

An Analysis of the Contributory Factors to Environmental Pollution in Residential Areas of Enugu Metropolis

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Abstract: This study analyzed the contributory factors to environmental pollution in residential areas of Enugu Metropolis, Enugu State, Nigeria with a view to proffering adequate measures in tackling these problems in the study area. Specific objectives of the study included to identify the various types of environmental pollution and its prevalence in Enugu Metropolis; analyze the factors that contribute to the continued environmental pollution and analyze the consequences of environmental pollution within the metropolis. The study adopted the survey research design which facilitated reach to all respondents. A total of 399 participants were chosen for the study using stratified, purposive, and simple random selection procedures. Information gathering was made easier by interviews, well-structured questionnaires, and in-person observations. Tables, percentages, and averages were used to show and evaluate the collected data, and the Chi-Square test was used to test the hypothesis. The study revealed that air pollution was more prevalent in the study area followed by noise pollution; land/soil pollution; waste pollution and water pollution. The study also found that ageing and ill maintained Tokunbo cars; lower fuel quality; growing need to move people and goods; high use of private vehicles; use of high emission engine vehicles; absence of appropriate road traffic among others contributed to the continued environmental pollution in Enugu Metropolis. From the study, it was revealed that health concerns (breathing problems, swollen eyes, frustration and anxiety and skin diseases); loss of aesthetic value of the urban environment and indiscriminate littering of refuse on the urban environment among others constituted the consequences of environmental pollution in Enugu Metropolis. Result from the hypothesis show that the consequences of environmental pollution are statistically significant in residential areas of Enugu Metropolis as the p value was (.001) was less than the significance level (α) of 0.05. The major recommendation of this study highlights that adequate awareness and sensitization programmes should be embarked on by physical planners and other stakeholders in the built environment on the dangers of pollution to the human health and environment. This will lead to attitudinal change on the negative actions that result to pollution.

Keywords: *Environment; Air Pollution; Water Pollution; Land/Soil Pollution; Noise Pollution; Waste Pollution; Enugu Metropolis.*

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I. INTRODUCTION

Due to unchecked population expansion and inadequate planning, most cities' rapid urbanization has resulted in metropolitan centers with subpar physical layout, deteriorating environments, and growing traffic, particularly in developing nations (Etim, 2020). Given that urban areas are expected to account for 80% of metropolitan humanity by

2030, this could be harmful (United Nations Population Fund, 2020).

It is interesting to note that urban areas present a problem and a prospect for environmental issues. The challenge arises from the fact that cities are a major source of pollution, accounting for over 80% of global greenhouse gas emissions and 75% of global energy consumption

(Whiteman, 2022). Since 1950, the usage of fossil fuels has doubled in the United States, while the country's gross national product (GNP) has increased by a factor of nine (DoE, 2020). Air pollution was still caused by the use of fossil fuels in the United States (Conservation Foundation, 2020). According to Freeman (2021), yearly gross benefits of air pollution control (not including advantages net of pollution mitigation expenditures) to the US population in 1981 ranged from \$20 billion to \$54 billion.

The main cause of contamination of the environment in Europe is the large amount of toxic gasses released into the atmosphere, which pollutes the air. About 12,000 people were murdered in 1952 when a massive cloud of sulfur aerosol enveloped London for only two days (Wang et al., 2020). According to Air Quality (2020), 7 million life years are lost each year as a result of air pollution, which lowers the average life expectancy in Europe by almost a year. According to Findley (2020), the most urgent environmental issue facing Brazil is air and water pollution. The primary sources of air pollution in urban areas are thousands of automobiles and industries (Findley, 2020).

Another case of environmental pollution in a developing nation is the case of Malaysia. In Malaysia, the biggest source of pollutant is waste arising from human, transportation and industrial activities. This results in water, air and land pollutions (Hadi, 2020). The ineffectiveness of waste management technique has exposed the urban environment to harmful substances which disturbs the health of the residents and the environment at large (Zamri, Kamaruddin, Samah, Saudi, Wahab, Saad & Bati, 2023).

It was not after the 1988 Koko toxic waste disposal scandal that environmental issues in Nigeria were given official attention. This highlighted the urgent necessity to create the Federal Ministry of Environment, the Nigeria Federal Environmental Protection Agency (FEPA), and other pertinent organizations, supposedly to address environmental challenges in the nation. The main environmental problems that needed to be addressed were ozone layer depletion, pollution, and poor sanitation. Using Lagos as an example, the city's fast population growth and urbanization, traffic congestion, and improper compliance to physical planning standards all pose serious environmental threats, with pollution (of the air, water, and noise) taking center stage (Olayiwola, 2020). This presents serious problems for the local population's health and the area's environmental quality, respectively.

In Enugu metropolis, which is one of the fastest growing urban cities in Southern Nigeria, has been experiencing high population increase which necessitates increased transportation and burning of fossil fuel. The continued and increased use of automobiles for transportation emits harmful gases into the atmosphere coupled with high noise levels is also a great concern. This has resulted in daunting health, environmental and socio-economic challenges both for city authorities and the residents at large. Therefore, the aim of this study is to analyse the contributory

factors to environmental pollution in residential areas of Enugu Metropolis.

