



Environmental Impact of Covid-19 Pandemic in Owerri Metropolis, Imo State of Nigeria

Amadi, C. V.^{1,2} and Njoku-Tony, R. F.²

1. Department of Environmental Engineering and Protection, Poznan University of Life Sciences Poland
2. Department of Environmental Management, Federal University of Technology Owerri Nigeria

Abstract:

This study investigated the environmental impact of COVID-19 in Owerri metropolis of Imo State. The study used a city-based descriptive survey design for the assessment of the environmental impacts of COVID-19 pandemic in Owerri metropolis. Structured questionnaire was used to collect data and analysis was conducted with the help of multivariate analyses of variance (MANOVA). Survey showed that 54.0% of the respondents were males while 46.0% were females of an average age of 35.5 years. Greater percent of the respondents are traders (20.5%) and attained tertiary level of education (33.7%). Survey on research questions revealed that majority (43.4%) of the respondents agreed that there existed environmental impact of COVID-19 pandemic in Owerri metropolis; greater number (51.2%) strongly agreed that COVID-19 pandemic had a significant impact on public transportation; greater percent (28.3%) agreed that COVID-19 pandemic had a significant impact on the use of public water; majority (38.2%) agreed that there was a significant effect of COVID-19 pandemic on the use of public spaces; greater percent (31.2%) agreed that COVID-19 pandemic had a significant influence on environmental sanitation; and higher percent (42.4%) of the respondents agreed that COVID-19 pandemic had a significant impact on public health. Result from the analysis showed that COVID-19 pandemic significantly contributed greater percent of the environmental variations in Owerri metropolis of Imo State. The study recommended that sustainable effort should be geared towards prevention and control of COVID-19 epidemic in Owerri municipal and the State at large.

Keywords: Environmental Impact, COVID-19, Owerri Metropolis, Imo State, Nigeria.

INTRODUCTION

History has it that the Coronavirus disease known as COVID-19 outbreak emanated as an epidemic in the city of Wuhan, China in December 2019 and over a short time became a pandemic which is currently affecting the entire world without exception (Etukudoh *et al.*, 2020). The developed world (USA, Italy, France) is most hit by the pandemic in terms of number of infections and casualties as well as the developing economy such as Brazil and India. At a point, the COVID-19 brought the world to her knees and is still causing great havoc in virtually all the sectors of the economy and on the environment (WHO, 2020a; Nassiri, 2020). Symptoms exhibited by COVID-19 disease range from cough, respiratory symptoms, shortness of breath, and breathing difficulties (Uyo *et al.*, 2021). Fatal outcomes can include lower respiratory tract illnesses, such as pneumonia and bronchitis, or acute respiratory distress syndrome (ARDs) (Uyo *et al.*, 2021). Despite the high death rates in the developed world, the African people and the economy are worst affected. Nigeria is one of the countries in Africa that is presently witnessing tremendously upsurge of COVID-19 cases since 27th February, 2020 when the index case was recorded in Lagos (African Women Unite against Destructive Resources Extraction, 2020; UN Inter Agency Network

on Youth Development, 2020). National Centre for Disease Control (NCDC) reported the cases as at 1st September, 2020 to be: Sample Tested 405,916; Confirmed Cases 54,247; Active Cases 11,214; Discharged Cases 42,010; Death 1,023 (NCDC, 2020).

The corona virus pandemic has influenced significant global crisis and the greatest effects are being experienced by the poor, local habitants, the public and civil servants especially in the private sectors all over the world. On African countries such as Nigeria, the COVID-19 pandemic is affecting many economic sectors, social environmental crises such as the unemployment, closure of markets and factories, hunger, increase in poverty levels, social violence such as increase rate of rape cases, civil unrest, climate change, environmental degradation, increase in generation of waste and land grabs among others (African Women Unite against Destructive Resources Extraction, 2020). These in most cases emanated as a result of lockdown imposed to curtail the spread of the virus. Furthermore, scientists, analysts and academics are linking COVID-19 to intrusion into extract of high demand resource as possible from a forested area and ecosystems as large companies pursue gain through large farming, cutting down of trees for timber and mining. These acts no doubt conducted for profit reasons and endanger the nature through the exploitation which lies at the heart of the pandemic of the COVID-19 (WHO, 2020b).

