

Spatial Variations in Air pollution exposure and Human health outcomes in Ibadan, Nigeria

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Abstract

Air pollution is a major environmental challenge in rapidly growing urban centres, particularly in developing countries where increasing population, vehicular traffic, industrial activities, and poor environmental management contribute to declining air quality. This study examined the spatial variations in air pollution exposures and human health outcomes in Ibadan, Oyo State, Nigeria. A mixed-method approach involving questionnaire administration, field observation, and direct measurement of air pollutants was adopted. Residential neighbourhoods were classified into high-, medium-, and low-density areas. A total of 385 questionnaires were administered, across selected residential neighbourhoods in Ibadan. The distribution was based on residential density classification to ensure proportional representation. while concentrations of Carbon monoxide (CO), Hydrogen sulphide (H₂S), Methane (CH₄), and Carbon dioxide (CO₂) were measured

using a Crowcon Gas-Pro multi-gas detector. The collected data were analysed using both descriptive and inferential statistical techniques. The findings identified vehicular emissions (26.5%), generator fumes (21.8%), open waste burning (17.7%), construction activities (14.0%), industrial emissions (8.1%), and dust from untarred roads (11.9%) as the major sources of air pollution. Significant spatial variations in pollutant concentrations were observed, with high-density neighbourhoods recording highest pollution levels (4.13) than medium (3.39) and low-density (2.37) areas due to greater population concentration, traffic congestion, and commercial activities. Pollutant concentrations also declined with increasing distance from emission sources, indicating higher exposure among residents living closer to pollution hotspots. The study further revealed that prolonged

exposure to polluted air was associated with respiratory problems (32.6%), persistent cough (41.8%), eye and throat irritation (39.5%), headaches (34.2%), and other health-related symptoms. It concludes that residential density, land-use characteristics, and environmental management practices significantly influence air quality in Ibadan. The study recommends stricter vehicle emission control, improved waste management, regular air quality monitoring, enforcement of environmental regulations, and the integration of air quality considerations into urban planning to promote healthier and more sustainable cities.

Keywords: Air pollution, Human health, Neighbourhood, pollutants; Ibadan, Nigeria

1. Introduction

The environment provides essential resources and ecological services that sustain human life and support socio-economic development. However, rapid urbanization, population growth, industrialization, and increasing energy demand have significantly altered environmental conditions, particularly in urban areas. Among these challenges, air pollution has become one of the most critical environmental problems due to its adverse effects on human health, ecosystems, and sustainable urban development (United Nations Environment Programme [UNEP], 2021; World Health Organization [WHO], 2021).

Air pollution refers to the presence of harmful substances in the atmosphere at concentrations capable of causing adverse effects on humans, animals, vegetation, and the built environment. Major urban air pollutants include carbon monoxide (CO), carbon dioxide (CO₂), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), particulate matter (PM_{2.5} and PM₁₀), ozone (O₃), and volatile organic compounds (VOCs). These pollutants are mainly generated from transportation activities, industrial operations, fossil fuel combustion, construction activities, waste burning, and domestic energy use (Manisalidis *et al.*, 2020; WHO, 2021).

Globally, air pollution remains a major public health concern. The World Health Organization (2021) identified air pollution as one of the leading environmental risk factors responsible for millions of premature deaths annually. Exposure to polluted air has been associated with respiratory diseases, cardiovascular disorders,

impaired lung function, asthma, and chronic obstructive pulmonary disease (Landrigan *et al.*, 2018; Lelieveld *et al.*, 2020).

Urban areas are particularly vulnerable because they concentrate population, economic activities, transportation systems, industries, and energy consumption within limited spaces. In many developing countries, urban expansion has occurred faster than environmental management capacity, resulting in increased pollution levels due to inadequate infrastructure, poor waste management, traffic congestion, and dependence on fossil fuel-based energy sources (UN-Habitat, 2022).

Nigeria has experienced rapid urban growth driven by population increase, rural-urban migration, and economic expansion. However, this growth has created environmental challenges, including deteriorating air quality caused by vehicular emissions, generator use, industrial activities, and open waste burning (Amegah & Agyei-Mensah, 2017; Oluwole *et al.*, 2019). Ibadan, one of Nigeria's largest urban centres, has experienced significant spatial expansion and increasing human activities, which have contributed to rising air pollution levels. Previous studies have examined air pollution in Nigerian cities; however, limited attention has been given to how residential density, land-use characteristics, and proximity to pollution sources influence pollutant concentration and human exposure. Understanding these spatial variations is important for effective urban planning and public health protection. Therefore, this study examines the spatial variation of air pollution exposure and Human Health Outcomes in Ibadan, Oyo State.