➤ *Research Questions*

- What is the nature of environmental pollution in residential areas in Enugu Metropolis
- What are the contributory factors to environmental pollution in the study location.
- What are the consequences of environmental pollution in the area of study.

➤ *Study Hypothesis*

In order to arrive at veritable findings and conclusion, the under listed hypothesis was formulated and tested at 0.05 significance level:

The consequences of environmental pollution are not statistically significant in residential areas of Enugu Metropolis.

II. REVIEW OF LITERATURE

➤ *Theoretical Underpinning*

• *Change and Development Theory*

The viewpoint is linked to Wilkinson and Boulding's (1973) writings. The theory addresses challenges of development and change in modern societies, particularly as they pertain to ecologically related population growth trends, environmental changes, and the necessity of developing and sorting out methods for addressing development issues. According to the notion, as a society's population grows, its members place greater demands on its limited resources, including land in addition to natural resources, in order to survive. They engage in socioeconomic operations that degrade the environment and society, either directly or indirectly, and further damage (degrade) these areas.

These theories define socio-economic activities as the business and industrial operations undertaken by individuals in urban-industrialized civilizations in western Europe and North America, as well as the essential farming practices of residents in agrarian societies in Africa and Latin America.

The viewpoint went on to say that when a civilization outgrows its base of resources and productive system, progress is required. According to the perspective, societies are compelled to alter their practices when the producing system becomes more troublesome and the existing economic structure of a particular environment or society is shown to be insufficient. For example, people are driven to leave to urban areas in quest of employment when a society's population exceeds its capacity, particularly in rural civilizations.

In order to survive, some people sell their labor, while others invest in cattle in addition to retail and agricultural ventures. Some people continue to run technological and entrepreneurial firms. The establishment and operation of industrial activity by urban and city people pollutes society

equally. According to Wilkinson and Boulding (1973), these activities contaminate the environment either directly or indirectly, which has an impact on biodiversity. Therefore, it is clear from the aforementioned idea that people in the city of Enugu participate in activities that harm the environment and lower its quality.

➤ *Conceptual Clarifications*

• *Environment*

The term "environment" has been defined differently by many academics, organizations, and government agencies. However, the term "environment" merely describes what is around us, regardless of how one interprets it. The environment, according to Hagget (2015), quoted in Anijah-Obi (2021), is the culmination of all the circumstances that surround humans on the surface of the world at any given time. "The total of outside influences that impact the existence of a people or humanity, and primarily the survival of humankind along with all living things on the earth's surface," is one definition of the term "environment," according to Miller (2020).

Section 38 of the Federal Environmental Protection Agency (FEPA) Act of 1990 also provided a very clear definition of the environment, stating that it encompasses the land, water, and air as well as all plants, animals, and people that live there, as well as any relationships that may exist between any of these. According to the definitions given above, the environment includes all of the physical structures that surround us as well as the land, air, and water. Therefore, the term "environment" in this study refers to the entirety of time, place, and the sociocultural contexts in which humans and other living things exist.

• *Pollution*

Pollutes, which means to make anything filthy or less clean, especially by adding unpleasant or hazardous things to it, is the root of the word pollution. In a different development, the United States National Research Council's committee on pollution (2021) defined pollution as any unfavorable alteration to the physical, chemical, or biological properties of the air, land, and water that could negatively impact human life or the lives of other desirable species, as well as industrial operations, living conditions, and cultural assets that could potentially waste or degrade current raw material resources. According to the description given above, pollution is an environmental problem that results from the conversion of energy and the utilization of resources.

Accordingly, pollution is defined by Ekuri and Eze (2021) as contamination, defilement, mischief, disturbance, and a decrease in the worth of an object or thing. In a similar vein, Jande (2020) defines pollution as "making things unclean or less pristine, typically via the addition of poisonous or undesirable substances to it." Therefore, the term "pollution" is employed in this study to describe a condition in which waste products and/or hazardous substances can wear down, deplete, and damage the overall environment, causing disorder among all living things. Furthermore, those who care about the environment believe

that both natural disasters and human activity can contaminate the environment beyond a reasonable doubt. Additionally, documented evidence has demonstrated that ongoing environmental contamination causes environmental degradation and/or regression (Anijah-Obi, 2021; Gbehe, 2020; Ocheri, 2022).

➤ *Empirical Reviews*

• *Nature and Sources of Environmental Pollution*

Owaduge (2021) studied the contributions of road transport to environmental pollution in Owo, Ondo State, Nigeria. The study found that road transportation resulted in air, noise, water, land and waste pollution. The study found that emissions from exhaust pipes of vehicles, oil spillage, noise from construction equipment and loud honking sound from vehicles were major sources of pollution arising from road transport. The study suggested that a number of mutually reinforcing policies need to be used in urban areas in general, and the city of Owo in particular, to try and reduce the growing energy demand and emissions from the transport sector.

