

PAPER • OPEN ACCESS

Health implications of economic growth: the role of air pollution

To cite this article: A Afolabi *et al* 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **640** 012095

View the [article online](#) for updates and enhancements.

You may also like

- [Determinants of Renewable Energy Consumption in Nigeria: A Toda Yamamoto Approach](#)
O Gershon and P Emekalam
- [Decoupling economic and energy growth: aspiration or reality?](#)
Jin Guo, Chuan-Zhong Li and Chu Wei
- [Renewable Energy Consumption Shocks on CO2 Emissions and Economic Growth of Nigeria](#)
N Ezenwa, V Nwatu and O Gershon



The Electrochemical Society
Advancing solid state & electrochemical science & technology

242nd ECS Meeting

Oct 9 – 13, 2022 • Atlanta, GA, US

Early hotel & registration pricing
ends September 12

Presenting more than 2,400
technical abstracts in 50 symposia

The meeting for industry & researchers in

BATTERIES
ENERGY TECHNOLOGY
SENSORS AND MORE!



Register now!



**ECS Plenary Lecture featuring
M. Stanley Whittingham,**
Binghamton University
Nobel Laureate –
2019 Nobel Prize in Chemistry



Health implications of economic growth: the role of air pollution

A Afolabi¹ E Urhie¹ T Ogunbiyi¹ F Ogundiran¹ and A Afolabi¹

¹Covenant University, P.M.B 1023, Ota, Nigeria

E-mail: adesolafolabi@gmail.com

Abstract. Economic growth comes with benefit and cost. The benefits include improved standard of living, better health care facilities and longer years of living as well as better chances of attaining higher education. There are also costs to economic growth. Economic growth entails increasing productive and consumption activities that can lead to health challenges, increase in income inequality, depletion of natural resources and increased environmental pollution, especially air pollution. Air pollution also indirectly affects income generation and savings for households. It places additional cost burden on governments. This paper thus evaluated the relationship that exists between economic growth and health performance in Nigeria vis-à-vis air pollution. The study used the PROCESS software to estimate the direct, indirect and total effects of economic growth on the health performance in Nigeria. The study found a direct and positive relationship exist between gross domestic product and life expectancy, variables used to capture both economic growth and health performance in Nigeria. It further found that the relationship could be indirectly effected with the use of a transmission mechanism, in this case-air pollution, to show that economic growth may not always lead to better health outcomes.

Keywords: Air pollution, Economic growth, Health Performance in Nigeria, Mediation Analysis, Hayes, Process

1. Introduction

Economic growth is undoubtedly a most desirable phenomenon. It is a catalyst for economies to reduce poverty, improve standards of living, education, technology, infrastructure, health, as well as other conditions that yields development [1]. As desirable as economic growth is to economies around the world, it is not without its short falls. Researchers have linked issues such as risks to health, high rate of income disparity, aggravated environmental pollution and reduction of natural resources as effects of economic growth. The publication in [2] revealed, health is particularly threatened in developing countries as a result of issues like, air pollution, waterborne disease as well as exposure to chemicals. [3] also noted that developing countries are usually plagued with a rising spate of air pollution that stems from increase in productive activities. The negative chain reaction spiralling as a result of economic growth is thus examined in this study, a link is established and an attempt towards correctional measures is suggested.



In Nigeria, productive activities are often associated with massive pollution due to the poor supply of electricity, and poorly maintained state of mechanical engines. Electricity supply has been asserted to be positively related to productivity in Nigeria. [4] suggested that it is the force that drives continuous growth of any economy. Amidst other energy producing activities, the inadequate supply electricity in Nigeria, has inadvertently led to the massive acquisition of generators to power up homes, offices and shops. [5] reported an average availability of 3,400 Mega Watts supplied by the National grid is barely sufficient in meeting the country's teeming population needs, currently estimated to range between 8,000-10,000 Mega Watts, thus leaving room for alternative sources of electricity, supplied majorly by electricity generating sets. Unfortunately, the effects of productivity, powered majorly by electricity generating sets releases unhealthy portions of carbon dioxide into the atmosphere, causing pollution that increasingly causes threats to not just human health but on other living creatures on earth. According to [6], Nigeria is one of the leading importers of generators in the world, because almost 40 percent of the Nigerian populace has no access to grid-connected electricity. News report speculates that in most Nigerian communities, as much as 10 generating sets could be found within a radius of five metres pre-empting the number of deaths from generator smoke inhalation in Nigeria between 2008 and 2014 at no less than 10,000. Nigeria's President Muhammadu Buhari ordered a ban on the importation of a small power generating set, popularly known as "I-better-pass my neighbour", as a result of the alarming increase in death rates. More statistics reveal that 82 percent of the 29 million households in Nigeria, have no access to electricity from the national grid and that, at least 60 million Nigerians own an electricity generating set, while more than N4 trillion is spent every year to fuel these sets.

