 2017; Aderemi *et al*., 2021; United Nations, 2015). If caution is not put in place, energy usage could cause uncontrollable environmental hazards to human wellbeing. In the light of the above, the Sustainable Development Goal (SDG 7) advocates for the usage of energy from cleaner sources in the recent times in order to ensure the provision of energy on continuous basis in the global economy without affecting its availability to the future generation (United Nations, 2015; WCED, 1987).

Consequently, impact of energy usage on human welfare has largely been issue of concern among the scholars in Nigeria. But, literature has largely undermined energy sustainability and human welfare in Nigeria in the most recent time. For instance, available empirical evidence has shown that perpetual power outage in Nigeria has moved majority of the Nigerians into absolute poverty (Matthew *et al.*, 2018; Charles, 2014; Iwayemi, 2012). In the same vein, recent studies such as Aderemi *et al*. (2021) and Onabote *et al*. (2021) focused on energy sustainability and economic growth in Nigeria while ignoring human welfare which is critical to the concept of economic development. Against this backdrop, this study examined energy sustainability and human welfare in Nigeria. The novelty of this study lies in the existing gap in the literature, in which to the best of our knowledge no study in Nigeria has examined energy sustainability and human welfare, using life expectancy as measurement of human welfare in the country. The arrangement of this paper is as follows; background information to the study and gap in the literature were done respectively in the introduction. Literature review was captured in the section two, whereas section three focuses on methodology and data. Furthermore, section four contains discussion of results, summary and policy recommendation of the study.

Literature Review

Nigeria's annual per capita income stands at around US$2,500, making the country a lower middle income country (World Bank, 2018). To attain economic growth and development in any country, the role of energy is very important (Abam *et al.,* 2014), especially stable and consistent energy (Oyedepo, 2012). This is due to the fact that energy consumption is used to drive various sectors of the economy like manufacturing, industrialization, agriculture, and others (Osabohien *et al.,* 2021).

Interestingly, economic development brought about by industrialization and advancement in technology while being beneficial can also be hazardous especially when it poses a threat to the

people or the environment (Olagunju, 2018). The consciousness that development can bring about negative effects birthed the idea of "Sustainable Development", and in 1987, the Brundtland Report defines sustainable development as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Kono, 2014).

The United Nations in September 2015 passed some resolutions which were aimed towards Sustainable Development. These are known as the Sustainable Development Goals and they were supported by all its 193 member states including Nigeria.

The United Nations Sustainable Development Goal Number 3 (SDG3) emphasizes "good health and well-being of citizens" in developing economies by 2030 while Sustainable Development Goal Number 13 (SDG13), talks about "taking urgent action to combat climate change and its impacts". These goals are at variance with the issue of global warming, which is caused by activities expending energy from fossil fuel and industrialization.

Presently, Nigeria relies on petroleum as its main energy source. About 77 million Nigerians are not connected to the national electricity power grid (IEA, 2017). Among the rest of the population connected to the grid, a very large percentage of them (80%) still experience erratic power supply and as such have had to employ the use of carbon emission generators in order to augment their power needs (Roche *et al.,* 2020).

In world ranking, Nigeria ranks 10th among countries with the largest reserves of crude oil and 9th among countries with the largest reserves of natural gas (NBS, 2011). The estimate of natural gas reserves in Nigeria was put at 5.1 trillion cubic meters and this is the largest in Africa. However, due to the lack of the facilities needed in optimizing this vast reserve of natural gas, most of it is flared. As a result of this, Nigeria is a major emitter of greenhouse gas on the continent and this is due to this practice of gas flaring (Alege *et al.,* 2017; Martinot and McDom, 2002).

The practice of gas flaring has been reported to bring about environmental problems like acid rain, the release of contaminants into the atmosphere which can deplete soil nutrients and cause stunted growth in plants (Udok and Akpan, 2017).

Also, the use of energy from fossil fuel results in carbon emissions and constitutes environmental hazards and health deterioration (Oyedepo, 2012; Osabohien *et al.,* 2021). Studies have shown that increase in these carbon emissions into the atmosphere has led to increase in sea level and consequent flooding, global warming, destruction of crops and drought (Resnik, 2016). According to a study conducted by Osabohien *et al*. (2021), emission of carbon into the atmosphere can shorten life expectancy by 0.35%.