Going further, Zamri et al (2019) examined environmental pollution and solid waste management in Malaysia. From the study, it was observed that pollution from waste include water and air pollution coupled with extreme human health challenges. The study therefore highlights that the effective implementation of the 3R (Reduce, Reuse and Recycle) as well as the privatization of waste management can help improve finance and promote awareness by the public.

• *Driving Factors of Environmental Pollution*

Ityavyar & Thomas (2021) investigated environmental pollution in Nigeria with a need to create awareness for sustainable development. The study revealed that the major causes of pollution in Nigeria include transportation, industrial activities, noise, housing, and conflicts and wars. The study therefore recommends that awareness and change in attitudes for effective environmental and resources management strategies as a way forward.

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The causes of metropolitan solid waste management issues and the resulting costs to the economy, society, and health as well as the environment and aesthetics were investigated by Nwafor (2020). He determined that the lack of public participation, institutional factors, demographic factors, and inertia were all to blame. He asserts that the power of inertia functions from three perspectives: the

perceptual aspect, the response aspect, and the difficulty of enlisting the public's participation for change. Given the demographic factor, the population is growing quickly, which accelerates the rate of urbanization. The main institutional obstacles are a lack of coordination and communication across sectors to manage the environment. The city's environmental quality has been severely harmed by solid waste management issues, which have led to catastrophic environmental, economic, social, and health concerns.

• *Consequences of Reduced Environmental Quality/Pollution*

Appannagari (2020) in his study highlighted that population growth with its accompanied increase in transportation, increased general affluence and economic growth, nature of modern technology, urbanization, unplanned urbanization, coal burnt thermal power plants and poverty were among the major causes of pollution across cities of the world. The study further revealed that consequences of pollution include environmental degradation, increased pressure on available resources and ecosystem, generation of more and more waste, and underlining health conditions.

Ityavyar & Thomas (2021) investigated environmental pollution in Nigeria with a need to create awareness for sustainable development. The study highlighted the consequences of these activities to include loss of vegetation, land degradation through erosion and severe grazing, loss of aquatic life and water pollution, health conditions like typhoid, dysentery, epidemics, anxiety, damage to the tympanic membrane, increase waste generation, deaths, among others. The study therefore recommends that awareness and creation and change in attitudes for effective environmental and resources management strategies as a way forward.

Emodi (2020) investigated the environmental quality of Abakaliki, Nigeria as impacted by the primary air pollutants from transport emissions in the area. Classifying the metropolis in different neighbourhoods and the stratifying into low, medium and high-density areas, samples were collected randomly from the neighbourhoods. Result from the study indicates that 91.7% variations in the residential environmental quality could be predicted from air pollution. Results also revealed that health challenges like reduced oxygen carrying capacity of blood, chronic bronchitis and worsening respiratory illness were identified as some of the effects. Findings also showed that acidification of soils, staining of fabrics accounts as environmental problems. The study further recommends that making petroleum products like kerosene available and affordable will serve as a mitigating measure.

Using standard analytical techniques, Okeke, Okeke, Ezeh, Adunola, and Nwigwe (2020) examined air outside pollution levels at vehicular traffic intersections in the main cities of Nsukka, Abakaliki, and the semi-urban district of Awgu, all in Abakaliki State, Nigeria. According to the survey, the average hourly traffic density at the vehicular traffic intersections in Awgu, Abakaliki, and Nsukka was 587, 2873, and 2015, respectively. In the environments under investigation, the mean range of PM_{2.5}, NO₂, SO₂, O₃, and CO values in automobiles junctions was 1.67 to 12.16 µg/m³, 3.72 to 23.83 µg/m³, 2.96 to 30.09 µg/m³, 5.45 to 66.54 µg/m³, and 1.18 to 15.17 ppm, respectively. There were notable differences in the mean concentrations of the identified airborne contaminants in the vicinity of vehicle traffic intersections in the semi-urban area of Awgu, the city of Abakaliki, and the city of Nsukka. The mean concentrations of PM_{2.5} and CO in the air near vehicle traffic intersections in the cities of Abakaliki and Nsukka were higher than the suggested allowable limits. Therefore, it was determined that the single most significant factor influencing the fluctuating levels of air pollution seen in the areas under investigation was traffic density. In order to significantly reduce the amount of toxic air pollutants that are released into surroundings through vehicular activities, the study suggested that the Nigerian government examine the mechanical and physical conditions of the vehicles that are on the road in the country's major cities, the quality of the fuel that is supplied to drivers, and the harsh penalties that are imposed on those who drive outdated, rickety, and deteriorating vehicles as well as those who violate traffic laws. According to the review, pollution is a direct result of human activity. Numerous writers have written extensively about pollution and the environmental effects it causes. However, the examined literature clearly ignores both locational and empirical gaps, which this study attempted to address.

III. MATERIALS AND METHODS

➤ *The Study Area*

Enugu Metropolis is geographically located at the centre of Enugu State, lying approximately between latitudes 6°23'N and 7°03'N of the equator and longitudes 7°03'E and 7°19'E of the Greenwich Meridian. Its administrative boundaries include the city centre and surrounding districts that occupy an area of about 72 square kilometers (Iyi, 2020).

