Assessment of Public Awareness of Atmospheric Pollution and Perceptions of Climate Change in Lafia Local Government Area, Nasarawa State, Nigeria.

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ABSTRACT

This study assessed public awareness of atmospheric pollution and perceptions of climate change in Lafia Local Government Area, Nasarawa State, Nigeria, using a descriptive cross-sectional survey and structured questionnaires administered in nine selected communities. Data were analysed using frequencies, percentages and reported chi-square tests. Findings showed that respondents were generally aware of atmospheric pollution, with 25 of 40 respondents understanding its meaning, 38 able to identify local pollution sources, and 35 recognising vehicle emissions as a contributor to air pollution. Regarding perceived climate-related changes, 37 respondents reported rising temperatures, 26 observed changes in rainfall patterns, and 30 perceived longer dry seasons. Industrial emissions and motor vehicles were prominent perceived pollution sources, identified by 36 respondents and 32 of the 39 valid responses, respectively. Support for environmental protection was strong: all 40 respondents favoured proper waste management, 39 supported public environmental education, and 38 endorsed stricter enforcement of pollution-control laws. The study recommends targeted environmental education, stronger emission-control enforcement, improved waste management, community participation and regular air-quality monitoring. However, the findings represent respondents' awareness, perceptions and attitudes rather than direct pollution measurements or independently verified climatic trends. The discrepancy between the stated sample of 80 respondents and the 40 responses recorded for most questionnaire items should be checked against the original survey data.

Keywords: Atmospheric pollution; public awareness; climate change; environmental perceptions; pollution control; Lafia LGA.

Background of the Study

Atmospheric pollution and climate change are major environmental challenges affecting human health, ecosystem stability and sustainable development. Atmospheric pollution, or air pollution, occurs when harmful substances such as particulate matter, smoke, dust and gaseous pollutants contaminate the atmosphere. Major sources include vehicular emissions, industrial activities, fossil-fuel combustion, biomass burning and improper waste disposal. Exposure to air pollution is associated with respiratory and cardiovascular diseases and other adverse health effects (Manisalidis et al., 2020). In Nigeria, Abulude et al. (2024) identified vehicular exhaust, industrial emissions, biomass burning and household cooking fuels as important pollution sources and highlighted the need for effective mitigation measures.

Climate change refers to long-term changes in the Earth's climate system, including temperature and precipitation patterns. Human activities, particularly greenhouse gas emissions, are the principal drivers of observed global warming since the pre-industrial period (Intergovernmental Panel on Climate Change [IPCC], 2023). Although atmospheric pollution and climate change are distinct, they are interconnected because activities such as fossil-fuel combustion, transportation and waste burning can release both air pollutants and greenhouse gases. Understanding their differences is essential for assessing public knowledge of these environmental challenges.

In Nigeria, urbanisation, population growth, transportation, household energy use, construction and inadequate waste management can intensify environmental pressures. Meanwhile, climate variability and climate change have implications for agriculture, water availability and human well-being. Abdullahi (2020) highlighted the importance of climate education in North-Central Nigeria, while the IPCC (2023) documented the widespread consequences of human-induced climate change. However, national reviews and studies focused on educational institutions do not necessarily establish the level of environmental awareness among residents of a particular locality.

Public awareness influences how people recognise environmental problems, understand their causes and interpret their consequences. Residents may identify vehicle exhaust, dust, smoke and open waste burning as pollution sources without fully understanding their effects. Similarly, they may associate hotter conditions or irregular rainfall with climate change without distinguishing short-term weather variability from long-term climatic trends. Examining public awareness and perceptions can therefore provide insight into environmental understanding at the local level. However, residents' observations do not establish actual pollutant concentrations or independently verify long-term climate trends, which require air-quality measurements and meteorological records, respectively.

Lafia Local Government Area (LGA), the administrative capital of Nasarawa State in North-Central Nigeria, provides a relevant setting for examining these issues. Its residential, commercial, administrative and transportation activities create a context for investigating public perceptions of atmospheric pollution. Potential sources include vehicular emissions, road dust, construction activities, fuel combustion and open burning of refuse. Although these sources are consistent with those discussed by Abulude et al. (2024), their relative contributions in Lafia are not measured by the present study. Residents' perceptions of hotter conditions and changes in rainfall patterns likewise provide evidence of their experiences, rather than independent confirmation of climatic trends.