The outbreak in Nigeria has so far spread to all the States and the Federal Capital Territory, Abuja. Record shows that Lagos has the highest cases of the Covid-19 and Owerri a city in Imo State in the Southeast was among cities of confirmed cases as at September, 2020. Furthermore, it is estimated that 29% of the country's disease burden is linked to risk factors in the environment being the home of man. The environment is the sum total of all surroundings of living organisms; the aggregate of social, cultural, physical, chemical and biotic factors that influence the life of organisms, individuals and communities. It is very pertinent to note that the environment is very patient and absorbs both natural and anthropogenic activities but never forgives and gives back severely to the offender. Arguably, man through various anthropogenic activities has done more harm than good to the environment. These activities of man have resulted to numerous environmental problems that are bedeviling the world especially the developing economy. While the developed world has imbedded the concept of environmental sustainability, same cannot be said of the underdeveloped world such as Nigeria (Mshelia et al., 2020).

MATERIALS AND METHODS

Study Area

The study was conducted in the Owerri metropolitan area of Imo State, Southeast Nigeria. The Owerri metropolitan area is approximately 120 km² in area, covering four Local Government Areas, namely; Owerri Municipal, Owerri West, Owerri North and Mbaitoli with a projected population of about 882,500 for the four LGAs in 2016 (National Bureau of Statistics, 2016). Owerri city sits at the intersection of roads from Port Harcourt, Onitsha, Aba, Orlu, Okigwe and Umuahia (City Population, 2017). The area lies between geographical coordinates of latitudes 5°26' North to 5°53' North and longitudes 6°97' East to 7°03' East.

Owerri has a tropical climate with a mean temperature range between 24°C to 34°C and a relative humidity of 70% in dry months and 90% in wet months (Emeribeole, 2015). An annual mean rainfall of about 2000 mm to 2500 mm is experienced in the study area (Okonkwo & Mbajiorgu, 2010). Owerri has two distinctive seasons, the dry and rainy seasons. The rainy season ranges from April to November with its peak in July and September, and a short break in August. The dry season ranges from December to February with the influence of Harmattan felt between the

months of December and January (Nwachukwu *et al.*, 2018). Vegetation in the area ranges from light rainforest to Savannah with high trees particularly oil bean and palm trees around stream banks and swamps (Nwachukwu *et al.*, 2018). In terms of relief, Imo state is characterized by high, medium and low areas and Owerri urban falls within the low areas (Nwachukwu *et al.*, 2018). The general topography of Owerri is fairly flat (Ezemonye & Emeribe, 2012). Owerri Urban is characterized by influx of people and high density of vehicular flows in and out of the city (Omenikolo *et al.*, 2017). According to google a map, Owerri urban is made up of 30 markets comprising 17 open markets and 13 shopping centers/supermarkets.

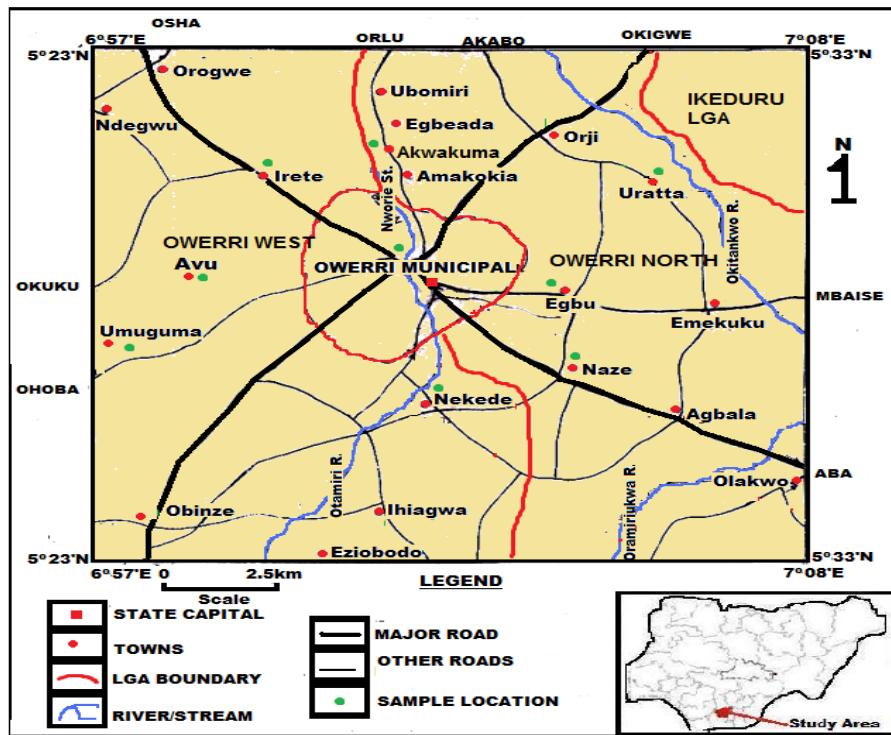


Fig. 1: Study Area

Study Design

This study uses a city-based descriptive survey design for the assessment of the environmental impacts of COVID-19 pandemic in Owerri metropolis. This design was used to describe what the inhabitants know about COVID-19 pandemic and its impacts on environmental factors in Owerri metropolis.