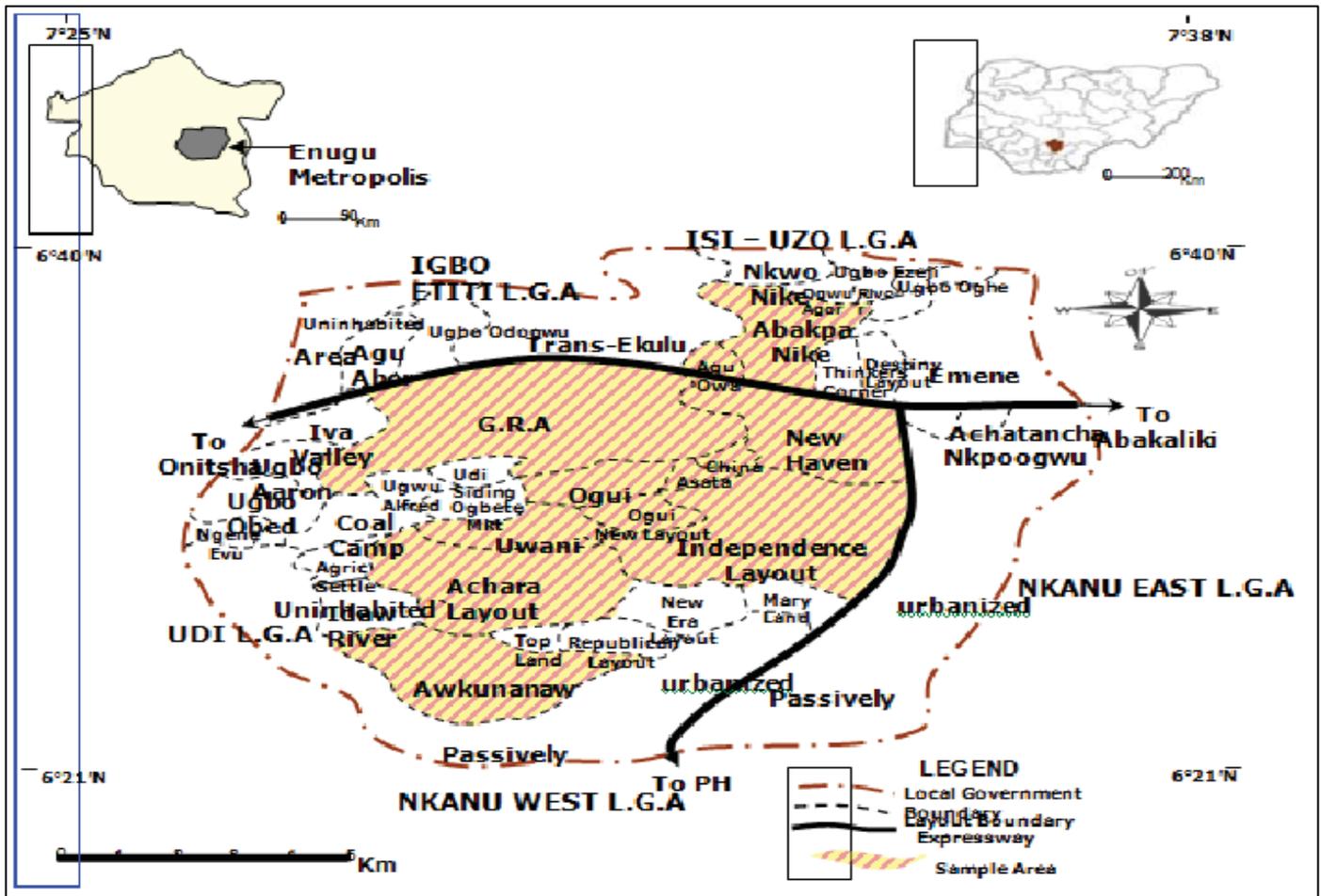


Fig 1 Map of Enugu Metropolis
 Source: Enugu State Geology and Survey, 2025

The highest hills in Enugu can rise up to 1,000 meters (3,300 feet). Generally speaking, sandstone underlies the highlands around Enugu, whilst shale underlies the lowlands. Soil along with gully erosion have severely damaged a large portion of the escarpment that stretches from Enugu to Orlu (Egboka, 2020). Air, water, inorganic (mineral) particles, and organic matter (decomposing biomass) make up soil. Enugu soil is referred to as mineral soil because of its comparatively low organic matter concentration, which ranges from 1% to 10%. The city of Enugu is located in an equatorial climate zone. Rainfall varies between 1250 mm to 2030 mm every year. According to Weather Spark (2020), the average yearly temperature falls between 220°C and 300°C.

The range of the relative humidity is 40% to 80%. Enugu is located in the Guinea savannah belt, one of Nigeria's six vegetation belts. The widest belt in Nigeria is the Guinea savannah belt. It covers the whole middle belt, from Zaria in the north to Enugu in the south. Tall grasses and small to medium-sized trees make up the majority of the natural vegetation in this region. To reduce moisture loss through transpiration, the majority of trees are deciduous. The locust bean, shear butter, oil bean, and isoberlina tree are common tree species in the area; they typically grow to a height of less than 6 meters. Enugu North, Enugu South, and Enugu East are the three local government areas that make up the city (Figure 1). The population of the three (3) local government

areas that make up the city is estimated at 722,665 persons with 348,902 males and 373763 females.

