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Article *in* International Journal of Civil Engineering and Technology · January 2019

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International Journal of Civil Engineering and Technology (IJCIET)
Volume 10, Issue 01, January 2019, pp. 2401-2414, Article ID: IJCIET_10_01_216
Available online at http://www.iaeme.com/ijciet/issues.asp?JType=IJCIET&VType=10&IType=01
ISSN Print: 0976-6308 and ISSN Online: 0976-6316

MANUFACTURING INDUSTRIES AND CONSTRUCTION EMISSIONS IN NIGERIA: EXAMINING THE EFFECTS ON HEALTH CONDITIONS

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ABSTRACT

It has been observed that the manufacturing industries, the transport of building materials and the installation and construction of buildings consume large amounts of energy and produces large amount of carbon dioxide that have a negative impact on people's health. Thus, this study examines the effect of manufacturing industries and construction emissions on health conditions in Nigeria using time series data from 1985 to2017 employing the Auto-regressive Distribution Lag (ARDL) econometric approach of co-integration. The study found out that there is a negative relationship between carbon emissions and health conditions. Therefore, the study recommends that the government should formulate environmental policies that will help reduce the adverse effect of CO2 emissions; this should be directed towards the industrial sector, thereby reducing the hazards associated with gaseous emissions, when this is done the health condition of the people will be improved upon.

Keywords: Carbon emissions, health conditions, manufacturing industries.

Cite this Article: MATTHEW, Oluwatoyin, OSABOHIEN, Romanus., OLAWANDE, Tomike and URHIE, Ese, Manufacturing Industries and Construction Emissions in Nigeria: Examining the Effects on Health Conditions, *International Journal of Civil Engineering and Technology*, 10(1), 2019, pp. 2401-2414.

http://www.iaeme.com/IJCIET/issues.asp?JType=IJCIET&VType=10&IType=01

1. INTRODUCTION

Exposure to environmental pollutants in towns and cities is a serious global concern for the environment and health [1][2].In the works of [3][4][5][2][6] the relationship between health effects and air pollution leads to serious health effects ranging from respiratory to chronic diseases, which can lead to high mortality.Considering that poor hygiene and health care are linked to low-income populations exposed to atmospheric pollution because they live in confused environments, industrial areas and roads to gain access to workplaces, thereby exposing themselves to all kinds of environmental hazards and, in many cases,isdenied access to health care leading to death.In addition, industrialisation, development and economic activity globally have increased over the years as a result of man's quest for improved living standards, which are evident in the production and use of fossil fuels for motorisation. [7] In their study identified the petroleum chemical industry as the main pollution sources.

Pb, Cd, Ni, Mn and Cr have been largely linked to many of these diseases affecting people and their environment [8]. Generally, heavy metals cause systemic toxicity, affect behavior, disrupts the neurological system and the function of the mind. [9] have identified large amounts of heavy metals as a result of industrial pollution in the soil and water.

According to [10], two types of pollution sources are responsible for land and water degradation, including industrialisation, agricultural activities and motorisation, whereas both plants and animals are affected by each source and pose a serious risk to human health.Most heavy metals cannot be easily degraded and thus enter the body of water and soils, where they are organically accumulated in the food chain. Human beings are exposed to certain carcinogenic metals (As, Cd, Ni, Pb, Cr and Co) by ingestion of contaminated food [11]. These metals threaten the environment in general and human existence.

Studies have shown that soils and dust are contaminated during industrialization, production, agriculture, mining, waste disposal, industrial effluents and atmospheric disposal by heavy metal percolation and infiltration.In most cases, metals do not degrade chemically microbial and persist once introduced to the medium and seriously prevent the biodegradation or deconcentrating of any organic contaminants found in the immediate environment. They pose risks to people through the ecosystem or direct ingestion, inhalation or dermal contact. [12],[13],[14],[15],[16]. Construction emission sources are basically carbon monoxide (CO), carbon dioxide (CO_2), methane (CH4) and nitrous oxide (N_2O). Other emitters include water vapor and many compounds of halocarbon. Fossil fuel combustion accounts for more than 75 percent of human CO_2 emissions. Change in land use (mainly deforestation) is responsible for the rest. Over the past 25 years, human activities have more than doubled the emission rate of CH4 [17],[18],[19],[20].