While an emission record in Nigeria to indicate the contribution of pollution from various sources is not yet standardised, evaluations indicate petrol or diesel fuelled engines used to power homes and businesses are major sources of pollution [4]. Emissions from diesel and petrol run engines including generators, cars and other means of transportation, constantly pollute the environment, without efficient checks to prevent hazards. Air pollution has serious implications on the health status of a nation. The report in [7] described it as health's biggest environmental risk. Air pollution (outdoor alone) is responsible for the death of 3 million people around the world each year, with majority of these deaths arising from non-communicable diseases. This study's objectives are to:

- Examine the effects of economic growth on health status.
- Identify the existence of an indirect effect of productive activities on health status through air pollution.

2. Economic Growth and Sustainable Economic Development in Nigeria

Economic growth is a prerequisite for achieving economic development at all levels. Irrespective of the positive and adverse effects of economic growth economic development cannot be achieved without first attaining growth. However, growth alone does not guarantee development. This implies that development of an economy will not just require growth in terms of numbers, but entails social and economic progress. A review of empirical data showed that between 2005 and 2017, Nigeria's Gross Domestic Product (GDP), a measure of economic growth, grew by over 235 percent from \$112 billion to \$375 billion. Within the same period, the country's Human Development Index (HDI) value, a measure for economic development, increased by a mere 14.4 percent from 0.465 to 0.532. A review of employment rate in the country also showed that despite the GDP trajectory recorded, youth unemployment in the country has worsened over time. According to data from [8], youth unemployment grew from 13 percent in 2000 to a record high of over 38 percent. This is indicative of a challenge with sustainable development and a growth level in the country that is non-inclusive. Most economies thus prefer to employ a measure of social and economic progress to determine their true level of development.

In ascertaining development levels, indicators such as the Human Development Index (HDI), Poverty Rate, Life Expectancy including education are assessed. The HDI, is an index used to measure average achievement through 3 basic dimensions of human development, namely; a healthy and long life, a

standard of living that is decent as well as a measure of knowledge. The United Nations Development Programme, UNDP uses the three indicators, weighted equally to rank countries of the world. The index accounts for longevity, measured by life expectancy at birth. It also accounts for knowledge measured by the literacy levels of the adults and number of years children that are enrolled at school. The third indicator used is the living standard accounted for through the use of GDP per capita. These indicators are used by the UNDP to form the scales of development index that range from 0- which means no development to 1 which depicts complete development. Latest data from the UNDP shows that of 189 countries ranked in 2017 Nigeria was at the 157th position with a low HDI of 0.532. An index of 0 – 0.55 means low development, from 0.55 -0.69 means medium development, for example, Cameroon, Angola, Ghana and South Africa ranked 0.556, 0.581, 0.592 and 0.699 respectively. An index of 0.7 to 0.79 means high development, for example, China was 0.752. While an index above 0.8 means very high development as seen in Norway which was 0.953 in 2017.

2.1. Economic Growth

A country's economic growth represents the level of economic activity that takes place within such economy. It is represented by a key macro-economic indicator known as the Gross Domestic Product (GDP). In [9], a world development report by the World Bank posited that the environmental quality of developing countries like Nigeria are expected to improve as their income rises, however, new factors such as pollutants, cross-border environmental effects, trade in polluting activities and the growth of automobile traffic may change the usual pattern, causing an unlikely scenario for developing countries in replicating the environmental histories of developed countries. The author however established that there is a positive correlation between the levels of income and the quality of the environment. The study projected that during development of developing economies, environmental quality may decline but can be reversed in the long run. An examination of Nigeria's growth history with the nominal figures for GDP from 1990-2017, as against the price of crude oil (Figure 1), a major contributor to the country's income showed a remarkable semblance in periods of peak, trough and seasons in between, corroborating studies [10, 11, 12] that states Nigeria's economy is highly correlated with variations in the production and price of crude oil-a major natural resource responsible for several aspects of pollution.