➤ *Methods*

The survey research design was used in the study. Independence Layout, New Haven, Achara Layout, Trans Ekulu, Abakpa, and Awkunanaw are just a few of the built environment professionals who reside in Enugu Metropolis. The chosen design for this study helped the researcher clarify important information from residents of the chosen areas, different transportation administration agencies in the areas, transport company unions, town planners, and other professionals. Information gathering was made easier via questionnaires, interviews, and in-person observations. The used questionnaire was open-ended, well-structured, and written in plain English so that respondents could easily understand it. In certain situations, the respondents were supposed to indicate more than one response, but in most circumstances, they were asked to select their preferred response from a list of possibilities. The purpose of the questionnaire instrument was to gather data on the types and causes of pollution caused by road transportation in the research area. The tool also assisted in gathering the necessary information about the causes and effects of environmental pollution caused by road transportation in the research area. For the study, stratified, purposive, and basic random sampling approaches were used. In stratified

sampling, the city was divided into low-, medium-, and high-density areas based on density.

For the study, high density areas include: Abakpa, Iva valley, Asata, Camp, Ogbete, Ogui New layout Achara layout, Ogui, Uwani. Medium densities include the following areas: Awkunanaw, Idaw River, New era, New Haven, Trans-Ekulu, secretariat quarter and Udi Siding. The Low-density areas include: Aria, City Layout, G.R.A, Independence Layout, Republic, Maryland, River side, and Thinkers Corner. Six (6) samples have been selected at random from these density zones, eliminating any possibility of bias. For the study, three (3) high density, two (2) medium density, and one (1) low density area were selected. The study's high-density sample regions were Abakpa Nike, Achara Layout, and Awkunanaw, whereas the low-density sample areas were Independence Layout, Trans Ekulu, and New Haven. Accordingly, 399 questionnaires were distributed throughout the research region. 50 questionnaires were given to experts in the built environment, such as town planners, and 345 were given to the citizens. Frequencies, percentages, and averages were used to display and evaluate the collected data, and the Chi-Square test was used to test the hypothesis.

IV. FINDINGS

➤ Analyzing Objective One

- *Nature of Environmental Pollution in Residential Areas of Enugu Metropolis*

Figure1 revealed that majority of the respondents in Enugu Metropolis indicated that all the identified forms of environmental pollution were prevalent in the study area. From the result in figure1, majority of the respondents given the chance for multiple responses indicated that air pollution was more prevalent (98%) in the study area. This was followed by noise pollution (90%); land/soil pollution (78%); waste pollution (73%) and water pollution (66%). This therefore implies that environmental pollution is actually a challenge facing the residents of Enugu Metropolis and drastic measures must be taken to tackle it. This result is in unison with that of Appannagari (2020) and Owuduge (2021) who averred that air, water, soil/land, waste and noise pollution were the major forms of pollution facing cities of the 21st century.