Residents' attitudes towards environmental protection and pollution-control measures are also important because awareness does not necessarily translate into support for environmental regulations or pollution-prevention initiatives. Attitudes towards waste management, emission control, regulatory enforcement and public education can help identify opportunities for improving environmental communication and community engagement. The mitigation measures discussed by Abulude et al. (2024) and the educational approaches highlighted by Abdullahi (2020) provide relevant context for examining these issues.

Despite existing research on air pollution in Nigeria and climate-change awareness in North-Central Nigeria, further local evidence is needed to understand residents' awareness, perceptions and attitudes in Lafia LGA. This study therefore assesses residents' awareness of atmospheric pollution and climate change, identifies perceived major sources of atmospheric pollution and perceptions of climate-related environmental changes, and examines attitudes towards environmental protection and pollution-control measures. The findings are expected to identify public-awareness gaps and inform environmental education, community engagement and locally appropriate pollution-management initiatives in Lafia LGA.

Statement of the Problem

Atmospheric pollution and climate change are major environmental challenges with implications for human health, environmental quality and sustainable development. Atmospheric pollution arises from sources such as vehicular emissions, industrial activities, fossil-fuel combustion, biomass burning and improper waste disposal (Manisalidis et al., 2020). Human-induced greenhouse gas emissions are the principal driver of contemporary global warming and associated climatic changes (IPCC, 2023). In Nigeria, Abulude et al. (2024) reviewed the sources, effects and mitigation of air pollution, while Abdullahi (2020) examined climate-change awareness and education among teachers and head teachers in North-Central Nigeria.

The specific research gap is the lack of locally specific evidence, within the literature cited here, that jointly establishes residents' awareness of atmospheric pollution and climate change, their perceptions of major pollution sources and climate-related environmental changes, and their attitudes towards environmental protection and pollution-control measures in Lafia Local Government Area (LGA), Nasarawa State. Abulude et al. (2024) focused on air pollution in Nigeria broadly, whereas Abdullahi (2020) investigated climate awareness

within an educational population rather than the general adult population of Lafia. Consequently, these studies do not establish how well Lafia residents understand the two environmental challenges, which pollution sources they consider most important, how they interpret perceived changes in temperature and rainfall, or the extent to which they support environmental protection measures. Although residents' perceptions can reveal environmental concerns and potential knowledge gaps, they cannot independently verify pollutant concentrations or long-term climatic trends (IPCC, 2023).

This study addresses this gap by assessing residents' awareness of atmospheric pollution and climate change, identifying their perceived major pollution sources and perceptions of climate-related environmental changes, and examining their attitudes towards environmental protection and pollution-control measures in Lafia LGA. The findings will provide context-specific evidence to inform environmental education, public engagement and pollution-management initiatives.

Research Questions

i. What is the level of public awareness of atmospheric pollution and climate change among residents of Lafia Local Government Area, Nasarawa State?
   What are the perceived major sources of atmospheric pollution, and how do residents perceive climate-related environmental changes in the study area?
ii. What are residents' attitudes towards environmental protection and pollution-control measures in Lafia Local Government Area?

Research Objectives

i. Assess public awareness of atmospheric pollution and climate change among residents of Lafia Local Government Area, Nasarawa State.
ii. Identify the perceived major sources of atmospheric pollution and examine public perceptions of climate-related environmental changes in the study area.
iii. Assess public attitudes towards environmental protection and pollution-control measures in Lafia Local Government Area.

LITERATURE REVIEW

Atmospheric pollution is a major environmental and public health concern arising from the release of harmful gases, particulate matter and other substances into the atmosphere. Major sources include vehicular emissions, industrial activities, fossil-fuel combustion, biomass burning and improper waste disposal. Manisalidis et al. (2020) reviewed the health and environmental effects of air pollution, highlighting its association with respiratory and cardiovascular diseases. Similarly, Safdar et al. (2025) examined pollution sources and their implications for public health and the environment, emphasising public awareness, monitoring and coordinated pollution-control measures. In Nigeria, Abulude et al. (2024) identified industrial emissions, vehicular exhaust, biomass burning and household cooking fuels among relevant pollution sources and highlighted the importance of cleaner energy and effective mitigation strategies. These studies establish the importance of atmospheric pollution but do not, by themselves, determine residents' awareness of its causes and consequences in Lafia Local Government Area.