Population of the Study

The population for the study included both male and female residing within Owerri metropolis of Imo State who are 15 years and above, which is projected to stand at about 882,500 persons in 2016 (National Bureau of Statistics, 2016).

Sampling and Sampling Technique

Sample Frame:

In the first stage, the study purposively selected four (4) local government areas (L.G.A.s) that make up the Owerri metropolis. In the second stage, one hundred (100) participants were randomly selected from Owerri municipal, while fifty (50) participants each were randomly selected from the three other local government areas to give a total of 250 participants for the study (Table 3.1).

Table 1: Sample Frame

State	City	L.G.A.	Sample size
Imo	Owerri metropolis	Owerri Municipal	100
		Owerri West	50
		Owerri North	50
		Mbaitoli	50
Total			250

Sampling Procedure

The sample method adopted in this study was the stratified random sampling method. Stratified sampling was used as the population has a sample frame and questionnaire distributed in proportion to the population size. This method enables every element of the population to have equal chance of being selected and ensure greater degree of representation. The population of study was picked from 250 selected persons/inhabitants from the different local government areas in Owerri metropolis, Imo state.

Instrument for Data Collection

In this study, instruments used include questionnaire and interview. Questionnaire is the main research instrument used for the study to gather necessary data from the sample respondents. The questionnaire is structured in such a way that it provides answers to the research questions. Following a cover letter of introduction, this instrument is divided into two parts. Part one dealt with the socio-economic characteristics of the respondents, whereas part two was divided into sections according to study objectives. Sections A to F were concerned with questions about environmental impacts of COVID-19 pandemic. Options or alternatives were provided for respondents to pick or tick one of the options to the best of their knowledge.

Reliability of Instrument

The questionnaire was pilot-tested and distributed to a small group of respondents (20 respondents) similar to those in the study population within Owerri metropolis. The result of the pilot study was to make appropriate corrections/adjustments for content and clarity.

Method of Data Collection

The number of questionnaires distributed was 250, but 205 were retrieved. The data was collected from inhabitants of Owerri metropolis; after thorough explanation of the research, the objectives of the study was disclosed to them and questionnaires were given to them. Face to face administration of the questionnaires was performed in order to get full co-operation of the participants in the survey. On that note, the questionnaires were administered at random to the respondents in their different locations. They were encouraged to ask questions on what they do not understand in the questionnaires for explanation to aid their understanding.

Method of Data Analysis

The methods of data analysis used for the study are multiple regression analysis and in order to avoid error, Statistical Package for the Social Science (SPSS) was used. After data collection, both qualitative and quantitative data were coded and entered in Statistical Package for Social Sciences (SPSS) version 22. Descriptive statistics were analyzed for the purpose of determining the different views of the respondents regarding environmental impact of COVID-19 pandemic in Owerri metropolis. To establish the strength and direction of the relationship, multivariate analysis of variance (MANOVA) was performed.

Multivariate Regression Analysis

Multivariate Regressions is an extension of simple linear regression. It is used when there is need to predict the value of two or more other variables. In this study, the variables to predict are called the dependent variables (which include public transportation, water, space, sanitation, and health). The variable that is used to predict the value of the dependent variables is called the independent variable or sometimes, explanatory variable (in this case, COVID-19 pandemic). This method of analysis is known as multivariate linear regression which helps to predict multiple dependent variables against one or more explanatory variables, as long as there is established relationship between the variables (Nworuh, 2004).

Equation below describes the relationship between a dependent variable and an independent variable;

$$Y = \beta_0 + \beta_1 X_1 + \epsilon_i$$

Where:

- Y = dependent variable,
- X_1 = independent variable
- β_0 = a constant value of Y when X values is 0
- β_1 = net regression coefficients
- ϵ_i = error term.

Decision Rule

The decision rule is the verbal equivalent of a graphical decision tree which specifies the class membership based on a hierarchical sequence of (contingent) decisions. Each rule in a set of decision rules therefore generally takes the form of a Horn clause wherein class membership is implied by a conjunction of contingent observations. It states that when the P-value is < 0.05 level of significant, the null hypothesis is rejected and the alternative is accepted. But when the P-value is > 0.05 the null hypothesis is accepted.