1.2 Statement of the Problem

Air pollution has become a major environmental and public health challenge in rapidly growing cities, particularly in developing countries where urban expansion often outpaces environmental management. In Ibadan, increasing population growth, vehicular traffic, industrial activities, generator use, construction works, and open waste burning have contributed to deteriorating air quality and increased residents' exposure to harmful pollutants. Despite growing concerns over air pollution, there is limited empirical evidence on how pollutant concentrations and associated health effects vary across different residential neighbourhoods, generally and Ibadan in particular. Existing studies have largely focused on pollution sources without adequately examining the in-

fluence of residential density and land-use characteristics on spatial variations in air quality and human exposure. This knowledge gap limits the ability of policymakers and urban planners to identify high-risk areas and implement effective pollution control measures. Consequently, this study investigates the spatial variation in air pollution and its implications for human health across high-, medium-, and low-density residential neighbourhoods in Ibadan, Oyo State, with the aim of providing evidence to support environmental planning and public health decision-making.

1.3 Aim of the Study

The aim of this study is to examine the spatial variation in air pollution exposure and its implications for human health in Ibadan, Oyo State, Nigeria, with a view to providing strategies for improving air quality and promoting healthy urban development.

1.4 Objectives of the Study

The specific objectives are to:

1. examine the major sources of air pollution in Ibadan;
 2. analyse the concentration levels and spatial distribution of major air pollutants across residential neighbourhoods;
 3. examine variations in air pollution levels among high-, medium-, and low-density residential areas;
- assess the health effects associated with exposure to air pollution among residents;

2 Study Area

Ibadan, the capital of Oyo State, is one of the largest metropolitan cities in southwestern Nigeria. It is located approximately between latitude 7°23'N and longitude 3°56'E, about 120 km northeast of Lagos. The city serves as a major administrative, commercial, educational, and cultural centre. Rapid population growth, rural-urban migration, and economic development have driven Ibadan's physical expansion, resulting in increased residential development, transportation, and energy demand. These activities have intensified environmental challenges, particularly air pollution.

The city comprises high-, medium-, and low-density residential neighbourhoods with varying land-use patterns and population densities. High-density areas are characterised by congested development, heavy traffic, commercial activities, and frequent generator use, mak-

ing them more susceptible to air pollution than medium- and low-density neighbourhoods.

Ibadan's economy is supported by commerce, manufacturing, transportation, agriculture, education, and other service activities, which contribute to atmospheric emissions through vehicular traffic, industrial operations, construction activities, generator use, and open waste burning. The city experiences a tropical wet and dry climate, with seasonal weather conditions influencing the dispersion and concentration of air pollutants. The combination of rapid urbanisation, diverse residential densities, and multiple pollution sources makes Ibadan an appropriate study area for examining the spatial variation in air pollution and its implications for human health.

3 Methodology

3.1 Research Design

The study adopted a mixed-method research design combining quantitative and qualitative approaches. The quantitative component involved the collection of primary data through structured questionnaires and direct measurement of air pollutants, while the qualitative component involved field observations of pollution sources and environmental conditions across residential neighbourhoods. The mixed-method approach was adopted because air pollution is influenced by both measurable environmental factors and human activities. While pollutant measurements provide scientific evidence of air quality conditions, residents' perception and experiences provide additional understanding of exposure patterns and health effects.

3.2 Sampling Procedure

A stratified sampling technique was adopted to ensure adequate representation of different residential environments in Ibadan. The residential areas were classified into three categories: The High, Medium and Low-density residential areas. The classification was based on pattern of population concentration, housing characteristics, development intensity, land-use activities, and environmental conditions observed during reconnaissance surveys. A proportional allocation in the ratio of 3:2:1 was applied to high-, medium-, and low-density neighbourhoods respectively. This ensured that areas with higher population concentration and greater

pollution exposure received adequate representation. The selected neighbourhoods is being highlighted in table 1

Furthermore, the population of Ibadan according to 2026 projected population is 3,649,000. Cochran (1963), equations 1 and 2 were used to determine the required control sample size for this study, as shown in Table 3.7

Following Cochran (1963), equations 1 and 2 were used to determine the required control sample size for this study, as shown in Table 3.7. Using equation (2) to determine the control sample size, thus, $n = 385$. Therefore, 385 questionnaires were administered across selected residential neighbourhoods in Ibadan. The distribution was based on residential density classification to ensure proportional representation.