Atmospheric pollution and climate change are interconnected but distinct environmental challenges. While some air pollutants primarily affect local air quality, greenhouse gas emissions contribute to global warming, and certain atmospheric particles influence the Earth's radiation balance. The Intergovernmental Panel on Climate Change (IPCC, 2023) established those human activities, particularly greenhouse gas emissions, are the principal drivers of observed global warming since the pre-industrial period. Jacob and Winner (2009) further demonstrated that temperature, precipitation and atmospheric circulation influence air quality by affecting pollutant formation, dispersion and concentration. These findings highlight the importance of distinguishing public understanding of visible pollution sources from awareness of the broader processes underlying climate change.

Public awareness is an important consideration in environmental management because it can influence how people recognise environmental problems, interpret their causes and understand their consequences. Safdar et al. (2025) emphasised public education and engagement in addressing air pollution, while Abulude et al. (2024) highlighted the need for coordinated pollution-management measures in Nigeria. In North-Central Nigeria, Abdullahi (2020) examined climate-change awareness and education among teachers and head teachers in public primary schools and recommended strengthened climate education. Although these studies demonstrate the relevance of public awareness, their respective scopes do not establish the level of awareness of atmospheric pollution and climate change among residents of Lafia LGA.

Residents' perceptions of pollution sources and climate-related environmental changes provide another important dimension of environmental assessment. People may identify vehicle exhaust, industrial emissions, smoke, road dust and waste burning as major sources of pollution, while associating hotter conditions, irregular rainfall and prolonged dry seasons with climate change. However, perceived pollution sources do not establish their actual contribution to local air pollution, and personal observations cannot independently confirm long-term climatic trends. Instrumental air-quality measurements and meteorological records are required to quantify pollutant concentrations and establish changes in climatic variables over time. Nevertheless, examining residents' perceptions can reveal their environmental concerns and understanding of the conditions affecting their communities.

Public attitudes towards environmental protection and pollution-control measures are equally relevant to environmental management. Safdar et al. (2025) and Abulude et al. (2024) emphasised public engagement, pollution mitigation and coordinated control strategies, while Abdullahi (2020) highlighted the importance of education in strengthening climate awareness. However, recommendations for environmental protection do not establish whether residents support particular interventions, including improved waste management, pollution prevention, environmental education and stricter regulatory enforcement. Such attitudes must be assessed within the population concerned.

Overall, the reviewed literature establishes the health and environmental implications of atmospheric pollution, its connections with climate change, and the importance of public awareness and environmental management. However, the cited studies do not directly establish residents' awareness of atmospheric pollution and climate change, their perceptions of major pollution sources and climate-related environmental changes, or their attitudes towards environmental protection measures in Lafia LGA. This study addresses these issues by assessing public awareness, examining perceived pollution sources and climate-related environmental changes, and evaluating attitudes towards environmental protection and pollution-control measures. The findings are intended to provide locally relevant evidence to inform environmental education, community engagement and pollution-management initiatives.

The Study Area

Lafia Local Government Area (LGA), the administrative capital of Nasarawa State in North-Central Nigeria, is the study area. Lafia is located approximately at latitude 8.4939°N and longitude 8.5153°E, with an elevation of about 179-199 metres above sea level. The area has a relatively flat terrain with gentle undulations, characteristic of Nigeria’s Middle Belt region. According to the 2006 national census, Lafia LGA had a population of 330,712, although the population has increased due to urbanisation and migration.

Lafia experiences a tropical climate characterised by distinct wet and dry seasons. The wet season generally extends from April to October, while the dry season lasts from November to March (NIMET, 2005). Annual rainfall ranges from approximately 1,000 mm to 1,500 mm, although its distribution varies seasonally. Temperatures can reach about 39°C during the hottest period, while minimum temperatures may fall to approximately 17°C during the cooler months (Binbol, 2007). These climatic conditions influence agricultural activities, particularly rice cultivation, which depends on adequate water availability and suitable growing conditions.