This resultant issue of health deterioration and environmental degradation has in turn led government to increase budgetary allocations for the funding of health care (Balan, 2016). In a study conducted by Odusanya *et al.* (2014) to establish the relationship between carbon emissions and health expenditure, using data spanning a period of more than 50 years (1960-2011) it was revealed that increase in carbon emissions is directly proportional to spending on health. This is also in line with the findings of Assadzadeh *et al.* (2014), where it was reported that carbon emissions increases spending on health and to some extent shortens life expectancy.

Access to cleaner and more efficient fuels like natural gas, biogas and advanced biomass stoves will help in reducing carbon emissions and also reduce the health risks associated with it (Ben Youssef *et al.,* 2014).

Experts have stated that renewable energy is the way forward and the solution to this environmental problem (Woo *et al.,* 2015). Oyedepo (2012) also stressed that the development of renewable energy should be given greater attention and priority in Nigeria, against the

backdrop of the environmental hazards caused by fossil fuels. However, Nigeria is yet to harness its renewable energy potentials hence the population still relies on the use of fossil fuel as source of energy (Abam *et al.,* 2014).

Nigeria has in abundance renewable energy resources which can be used to drive its energy policy. These range from wind, hydro, biomass to solar energy. Out of all these renewable energy sources, hydroelectric power is Nigeria's main source of power (Akuru *et al.,* 2017) and it is also the most commonly used renewable energy owing to its low carbon emission rate (Basil, 2020).

Oyedepo (2012) further stated that aside from being clean and pollution free, renewable energy cannot be depleted, and they can provide a sustainable and indefinite supply. He also stated that renewable energy is very flexible as it can be decentralised and set up in small units for the use of small communities in rural areas.

A decentralised renewable energy system is a viable option for the attainment of the Sustainable Development Goals (United Nations, 2018; Oyedepo, 2012; Deshmukh, 2009). According to a United Nations report (UNEP, 2013) a change from carbon based to renewable energy will reduce the amount of carbon dioxide emissions by 6.4 million tonnes a year in Nigeria (UNEP, 2013).

Indoor pollution affects a lot of Nigerians due to the use of Kerosene lamps, and a good percentage of household burns in Nigeria has been discovered to be attributed to Kerosene lamp explosions (Oladele and Olabanji, 2010). A decentralised renewable energy system employing the use of solar lights will bring about a better health care and welfare in the lives of the people.

Methodology and Material

The relationship between energy sustainability and human welfare in Nigeria has been examined in this study. To achieve this, an ex-post facto research design was considered appropriate for the study because the principal objective of this study is to explore the viable relationship, and as well described how energy sustainability predicts variation in human welfare in Nigeria. Moreover, the study employed annual data which was extracted from the World Development Indicators. The scope of the study was between 1990 and 2014. However, it is instructive to state that this scope was exclusively limited to 2014 due to the non-availability of data for electricity production from hydroelectric sources beyond this year in Nigeria.

Model Specification

Building model for estimation of the relationship between energy sustainability and human welfare in this study requires some insights to be drawn from the works of Aderemi *et al*. (2022), Onabote *et al.* (2021), Osabohien *et al.* (2021), Olaoye *et al.* (2020) and Maji (2015). Some modification was however done on the adapted model to suit the purpose of this study. Therefore, the model is enunciated as follows:

$$HWF = f(SEC) \tag{1}$$

Introduction of some control variables into equation (1) leads to equation (2)

$$HWF = f(SEC, GEX, PGR) \tag{2}$$

The classic Cobb-Douglas production function version of the above equation could be stated as:

$$HWF = SEC^{\theta_1} GEX^{\beta_2} PGR^{\Omega_3} \tag{3}$$

If the natural logarithm is introduced into some of the explanatory variables in model (3) to satisfy the conventional linearity assumption of the OLS, the following model is emerged;

$$HWF_t = a + \theta_1 LogSEC_t + \beta_2 LogGEX_t + \Omega_3 PGR_t + \mu_t \quad (4)$$

where HWF is used to denote human welfare. This is measured by life expectancy, which its unit is in year. SEC represents energy sustainability, electricity production from hydroelectric sources is used as its proxy, and its unit in megawatt. GEX denotes government expenditure on health in billion naira. This combines both capital and recurrent expenditure on health. PGR is used to capture population growth rate, in which its unit is in percentage and μ_t represents the error term. In addition, α, is intercept. θ_1, β_2 and Ω_3 represent the parameters of SEC, GEX and PGR respectively. Log represents natural logarithm and t ranges between 1990 and 2014. It is expected that θ_1, and $\beta_2 > 0$ and $\Omega_3 < 0$.