To the best of the knowledge of the authors, studies on the effects of manufacturing industries and building emissions on the health conditions of the Nigerian population have not been carried out so this study contributes to literature by filling this gap. To this end, this study sets out to examine the effect of manufacturing industries and construction emissions on health conditions in Nigeria.Therefore, this study comprises five sections viz; section two, which presents some insights from empirical literature and theoretical framework, follows this introductory section. Section three presents the model specification and the method used in the study; section four discusses the empirical analysis of the study results and results; section five concludes the study by recommending policies which, despite the presence of manufacturing industries and construction emissions, will improve health conditions in Nigeria.

2. LITERATURE REVIEW AD THEORETICAL FRAMEWORK

Building has a very significant environmental impact and the construction industry is one of the biggest consumers of resources and raw materials. It was observed that building construction consumes 40% of the stone, sand and gravel, 25% of the wood and 16% of the world's water each year. The production and transport of building materials and the installation and construction of buildings consume large amounts of energy and emit large quantities of greenhouse gasses (GHGs).It was observed that buildings consume approximately 50% of the total energy demand throughout their life cycle, including construction, operation and demolition, and contribute nearly 50% of the CO_2 emissions released into the atmosphere [21].

The importance of health cannot be underestimated since it a very important aspect of an individual's wellbeing and a nation's economy, as it is often said that "a healthy nation is a wealthy nation". Since the individuals make a nation, giving the citizens of a country good healthcare service is a very important and necessary condition needed to achieve long-term sustainable economic development. Health can be defined as the fitness of a total physical condition, that is, the fitness of the body or mind, particularly in the absence of disease, injury or impairment.The issue of a good health condition is very important because it deals with not just humans but with the human body. Without a good health condition, it is almost impossible, if not totally impossible to carry out any meaningful economic activity, thus having good health is vital to the growth of any nation [22]. However, construction emissions have adverse effects on the health of the individuals that live in the country. When health is adversely affected, aggregate output in the country will reduced [23],[24].

People's activities as a result of the combustion of fossil fuels, cement manufacturing and land use for agricultural purposes are some causes of carbon dioxide emissions which are basically gaseous substances [25]. Globally, there has been a serious concern about the cumulative increased level of construction emissions which are been trapped into the atmosphere. [26]; [19] using the VAR approach opined that construction emissions have been on the increase since the industrial revolution. One of the dangers posed by these gas emissions is that it results to climatic change, and this affects the environment negatively as well as hinders both human and economic activities adversely. [27] and[28] opined that increased emissions in construction sites threaten an economy because they can bring about a massive decline in human productivity because of the adverse effect on the health status of the people.

According to the reports of [29] and [30], these gaseous pollutants have reached a worrisome level. Exhaustion from all combustion engines which contain these pollutants has adverse effects on the health status of the populace which in turn also affects their productivity adversely. Taking it to the larger environment, the combustion of engines contributes to the accumulation of carbon dioxide in the atmosphere and contributes to climate change [31]. Air pollutant emissions such as carbon dioxide and methane which are construction gases play notable role in global warming, as they shut in heat without returning them as infrared or thermal radiation thereby contributing to the emerging global hazard [32],[33],[34]. According to recent estimation by [35], the effects of methane, a chemically reactive gas is substantially larger than ever estimated. In case of Sulphur dioxide, both terrestrial and aquatic ecosystem are adversely affected by acid rain that it produces [36].