3.3 Air Quality Measurements

Direct measurement of gaseous pollutants was conducted using a Crowcon Gas-Pro Multi-Gas Detector. The instrument was used because of its reliability in detecting multiple gaseous pollutants under field conditions. The study measured four major pollutants: Carbon monoxide (CO); Carbon dioxide (CO₂); Hydrogen sulphide (H₂S); and Methane (CH₄).

Measurements were taken from identified pollution sources, including: automobile emission points; waste burning locations; construction areas; industrial emission zones; and dusty untarred roads. The instrument was positioned approximately 1.5 metres above ground level to represent the average human breathing zone. Measurements were taken during similar periods of the day to reduce variations caused by weather conditions. Multiple readings were obtained at each location, and the average values were used for analysis.

3.4 Data Analysis

The collected data were analysed using both descriptive and inferential statistical techniques. ANOVA was used to analyse variations in pollutant concentrations among high-, medium-, and low-density residential areas. The Chi-square test was used to examine the relationship between residential characteristics and reported health effects associated with air pollution.

The measured pollutant concentrations were compared with recommended air quality standards provided by the Federal Environmental Protection Agency (FEPA) and international guidelines to determine pollution severity. The air quality monitoring equipment was calibrated according to manufacturer specifications before field measurements to ensure accuracy and reliability of recorded pollutant con-

centrations.

4. Results and Discussion

The results show that vehicular emissions (26.5%) was identified as the leading source of air pollution in Ibadan, followed by generator fumes (21.8%) and open waste burning (17.7%). Construction activities (14.0%), dust from untarred roads (11.9%), and industrial emissions (8.1%) were also reported as notable pollution sources. The findings indicate that transportation, energy generation, and poor waste management were the principal contributors to deteriorating air quality, particularly in densely populated neighbourhoods.

4.1 Spatial Variations in Air Pollution across Residential Areas

The results indicate clear spatial variations in air pollution across residential neighbourhoods in Ibadan. High-density neighbourhoods recorded the highest perceived pollution level with a mean score of **4.13**, ranking first. About **77.9%** of respondents in these areas rated air pollution as **high** or **very high**, reflecting the influence of heavy traffic, commercial activities, generator use, poor waste management, and high population concentration.

Medium-density neighbourhoods recorded a **moderate** pollution level with a mean score of **3.39**, ranking second. Most respondents (**35.8%**) perceived pollution as moderate, while **45.7%** considered it high or very high. This suggests that although these areas experience considerable anthropogenic activities, their pollution levels are lower than those of high-density neighbourhoods.

Low-density neighbourhoods had the lowest pollution level, with a mean score of **2.37**, ranking third. The majority of respondents (**62.1%**) rated pollution as **low** or **very low**, indicating that lower population density, better road networks, reduced traffic congestion, and improved environmental management contribute to better air quality.

Overall, the findings demonstrate that air pollution decreases from high- to low-density residential neighbourhoods, confirming that residential density and urban land-use characteristics significantly influence air quality in Ibadan. This pattern underscores the need for targeted environmental management strategies, particularly in densely populated neighbourhoods where pollution exposure is greatest.

4.2 Spatial Variation in Carbon Monoxide (CO) Concentration

Carbon monoxide (CO) is one of the most important pollutants associated with urban activities. It is produced mainly through incomplete combustion of fossil fuels from vehicles, generators, industrial activities, and waste burning. The measurement results show considerable variations in carbon monoxide concentration across residential neighbourhoods in Ibadan.

High-density areas recorded the highest CO concentrations, particularly locations such as Moniya, Oloyin, and Olunloyo. These areas are characterised by intense traffic activities, commercial development, generator use, and increased human activities. The highest CO concentration was recorded from automobile emissions in Olunloyo, where values reached approximately **15.80 mg/m³**, while lower-density areas such as Oluyole recorded comparatively lower concentrations.