Results and Discussion

Table 1 indicates the results of the descriptive statistics of the estimated variables. Thus, there are four variables in the model which are human welfare – life expectancy, government expenditure, electricity consumption, and population growth rate. Firstly, life expectancy in Nigeria for 1990 to 2014 had its maximum value to be 52.7 years and the minimum value as 45.8 years. Meanwhile, its mean value is 47.9 years with the standard deviation of 2.4. This variable is moderately dispersed because its mean value was greater than the standard deviation. The same way, the skewness of the data set was positive and had the kurtosis of 1.9 which makes it not to satisfy a symmetrical distribution assumption because the value is far from 3.

Similarly, expenditures of government on health in its log form had a maximum value of 40.37 billion naira and the minimum value is 0. 4 billion naira. The mean value was 16.46 billion naira and standard deviation was 14.8. This attests that this variable was moderately dispersed because the mean value is greater than standard deviation.

However, the electricity consumption in log form and population growth rate estimates had 156.7 megawatt, and 2.72% as their maximum values and the minimum values as 74.5 megawatt and 2.52% respectively. In the same vein, the both variables had the mean values as 108.5 megawatt and 2.6% respectively with the standard deviations as 26.3 and 0.07 respectively. The implication of this is that the variables were moderately dispersed because their means were greater than the standard deviations.

Table 1. Descriptive Statistics

Descriptive Statistics	HWF	LogGEX	LogSEC	PGR
Mean	47.97392	16.46688	108.5654	2.602800
Median	46.83500	21.84400	101.9250	2.580000
Maximum	52.67200	40.36700	156.7970	2.720000
Minimum	45.84300	0.400000	74.49100	2.520000
Std. Deviation	2.387652	14.81628	26.35138	0.076894
Skewness	0.706275	-0.006254	0.318911	0.352673
Kurtosis	1.978346	1.427529	1.738031	1.472363
Jarque-Bera	3.165703	2.575856	2.082690	2.949153
Probability	0.205389	0.275842	0.352980	0.228876
Sum	1199.348	411.6720	2714.134	65.07000
Sum. Sq. Deviation	136.8211	5268.533	16665.49	0.141904
Observation	25	25	25	25

Source: authors` calculation (2022).

The essence of doing a unit root test is to check how stationary the variables of interest are at various forms. This test is so important that it helps to reduce the risk of nonsense or spurious

results in a study. In this line, the study thereby used the Augmented Dickey Fuller (ADF) and Phillip Peron test (PP) to test whether these variable have a unit root or not. The results presented in Table 2 showed that life expectancy, government expenditures on health, population growth rate and electricity consumption were all stationary after the first differencing. This is an indication that all the variables do possess a unit root. Hence, this study utilized data with of integration order one (1), which implies that the variables can possess a sort of divergence in the short run but the divergence could return to equilibrium in the long run and this can be verified using the Johannsen cointegration test.

Table 2. Unit Root Test

Variables	ADF Test				
	Level	**Prob.**	**1st Dif.**	**Prob.**	**Decision**
HWF	-2.981038	0.3909	-2.998064	0.0345	I(1)
LogGEX	-2.971853	0.7067	-2.976263	0.0005	I(1)
LogSEC	-2.991878	0.7919	-2.998064	0.0001	I(1)
PGR	-2.976263	0.0112	-2.976263	0.0002	I(1)
	PP Test				
	Level	**Prob.**	**1st Dif.**	**Prob.**	**Decision**
HWF	-2.967767	0.9997	-2.998064	0.0345	I(1)
LogGEX	-2.971853	0.7176	-2.976263	0.0005	I(1)
LogSEC	-2.991878	0.8300	-2.998064	0.0001	I(1)
PGR	-2.967767	0.6620	-2.976263	0.0002	I(1)

Source: authors` calculation (2022).