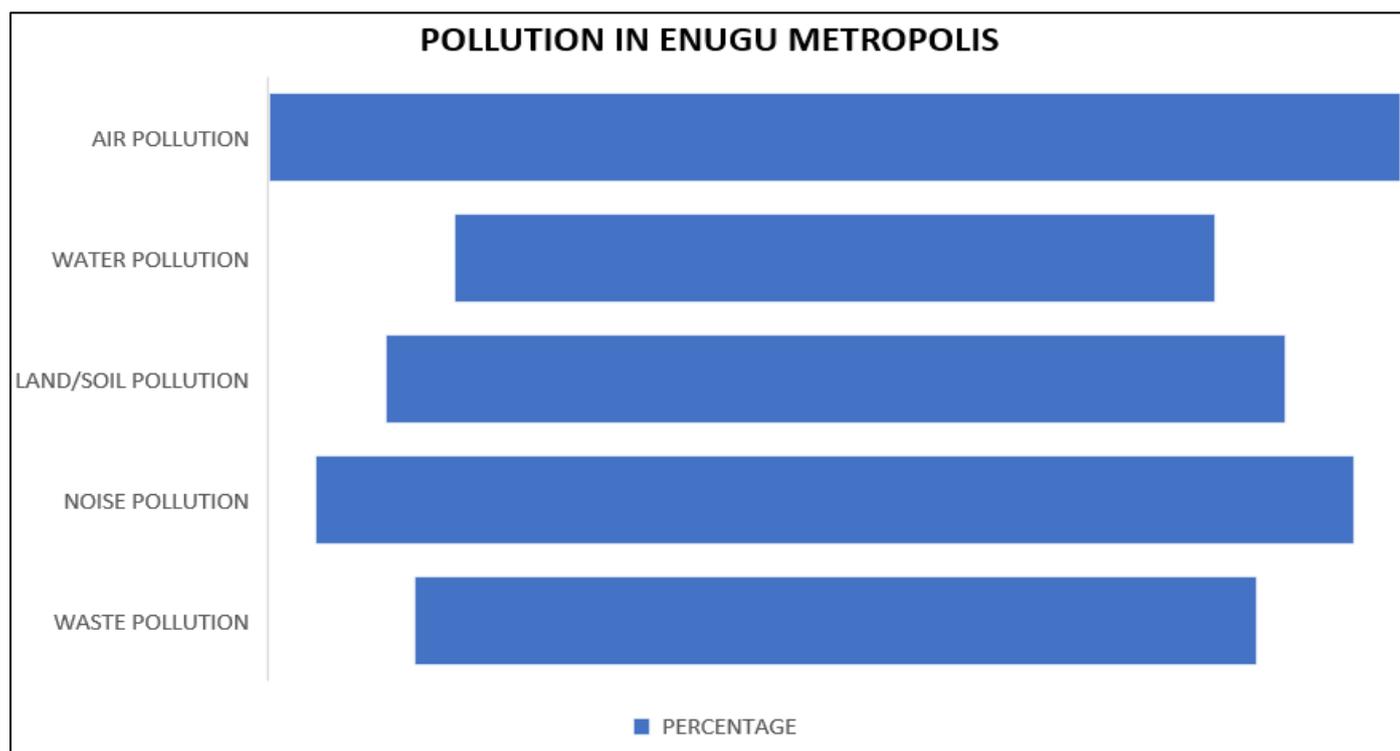


Fig 2 Pollution in Enugu Metropolis
Source: Researcher’s Fieldwork, 2026

➤ Analyzing Objective Two

- *Factors that Contribute to the Continued Environmental Pollution in the Study Location*

Table 1 indicated the factors that contribute to environmental pollution in the study area. From the results in table 1, all the identified 10 factors were accepted as they recorded mean scores above 1.49. These factors included ageing and ill maintained Tokunbo cars (m= 2.80); lower fuel

quality (m= 2.66); growing need to move people and goods (m= 2.64); high use of private vehicles (m= 2.52); use of high emission engine vehicles (m= 2.50); absence of appropriate road traffic reduction strategy (m= 2.48); lack of adequate green/open spaces in the urban area (m= 2.44); absence of an efficient public transport system (m= 2.36); increased population and urbanization (m= 2.20) and poor waste management techniques (m= 1.76). This result corroborates with that of Ityavyar and Thomas (2021) and Owaduge

(2021) who averred that ageing and ill maintained Tokunbo cars, lack of open spaces, poor waste management, poor fuel quality and the use of high emission engine vehicles among

others contributed to environmental pollution in many cities of the world.

Table 1 Response on Situations that Contribute to Environmental Pollution in Enugu Metropolis (N= 50)

S/N	Situations that contribute to road transport induced environmental pollution	Significant 3	Moderate Significant 2	Not significant 1	Mean	Rmk
1	Growing need to move people and goods	33	16	1	2.64	Accepted
2	Absence of appropriate road traffic reduction strategy	29	16	5	2.48	Accepted
3	Ageing and ill maintained 'tokunbo' cars	40	10	-	2.80	Accepted
4	Absence of an efficient public transport system	26	16	8	2.36	Accepted
5	Lower fuel quality	34	15	1	2.66	Accepted
6	Use of high emission engine vehicles	27	21	2	2.50	Accepted
7	High use of private vehicles	31	14	5	2.52	Accepted
8	Increased population and urbanization	19	22	9	2.20	Accepted
9	Poor waste management techniques	15	18	7	1.76	Accepted
10	Lack of adequate green/open spaces in the urban area	24	24	2	2.44	Accepted

Source: Researcher's Fieldwork, 2025

➤ Analyzing Objective Three

• Consequences of Environmental Pollution within the Metropolis

Table 2 revealed the consequences of environmental pollution in Enugu Metropolis. From the result, all the 13 identified consequences were accepted as they scored means above the benchmark of 1.49. These consequences included health concerns (breathing problems, swollen eyes, frustration and anxiety, skin diseases etc) (m= 2.66); loss of aesthetic value of the urban environment (m= 2.52); indiscriminate littering of refuse on the urban environment

(m= 2.48); damage and loss of vegetation (m= 2.44); urban flooding (m= 2.42); poor water quality (m= 2.42); increased urban heat levels (m= 2.40); visible particles in the atmosphere/poor visibility (m= 2.38); acidic rain (m= 2.36); polluted air/foul smell (m= 2.32); decreased crop yield (m= 2.28); imbalance in the ecosystem (m= 2.08) and emigration of people from noisy areas (m= 2.04). This result is in line with that of Ityavyar & Thomas (2021) and Owuduge (2021) who opined that increased urban heat levels, acidic rain which causes damage to vegetation, poor water quality, loss of aesthetic value of the urban environment among others constituted major consequences of environmental pollution.