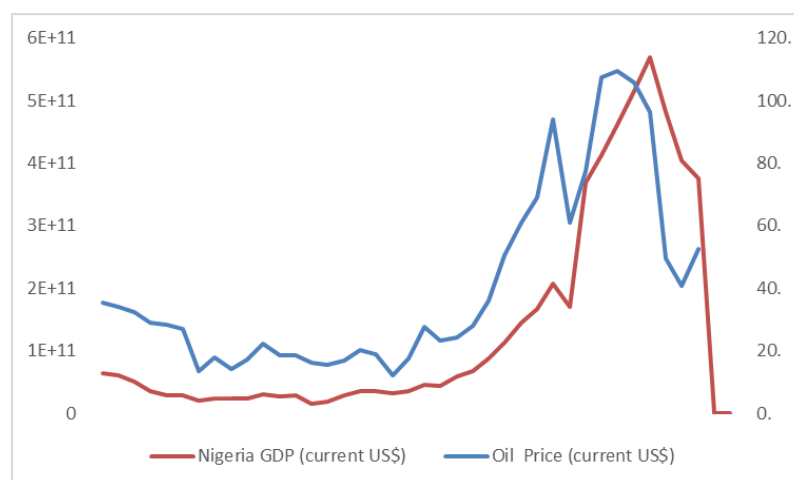


Figure 1. Combination of Nigeria's GDP and Oil Price from (1980-2017)

Source: Researcher's compilation from WDI and OPEC (2018) data.

2.2. Health Status

Being healthy is described by [13] as a moment of wholeness in the body, mind and the social state of man which includes the non-appearance of ailments. According to [14], there exist inadequacy in the quality of Nigeria's health care status, system and delivery. The study by [15] also observed that

prioritising the health status of residents in Nigeria is lax at all governance level. The reasons behind their observations are not farfetched as health indicators show that the odds have fallen out of favour with respect to the Nigerian scenario. For example the country is the 15th highest across countries of the world with high death rates per 1000 live persons [16], accounting for 12.5 deaths per 1000 live persons as against global average of 7.6 deaths per 1000 live persons. Similarly, Infant mortality rate of 64.6 per 1000 live births puts Nigeria as the 9th country globally with high infant mortality rate. This is in sharp contrast to the average 29.4 per 1000 live infants that die across the world before reaching one year of age.

The report in [17] pointed out that the leading cause of death globally is currently air pollution. According to [18], about seven million lives are lost every year to air pollution alone. A research done by the University of Chicago's Air Quality Life Index (AQLI) discovered that air pollution is cutting lives short by an average of two years, depending on where an individual resides. The AQLI study suggests that current population will loose about 12.8 billion years of life if current pollution levels continue. [19] however suggests that taking actions against the endemic air pollution will improve the environment and resultant health outcomes. But, while air pollution is established as the leading cause of death in the world, Nigeria's health status is influenced by other factors besides air pollution, such as income, availability of health facilities, educational status, expenditure on health etc.

2.3. Air Pollution

Air pollution indicators from the [18] highlights that over 90 percent (in Figure 2) of the countries of the world emit pollutions that are significantly above the World Health Organisation (WHO) recommended standards. Air pollution is a leading cause of cancer and respiratory diseases [17], it depletes the ozone layer atmosphere and contributes to global warming. The air can get polluted through various means and sources including natural and man-made. For instance, as seen by [20], air pollution does not just threaten the health status of citizens, it is a reminder that unsustainable economic development has brought environmental degradation. A consistent trait with sources of air pollution which include carbon monoxide, sulphur nitrate, nitrogen etc. is the existence of particulate matter. Unfortunately exposure to particle pollution is consistent with breathing, [21], noted coughing, breath shortness, tightening of the chest and eye irritation as short term effects following exposure to particle pollution.