The high concentration of CO in densely populated areas

Table 3.1: Selected neighbourhood in Ibadan

Residential Density	Selected Neighbourhoods
High Density	Moniya, Oloyin, Olunloyo
Medium Density	Mapo, Ring Road
Low Density	Oluyole

$$n_o = \frac{Z^2 Pq}{e^2} \quad \text{eqn 1}$$

$$n = \frac{n_o}{1 + \frac{(n_o - 1)}{N}} \quad \text{eqn 2}$$

n_o = Control Sample Size

n = Required Sample Size

Z = Z-score / Abscissa of the Normal Curve at 95% Confidence Level (1.96)

e = Degree of Precision (0.05)

P = Level of Variability (0.5)

q = $1 - P$

N = Population Size (i.e Population of residents)

indicates increased exposure risks among residents. Continuous exposure to elevated carbon monoxide levels may result in headaches, dizziness, fatigue, breathing difficulties, and other health problems (Munzel, 2018). The result agrees with previous studies which identified transportation activities as one of the major contributors to urban air pollution in cities of developing countries. The results indicate that automobile emissions remain the dominant contributor to carbon monoxide concentration in Ibadan. This highlights the need for stronger vehicle emission control measures and improved public transportation systems.

4.3 Effect of Distance from Pollution Sources on Carbon Monoxide Concentration

Table 4.3 shows the variations in carbon monoxide (CO) concentration with increasing distance from major pollution sources in Ibadan. The results indicate a clear inverse relationship between distance and pollutant concentration. Areas located within **0–20 metres** of pollution sources recorded the highest mean CO concentration (**16.42 mg/m³**), exceeding the **FEPA permissible limit of 10.00 mg/m³**. This suggests that residents living close to major roads, waste-burning sites, and industrial facilities are exposed to unhealthy levels of carbon monoxide.

At distances of **21–40 metres**, the mean CO concentration decreased to **13.18 mg/m³**, although it still

exceeded the recommended standard. Between **41 and 60 metres**, the concentration further declined to **10.54 mg/m³**, approaching the permissible limit. Areas located **beyond 60 metres** recorded the lowest mean concentration (**7.26 mg/m³**), which falls below the FEPA standard and indicates relatively better air quality.

The findings demonstrate that **carbon monoxide concentrations decrease with increasing distance from emission sources**, confirming that proximity to pollution sources is a major determinant of residents' exposure. This highlights the importance of enforcing appropriate setback distances and incorporating buffer zones between residential developments and major pollution sources in urban planning to reduce health risks associated with air pollution.

4.4 Spatial Variations in Hydrogen Sulphide (H₂S) Concentration

Table 4.4 presents the mean Hydrogen Sulphide (H₂S) concentrations across residential neighbourhoods in Ibadan. The results show that **high-density neighbourhoods** recorded the highest mean H₂S concentration (**0.082 ppm**), followed by **medium-density neighbourhoods** (**0.056 ppm**), while **low-density neighbourhoods** recorded the lowest concentration (**0.031 ppm**).

The relatively high concentration of H₂S in high-density areas is attributable to poor environmental sani-

Table 4.1: Major Sources of Air Pollution Identified by Respondents

Source of Air Pollution	Frequency (n)	Percentage (%)	Rank
Vehicular emissions	102	26.5	1st
Generator fumes	84	21.8	2nd
Open waste burning	68	17.7	3rd
Construction activities	54	14.0	4th
Dust from untarred roads	46	11.9	5th
Industrial emissions	31	8.1	6th
Total	385	100.0	

Source: Field Survey, 2026.

tation, indiscriminate waste disposal, blocked drainage systems, and the decomposition of organic waste, which are more common in densely populated neighbourhoods. Medium-density areas recorded moderate concentrations due to comparatively better waste management and lower population pressure. Low-density neighbourhoods experienced the least H₂S pollution because of improved sanitation, lower waste generation, and better environmental conditions.

The findings indicate that residential density significantly influences hydrogen sulphide concentrations in Ibadan. Higher H₂S levels increase the likelihood of health problems such as eye irritation, throat discomfort, headaches, and respiratory difficulties among exposed residents. Consequently, improving waste collection, drainage maintenance, and environmental sanitation is essential for reducing hydrogen sulphide pollution and safeguarding public health.

Table 4.5 presents the variation of methane (CH₄) concentrations across different residential neighbourhoods in Ibadan. The results reveal that **high-density neighbourhoods recorded the highest mean methane concentration (18.64 ppm)**, followed by **medium-density areas (12.47 ppm)**, while **low-density neighbourhoods recorded the lowest concentration (7.35 ppm)**.

The higher methane concentration observed in high-density areas can be attributed to increased popu-

lation concentration, greater waste generation, inadequate waste disposal practices, and frequent open burning of organic materials. Locations such as Moniya and Olunloyo experience intense human activities, which contribute to higher methane emissions through waste decomposition, generator operations, and transportation activities.