Table 3 above shows the estimated results of the long run equilibrium relationship between human welfare and energy sustainability in Nigeria within the context of Johansen Cointegration Test. The above findings established that there were presence of at most three (3) cointegration vectors in the estimated model. This indicates that energy sustainability and human welfare have a long run convergence in Nigeria.

Table 3. Johansen Cointegration Test (Trace Statistics) and (Maximum Eigen value)

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**P-Value**	**Max-Eigenvalue**	**P-Value**
None	0.932298	102.7875	0.0000	61.932298	0.000
At most 1	0.689613	40.85665	0.0018	26.90851	0.0069
At most 2 *	0.374428	13.94815	0.0844	10.78904	0.1651
At most 3 *	0.128337	3.159102	0.0755	3.159102	0.0755

Source: authors` calculation (2022).

The long run relationship between energy sustainability and human welfare using the Fully Modified Ordinary Least Squares (FMOLS) method was estimated in Table 4. It is only energy sustainability estimate that possesses the expected sign. The R-squared is 0.92, which therefore indicates that 92.4% of variation in human welfare was explained by the explanatory variables. Hence, the model used for the analysis of the paper was relatively good.

However, energy sustainability and life expectancy had a positive and significant relationship in Nigeria. A unit change in energy sustainability brings about 0.035% increment in life expectancy in the country. However, government expenditures on health had both negative and insignificant relationship with life expectancy in Nigeria. The reason for this result might be the poor funding of health sector in Nigeria in the past decades, although population growth rate and human welfare had a positive but significant relationship with each other in Nigeria.

In a nutshell, energy sustainability increases life expectancy significantly in Nigeria. This is a strong indication that energy sustainability contributes immensely to better human welfare in the country.

Table 4. Fully Modified Ordinary Least Squares (FMOLS)

Dependent Variable: Human Welfare

Regressors	Coefficient	T-statistics	Prob. Value
LogSEC	0.034694	2.237078	0.0368
LogGEX	-0.001113	0.066143	0.9479
PGR	20.94622	4.019365	0.0007
R-Squared	0.924930		

Source: authors` calculation (2022).

It had been previously established in Table 3 that energy sustainability and human welfare possessed a long run convergence. However, this study further determined the direction of the causal relationship among the relevant variables. Consequently, the estimated results were presented in Table 5 as follows; firstly, there was a unidirectional causality flowing from life expectancy to electricity consumption from hydroelectric sources in Nigeria. This implies that human welfare is one of the major factors driving energy sustainability in the country. Furthermore, one way feedback flows from government expenditure on health to life expectancy. There was bidirectional causality between population growth rate and life expectancy in the country.

Table 5. Pairwise Granger Causality Test

Null hypothesis	F-statistic	Prob.	Decision	Causality
SEC does not granger cause HWF	2.58748	0.1029	Reject	
HWF does not granger cause SEC	3.86935	0.0400	Accept	Unidirectional
GEX does not granger cause HWF	4.26983	0.0271	Accept	Unidirectional
HWF does not granger cause GEX	2.43345	0.1110	Reject	
PGR does not granger cause HWF	4.82045	0.0178	Accept	Bidirectional
HWF does not granger cause PGR	5.99808	0.0080	Accept	Bidirectional
GEX does not granger cause SEC	2.35574	0.1234	Reject	None
SEC does not granger cause GEX	1.06400	0.3658	Reject	None
PGR does not granger cause SEC	2.67443	0.0962	Reject	None
SEC does not granger cause PGR	2.06392	0.1560	Reject	None
PGR does not granger cause GEX	0.27606	0.7614	Reject	None
GEX does not granger cause PGR	1.62530	0.2198	Reject	None

Source: authors` calculation (2022).

Conclusion and Policy Recommendation

The relationship between energy sustainability and human welfare from 1990 to 2014 has been investigated within the framework of Fully Modified Ordinary Least Squares (FMOLS) and Granger causality test. Consequently, the summary of the principal findings in this is enunciated as follows; energy sustainability and life expectancy had a positive and significant relationship in Nigeria. The life expectancy in Nigeria was negatively affected due to government expenditures on health. Also, there was one causal relationship flowing from life expectancy to electricity consumption from hydroelectric sources in Nigeria. Furthermore, one way feedback flows from government expenditure on health to life expectancy. There was bidirectional causality between population growth rate and life expectancy in the country. This implies that human welfare is one of the major factors driving energy sustainability in the country.