When exposed for a long term, the body records reduced functions of the lungs, respiratory disease in children, aggravates existing lung diseases and causes premature death of people living with lung disease. Exposure to particle pollution is also known to affect the heart while groups of people that are mostly at risk from exposure to this form of pollution are Children, Elderly, people with existing heart or lung disease, as well as people who exercise or work outdoors. [22] in a mini review of the environmental status of the Nigerian economy establishes that problems such as social and environmental welfare losses have arisen as a result of regulatory failure buoyed by lack of data inefficiency in manpower capacity and ineffective framework for national enforcement. The authors noted the country's acknowledgement of its many environmental problems in a report of the vision 2020 which was set up as a guide to catapult Nigeria as one of the top 20 economies in the world by year 2020. The international health organisation body, WHO however establishes that air pollution does not recognize borders. A sustained and coordinated government action at all levels, is therefore needed to improve air quality, as countries need to come together in seeking out solutions for a more efficient transport system, renewable energy production and management of waste [23, 24].

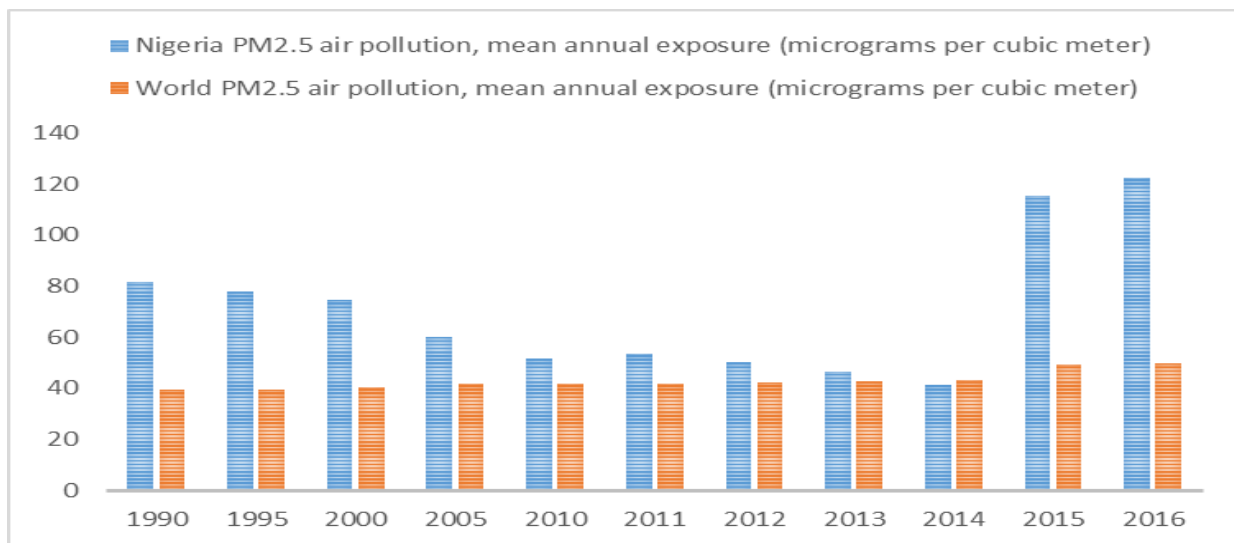


Figure 2. Level of Nigeria's emissions in comparison with world average (PM_{2.5}) (1990-2017)

Source: Researcher's compilation from [16] data.

3. Review of Related Literature

A research carried out in Chinese cities by [25] described air pollution as not just an environmental issue but as a health, and socio-economic issue. The study which focused on the environment, health and economic development, through an integrated analysis found that production efficiency in China were slightly higher than scores from health efficiency suggesting better efficiency in inputs and outputs that impact health outcomes. Another study by [26], labelled the positive rate of Nigeria's growth performance as a miracle. According to the study, the scenario obtained in the country in terms of sustainable development contradicts expected outcomes from proven theories. Nigeria's budgetary allocations over the years makes overlooking economic activities in Nigeria precarious, as it shows the economy is being powered 70 percent by proceeds from the sale of crude oil. Other sectors which constitute the rest of the economy's growth component likewise utilise by-products of this mineral resource to successfully carry out productive activities. The health effect of this situation is loss of productivity and death as well as higher health expenditure, lower savings, lower investments and eventually lower growth rates in the future [26]. Economic growth is seen to have a positive impact on health expenditure [27]. In modelling the interconnectedness between health expenditure, the growth in sub-Saharan economies and environmental pollution, the study applied an auto regressive distributed lag approach to discover the positive impact economic growth has on health expenditure. The study further noted that in the long run environmental pollution adversely impacted don health expenditure. To check the direction of causality, the authors employed the use of a VECM granger causality test and discovered a one-way relationship from health expenditure GDP per capita as against a two-way causality relationship found between environmental pollution and economic growth and also between health expenditure and environmental pollution.