Medium-density neighbourhoods recorded moderate methane levels due to a combination of residential activities, moderate waste generation, and transportation-related emissions. In contrast, low-density areas recorded lower methane concentrations because of reduced population pressure, better environmental conditions, and limited accumulation of organic waste.

The findings demonstrate that urban density and waste management practices significantly influence methane emissions. Poor waste disposal systems in densely populated areas contribute not only to local air quality problems but also to increased greenhouse gas emissions. Therefore, improved waste collection, recycling practices, and sustainable waste management strategies are necessary to reduce methane emissions and enhance environmental quality in Ibadan.

4.5 Air Pollution and Health Effects among Residents in Ibadan

Table 4.6 presents the reported health effects associated with exposure to air pollution across high-, medium-, and low-density residential neighbourhoods in

Table 4.2: Perceived Level of Air Pollution across Residential Neighbourhoods in Ibadan (N = 385)

Residential Density	Very High	High	Moderate	Low	Very Low	Mean Score	Rank
High-density neighbourhoods	172 (44.7%)	128 (33.2%)	56 (14.5%)	20 (5.2%)	9 (2.3%)	4.13	1st
Medium-density neighbourhoods	64 (16.6%)	112 (29.1%)	138 (35.8%)	49 (12.7%)	22 (5.7%)	3.39	2nd
Low-density neighbourhoods	18 (4.7%)	42 (10.9%)	86 (22.3%)	156 (40.5%)	83 (21.6%)	2.37	3rd

Ibadan. The findings indicate that health problems related to air pollution were most prevalent among residents in high-density neighbourhoods compared with medium- and low-density areas.

Among the reported health effects, persistent cough recorded the highest occurrence, with 41.8% of respondents in high-density areas, compared with 27.6% in medium-density areas and 9.4% in low-density areas. This was followed by eye, nose, and throat irritation, reported by 39.5% of high-density residents, 25.2% of medium-density residents, and 8.3% of low-density residents. The high prevalence of these symptoms may be linked to prolonged exposure to smoke, dust particles, and gaseous pollutants from vehicles, generators, waste burning, and other urban activities.

Respiratory-related conditions such as asthma and bronchitis were also most common in high-density neighbourhoods (37.4%) compared with medium-density (22.8%) and low-density areas (6.5%). This suggests that continuous exposure to elevated pollutant concentrations may contribute to respiratory irritation and aggravation of existing health conditions.

The results further show that headaches, breathing difficulties, and general discomfort followed a similar pattern, with higher occurrences among residents in high-density areas. The greater incidence of these health problems in densely populated neighbourhoods can be

attributed to the concentration of pollution sources, including heavy traffic, generator emissions, poor waste disposal practices, and dust from unpaved roads.

Overall, the findings demonstrate a clear relationship between residential density, air pollution exposure, and health outcomes. Residents living in high-density areas are more vulnerable to air pollution-related health risks due to increased pollutant sources and reduced environmental capacity for pollutant dispersion. The results highlight the need for improved air quality management, effective waste disposal systems, emission control measures, and better urban planning practices to reduce exposure and protect public health in Ibadan.

5 Discussion of findings

The study revealed that air pollution in Ibadan is largely influenced by human activities associated with urban growth, transportation, energy consumption, waste management, and land-use practices. Vehicular emissions emerged as the dominant pollution source, supporting previous studies that identify transportation activities as major contributors to urban air pollution. In developing cities, increasing vehicle ownership, traffic congestion, poor vehicle maintenance, and dependence on fossil fuels significantly increase emissions of carbon monoxide and other pollutants (WHO, 2021; Amegah & Agyei-Mensah, 2017).

Table 4.1: Carbon Monoxide Concentration across Selected Residential Areas in Ibadan

Pollution Source	Oluyole	Mapo	Ring Road	Moniya	Oloyin	Olunloyo
Waste burning	8.42	10.43	10.28	11.37	11.45	12.58
Construction dust	6.73	9.38	10.11	9.52	10.21	10.43
Industrial emissions	6.89	8.46	8.69	10.93	11.02	10.88
Automobile emissions	11.29	12.44	13.62	14.38	14.79	15.80
Untarred road dust	9.38	10.83	10.76	12.53	11.62	11.59

Source: Author's Field Survey, 2026

The finding that high-density neighbourhoods recorded higher pollutant concentrations than medium- and low-density areas agrees with previous research indicating that urban density and land-use intensity influence pollution exposure patterns. Densely populated neighbourhoods often experience higher pollution levels because of increased traffic activity, commercial concentration, generator dependence, poor waste disposal practices, and limited space for pollutant dispersion (UN-Habitat, 2022; Kumar et al., 2016).