The adverse effects of construction emissions on humans are quite all-encompassing [36]. Specifically, the pollutants have known adverse effect on human health especially children, who are the most susceptible age group due to their peculiarities. Ozone, sulphur dioxide, nitrogen dioxide gaseous substances can cause an increase in respiratory tract illness, asthma

attacks and a reduction in the functioning of the lung. In some communities, breathing and circulation hospitalizations, cardiac death and even cancer of the lung are attributed to unpleasant repercussions of air pollutions [34]. If the nitrogen dioxide (NO_2) concentration is high, it can cause serious lung damage that leads to shortness of breath and chest pain. Methane as an asphyxiant is known to displace oxygen, and when the displacement is 18%, asphyxia can result in exposed persons. In the case of H_2S, short-term contact with a high level of concentration may cause respiratory tract ailments. The aftermath effect after a long while may result to undue tiredness, appetite lost, pain, and tetchiness, loss of memory, faintness and women miscarriages [34]. Too much contact with high level of concentration (say about 10 - 50ppb) of SO_2 causes respiratory tract ailments [36].

In the study by [37] on differentiation of emissions of four construction gas emissions (carbon dioxide, methane, nitrogen oxides and nitrous oxides) in European Union member states using cluster analysis-agglomerative algorithm. The study distinguished each homogenous country by their total emissions level and per capita emissions level and found that in European countries such as Germany, UK, France, Turkey, Poland, Italy and Spain are the largest emitters of construction gasesas a result of high level of industrialization while Denmark and Ireland are top negative per capita emitters. According to [18], they used cool farm tools, which incorporated several empirical models from farm activities into one tool for estimating gas emissions from manufacturing ventures. Their study in India related and analyzed greenhouse gas emissions of major food commodities and livestock production. Their results showed that livestock and rice production were the main causes of gas emissions from manufacturing ventures. They concluded that increased consumption in animal foods particularly milk and egg in India leads to a greater production of gases from industries. Thus, the study recommended a reduction in the livestock production (in order to reduce gas emissions) which may however be detrimental to the health of the people.

2.1. Theoretical Framework

It has been established that since the 1900s, the activities of the human beings cause construction emissions which is at a dangerous state, and this has adversely affected the health of the individuals in the society [38]. As a consequence of this increase in emission rates, atmospheric gas concentrations have increased by 30% since pre-industrialtimes [38]. Examples of such anthropogenic activities include: construction, trade, agriculture, deforestation (or forestry), consumption of fossil energy or fuel and other economic growth activities.However, the theoretical basis for this study is based on the structural models of Ramsey–Cass–Koopmans' infinitely-lived climate-economy interactions [39],[40],[41],[42]. They believed that the increase in fossil fuel consumption was largely due to an increase in economic growth.

In addition, [39] opined that the Environmental Kuznets Curve (EKC) is involved in describing the two-fold relationship existing between economic actions and pollutants of construction gas emissions that are emitted by construction companieson one hand; and among the level of economic activity and the use of natural resources on the other hand. The Environmental Kuznets Curve (EKC) theory has it that dilapidation of the environment primarily hiked when a nation’s income per capital is minimal over a period. Thus, as the economy experience growth, invariably, the dilapidation of the environment reduces. This reduction leads to an upturned ‘U-shaped’ relationship between per capital income; natural resources use and emissions waste [39].

Sharma reiterated that energy such as crude oil, gas and coal, are highly essential as they are needful in the satisfaction of both residential and industrial energy needs, useful in the

transportation of human beings / goods and electricity generation. The combustion of fossil fuel is essential in all nations as it is required in producing goods and services. It is also a known fact that the combustion of fossil fuel releases a lot of carbon dioxide which contaminates the environment, which in turn has an adverse effect on the health of the individuals living in such an environment. Despite the fact that Sharma observed that a higher economic growth (as proxied by the Gross Domestic Product) has an impact on the emissions of CO_2 at least in the short-run, the health of individuals is still adversely affected [39].

3. METHODOLOGY

The Auto-regressive Distribution Lag (ARDL) econometric technique is engaged in this study to achieve its objectives.The insight of the ARDL technique was drawn from the studies of [43, 23]. In their study, [23] examined the effect of greenhouse gas emissions on health outcomes in Nigeria engaging data-set from 1985 to 2016. Engaging an ARDL co-integration approach, the results from [23] with respect to co-integration method revealed that there exist a long-run relationship between greenhouse gas emissions and health outcomes. Akin to [23] and [43], this study engaged the ARDL to analyze the long run effect of manufacturing industries and construction emissions on the aggregate health condition in Nigeria.