[25] in finding out the economic cost of environmental degradation on health was addressed with the use of a damage function/dose response approach to estimate the mortality and morbidity effects. The study discovered that the country spends about 4.31 percent of its GDP during the year of study as economic cost of environmental degradation particularly- particulate air pollution (PM₁₀). The findings strengthens the assertion that a more serious consideration of the environment be taken by policy makers in the pursuit for economic progress. A study carried out by [28] on countries in the Middle East and in the North African region to determine the impacts of economic growth and environmental quality on health expenditure showed a co-integration panel exist among all three components. Also using the ARDL approach the authors found that income, CO₂ and PM₁₀ have positive effects on health

expenditure. The study also posits that spending on health holds a higher sensitivity to income in countries in the middle-east and in the North African region. Overall the selected literature infer that environmental exploitation for economic growth is being largely practiced across the globe, and has ensued consideration for efficient productivity, however, environmental degradation particularly air pollution differ in its effects on health status across economies of the world [27].

4. Methodology

4.1 Theoretical Framework

Using Figure 3 by [20] which showed the circular flow model of economic growth and air pollution. The circular flow model demonstrates the link between production and consumption activities of an economy. The two major market structures in the model which comprise the households and the firms are respectively represented as the consumers and the producers in a circular flow motion through which the supply of factors of production and demand for output describe the process of economic activities. These economic activities and the magnitude of the flow are however largely dependent on socio economic factors such as the population growth, technological advancement, labour productivity, capital accumulation and natural phenomena such as drought or flood. The model also succinctly illustrates the relationship between economic activities and the environment. An engagement in consumption and productive acts is known to dwell on the supply of natural resources earth has been blessed with. Both activities, however, generate by-products that can pollute the environment. This means that the essential decisions that comprise economic activities are directly connected to problems that besiege the environment.

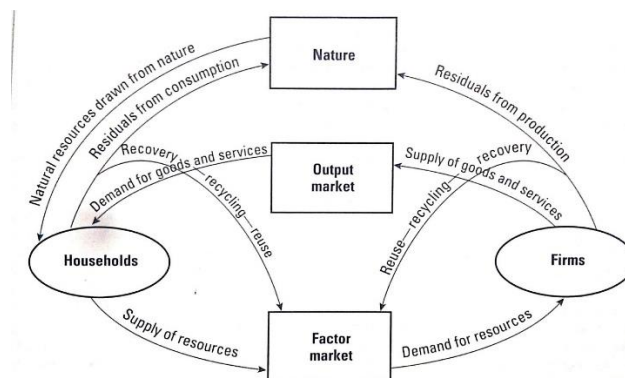


Figure 3. The Circular Flow Model of Economic Growth and Air Pollution
Source: Callan and Thomas (2013)

4.2. Conceptual framework and Model Specification

The framework to achieve the objectives of this study which aims to examine the correlation between economic output and the level of pollution and identify the implication of production on selected social and economic macro variables is actualised through the mediation model in Figure 4.

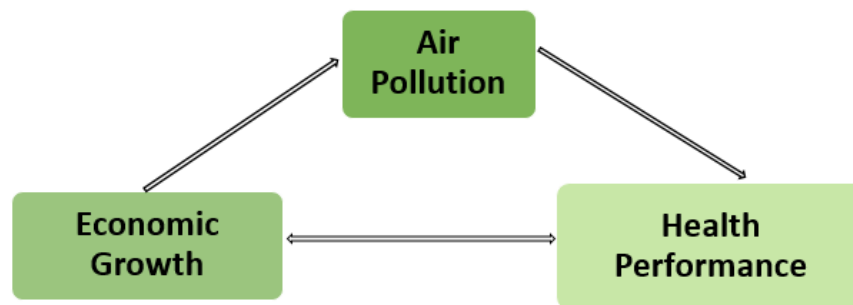


Figure 4. Conceptual model

The model examines the relationship between economic growth as it affects Nigeria's health performance between 1980 and 2017. Economic growth is captured with the use of Gross Domestic Product per capita (GDP). The model shows it has a direct relationship with health status and is captured with Life Expectancy at Birth (LEAB)

Air pollution variable Carbon dioxide (CO₂) serves as the mediating factor. In the model, LEAB is the dependent variable was used to capture Nigeria's health performance.