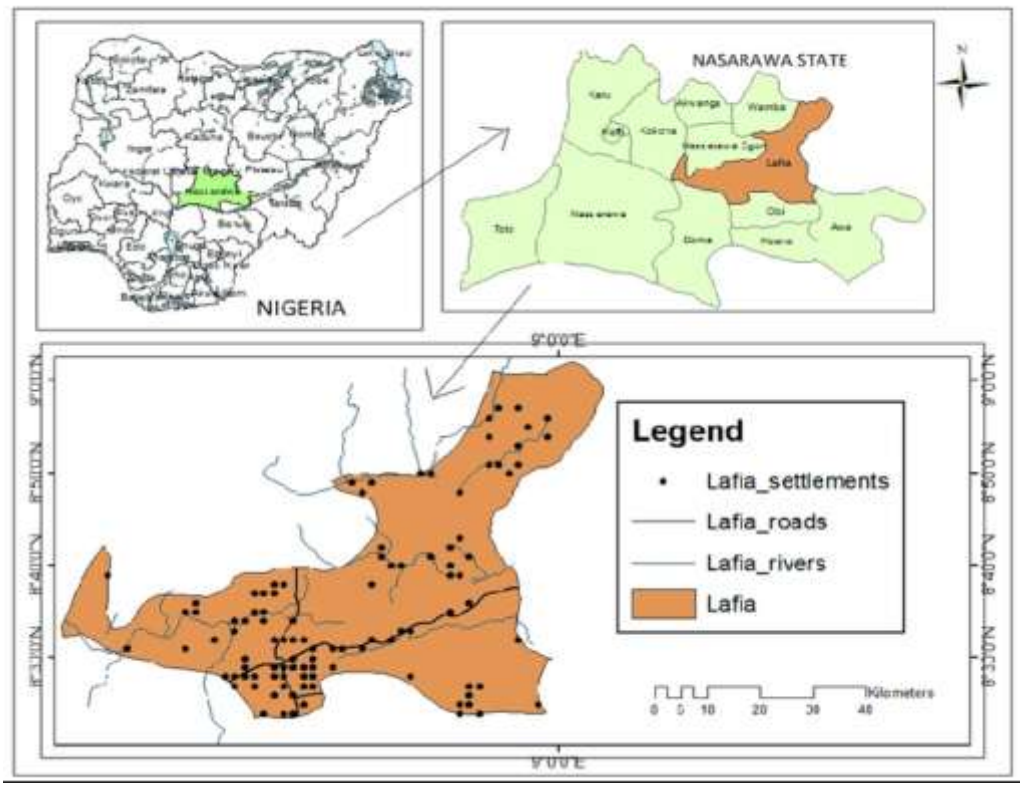
Agriculture is an important economic activity in Lafia LGA, alongside commerce, small-scale industries, and government services. Major crops cultivated include rice, maize, yam, and cassava. Farming is particularly

important in rural and peri-urban communities, where household livelihoods depend substantially on agricultural production. Land use includes residential and commercial settlements, agricultural lands, and natural vegetation, while expanding urban development continues to influence land-use patterns.

The drainage system comprises streams and rivers associated with the wider Benue River Basin. These water resources support agricultural activities but may also expose some locations to flooding during periods of heavy rainfall. Variations in rainfall, prolonged dry spells, and high temperatures can affect farming operations, crop yields, and farmers' livelihoods. Consequently, the climatic and agricultural characteristics of Lafia LGA make it suitable for assessing climate variability, climate change awareness, and preparedness among rice farmers. The study focuses specifically on rice farmers within Lafia LGA to determine their awareness of climatic changes, their level of preparedness, and the factors influencing their responses to climate-related risks.

METHODOLOGY

The study adopted a descriptive cross-sectional survey design to assess public awareness of atmospheric pollution, perceptions of climate change, and attitudes towards environmental protection in Lafia Local Government Area (LGA), Nasarawa State, Nigeria. Primary data were collected from 80 respondents using a structured questionnaire developed in line with the study objectives and relevant literature. The questionnaire covered awareness of atmospheric pollution and climate change, perceived sources of atmospheric pollution, reported climate-related environmental changes, and attitudes towards environmental protection and pollution-control measures. Respondents were drawn from nine communities: Akurba, Gandu, Bakinrijiya, Shabu, Kwandare, Agyaragun Tofa, Akunza, Angwan Rere, and Adogi. A multistage sampling technique was used to organise respondent selection across the selected communities, with respondents selected at the community level. Participation was voluntary, and responses were treated confidentially and used solely for academic purposes. Data were analysed using descriptive statistics, particularly frequencies and percentages, and presented in tables. Percentages were calculated using the valid responses to each question as the denominator, while multiple-response items were identified and interpreted accordingly. Frequencies and percentages were checked against the original questionnaire data to ensure consistency. Given the sample size of 40 respondents, the findings were interpreted cautiously and were not assumed to be statistically representative of all residents of Lafia LGA. The analysis focused on respondents' reported awareness and perceptions and did not constitute direct measurement of atmospheric pollutant concentrations or independent verification of long-term climate trends.