RESULTS AND DISCUSSIONS

Table 2: Percentage of questionnaire retrieved

Number of Questionnaire Distributed	Number of Questionnaire Retrieved	Percentage of Questionnaire Retrieved (%)
250	205	82%

Two hundred and fifty (250) copies of questionnaire were administered to the respondents, but only Two hundred and five (205) were retrieved (Table 2). This gave a favorable response rate of 82%. This research was carried out during working days.

Demographic Characteristics of Respondents

In the analysis of questionnaire, total percentage analysis was used for the analysis/computation of all relevant questions with respect to the response generated through the questions.

Gender of Respondents

Distribution of respondents by their gender is presented in Figure 2

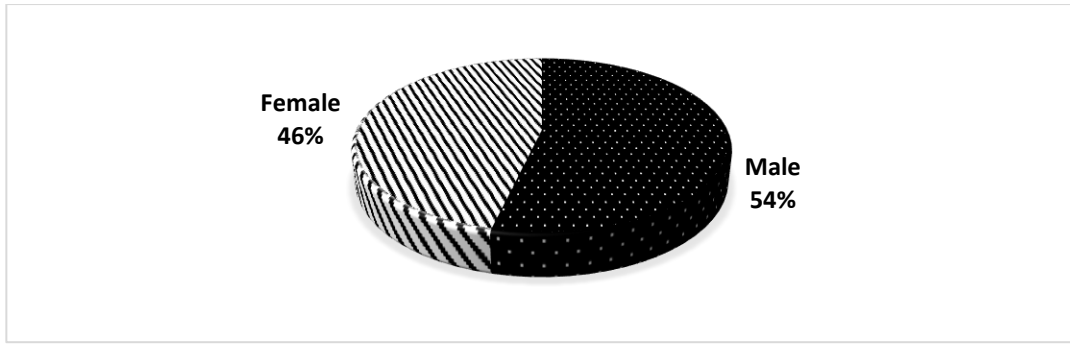


Figure 2: Pie chart showing gender of respondents

Base on the gender of respondents, the pie chart reveals that a total of 54% of the respondents were males, while 46% of the respondents were females (Figure 2).

Age Group of Respondents

Distribution of respondents by their age groups is represented in Figure 3

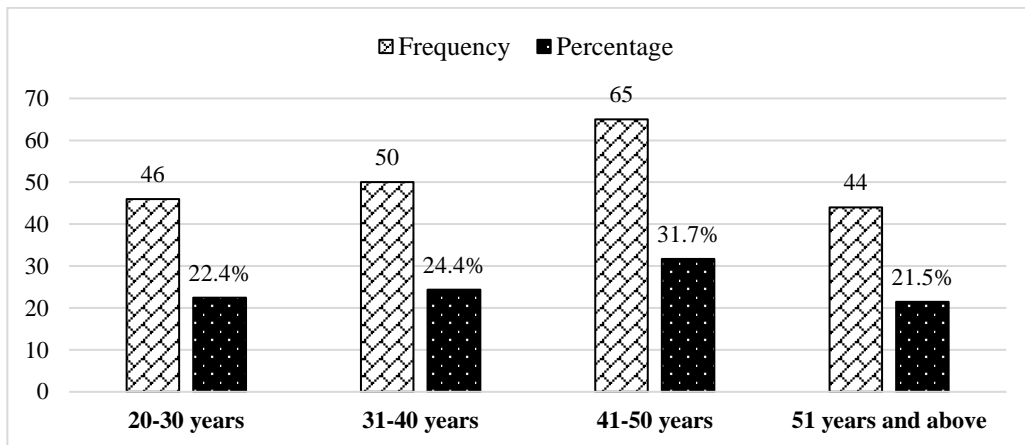


Figure 3: Histogram showing the age groups of respondents

31.7% of the respondents are of the age group of 41-50 years; 24.4% are of the age group of 31-40 years; 22.4% of the respondents are between 20-30 years of age; while the remaining 21.5% are above 51 years of age. The average age of respondents is 35.5 years (Figure 3).