This statement is written in functional form as;

$$LEAB = F(GDPPC, CO_2E) \quad (1)$$

The econometric equation based on the above specified model can be thus written as;

$$LEAB = \alpha_0 + \alpha_1 GDPPC + \alpha_2 CO_2E + \mu \quad (2)$$

$$\text{and } M = \beta_0 + \beta_1 X_1 + e \quad (3)$$

Where; α_0 is the Intercept, α_1 , α_2 are the elasticity of the output of economic growth, and air pollution on health respectively, while μ represents the error term. The coefficient of the explanatory variables are expected to take the following signs: $\alpha_0 > 0$, $\alpha_1 > 0$, $\alpha_2 < 0$. This mean, increase in these explanatory variables should be positively linked with the rate of increased life expectancy at birth, safe for air pollution, ceteris paribus.

5. Results and Discussion

The results and analysis of data collated from the world development indicators of the World Bank are evaluated with a computational tool for path analysis-based moderation and mediation analysis referred to as process model. Besides presenting the data in charts and explained with simple percentages and mean scores, this study employed the use of process to evaluate the relationship observed with the variables under study. For the purpose of this study, this section dealt with the analysis based on the objectives of this study. The OLS regression model facilitated by Process was used to obtain the parameter estimates and verify the economic theory on the subject matter. In estimating the model formulated in Figure 4 the study used time series data from 1980 to 2017.

Table 1. Descriptive Analysis

	Minimum	Maximum	Mean	Std.	Skewness	Kurtosis			
	Statistic	Statistic	Statistic	Std. Error	Deviation	Statistic	Std. Error	Statistic	Std. Error
LEAB	45.331	53.428	47.685	.414	2.515924	1.105	.388	-.274	.759
CO2E	.325	.928	.610	.031	.184	-.075	.398	-1.223	.778
GEXHT H	.041	257.720	57.305	13.292	81.940	1.351	.383	.404	.750
GDP	15789003 752.759	56849893 7587.905	14062924 9185.231	27575330 315.636	16998575 2334.201	1.380	.383	.409	.750

Source: Computed by the Researchers via Process software in SPSS

Despite notable improvement in the Life Expectancy at Birth (LEAB) from 45 years in 1980 to 53 years in 2017, average expected livelihood of a Nigerian citizen is still pegged at a low of 47.6 years. Carbon dioxide emissions in the country have also been described to have hit an all-time high of .928 in the early 80's after which it trended southwards to 0.325 (the lowest in 1998) however most recent figures shows emissions are re-gathering momentum with 2017 figures pegged at 0.546. Government expenditure on health is seen to be at the peak in 2015 with N257.7 billion allocated for health expense, ironically this development came on the heels of an Ebola outbreak that shook the core of the country, after which funds for health began to dwindle. Table 2 shows the summary of the model with an R-squared value of 0.8079 and adjusted R² of 0.6528, expressing that the model has a goodness of fit on the estimation. The 0.8914 value of the adjusted R² reveal 80 percent systematic variations in the dependent variable (Life Expectancy at Birth) due to changes in the independent variables (CO₂ emissions and GDP per capita). This indicates that the mode's explanatory power is high. The F-statistic value of 48.87 is also rationally high. The combination of independent variables is also found to be suitable in explaining the variations in Nigeria's health status in the short term, to imply the explanatory variables have a joint effect on the dependent explained variable.

Table 2. Model Summary

R	R-sq	MSE	F	df1	df2	p
.8079	.6528	5.4174	48.8741	2.0000	52.0000	.0000

Table 3. Linear Regression Model Results

	coeff	se	t	p	LLCI	ULCI
constant	40.0472	.7584	52.8039	.0000	38.5254	41.5691
GDPPC	.0034	.0004	7.7843	.0000	.1022	.8225
CO2E	5.2155	1.2671	4.1162	.0001	2.6729	7.7581