Table 2 Response on Consequences of Environmental Pollution in Enugu Metropolis (N= 50)

S/N	Situations	Significant 3	Moderate Significant 2	Not significant 1	Mean X	Rmk
1	Emigration of people from noisy areas	36	10	4	2.04	Accepted
2	Increased urban heat levels	24	22	4	2.40	Accepted
3	Visible particles in the atmosphere/poor visibility	22	25	3	2.38	Accepted
4	Acidic rain	25	18	7	2.36	Accepted
5	Decreased crop yield	24	16	10	2.28	Accepted
6	Damage and loss of vegetation	25	22	3	2.44	Accepted
7	Imbalance in the ecosystem	17	20	13	2.08	Accepted
8	Polluted air/foul smell	22	22	6	2.32	Accepted
9	Poor water quality	26	19	5	2.42	Accepted
10	Loss of aesthetic value of the urban environment	28	20	2	2.52	Accepted
11	Urban flooding	22	27	1	2.42	Accepted
12	Indiscriminate littering of refuse on the urban environment	28	18	4	2.48	Accepted
13	Health concerns (breathing problems, swollen eyes, frustration and anxiety, skin diseases etc)	33	17	-	2.66	Accepted

Source: Researcher's Fieldwork, 2026

➤ *Testing of Hypothesis*

- Ho₁: The consequences of environmental pollution are not statistically significant in residential areas of Enugu Metropolis.
- Ho₂: The consequences of environmental pollution are statistically significant in residential areas of Enugu Metropolis.

In order to test the above hypothesis, the values from tables 2 on ‘Response on Consequences of environmental pollution in Enugu Metropolis’ was inputted into the computer with the software (Statistical Package for Social Sciences) and the Chi-Square results in Table 3 were obtained.

Table 3 Chi-Square Results

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	54.946 ^a	24	.000
Likelihood Ratio	56.167	24	.000
Linear-by-Linear Association	1.102	1	.294
N of Valid Cases	650		

a. 13 cells (33.3%) have expected count less than 5. The minimum expected count is 4.77.

Source: SPSS, 2026

Chi-Square Value = 54.946
 p Value = .001
 Level of significance (α) = 0.05 (See Appendix I)

✓ *Decision Rule:*

Reject Ho, if p value is less than level of significance and accept Ho if otherwise.

✓ *Conclusion:*

p value = .001
 Level of significance = 0.05

Therefore, Ho is rejected because p value (.001) is < (less than) level of significance which is 0.05. Also, a Pearson’s R² and Spearman correlation value of 1 and .754 respectively shows strong correlation between the variables.

✓ *Implication:*

The implication of this result is that the null hypothesis (Ho) was not accepted, which states that the consequences of environmental pollution are not statistically significant in residential areas of Enugu Metropolis and H₁ is accepted which states that the consequences of environmental pollution are statistically significant in residential areas of Enugu Metropolis. Therefore, it is concluded that the consequences of environmental pollution are statistically significant in residential areas of Enugu Metropolis.

V. CONCLUSION AND RECOMMENDATIONS

➤ *Conclusion*

Environmental pollution is one of the biggest and most expensive problem currently facing major cities of the world. The problem cuts across both developed and developing countries. Ignoring this problem, however, will have disastrous consequences and lead to the end of life as we know it. According to the study, there would be a significant reduction in the amount of pollution to the environment each year if green spaces were designated and expanded in urban areas, electric, hybrid, and natural gas vehicles were encouraged, air quality laws were implemented and improved, traffic policies and restrictions were reinforced, a good transportation management system was in place, necessary road facilities were provided, the uncontrolled dumping and burning of damaged motor parts was prohibited, and good access to public transportation and non-motorized transport infrastructure was made available.

➤ *Recommendations*

With reference to the above findings of the study, the following physical planning proposals are made:

- Adequate awareness and sensitization programmes should be embarked on by physical planners and other stakeholders in the built environment on the dangers of pollution to the human health and environment. This will lead to attitudinal change on the negative actions that result to pollution.
- Physical planners and government agencies like ESWAMA and Ministry of Environment should

collaborate on the best practice concerning waste (solid, liquid and gas) disposal in the urban area.

- The outright banning of the use of high carbon emitting vehicles will go a long in curbing environmental pollution.
- Adequate laws and policies concerning pollution should be implemented and enacted to the later to curb this urban menace. Also, institutional, technical, legal and administrative frameworks concerning pollution should be strengthened to tackle pollution in the urban area.
- The federal, state and local government should implement programmes that enhance the living conditions and standard of living of the people residing in the country, state and local government areas. This will entrench the use of electric and non-motorized transport in no short time in Enugu Metropolis and Nigeria in general.