This study therefore concludes that energy sustainability increases life expectancy significantly in Nigeria. This is a strong indication that energy sustainability contributes immensely to better human welfare in the country. From these findings, this study recommends that Nigeria would be able to achieve the Sustainable Development Goals one (1) - promoting good life for the people, and seven (7) - affordable and clean energy simultaneously before the SDGs timeline

elapses in 2030, if the Nigerian policymakers and all stakeholders are aggressively involved in energy sustainability movement in the country.

References

1. Abam, F. I., Nwankwojike, B. N., Ohunakin, O. S., and Ojomu, S. A. (2014). Energy resource structure and on-going sustainable development. *Int J Energy Environ Eng*, 5:102.
2. Aderemi, T. A., Alejo, A., Omoyele, O. S., Olaoye, O. P., Olanipekun, W. D., & Azuh, D. E. (2022). An Econometric Analysis of Clean Energy Supply and Industrial Development in Nigeria: Implications for Sustainable Development. *International Journal of Energy Economics and Policy*, *12*(3), 209-215.
3. Aderemi, T. A., Oyegoke, A.A., Wahid D. O., Olaoye, O. P, Ayodeji, G. B. and Azuh, D. E. (2021). Human Capital Development, Energy Consumption and Crude Oil Exports in Nigeria: Implications for Sustainable Development. International *Journal of Energy Economics and Policy*, 11(4), 443-449
4. Akuru, U. B., Onukwube, I. E., Okoro, O. I., and Obe, E. S. (2017). Towards 100% renewable energy in Nigeria. (2017). *Renewable and Sustainable Energy Reviews,* 71, 943-953.
5. Alege, P. O., Oye, Q. E., Adu, O. O., Amu, B. and Owolabi, T. (2017). Carbon Emissions and the Business Cycle in Nigeria. *International Journal of Energy Economics and Policy*, 7(5):1- 8.
6. Assadzadeh, A., Faranak, B., and Amir, S. (2014). The Impact of Environmental Quality and Pollution on Health Expenditures: A Case Study of Petroleum Exporting Countries. Sydney, Australia: *Proceedings of 29th International Business Research Conference*, pp 24-5.
7. Balan, F. (2016), Environmental quality and its human health effects: A causal analysis for the EU-25. *International Journal of Applied Economics*, 13(1), 57- 71.
8. Ben Youssef, A., Lannes, L., Rault, C., and Soucat, A. (2016). Energy Consumption and Health Outcomes in Africa. Discussion Paper No. 10325 October 2016.
9. Charles, A. (2014). *How is 100% Renewable Energy Possible for Nigeria?* Global Energy Network Institute. Global Energy Network Institute.
10. Deshmukh, A. (2009). The Role of Decentralized Renewable Energy for Rural Electrification. Erasmus Mundus Masters Course in Environmental Sciences, *Policy and Management*, pp 45-46.
11. IEA. (2017). World energy outlook 2017: Special report on energy access - from poverty to prosperity. Retrieved from http://www.iea.org/access2017/
12. Iwayemi, A. (2012). Energy Resources and Development in Nigeria. *NAEE/IAEE 4th Annual International Conference.* Retrieved from www.naee.org
13. Kono, N. (2014). Brundtland Commission (World Commission on Environment and Development). In: Michalos A.C. (Eds.) *Encyclopedia of Quality of Life and Well-Being Research*. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-0753-5_441.
14. Maji, I. K. (2015). Does Clean Energy Contribute to Economic Growth? Evidence from Nigeria. *Energy Reports, 1*, 145–150.
15. Matthew, O. A., Ede, C. U., Osabohien, R., Ejemeyovwi, J., Fasina, F. F. and Akinpelumi, D. (2018). Electricity Consumption and Human Capital Development in Nigeria: Exploring the Implications for Economic Growth. *International Journal of Energy Economics and Policy*, 8(6), 8-15.
16. Odusanya, I. A., Adegboyega, S. B., Kuku, M. A. (2014), Environmental quality and health care spending in Nigeria. *Fountain Journal of Management and Social Sciences*, 3(2), 57-67.
17. Oladele, A. O. and Olabanji, J. K. (2010). Burns in Nigeria: a Review. Annals of Burns and Fire Disasters. Annals of Burns and Fire Disasters, *Journal of the Euro-Mediterranean Council for Burns and Fie Disasters*, 23(3), 120–127.
18. Olagunju, O. (2018). Prospects and Challenges of Achieving Sustainable Development Goals in Nigeria. Low-Carbon Economy as Solution for Mitigating Climate Change Impacts: A Case Study of Lagos State Seminar Paper, 2018.
19. Olaoye, O. P., Aderemi, T.A,, Nwagwu, C. J., Yvonne, J. O. & Azuh, D. E. (2020). Energy Consumption and Foreign Direct Investment Inflows in Nigeria: An Empirical Perspective. *International Journal of Energy Economics and Policy*, 10(2), 1-6.