Source: Calculated by the Researchers through Process software in SPSS

The explanatory variables in the model conformed to expected signs safe for CO₂ Emissions. The constant term which represents the regression line estimate, showed a positive intercept, implying that, other things being held constant, the explained variable, which is Life Expectancy at Birth, has a positive value of 40.05 units. The positive sign of the coefficient of GDP Per Capita shows the presence of a positive relationship between GDP per capita and Life Expectancy at Birth. This means, a unit increase

in GDP per capita will result in .0034 unit appreciation in life expectancy, with other factors remaining same i.e. the more income that is accrued to every one citizen of the country, the better or higher the expected length of life for such individuals. The results further show that the total effect of economic growth on the health status of Nigerians is 0.0038 units. Directly, economic growth affects health status by 0.0034 units, and indirectly via air pollution by 0.0004 units as shown in Table 4, 5 and 6 respectively.

Table 4. Total effect of GDPPC on LEAB

Effect	se	t	p	LLCI	ULCI
.0038	.0005	7.8816	.0000	.0028	.0048

Source: Computed by the Researchers via Process software in SPSS

Table 5. Direct effect of X on Y

Effect	se	t	p	LLCI	ULCI
.0034	.0004	7.7843	.0000	.0025	.0042

Source: Calculated by the Researchers through Process software in SPSS

Table 6. Indirect effect (s) of GDPPC on LEAB

C02E	Effect	BootSE	BootLLCI	BootULCI
	.0004	.0003	-.0001	.0012

Source: Calculated by the Researchers through Process software in SPSS

6. Conclusion

This paper assessed the relationships between economic growth and the health status of Nigerian citizens. It observed that productive activities in Nigeria contribute to overall wellbeing of citizens, but it leaves indirect and negative health implications. These negative effects can be curtailed through deeper awareness and a conscious effort to cut down of fossil fuel burning that causes environmental pollution. There is an urgent need to enable households, organisations and government carry out their due diligence in terms of environmental preservation. This can be aided with the availability of up to date and credible data on each pollutant and their levels of emissions at a given period across different states in the country. Environmental control will also be better achieved with the publication of environmental laws and emission limits by environmental regulatory agencies in the country. This will help in contributing significantly towards reducing the knowledge gap and improving the level of pollutant free environment. Placing the third Sustainable Development Goal; which is geared towards guaranteeing healthy lives and enhancing well-being for everyone at all ages, as well as Goal 11; which hinges on sustainable cities and communities, the study, was further motivated by the need to improve the boundaries of knowledge and inform policy makers towards promoting strategies and programmes that will help improve the health status of Nigerians, given the study's examination of economic activities hampering the required well-being of citizens as a result of crude means of production or consumption. The study recommends that: policies on proper productive and consumption method be adopted. Also, a wide coverage of education to endear sustainable production should be implemented. Additionally sustainable practices should be encouraged and incorporated amongst business owners as well as among leaders of private and state-owned institutions. Sustainability should also be adequately taught from the elementary stages of school learning. The government should invest in environmental awareness campaigns and schemes to encourage productive activities that can yield a sustainable livelihood.

Acknowledgement

The authors appreciate the financial contribution of Covenant University Centre for Research, Innovation and Discovery towards the Open access of this article.