Respondents Occupation

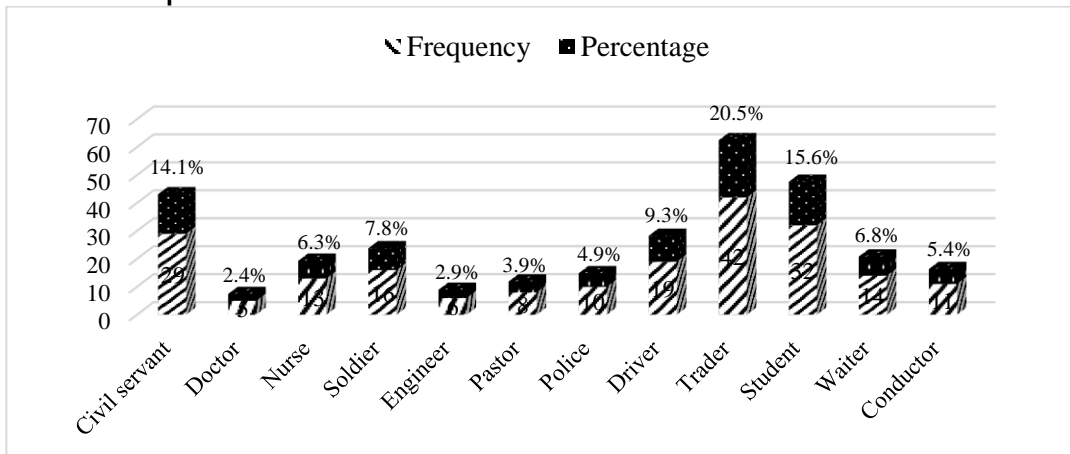


Figure 4: Histogram showing occupations of respondents

This survey reveals that majority (20.5%) of the respondents are traders; this is followed by 15.6% of students, and 14.1% of civil servants. On the other hand, doctors represent the least number (2.4%) of respondents studied, followed by 2.9% of engineers and 3.9% of pastors (Figure 4).

Respondents Level of Education

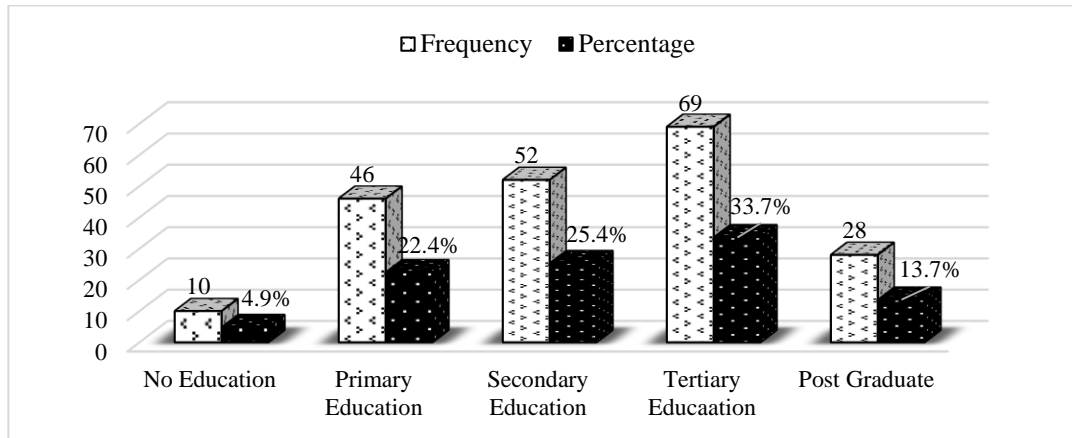


Figure 5: Histogram showing respondents' level of educational

This survey revealed that greater percent (33.7%) of the respondents attained tertiary level of education; 25.4% of the respondents attained secondary level of education; 22.4% attained primary education; 13.7% attained their postgraduate level of education, whereas the remaining 4.9% had no education (Figure 5).

Analysis of Research Questions

Environmental Impact of COVID-19 Pandemic in Owerri Metropolis:

Table 1: Environmental impact of COVID-19 pandemic in Owerri metropolis

Response	Frequency	Percentage
Strongly Disagreed	6	2.9%
Disagreed	15	7.3%
Neutral	25	12.2%
Agreed	89	43.4%
Strongly Agreed	70	34.1%
Total	205	100%

This indicate that majority (43.4%) of the respondents agreed that COVID-19 pandemic had a significant environmental impact in Owerri metropolis; 34.1% strongly agreed; 12.2% were undecided or neutral on the issue; 7.3% disagreed; while the remaining 2.9% strongly disagree on environmental impact of COVID-19 pandemic in Owerri metropolis (Table 2).

Impact of COVID-19 Pandemic on Public Transportation in Owerri Metropolis

Table 3: Impact of COVID-19 pandemic on public transportation in Owerri metropolis

Response	Frequency	Percentage
Strongly Disagreed	0	0.0
Disagreed	3	1.5%
Neutral	11	5.4%
Agreed	86	42.0%
Strongly Agreed	105	51.2%
Total	205	100%

The survey reveals that the majority (51.2%) of the respondents strongly agreed that COVID-19 pandemic had a significant impact on the use of public transportation in Owerri metropolis; 42.0% agreed on the issue; 5.4% were neutral; and the remaining 1.5% disagreed that COVID-19 pandemic had a significant impact on the use of public transportation in Owerri metropolis (Table 3).