3.1. Model Specification and Method of Estimation

In order to examine the effects of manufacturing industries and construction emissions on health conditions in Nigeria, the Auto-regressive Distributed Lag (ARDL) approachto co-integration is undertaken. The ARDL co-integration approach gained popularity from the works of [44,45,46,47], which have advantages over the traditional approach to co-integration. The main advantage of the ARDL co-integration approach is that it is applicable despite the stationary nature of the variables; that is, whether variables achieve stationarity at levels [I(0)] or at first difference [I(1)] and variables should not be differenced to order two [1(2)] [47]. The error correction mechanism (ECM) assimilates the dynamics of the short-run and the long-run equilibrium. It was discovered from literature that the use of ARDL model averts the issues that may result from non-stationary time series data. The implicit and explicit forms of the model are shown in equations (1) and (2):

$$\text{Hoc} = f(\text{Manq}, \text{Mr}, \text{Phexp}, CO_2) \quad (1)$$

$$Hoc = \beta_0 + \beta_1 Manq + \beta_2 Mr + \beta_3 Phexp + \beta_4 CO_2 + \varepsilon_t \quad (2)$$

where: Hoc means health condition proxied by life expectancy in years, CO_2 means carbon emissions from manufacturing industries and construction(% of total fuel combustion), Mr represents mortality rate, phexp represents public health expenditure and Manq represents manufacturing output (see Table 3.1). β_0 is the constant term, β_1, β_2, β_3 and β_4 are the parameters of the explanatory variables, while ε is the error term.

$$\Delta Hoc_t = \beta_0 + \sum_{t=1}^{n} \beta_1 \Delta Manq_{t-1} + \sum_{t=0}^{n} \beta_2 \Delta Mr_{t-1} + \sum_{t=0}^{n} \beta_3 \Delta\, Phexp_{t-1} + \sum_{t=0}^{n} \beta_4 \Delta CO2_{t-1} + \gamma ECM_{t-1} + \varepsilon_t \quad (3)$$

where: Δ means the change in operator and the ECM_{t-1} denotes error correction term. γ demotes the speed of adjustment from the short-run to the long-run. Given the above,the Auto-regressive Disttribution Lag (ARDL) model is represented in equation (4) as:

$$\Delta Hoc_t = \beta_0 + \sum_{t=1}^{n} \beta_1 \Delta Manq_{t-1} + \sum_{t=0}^{n} \beta_2 \Delta Mr_{t-1} + \sum_{t=0}^{n} \beta_3 \Delta\, Phexp_{t-1} + \sum_{t=0}^{n} \beta_4 \Delta CO2_{t-1} + \varepsilon_{t-1} \quad (4)$$

Thus, it is expected that $\beta_1, \beta_3 > 0, and\ \beta_2, \beta_4 < 0$,*ceteris paribus*, the '*apriori* expectaion is that an increase in the exogenous variables except mortality rate and carbon emissionspositively affect health status thereby increasing life expectancy.

Table 3.1 Variables, Data Sources and Measurement

Variable Name	Identifier	Source of Data	Definition and Measurement
Health Condition	Hoc	WDI, 2018	Health condition measured by life expectancy at birth, total (years)
CO_2Emissions	CO2	WDI, 2018	Carbon emissions from manufacturing industries and construction. It is measured by kt of CO_2 equivalent, which is made up of emissions of carbon dioxide resulting from consumption of liquid fuel (kt); (% of total fuel combustion).
Mortality Rate	Mr	WDI, 2018	Death rate, crude (per 1,000 people)
Public Health Expenditure	Phexp	WDI, 2018	Health expenditure, public (% of government expenditure)
Manufacturing Output	Manq	WDI, 2018	The output of the manufacturing sector. It is measured as a percentage of total output.