20. Onabote, A., Jolaade, A., Osabohien, R., Otobo, O., Ede, C. and Okafor, V. (2021). Energy sustainability, Energy Financing and Economic Growth in Nigeria, *International Journal of Energy Economics and Policy*, 11(1), 433-439.
21. Osabohien, R., Aderemi, T. A., Akindele, D. B., and Jolayemi, L. B. (2021). Carbon Emissions and Life Expectancy in Nigeria.*International Journal of Energy Economics and Policy*. 11(1), 497-501. https://doi.org/10.32479/ijeep.10834
22. Oyedepo, S. O. (2012). Energy and sustainable development in Nigeria: The way forward. Oyedepo Energy, *Sustainability and Society*, 2:15 http://www.energsustainsoc.com/content/2/1/15.
23. Martinot, E., and McDom, O. (2002). Promoting Energy Efficiency and Renewable Energy GEF Climate Change Projects and Impacts; Global Environmental Facility. Washington, DC.
24. National Bureau of Statistics (NBS) *Annual abstract of statistic* (2011). http://www.nigerianstat.gov.ng/. Accessed 05 Feb 2013.
25. Nwachukwu, M.U., Ezedinma, N.F., & Jiburum, U. (2014). Comparative Analysis of Electricity Consumption among residential, commercial and industrial sectors of the Nigeria's economy, *Journal of Energy Technologies and Policy*, 4(3), 7-13
26. Resnik, D. B. (2016). Climate change: causes, consequences, policy, and ethics. In: B*ioethical Insights into Values and Policy*. Springer, Cham; 2016. pp. 47-58.
27. Roche M. Y., Verolme, H., Agbaegbu, C., Binningtond, T., Fischedick, M. and Oladipo, E. O. (2020). Achieving Sustainable Development Goals in Nigeria's power sector: Assessment of Transition Pathways. *Climate Policy*, 20(7), 846– 865. https://doi.org/10.1080/14693062.2019.1661818.
28. Sambo, A. S., Garba, B., Zarma, I. H. & Gaji, M.M. (2012). Electricity Generation and the Present Challenges in the Nigerian Power Sector. *Journal of Energy and Power Engineering*, 6(7), 1050-1059.
29. Udok, U. and Akpan, E. B. (2017). Gas Flaring in Nigeria: Problems and Prospects. *Global Journal of Politics and Law Research*, .5(1), 16-28.
30. United Nations (2018). *High Level Political Forum on Sustainable Development*, pp 8. https://sustainabledevelopment.un.org/hlpf/2018.
31. United Nations Environment Programme (2013). *UNEP Guide for Energy Efficiency and Renewable Energy Laws*.
32. United Nations. (2015). Report on sustainable development goals for the West Africa sub-region. *United Nations Economic Commission for Africa*.
33. United Nations. (2020). *Sustainable Development Goals (SDGs) and Disability*. Retrieved from United Nations: https://www.un.org/development/desa/disabilities/envision2030-goal12.html#menu-header-menu
34. WCED (1987). *Our Common Future. World Commission on Environment and Development.* World Commission on Environment and Development. Oxford: Oxford University Press.
35. Woo, C., Chung, Y., Chun, D, Seo, H, and Hong, S. (2015). The static and dynamic environmental efficiency of renewable energy: a Malmquist index analysis of OECD countries. R*enew Sustain Energy Rev*. 2015; 47:367–76.
36. World Bank (2019). *World Development Indicators.* The World Bank. Washington, D.C.: World Bank.
37. World Bank (2018). Nigeria data bank. Retrieved from https://data.worldbank.org/country/nigeria