Data Presentation

A self-administered questionnaire was developed based on a review of relevant literature. The instrument was validated by three experts in environmental science and research methodology from Nasarawa State University Keffi, and their inputs were incorporated to enhance clarity, relevance, and overall validity.

The questionnaire comprised two sections. The first section captured respondents' demographic characteristics, including age, sex, education, occupation, and years of residence. The second section focused on awareness of atmospheric pollution, perceived climate change impacts, sources of pollution, and mitigation and adaptation strategies.

Responses were measured using a five-point Likert scale: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), and Strongly Agree (SA). For analysis, responses were grouped as follows:

SD and D = Not Agreed; N = Undecided; A and SA = Agreed. Higher scores indicated greater knowledge of atmospheric pollution.

The total scores were converted into percentages by dividing the obtained score by the maximum possible score and multiplying by 100. The results were categorized as follows: Low level (≤60%),

Medium level (61–70%), and High level (≥71%).

The demographic characteristics and questionnaire results are presented in Tables 4.1 and 4.2, respectively.

Table 4.1: Demographic characteristics of the Respondents

Demographic Information	**Respondents (n=80)**	
	No	**%**
Age group		
Under 25	15	12.5
25-34	25	17.5
35-44	20	25.0
45-54	15	27.5
55 and above	5	15.0
Min-Max	22–65 years	
Mean±SD	41.3 ± 11.4	
Educational level		
Postgraduate degree	17	12.5
University degree	22	45.0
Tertiary education (Diploma/NCE)	25	25.0
Primary/Secondary education	10	7.5
No formal education	6	10.0
Period of residence		
5 years	10	12.5
10 years	30	37.5
15 years and above	40	50.0
Min-Max	3–25 years	
Mean±SD	13.8 ± 5.6	

Occupation		
Employed	30	37.5
Unemployed	12	15.0
Farmers	18	22.5
Self-Employed	20	25.0

Source: Field Survey, 2026**.**

Statistical Analysis

The collected data were coded, entered, and analyzed using IBM SPSS Statistics (version 26). Descriptive statistics, including frequencies, means, and standard deviations, were used to summarize the data.

The normality of data distribution was assessed using the Kolmogorov–Smirnov test. Inferential analysis was conducted using Analysis of Variance to determine significant differences among groups. Where significant differences were observed, the Bonferroni post hoc test was applied to identify specific group differences. All statistical tests were conducted at a 5% level of significance ($p < 0.05$).

Respondents' Awareness and Perception of Atmospheric Pollution and Climate-Related Changes.

4.1: Awareness of atmospheric pollution

Table 4.2: Awareness of Atmospheric Pollution * responses Cross-tabulation

			responses			Total
			agreed	not agreed	have no idea	
Awareness of Atmospheric Pollution	aware of what atmospheric pollution means	Count	25	5	10	40
		Expected Count	32.8	1.3	5.8	40.0
		% within Awareness of Atmospheric Pollution	62.5%	12.5%	25.0%	100.0 %
		% within responses	12.7%	62.5%	28.6%	16.7%
		% of Total	10.4%	2.1%	4.2%	16.7%
	I can identify sources of air pollution in my community	Count	38	0	2	40
		Expected Count	32.8	1.3	5.8	40.0
		% within Awareness of Atmospheric Pollution	95.0%	0.0%	5.0%	100.0 %
		% within responses	19.3%	0.0%	5.7%	16.7%
		% of Total	15.8%	0.0%	0.8%	16.7%
	Vehicle emissions contribute to air pollution in Lafia	Count	35	3	2	40
		Expected Count	32.8	1.3	5.8	40.0
		% within Awareness of Atmospheric Pollution	87.5%	7.5%	5.0%	100.0 %
		% within responses	17.8%	37.5%	5.7%	16.7%
		% of Total	14.6%	1.3%	0.8%	16.7%
	Industrial activities in	Count	38	0	2	40
		Expected Count	32.8	1.3	5.8	40.0