Source: Authors' Compilation using World Bank WDI Data Set, 2019. *Note: WDI means World Development Indicators.*

This sub-section of the study presents variable summary statistics as shown in Table 3.2. The results showed the summary statistics of the selected variables that were engaged in this study, the variables are: ***hoc*** *(health condition represented by total life expectancy in years), manq (manufacturing output),* ***mr*** *(mortaility rate),* ***phexp*** *(public health expectancy) and* co_2 *(carbon emissions)[see Table 3.2*].The mean, standard deviation, minimum and maximum are as presented, to bring out the real information (in terms of ascertaining the trend of the respective variables) needed for the study [43].

4. RESULTS

Table 3.2 Summary Statistics of Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
Hoc	47.2562	2.2621	47.109	51.3544
Manq	232421.7	84262.3	133872.1	354291.3
Mr	16.3532	2.0008	13.2363	19.3453
Phexp	6.2562	1.5356	3.5262	10.1133
CO_2	6.6232	0.4626	5.7382	6.72604

Source: Authors' Computation using STATA 13, 2019.

The ARDL is a method of co-integration that involves three different phases. The first phase is the formulation and testing of the hypothesis that co-integration does not exist. Concisely, the null hypothesis is stated such that jointly, the coefficients of lagged exogenous variables in the fundamental ARDL error correction mechanism are assumed to be zero. ARDL co-integration has three major advantages over the traditional approach to co-integration; first is that all the variables under study need not to be stationary at the same order, and secondly the ARDL model is applicable when the underlying variable are integrated of order 1 [I(0)],or order 0 [I (0)], as shown in Table 3.3, and three, the ARDL obtains more efficient estimate of the long-run model [43],[48],[49],[47],[44]. Two different groups of values for the variables are shown in Table 3.3. Firstly, the underlying assumption is that variables attain stationarity at first difference [I (1)], while the second assumption is that variables attain stationarity at level [I (1)] as shown in Table 3.3. Annual data (time-series) data form 1985-2017 sourced from WDI (World Development Indicators of World Bank) is engaged to achieve the objective of this study as presented in Table 3.3 which presents the test of stationarity (both at levels and at first difference respectively) that was conducted with the Augmented Dickey Fuller (ADF) unit root test for stationarity.It is observed from literature that in most cases, time series variables possess a unit root while other variables may not have a unit root. Variables are said to have unit root when they are not stationary at levels [50],[51]. This is presented in Table 3.3 which revealed that some of the variables (manufacturing output, mortality rate and public health expenditure) are not stationary at levels. This means that they possess a unit root, this was discovered after conducting the test of stationarity (unit root test) at levels and this is the rationale for differencing to make them stationary as shown in Table 3.3. The rule of thumb for stationarity is that the absolute value of the ADF trace statistic should be greater than the corresponding absolute critical value for variables to be considered as stationary as presented in Table 3.3.

Table 3.3 Unit Root Test at Levels

Variables	**DF t-statistic**	**Critical Value5 %**	**IntegrationOrder**	**Remarks**
Hoc	-3.7536	-3.4325	I(0)	Stationary
Manq	-6.6382	-3.7022	I(1)	Stationary
Mr	-4.5424	-3.6324	I(1)	Stationary
Phexp	-4.8324	-3.4192	I(1)	Stationary
CO_2	-3.6063	3.1738	I(0)	Stationary

Source: Authors' Computation using STATA 13, 2019.

Before conducting the ARDL co-integration, the unit root test for the stationarity was carried out on all the exogenous variables in the model to examine the integrating order of the selected variables. This is considered to be a necessary condition in validating the assumption that none of the variables should not be differenced twice or second-order stationary (that is, I [2]), this is to prevent 'spurious or nonsensical' output. Therefore, engaging a unit root test in the ARDL approach to co-integration is to ensure that none of the variables is integrated of

order 2 (See Table 3.3). Following the results in Table 3.3, the next step is to present the results of the ARDL (short and long-run dynamics) as shown in Table 3.4. The upper part of Table 3.4, (ADJhoc) shows the co-integrating equation. The results show that there is a long-term relationship between the specified variables requiring the error correction mechanism to be specified.