The observed reduction in pollutant concentration with increasing distance from emission sources supports existing evidence that proximity to pollution sources increases human exposure. Studies have shown that residential areas located close to major roads, industrial zones, and waste disposal areas are more vulnerable to elevated pollutant concentrations (Karagulian et al., 2015). Therefore, effective zoning regulations, buffer zones, and proper separation of sensitive land uses from pollution sources are important strategies for reducing exposure risks.

The health findings also correspond with previous studies linking air pollution exposure with adverse health outcomes. Higher levels of respiratory problems, cough, eye irritation, headaches, and breathing difficulties among residents in high-density neighborhoods demonstrate the public health implications of poor air

quality. Exposure to pollutants such as carbon monoxide and particulate matter has been associated with increased risks of respiratory and cardiovascular diseases (Landrigan et al., 2018; Lelieveld et al., 2020).

Overall, this study confirms that air pollution in Ibadan results from the interaction between urban growth, transportation systems, environmental management practices, and residential characteristics. Addressing the challenge requires integrated approaches involving sustainable urban planning, improved waste management, cleaner transportation systems, emission control measures, and continuous air quality monitoring.

6 Conclusion

This study concludes that air pollution is a significant environmental challenge in Ibadan, Oyo State, with variations across residential neighbourhoods. The findings revealed that major sources of air pollution include automobile emissions, waste burning, construction activities, industrial fumes, and dust from untarred roads. High-density neighbourhoods recorded highest pollutant concentrations due to intense human activities and greater exposure to pollution sources. The study also established that air pollution contributes to health problems such as headaches, respiratory difficulties, eye and throat irritation, and general discomfort among residents. Therefore, effective measures are required to improve air quality and enhance public health in Ibadan.

Table 4.3: Mean Carbon Monoxide (CO) Concentration at Different Distances from Pollution Sources in Ibadan

Distance from Pollution Source (m)	Mean CO Concentration (mg/m ³)	FEPA Standard (mg/m ³)	Air Quality Status
0–20	16.42	10.00	Very High
21–40	13.18	10.00	High
41–60	10.54	10.00	Moderate
Above 60	7.26	10.00	Low

Source: Authors' Field Measurements, 2026.

Table 4.4: Mean Hydrogen Sulphide (H₂S) Concentration across Residential Neighbourhoods in Ibadan

Residential Density	Mean H ₂ S Concentration (ppm)	Standard Deviation	Air Quality Status	Rank
High-density	0.082	0.018	High	1st
Medium-density	0.056	0.014	Moderate	2nd
Low-density	0.031	0.010	Low	3rd

Source: Field Measurements, 2026

Table 4.5: Mean Methane (CH₄) Concentration across Residential Neighbourhoods in Ibadan

Residential Density	Mean CH ₄ Concentration (ppm)	Standard Deviation	Major Contributing Factors	Rank
High-density	18.64	3.21	Organic waste decomposition, open waste burning, generator use, intense human activities	1st
Medium-density	12.47	2.68	Moderate waste generation, domestic energy use, transportation activities	2nd
Low-density	7.35	1.94	Limited waste accumulation and reduced human activities	3rd

Source: Authors' Field Survey, 2026

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Table 4.6: Reported Health Effects Associated with Air Pollution in Ibadan

Health Effect	High Density (%)	Medium Density (%)	Low Density (%)
Persistent cough	41.8	27.6	9.4
Eye, nose and throat irritation	39.5	25.2	8.3
Asthma/Bronchitis	37.4	22.8	6.5
Headache	34.2	21.7	7.1
Breathing difficulties	32.6	20.5	6.8
General discomfort	30.4	18.7	5.9

Source: Authors' Field Survey, 2026

7. Recommendations

Based on the findings, the study recommends that:

1. Vehicle emission control should be strengthened through regular inspection of vehicles and promotion of cleaner transportation systems.
2. Open burning of waste should be discouraged by improving waste collection and disposal services.
3. Air quality monitoring should be regularly conducted across Ibadan to identify pollution hotspots and guide environmental policies.
4. Urban planning regulations should be enforced by providing adequate separation between residential areas and pollution sources.
5. Public awareness programmes should be promoted to educate residents on the causes, effects, and prevention of air pollution.

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