	Lafia release harmful gases into the air	% within Awareness of Atmospheric Pollution	95.0%	0.0%	5.0%	100.0 %
		% within responses	19.3%	0.0%	5.7%	16.7%
		% of Total	15.8%	0.0%	0.8%	16.7%
	Burning of refuse and waste materials pollutes the air	Count	28	0	12	40
		Expected Count	32.8	1.3	5.8	40.0
		% within Awareness of Atmospheric Pollution	70.0%	0.0%	30.0%	100.0 %
		% within responses	14.2%	0.0%	34.3%	16.7%
		% of Total	11.7%	0.0%	5.0%	16.7%
	Air pollution in Lafia has increased over the past 10 years	Count	33	0	7	40
		Expected Count	32.8	1.3	5.8	40.0
		% within Awareness of Atmospheric Pollution	82.5%	0.0%	17.5%	100.0 %
		% within responses	16.8%	0.0%	20.0%	16.7%
		% of Total	13.8%	0.0%	2.9%	16.7%
Total		Count	197	8	35	240
		Expected Count	197.0	8.0	35.0	240.0
		% within Awareness of Atmospheric Pollution	82.1%	3.3%	14.6%	100.0 %
		% within responses	100.0%	100.0%	100.0%	100.0 %
		% of Total	82.1%	3.3%	14.6%	100.0 %

Source: Field Survey, 2026**.**

Table 4.3: Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	39.136[a]	10	.000
Likelihood Ratio	40.357	10	.000
N of Valid Cases	240		

Source: Data Analysis, 2026.

4.2: Perception of Climate-Related Environmental Changes

Table 4.4: Perception of Climate-Related Environmental Changes * responses Crosstabulation						
			responses			Total
			agreed	not agreed	have no idea	
Perception of Climate-	Temperatures in Lafia	Count	37	2	1	40
		Expected Count	25.9	3.0	11.1	40.0

Related Environmental Changes	have become hotter over the years	% within Perception of Climate-Related Environmental Changes	92.5%	5.0%	2.5%	100.0%
		% within responses	15.9%	7.4%	1.0%	11.1%
		% of Total	10.3%	0.6%	0.3%	11.1%
	Rainfall patterns have changed in recent years	Count	26	5	9	40
		Expected Count	25.9	3.0	11.1	40.0
		% within Perception of Climate-Related Environmental Changes	65.0%	12.5%	22.5%	100.0%
		% within responses	11.2%	18.5%	9.0%	11.1%
		% of Total	7.2%	1.4%	2.5%	11.1%
	Dry seasons are now longer than before	Count	30	4	6	40
		Expected Count	25.9	3.0	11.1	40.0
		% within Perception of Climate-Related Environmental Changes	75.0%	10.0%	15.0%	100.0%
		% within responses	12.9%	14.8%	6.0%	11.1%
		% of Total	8.3%	1.1%	1.7%	11.1%
	Water sources are drying up more frequently	Count	32	8	0	40
		Expected Count	25.9	3.0	11.1	40.0
		% within Perception of Climate-Related Environmental Changes	80.0%	20.0%	0.0%	100.0%
		% within responses	13.7%	29.6%	0.0%	11.1%
		% of Total	8.9%	2.2%	0.0%	11.1%
	Agricultural productivity has declined due to climate changes	Count	19	1	20	40
		Expected Count	25.9	3.0	11.1	40.0
		% within Perception of Climate-Related Environmental Changes	47.5%	2.5%	50.0%	100.0%
		% within responses	8.2%	3.7%	20.0%	11.1%
		% of Total	5.3%	0.3%	5.6%	11.1%
	Health problems related to heat have increased	Count	17	0	23	40
		Expected Count	25.9	3.0	11.1	40.0
		% within Perception of Climate-Related Environmental Changes	42.5%	0.0%	57.5%	100.0%
		% within responses	7.3%	0.0%	23.0%	11.1%
		% of Total	4.7%	0.0%	6.4%	11.1%
	Air quality has worsened	Count	19	0	21	40
		Expected Count	25.9	3.0	11.1	40.0

	affecting respiratory health	% within Perception of Climate-Related Environmental Changes	47.5%	0.0%	52.5%	100.0%
		% within responses	8.2%	0.0%	21.0%	11.1%
		% of Total	5.3%	0.0%	5.8%	11.1%
	Economic activities are affected by climate variations	Count	22	3	15	40
		Expected Count	25.9	3.0	11.1	40.0
		% within Perception of Climate-Related Environmental Changes	55.0%	7.5%	37.5%	100.0%
		% within responses	9.4%	11.1%	15.0%	11.1%
		% of Total	6.1%	0.8%	4.2%	11.1%
	Climate change is a serious threat to our community	Count	31	4	5	40