References

- [1] World Health Organization, WHO 2000 *The World Health Report 2000 - Health Systems: Improving Performance*. Geneva: World Health Organization. <http://www.who.int/whr/2000/en/>.
- [2] World Bank 2014 Responding to Global Public Bads: Learning from Evaluation of the World Bank Experience with Avian Influenza, 2006–2013. Washington, DC: World Bank. Independent Evaluation Group (IEG) https://ieg.worldbankgroup.org/Data/reports/avian_flu1.pdf.
- [3] Dhanya J 2015 The Impact of Savings in Economic Growth: An empirical Study Based on Botswana *International Journal of Research in Business Studies and Management* **2** (9) 10 - 21
- [4] Nwankwo O C and Njogo B O 2013 The Effect of Electricity Supply on Industrial Production within the Nigerian Economy (1970 – 2010) *Journal of Energy Technologies and Policy* **3** (4) 34 - 42
- [5] World Bank. 2017. State of Electricity Access Report 2017. Accessed online from <http://documents.worldbank.org/curated/en/364571494517675149/full-report>.
- [6] Modor Intelligence 2017 *Nigeria Power Market - Trends, growth, Industry Analysis, Outlook to 2022* Accessed online from <https://www.mordorintelligence.com/industry-reports/nigeria-power-market>
- [7] World Health Organization (2016). *Ambient air pollution: A global assessment of exposure and burden of disease*. Geneva.
- [8] National Bureau of Statistics, NBS 2018 *Labour Force Statistics – Volume 1* Unemployment and Underemployment Report Q4 2017 – Q3 2018 National Bureau of Statistics
- [9] Beckerman W. World Development Report (1992). *Economic Development and the Environment Conflict or Complementarity?* Background paper for World Development Report 1992
- [10] Gbadebo, O 2008 Crude Oil and the Nigerian Economic Performance. *Oil and Gas Business*. Accessed online from <http://www.ogbus.ru/eng/>
- [11] Nwonu C 2017 Impact of Fallen Oil Prices on the Nigeria Economy *Journal of Poverty, Investment and Development* **33** 75-82
- [12] Umar M G Aliyu I B and Ahmad M 2017 Oil Price Fluctuations and Economic Growth in Nigeria (Evidence from Granger Causality Test). *Australasian Journal of Social Science* **3** 1 - 16
- [13] Lustig N 2004 *Investing in Health for Economic Development*. Report by the Mexican Commission on Macroeconomics and health
- [14] Olaniyan T 2012 The health status in Nigeria and the Nigerian health system *Medik 411 Special Reports* 1-10
- [15] Suleiman D E 2016 Mental health disorders in Nigeria: A highly neglected disease *Annals of Nigerian Medicine* **10** (2) 47 – 48
- [16] World Development Indicators, WDI 2018 Death rate, crude (per 1,000 people) World Bank Data Accessed online from <https://data.worldbank.org/indicator/sp.dyn.cdrt.in>
- [17] World Economic Forum WEF 2018 *The Global Risks Report 2018* 13th Ed. World Economic Forum Geneva.
- [18] World Bank 2018. *Operational Framework for Strengthening Human, Animal, and Environmental Public Health Systems at their Interface*. Accessed report from <http://documents.worldbank.org/curated/en/961101524657708673/pdf/122980-REVISED-PUBLIC-World-Bank-One-Health-Framework-2018.pdf>
- [19] Kearns J Dormido H and McDonald A 2018 China's War on Pollution Will Change the World *Bloomberg* Accessed online from <https://www.bloomberg.com/graphics/2018-china-pollution/>
- [20] Callan S J and Thomas J M 2013 *Environmental Economics and Management. Theory Policy and Applications* International Edition 6th Edition.
- [21] Salvador S and Salvador E 2012 *Overview of particle Air Pollution (PM2.5 and PM10)* Quality Communication Workshop.
- [22] Nabegu A Mustapha and Naibbi A 2017 Environmental Regulations in Nigeria: A Mini Review. *International Journal of Environmental Science and Natural Resources* **1** (5) 1 – 3
- [23] Afolabi A Ojelabi R Tunji-Olayeni P F Omuh, I and Afolabi A 2018 Quantitative analysis of socio-economic drivers of housing and urban development projects in megacities *International Journal of Civil Engineering and Technology* **9** (6) 1096-1106
- [24] Afolabi A O Tunji-Olayeni P F Ojelabi R A and Omuh I O 2018 Construction Waste Prevention as a Sustainable tool in Building Mega Cities: A Theoretical Framework. *2nd International Conference on*

Environmental and Energy Engineering (IC3E), IOP Conference Series: Earth and Environmental Science 1 -7

- [25] Zhang T Chiu Y Li Y and Lin T 2018 Air Pollutant and Health Efficiency Evaluation Based on a Dynamic Network Data Envelopment Analysis *International Journal of Environmental Research and Public Health* **15** 20 – 46
- [26] Urhie E Odebiyi J Rosemary P 2017 Economic Growth, Air Pollution Standards Enforcement and Employment Generation Nexus in the Nigerian Context *International Journal of Innovative Research and Development* **6**(5) 19 – 25
- [27] Yazdi S K and Khanalizadeh B 2017 Air Pollution, economic growth and health care expenditure. *Economic Research* **30** (1) 1181-1190
- [28] Saida Z and Kais S 2018 Environmental pollution Health expenditure and Economic growth and in the Sub-Saharan Africa countries: Panel ARDL approach *Sustainable Cities and Society* **41**