Impact of COVID-19 Pandemic on Use of Public Water in Owerri Metropolis

Table 4: Impact of COVID-19 pandemic on the use public water in Owerri metropolis

Response	Frequency	Percentage
Strongly Disagreed	25	12.2%
Disagreed	36	17.6%
Neutral	33	16.1%
Agreed	58	28.3%
Strongly Agreed	53	25.9%
Total	205	100%

The survey revealed that greater extent (28.3%) of the respondents agreed that COVID-19 pandemic had a significant impact on the use public water in Owerri metropolis; 25.9% strongly agreed with the statement; 17.6% disagreed on the issue; 16.1% were undecided; whereas the remaining 12.2% of the respondents strongly disagreed that COVID-19 pandemic had a significant impact on the use public water in Owerri metropolis (Table 4).

Impact of COVID-19 Pandemic on Use of Public Spaces in Owerri Metropolis

Table 5: Impact of COVID-19 pandemic on the use public spaces in Owerri metropolis

Response	Frequency	Percentage
Strongly Disagreed	13	6.3%
Disagreed	24	11.7%
Neutral	22	10.7%
Agreed	78	38.0%
Strongly Agreed	68	33.2%
Total	205	100%

This survey shows that higher number (38.0%) of the respondents agreed that COVID-19 pandemic had a significant impact on the use public spaces in Owerri metropolis; 33.2% strongly agreed on the issue; 11.7% disagreed; 10.7% were neutral; while the remaining 6.3% strongly disagreed that COVID-19 pandemic had a significant impact on the use public spaces in Owerri metropolis (Table 5).

Impact of COVID-19 Pandemic on Environmental Sanitation in Owerri Metropolis

Table 6: Impact of COVID-19 pandemic on environmental sanitation in Owerri metropolis

Response	Frequency	Percentage
Strongly Disagreed	25	12.2%
Disagreed	26	12.7%
Neutral	31	15.1%
Agreed	64	31.2%
Strongly Agreed	59	28.8%
Total	205	100%

This survey reveals that the majority (31.2%) of the respondents agreed that COVID-19 pandemic on had a significant impact on environmental sanitation in Owerri metropolis; 28.8% strongly agreed on the issue; 15.1% were neutral; 12.7% disagreed; while the remaining 12.2% strongly disagreed that COVID-19 pandemic had a significant impact on environmental sanitation in Owerri metropolis (Table 6).

Impact of COVID-19 Pandemic on Public Health in Owerri Metropolis

Table 7: Impact of COVID-19 pandemic on public health in Owerri metropolis

Response	Frequency	Percentage
Strongly Disagreed	3	1.5%
Disagreed	12	5.9%
Neutral	26	12.7%
Agreed	87	42.4%
Strongly Agreed	77	37.6%
Total	205	100%

The survey revealed that higher percent (42.4%) of the respondents agreed that COVID-19 pandemic had a significant impact on public health in Owerri metropolis; 37.6% strongly agreed with the statement; 12.7% were undecided on the issue; 5.9% disagreed; whereas the remaining 1.5% of the respondents strongly disagreed that COVID-19 pandemic had a significant impact on public health in Owerri metropolis (Table 7).

Reliability Analysis

Reliability Analysis was conducted using the Cronbach's Alpha for the dichotomous questions of the study. Cronbach's alpha test was employed to see if the question surveys are reliable. The result of the test was presented in Table 8 and 9 below.

Table 8: Reliability Statistic

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
.975	.984	6

The survey showed Cronbach's alpha at 0.975, which indicates that there is a high level of internal reliability between the questions as well as the variables for the study. In other words, the variables share high covariance (Table 8).

Table 9: Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Question 1	17.8500	41.713	.911	.850	.977
Question 2	17.6500	41.503	.918	.892	.977
Question 3	18.8500	34.134	.960	.949	.967
Question 4	18.6000	33.516	.965	.939	.967
Question 5	18.2000	34.168	.959	.928	.967
Question 6	18.6000	34.674	.972	.949	.965

This presented the value of what the Cronbach's alpha would be (Table 9), if a particular question or variable is deleted from the study. From the test, removal of any question would not yield zero

variance and would not result in a higher Cronbach's alpha. Therefore, we would not want to remove these questions.