Table 3.4 Estimates from ARDL (Short Run and Long Run Dynamics)

D.lexp	Coefficient	Standard Error.	P-value
ADJhoc			
L1	-0.0256	0.2256	0.000***
Long Run			
Manq	0.003158	0.000412	0.029**
Mr	-0.238544	0.263066	0.000***
Phexp	0.171826	2.323869	0.0046***
CO_2	0-.002350	1.081979	0.047**
Short Run			
Hoc			
LD	3.448545	1.290183	0.242
L2D	-3.037226	2.843422	0.483
L3D	1.139522	1.843893	0.653
Manq			
D1	8.17e-06	1.17e-06	0.022**
LD	5.86e-06	8.04e-06	0.624
L2D	3.72e-07	4.22e-07	0.498
L3D	3.84e-07	4.76e-07	0.568
Mr			
D1	-1.445421	0.16262	0.000***
LD	0.312562	0.42342	0.000***
L2D	0.463271	0.34262	0.000***
L3D	-0.342536	0.37191	0.000***
CO_2			
D1	-0.90221	0.402848	0.034**
LD	0.287981	0.413842	0.005***
L2D	0.126262	0.414286	0.000***
L3D	-0.42293	0.402527	0.004***
Phexp			
D1	-0.002827	0.016792	0.032*
LD	-0.000423	0.103523	0.965
L2D	-0.000483	0.004252	0.921
L3D	-0.000415	0.001365	0.765
_cons	1.463633	10.45675	0.928

Source: Authors' Computation using STATA 13, 2019. **Note**: while *, **, ***shows that the variables are significant at 10%, 5% and 1% respectively, while LD shows the lag dynamics.

Table 3.5 showed the ECM results of the variables. The error correction mechanism (term) coefficient is seen to be significant statistically and negative at 1% level. The result confirmed that there is the presence of a long-run equilibrium relationship among the time series (manufacturing output, mortality, public health expenditure and carbon emissions) in the health condition equation. From the results in Table 3.5, the coefficient of the error correction term (-0.3846) shows the rate of adjustment and is also consistent with the hypothesis of convergence towards the long-run equilibrium once the health condition equation is disturbed through carbon emissions, burning of fossil fuel and other harmful pollutants.

The rate of adjustment of health condition to previous equilibrium position once there is exogenous shock is about 38.46 percent. This is due to the fact that the ARDL result obtained indicates that in the long run carbon emissions pose a danger of reducing total life expectancy by 0.002350per cent, if not corrected; it means that the mortality rate will be increased by 138.545 percent in the long run. The best correction strategy recommended in this study is public health expenditure which has the capacity of improving health condition by approximately 17.18percent. Specifically, the ECM coefficient implies that about 38.46percent of any health condition is corrected in the next period as presented in Table 3.5.

Table 3.5 Estimates from Vector Error-Correction Model

Regressand Regressors	***D_hoc***	***D_manq***	***D_mr***	***D_ phexp***	***D_CO2***
EC term	-0.3846***	-12386	1.2521***	51.2679*	-0.2286***
	(0.000)	(0.122)	(0.000)	(0.101)	(0.000)
hoc(LD)	-1.76695***	-38655	1.92757***	3.63785	0.36756***
	(0.000)	(0.168)	(0.000)	(0.846)	(0.001)
manq(LD)	-1.24e-06**	-0.3268	8.52e-07**	-2.32e-06	-2.89e-07
	(0.018)	(0.346)	(0.015)	(0.738)	(0.009) ***
mr (LD)	4.13578***	-537557	3.646677***	-21.85673	0 .6533***
	(0.000)	(0.218)	(0.000)	(0.917)	(0.001)
phexp (LD)	-0.00428***	6272.091	0.00365***	-.15379	-.00086***
	(0.000)	(0.341)	(0.000)	(0.587)	(0.000)
CO_2 (LD)	-0.0280	2588754	-.224556	-17.626**	1.05678***
	(0.971)	(0.162)	(0.218)	(0.026)	(0.000)
Adj. R-sq	*0.9203*	*0.70455*	*0.8938*	*0.3804*	*0.9186*
AIC	*51.58483*				
HQIC	*53.53373*				
SBIC	*54.36738*				

Source: Author's Computation using STATA 13, 2019. **Note**: *, **, *** means significant at 10, 5 and 1%, respectively. LD signifies that they were lagged and differenced. The probability values are in parenthesis.