REFERENCES

- [1]. Air Quality in Europe, "Report can be found under <https://www.eea.europa.eu/publications/air-quality-in-europe-2020>" Retrieved 21/01/2026
- [2]. F.N. Anija-Obi, "Environmental Protection and Management: Planning, Process and strategies for sustainable development" University of Calabar Press, 2020
- [3]. R.R. Appannagari, "Environmental Pollution Causes and Consequences: A Study", *North Asian International Research Journal of Social Science & Humanities*. 3(8), 23-34, 2020
- [4]. R.G. Wilkinson, and K.E. Boulding, "Introduction: Poverty and Progress: an ecological perspective on economic development": Preager publishers, New York –Washington, 1973
- [5]. Conservation Foundation, "State of the Environment", a View Toward the Nineties, 1992
- [6]. Department of Energy (D.O.E.), "Annual Review of Energy" 2021
- [7]. B.C.E. Egboka, "Water Resources Problems in the Enugu Area of Anambra State, Nigeria". Water Resources and Environmental Pollution Unit (WREPU), Department of Geological Anambra State University of Technology: 95, 97. Geology and Survey, Enugu, 2020
- [8]. P. Ekuri, and E.B. Eze, "Teaching Environmental Pollution in Primary/secondary schools" Workshop paper, on the orientation workshop for teachers on the implementation of the National environmental education curricula at Ogoja, in October, 2021
- [9]. E.E. Emodi, "Environmental Quality of Enugu, Nigeria as Impacted by the Primary Air Pollutants in the Area", *International Journal of Environment and Pollution Research* Vol.8, No.4. ECRTD-UK, 2020
- [10]. E.U. Etim, "Air pollution emission inventory along a major traffic route within Ibadan Metropolis, southwestern Nigeria" *African Journal of Environment and Science Technology*, 4(5), 432-438, 2023
- [11]. C.T. Eze, J.L. Ugwoke, and J.J. Ugwoke, "Road traffic congestion and vehicular emissions in Enugu Urban, Nigeria" *Poll Research*, 38(1): 1-8, 2021
- [12]. R.W. Findley, "Pollution Control in Brazil" *Ecology Law Quarterly*. Vol. 15:1, 2021
- [13]. M. Freeman, "The Benefits of Air and Water Pollution Control: a Review and Synthesis of Recent Estimates" Council on Environmental Quality, Government Printing Office, 2021
- [14]. N.T. Gbehe, "Land Development in Nigeria: An Examination of Environmental Degradation Associated with land use Types. Conference Paper at the Department of Geography Benue State University (B.S.U.) Makurdi. January 2021.
- [15]. A.S. Hadi, "Perubahan Persekitaran Dan Kemudahan Terancam Lembangan Langat. Bangi, Selangor: Penerbit Universiti Kebangsaan Malaysia, 2020
- [16]. E.M. Ityavyar, and T.T. Thomas, "Environmental pollution in Nigeria: the need for awareness Creation for sustainable development" *Journal of Research in Forestry, Wildlife and Environment*. 4(2), 23-33, 2021
- [17]. E.A. Iyi, "A Review of Enugu (Enugu State, Nigeria) Urban Growth and Development. *Journal of Research in Environmental and Earth Sciences*: 1(3), 29-34, 2020
- [18]. G.G. Jande, "Legal Mechanisms for the control of Pollution on the high seas" *African Journal of Environmental Law and Development Studies*, 1(1), 1 –13, 2021
- [19]. Martos, R. Pacheco-Torres, J. Ordóñez, and E. Jdraque-Gago, "Towards successful environmental performance of sustainable cities: intervening sectors. A review" *Renew Sustainable Energy Rev* 57, 2016
- [20]. M.I. Ocheri, "Environmental Health Hazards and national Survival and Stability: A need for Education" *In Benue State University Journal of Education (BSUJE)* Vol 4. No. 2, 2021
- [21]. L.M. Olayiwola, "Techniques for Achieving Sustainable Development for Towns and Cities in Osun State, Paper presented at Workshop on Urban Planning and Sustainable Development in Osun State, 2021
- [22]. S.B. Owaduge, "The Contributions of Road Transport to Environmental Pollution in Owo, Ondo State, Nigeria. *Nordic Road and Transport Research*, 1, 8 – 11, 2021
- [23]. United Nations Population Fund (UNFPA), "State of World Population 2007 – Unleashing the Potential of Urban Growth" United Nations Population Fund, New York, USA, 2021
- [24]. United States National Research Council, "Committee on Pollution of the United States (U.S) National Research Council, 2023
- [25]. G. Wang, R. Zhang, M. E. Gomez, L. Yang, M. Levy Zamora, M. Hu, Y. Lin, J. Peng, S. Guo, J. Meng, J. Li, C. Cheng, T. Hu, Y. Ren, Y. Wang, J. Gao, J. Cao, Z. An, W. Zhou, G. Li, J. Wang, P. Tian, W. Marrero-Ortiz, J. Secrest, Z. Du, J. Zheng, D. Shang, L. Zeng, M. Shao, W. Wang, Y. Huang, Y. Wang, Y. Zhu, Y. Li, J. Hu, B. Pan, L. Cai, Y. Cheng, Y. Ji, F. Zhang, D. Rosenfeld, P. S. Liss, R. A. Duce, C. E. Kolb, M. J. Molina, "National Academic Science", 2021

- [26]. G. Whiteman, “Business strategies and the transition to low-carbon cities.” *Business Strategic Environment* 20(4), 2022
- [27]. N. Zamri, S., Kamarudin, M. K. A., Samah, M. A. A., Saudi, A. S. M., Wahab, N. A., Saad, M. H. M., & S.N.A.M. Bati, “The Environmental Pollution and Solid Waste Management in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, 9(12), 2023