Quantitative Analysis

In order to analyze research questions and hypothesis outlined in this study, data retrieved from the field survey were analyzed using the SPSS software.

Table 10: Descriptive Statistics of Related Items

	Mean	Std. Deviation	N
Public Transportation	4.4293	.66504	205
Public Water	3.3805	1.35820	205
Public Space	3.8000	1.20212	205
Environmental Sanitation	3.5171	1.34891	205
Public Health	4.0878	.92995	205

The overall rating of impact of COVID-19 pandemic on public transportation has a mean rating of 4.43 and the standard deviation of 0.67, impact on use of public water has a mean rating of 3.38 and standard deviation of 1.36, impact on use of public space has a mean rating of 3.8 and standard deviation of 1.20, impact on environmental sanitation has a mean rating of 3.52 and a standard deviation of 1.35, while impact on public health has a mean of 4.09 and standard deviation of 0.93. It was observed from the table that all the means are almost similar. High standard deviation means that the data are wide spread, which means that respondents gave variety of opinion and the low standard deviation means that respondents express close opinion (Table 10).

Regression Analysis

The study sought to determine the impact of COVID-19 pandemic on the use of public transportation, public water, public spaces, environmental sanitation, and public health. Since there are multiple dependent variables against one explanatory variable (COVID-19 pandemic), the study employed multivariate linear regression for a proper analysis. The output of the multivariate analysis is presented in Table 11.

Table 11: Tests of Between-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	Public Transportation	60.168	1	60.168	447.608	.000
	Public Water	23.843	1	23.843	59.971	.000
	Public Space	6.748	1	6.748	49.624	.000
	Environmental Sanitation	23.332	1	23.332	78.478	.000
	Public Health	3.799	1	3.799	50.407	.000
COVID-19 pandemic	Public Transportation	62.937	1	62.937	468.206	.000
	Public Water	295.615	1	295.615	743.556	.000
	Public Space	267.196	1	267.196	1964.960	.000
	Environmental Sanitation	310.837	1	310.837	1045.502	.000
	Public Health	161.122	1	161.122	2138.084	.000
Error	Public Transportation	27.288	203	.134		
	Public Water	80.707	203	.398		
	Public Space	27.604	203	.136		
	Environmental Sanitation	60.354	203	.297		

	Public Health	15.298	203	.075		
Total	Public Transportation	4112.000	205			
	Public Water	2719.000	205			
	Public Space	3255.000	205			
	Environmental Sanitation	2907.000	205			
	Public Health	3602.000	205			

The overall results of the multivariate regression for the entire dependent variables (environmental factors) as affected by or related to the independent variable (COVID-19 pandemic). The result reveals that the probability values (Sig.) for the dependent variables as affected by the predictor are all 0.000, which is less than 0.05 (critical level). This implies that there is a significant relationship between the variables (Table 11).

Table 12: Model Summary

Public Transportation	R Squared = .698	Adjusted R Squared = .696
Public Water	R Squared = .786	Adjusted R Squared = .784
Public Space	R Squared = .906	Adjusted R Squared = .906
Environmental Sanitation	R Squared = .837	Adjusted R Squared = .837
Public Health	R Squared = .913	Adjusted R Squared = .913

The result indicates that the goodness of fit for the models were satisfactory. These findings are supported by correlation coefficients (R^2) and adjusted R^2 .

From the result, R^2 for public transportation is 0.698, which tells that a COVID-19 pandemic explains changes in project delivery to the tune of 69.8%. In the same manner, COVID-19 explains 78.6% changes to the use of public water, 90.6% changes to the use of public spaces, 83.7% changes to environmental sanitation, and 91.3% changes to public health. This means that COVID-19 pandemic contributed greater percent of the environmental variations in Owerri metropolis of Imo State (Table 12).

CONCLUSION

This study examined the environmental impact of COVID-19 in Owerri metropolis of Imo state. Survey showed that 54.0% of the respondents were males while 46.0% were females of an average age of 35.5 years. Greater percent (20.5%) of the respondents are traders, and also majority (33.7%) of respondents attained tertiary level of education.

Survey on research questions revealed that majority (43.4%) of the respondents agreed that there existed environmental impact of COVID-19 pandemic in Owerri metropolis; greater number (51.2%) strongly agreed that COVID-19 had a significant impact on public transportation; greater percent (28.3%) agreed that COVID-19 pandemic had a significant impact on the use of public water; majority (38.2%) agreed that there was a significant effect of COVID-19 pandemic on the use of public spaces; higher degree (31.2%) agreed that COVID-19 pandemic had a significant influence on environmental sanitation; and higher percent (42.4%) of the respondents agreed that COVID-19 pandemic had a significant impact on public health. Cronbach's alpha test indicated a high level (0.975) of internal reliability between 6 research questions for the study.