Source: Field Survey, 2026**.**

Table 4.5: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	89.596[a]	16	.000
Likelihood Ratio	105.566	16	.000
N of Valid Cases	360		

Source: Data Analysis, 2026**.**

4.3: Perceived Sources of Atmospheric Pollution

Table 4.6: Perceived Sources of Atmospheric Pollution * responses Crosstabulation

			responses			Total
			agreed	not agreed	have no idea	
Perceived Sources of Atmospheric Pollution	Motor vehicles (cars, motorcycles, trucks)	Count	32	0	7	39
		Expected Count	25.0	9.8	4.2	39.0
		% within Perceived Sources of Atmospheric Pollution	82.1%	0.0%	17.9%	100.0 %
		% within responses	17.9%	0.0%	23.3%	14.0%
		% of Total	11.5%	0.0%	2.5%	14.0%
	Industrial emissions from factories	Count	36	0	4	40
		Expected Count	25.7	10.0	4.3	40.0
		% within Perceived Sources of Atmospheric Pollution	90.0%	0.0%	10.0%	100.0 %
		% within responses	20.1%	0.0%	13.3%	14.3%
		% of Total	12.9%	0.0%	1.4%	14.3%
		Count	20	17	3	40

	Burning of household waste and refuse	Expected Count	25.7	10.0	4.3	40.0
		% within Perceived Sources of Atmospheric Pollution	50.0%	42.5%	7.5%	100.0 %
		% within responses	11.2%	24.3%	10.0%	14.3%
		% of Total	7.2%	6.1%	1.1%	14.3%
	Dust from construction activities	Count	28	10	2	40
		Expected Count	25.7	10.0	4.3	40.0
		% within Perceived Sources of Atmospheric Pollution	70.0%	25.0%	5.0%	100.0 %
		% within responses	15.6%	14.3%	6.7%	14.3%
		% of Total	10.0%	3.6%	0.7%	14.3%
	Smoke from cooking with firewood/char coal	Count	15	23	2	40
		Expected Count	25.7	10.0	4.3	40.0
		% within Perceived Sources of Atmospheric Pollution	37.5%	57.5%	5.0%	100.0 %
		% within responses	8.4%	32.9%	6.7%	14.3%
		% of Total	5.4%	8.2%	0.7%	14.3%
	Quarrying and mining activities	Count	18	18	4	40
		Expected Count	25.7	10.0	4.3	40.0
		% within Perceived Sources of Atmospheric Pollution	45.0%	45.0%	10.0%	100.0 %
		% within responses	10.1%	25.7%	13.3%	14.3%
		% of Total	6.5%	6.5%	1.4%	14.3%
	Bush burning practices	Count	30	2	8	40
		Expected Count	25.7	10.0	4.3	40.0
		% within Perceived Sources of Atmospheric Pollution	75.0%	5.0%	20.0%	100.0 %
		% within responses	16.8%	2.9%	26.7%	14.3%
		% of Total	10.8%	0.7%	2.9%	14.3%
Total		Count	179	70	30	279
		Expected Count	179.0	70.0	30.0	279.0
		% within Perceived Sources of Atmospheric Pollution	64.2%	25.1%	10.8%	100.0 %
		% within responses	100.0 %	100.0%	100.0%	100.0 %
		% of Total	64.2%	25.1%	10.8%	100.0 %

Source: Field Survey, 2026**.**

Table 4.7: Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	77.136[a]	12	.000
Likelihood Ratio	93.742	12	.000
N of Valid Cases	279		