4.1. Discussion of Results

As revealed in the ARDL estimation results, it can be deduced that activities of humans cause harmful effect to health, as gaseous emissions from construction works will affect the amount

of energy stored in the atmosphere which will in turn affect human beings adversely [21],[23] This is similar to the finding of Behera and Dash (2017) who noted in their study that human increasing atmospheric greenhouse gasses, mainly by burning fossil fuels, giving the example of CO_2 , known to be the major source of emissions. When the amount of CO_2 is increased, it means that more heat is trapped in the atmosphere; this leads harmful effect on human health. This is validated in this study as it was found that a 1% increase in carbon emissions reduces life expectancy (health condition) by 0.002350 percent, if this happens, invariably, mortality will be at138.5 percent. The finding of this study agrees with the findings of [21],[23] which highlighted different negative effects of carbon emissions on health condition, these negative effect ranges from amongst others high mortality rates. In the same vein, [52], estimated that approximately 150,000 people dies in developing nations per annum as a result of the negative impact of climate change resulting from gaseous emissions.

In addition, this study agrees with the study of [11], which also used the ARDL technique to analyze the impact characteristics of particles on cutting surfaces during the abrasive water jet processing in Malaysia. They concluded that manufacturing of items affect the health condition of workers. They found a positive relationship between the productivity of workers and their health conditions. The finding of this study supports this assertion of a positive relationship between manufacturing output and health conditions of the people.In addition, this study also supports the finding from [23] and [53] that found a negative relationship between mortality rate and health outcomes. The ARDL results in this study revealed that a long run negative correlation exists between health condition and mortality rate, a 1 percent increase in mortality rate(total death rate- infant and adult) reduces life expectancy approximately by 23.85 percent.

Finally, [54] examined the relationship that exists among environmental quality and government expenditure on health. Their studies revealed cross-sectional data from 49 countries, including Canada that countries with higher pollution have higher per capita health spending and countries with higher environmental budgets have significantly higher health spending. This finding is similar to [55], [56], [57], who for 10 years (1980 to 1989) have investigated the co-integration of government health expenditure and carbon emissions as environmental quality indicators in selected OECD countries. In both short-term and long-term dynamics, their study concluded that, as confirmed in this study. There is a long-term relationship between health spending and conditions variables. Our results demonstrated a long-term positive relationship between government health and Nigerian health expenditure.

4.2. Conclusion and Recommendations

This study had examined the relationship between manufacturing industries, construction emissions and health conditions in Nigeria. In conclusion, the study observed that carbon emissions arising from manufacturing and construction affect the health status of the people. This study posits that reduction in the emissions of carbon dioxide should be seen as a thing of importance in improving the health condition in Nigeria. This reduction can be done through the reduction of deforestation and conservation of land, controlling of wildfire, adopting better methods of combusting residues of metals and effective use of energy by forest dwellers amongst other measures. This will in turn help to reduce the rate at which people fall sick as a result of respiratory diseases.

The study, therefore, recommends the following; first, environmental policies should be formulated towards the mitigation of the adverse effect of CO_2 emissions, this should be directed towards the industrial sector (to bring about economic growth) rather than the environment that will constitute hazards to human health. Second, the government should

increase public health expenditure so that the health of the individuals in the society will be adequately taken care of and the mortality rate will reduce. This will ensure that the citizens would get good medical treatments in the hospitals when such need arises. This will in turn improve the health conditions of the populace. Lastly, in order to increase life expectancy, there should be a reduction in the mortality rate by improving on the healthcare given to women and children.

ACKNOWLEDGEMENTS

The Authors are grateful to the Covenant University Centre for Innovation and Discovery (CUCRID) and the Management of the University for the financial assistance given towards the publication of this paper.

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