Regression result showed that the probability values (0.000) for the environmental variables as affected by COVID-19 pandemic were all less than 0.05 significant level, which implies that there

were significant relationships between the variables. The summary of the models showed higher levels of R^2 , which means that COVID-19 pandemic contributed greater percent of the environmental variations in Owerri metropolis of Imo State.

REFERENCES

- African Women Unite Against Destructive Resources Extraction (2020). Covid-19 Crisis upon Crisis in Africa: An Ecofeminist Perspective. 8 April 2020. <https://roape.net/2020/03/31/pulverized-capitalism-africa-and-the-covid-19-crisis>.
- City Population (2017) Imo State in Nigeria: subdivision. Available from: <https://www.citypopulation.de/php/nigeria-admin.php?adm1id=NGA017>.
- Emeribeole, A.C. (2015). Managing flood disasters in Nigeria cities: Issues and strategies towards meeting the challenges in the modern world (A case study of Owerri metropolis, Imo State, Nigeria).
- Etukudoh, N. S., Ejinaka, R. O., Olowu, F. A., Obeta, M. U., Adebowale, O. M. And Udoudoh, M. P. (2020). Coronavirus (COVID-19); Review from A Nigerian Perspective. *American Journal of Biomedical Sciences and Research*. Vol. 9(1): 26 - 35.
- Ezemonye, M.N and Emeribe, C.N. (2012). Rainfall erosivity in Southeastern Nigeria. *Ethiopian Journal of Environmental Studies and Management*, 5, 2.
- Mshelia, S. S., Mbaya, Y.A. and Emmanuel, G. (2020). Environmental Effects of Cutting Down of Urban Trees for Road Constructions in Kaduna Metropolis. *International Journal of Advances in Engineering and Management*. 2(1): 176-186.
- Nassiri, (2020). Perspective on Wuhan Viral Pneumonia. *Advance in Public Health, Com and Trop Med: APCTM-106*. Kosmos Publishers.
- National Population Commission and National Bureau of Statistics Estimates (2016) Population Forecasts by State and Gender (2013-2016), 9. <https://nigeriastat.gov.ng>
- NCDC (2020). COVID-19 Nigeria - Nigeria center for disease control. Available at <https://covid19.ncdc.gov.ng/> (Accessed 22 February 2021).
- Nwachukwu, M.A., Alozie, C.P., and Alozie, G.A. (2018). Environmental and rainfall intensity analysis to solve the problem of flooding in Owerri Urban. *Journal of Environmental Hazard*, 1(1), 107.
- Nworuh, G.E (2004). Basic Research Methodology for Researcher Trainers and Trainers in Management Sciences. Owerri: Ambix
- Okonkwo G.I., Mbajiorgu C.C. (2010) Rainfall intensity duration frequency analysis for southeastern Nigeria. *Agricultural Engineering International: CIGR Journal*, 12(1):22-30. <http://www.cigrjournal.org>
- Omenikolo, A.I., Uduma, C.I., Chinekeokwu, T., and Abara, J.C. (2017). Assessment of air pollution generated by transport in owerri, south east, Nigeria. *Merit Research Journal of Environmental Science*, 5(1), 009-017.
- UN Inter Agency Network on Youth Development (2020). Statement on Covid-19 and Youths <https://www.youths@un.org>.
- Uyo, Chijioke & Iwuji, Keside & Asoegwu, Chisom & Uyo, Chukwuemeka & Acholonu, Chidinma & Ukpe, Aniefiok. (2021). Environmental Changes During Covid-19 Lockdown: A Holistic Review. *International Journal of Advanced Research*. 54-67. 10.46654/ij. 24889849.e7219.
- World Health Organisation (WHO) (2020a). WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020 [press release]. World Health Organisation (WHO) (2020b). Coronavirus disease (COVID-

19) situation report-149 Geneva: World Health Organization. Available at https://www.who.int/docs/default-source/coronaviruse/situationreports/20200623-covid-19-sitrep-155.pdf?sfvrsn=ca01ebe_2 (Accessed 22 February 2021).

World Health Organisation (WHO) (2020b). Coronavirus disease (COVID-19) situation report-149 Geneva: World Health Organization. Available at https://www.who.int/docs/defaultsource/coronaviruse/situationreports/20200623-covid-19-sitrep-155.pdf?sfvrsn=ca01ebe_2 (Accessed 22 February 2021).