Source: Data Analysis, 2026**.**

4.4: Attitude towards Mitigation and Environmental Protection

Table 4.9: Attitude Towards Mitigation and Environmental Protection * responses Crosstabulation

			responses			Total
			agreed	not agreed	have no idea	
Attitude Towards Mitigation and Environmental Protection	Tree planting can help reduce atmospheric pollution	Count	26	10	4	40
		Expected Count	34.4	2.3	3.3	40.0
		% within Attitude Towards Mitigation and Environmental Protection	65.0%	25.0%	10.0%	100.0 %
		% within responses	10.8%	62.5%	17.4%	14.3%
		% of Total	9.3%	3.6%	1.4%	14.3%
	Using cleaner energy sources will reduce air pollution	Count	32	0	8	40
		Expected Count	34.4	2.3	3.3	40.0
		% within Attitude Towards Mitigation and Environmental Protection	80.0%	0.0%	20.0%	100.0 %
		% within responses	13.3%	0.0%	34.8%	14.3%
		% of Total	11.4%	0.0%	2.9%	14.3%
	Government should enforce stricter pollution control laws	Count	38	0	2	40
		Expected Count	34.4	2.3	3.3	40.0
		% within Attitude Towards Mitigation and Environmental Protection	95.0%	0.0%	5.0%	100.0 %
		% within responses	15.8%	0.0%	8.7%	14.3%
		% of Total	13.6%	0.0%	0.7%	14.3%
	Public education on environmental protection is needed	Count	39	0	1	40
		Expected Count	34.4	2.3	3.3	40.0
		% within Attitude Towards Mitigation and Environmental Protection	97.5%	0.0%	2.5%	100.0 %
		% within responses	16.2%	0.0%	4.3%	14.3%
		% of Total	13.9%	0.0%	0.4%	14.3%
	Proper waste management systems should be established	Count	40	0	0	40
		Expected Count	34.4	2.3	3.3	40.0
		% within Attitude Towards Mitigation and Environmental Protection	100.0 %	0.0%	0.0%	100.0 %
		% within responses	16.6%	0.0%	0.0%	14.3%
		% of Total	14.3%	0.0%	0.0%	14.3%
	Communities should be involved in environmental monitoring	Count	27	6	7	40
		Expected Count	34.4	2.3	3.3	40.0
		% within Attitude Towards Mitigation and Environmental Protection	67.5%	15.0%	17.5%	100.0 %
		% within responses	11.2%	37.5%	30.4%	14.3%

		% of Total	9.6%	2.1%	2.5%	14.3%
	Regular air quality monitoring should be conducted	Count	39	0	1	40

Source: Field Survey, 2026.

Table 4.10: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	67.911[a]	12	.000
Likelihood Ratio	67.297	12	.000
N of Valid Cases	280		

Source: Data Analysis, 2026.

Interpretation of Results and Discussion of Findings

The findings revealed that residents of Lafia Local Government Area demonstrated considerable awareness of atmospheric pollution, particularly regarding industrial emissions and motor vehicle exhaust, although gaps remained in understanding the meaning of atmospheric pollution and the effects of household waste burning. Respondents also perceived rising temperatures, changing rainfall patterns, prolonged dry seasons and more frequent drying of water sources, but considerable uncertainty existed regarding the implications of these changes for agricultural productivity, human health and economic activities. Industrial emissions, motor vehicles, bush burning and construction dust were identified as prominent perceived sources of atmospheric pollution. Furthermore, respondents expressed strong support for improved waste management, public environmental education, stricter enforcement of pollution-control regulations and cleaner energy sources. These findings highlight the need for targeted environmental education, effective pollution-control measures, community participation and regular air-quality monitoring in Lafia LGA. However, the results reflect respondents' awareness, perceptions and attitudes rather than direct measurements of pollution or independently verified climatic trends, and the discrepancy between the stated sample size of 80 and the 40 responses recorded for most questionnaire items requires verification.

RECOMMENDATIONS

Based on the study objectives and findings, the following recommendations are proposed;

i. Relevant government agencies, environmental organisations, and community leaders should intensify public education on atmospheric pollution and climate change, particularly to address the observed gap in climate-change awareness. Youths, community groups, and local associations should be actively involved in awareness campaigns.
ii. Environmental regulatory agencies should strengthen the monitoring and enforcement of emission standards for motor vehicles and industrial activities, which respondents identified as major perceived sources of atmospheric pollution. Improved waste management and restrictions on open waste burning should also be promoted to reduce avoidable emissions.
iii. Government and relevant agencies should promote community participation in pollution-control initiatives and strengthen mechanisms for reporting environmental violations. Permanent air-quality monitoring systems should be considered for Lafia LGA to provide objective measurements of pollutant concentrations and support evidence-based environmental management.

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