

An Assessment of Environmental Determinants of Tourism Sustainability in Kaduna Metropolis

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ABSTRACT

Tourism in Kaduna Metropolis is increasingly impacted by environmental challenges that threaten its growth and sustainability. This study assessed environmental factors affecting the sustainability of the tourism industry in Kaduna Metropolis. Data were acquired using a standardized questionnaire delivered to 367 respondents and key informant interviews with relevant stakeholders. Quantitative data were analyzed using descriptive and inferential statistics, including regression and principal component analysis (PCA), while qualitative data were coded and reviewed with NVivo software. The results revealed that environmental factors exert a considerable influence on tourist behavior. Security and safety were the most decisive considerations, with 99.2% of respondents underlining their importance. Similarly, cleanliness, proper waste management, and absence of pollution influenced site choice, with over 85% agreement, while accessibility and infrastructure were also significant (88.1%). PCA confirmed three key clusters of factors: environmental–safety (security, pollution, climate, accessibility), natural endowments (scenic beauty, biodiversity), and cleanliness–waste management. Environmental issues inhibited tourism significantly: 39% of respondents were often deterred from visiting destinations owing to negative conditions, while 63.7% changed travel plans because of seasonal or environmental factors. Natural hazards had significantly stronger effects, with 91.8% saying that flooding, poor drainage, or pollution shaped their site preferences. Results of the regression analysis revealed inadequate site maintenance as the most critical challenge (Odds Ratios up to 2.77, $p < 0.001$), followed by flooding, deforestation, and climate variability. The study concluded that environmental quality directly influences the viability of tourism in Kaduna Metropolis. The study recommended increased policy enforcement, improved waste management and drainage infrastructure, biodiversity conservation, and active community participation to ensure long-term tourism growth and its contribution to economic development.

Keywords: Environmental factors; Tourism; Kaduna Metropolis; Sustainability; Visitor behavior

1.0 INTRODUCTION

Tourism is one of the world's fastest-growing businesses, contributing considerably to economic growth, job creation, and sustainable development (Garg, 2025; Rasool et al., 2021). Globally, the sector accounts for more than 10% of GDP and is expected to reach 1.8 billion international visitor arrivals by 2030 (Baloch et al., 2023; UNWTO, 2023). Tourism, in addition to its economic benefits, promotes cultural exchange, recreation, and social integration, as well as achieving numerous Sustainable Development Goals (SDGs) through economic, social, and environmental linkages. However, the industry's long-term viability is becoming increasingly dependent on environmental circumstances, which influence the attractiveness and competitiveness of destinations.

Tourism is strongly institutionalized in industrialized nations such as Europe and North America, thanks to robust infrastructure, policy frameworks, and sustainable practices that balance economic rewards with environmental conservation (Lu, 2025). In contrast, many developing countries, notably those in Africa, continue to face challenges such as inadequate infrastructure, insecurity, and environmental deterioration. Despite these obstacles, tourism is a key

engine of diversity and growth. For example, in 2023, the sector contributed US\$27.09 billion to Nigeria's GDP and employed approximately two million people (Statista, 2024). However, insecurity and environmental concerns have hampered its potential, particularly in northern Nigeria (Mustapha, 2025).

Kaduna State exemplifies both the benefits and limitations of tourist development in this setting. The state is rich in natural and cultural features, including the Nok Cultural Site, Matsirga Waterfalls, Kamuku National Park, and Kufena Hills (Bununu et al., 2015; Mohammed, 2022). Kaduna Metropolis, in particular, serves as the state's administrative and socio-cultural hub, including attractions such as Trappco Ranch, Fifth Chukker Polo Club, and colonial heritage sites (Jeremiah, 2020). These resources establish the metropolis as a prospective tourism hotspot in northern Nigeria. However, rising urbanization, poor garbage disposal, flooding, deforestation, and biodiversity loss are reducing its appeal and sustainability (Odjugo, 2010; Stefanica et al., 2021).

While various studies have looked into tourism in Kaduna State, most have focused on its economic benefits, resource distribution, or community

involvement (Atuk et al., 2020; Ibrahim & Falola, 2021; Uboegbulam, 2024). Much less emphasis has been placed on how environmental variables such as security, sanitation, waste management, pollution, and biodiversity influence tourist preferences, visiting patterns, and seasonal travel behavior. This gap is crucial because knowing the environmental factors of tourism is required for developing solutions that are both commercially and environmentally sustainable.

Therefore, this study focuses on the impact of environmental factors on tourism in the Kaduna Metropolitan Area. It defines the primary environmental drivers of tourism locations and evaluates how they influence visitor selections, visitation patterns, and seasonal preferences. As a result, it offers evidence-based insights to policymakers, tourism stakeholders, and local

communities looking to improve the region's tourist sustainability.

2.0 MATERIALS AND METHODS

2.1 Study Area

Kaduna Metropolis, located between Latitudes $10^{\circ}23'00''$ and $10^{\circ}39'00''N$ and Longitudes $7^{\circ}20'16''$ and $7^{\circ}35'00''E$, spans an area of around 3,156 km² (Baba et al., 2020). It encompasses Kaduna North and Kaduna South LGAs, with sections of Chikun and Igabi LGAs. The area sits within the Northern Guinea Savannah zone and has a tropical savanna climate (Aw), marked by distinct wet (April–October, ~1400 mm rainfall) and dry (November–March) seasons (Baba et al., 2022). Temperatures often exceed 30–35°C in the hottest months (March–May), while relative humidity ranges from 25% to 90% (Abubakar et al., 2024).

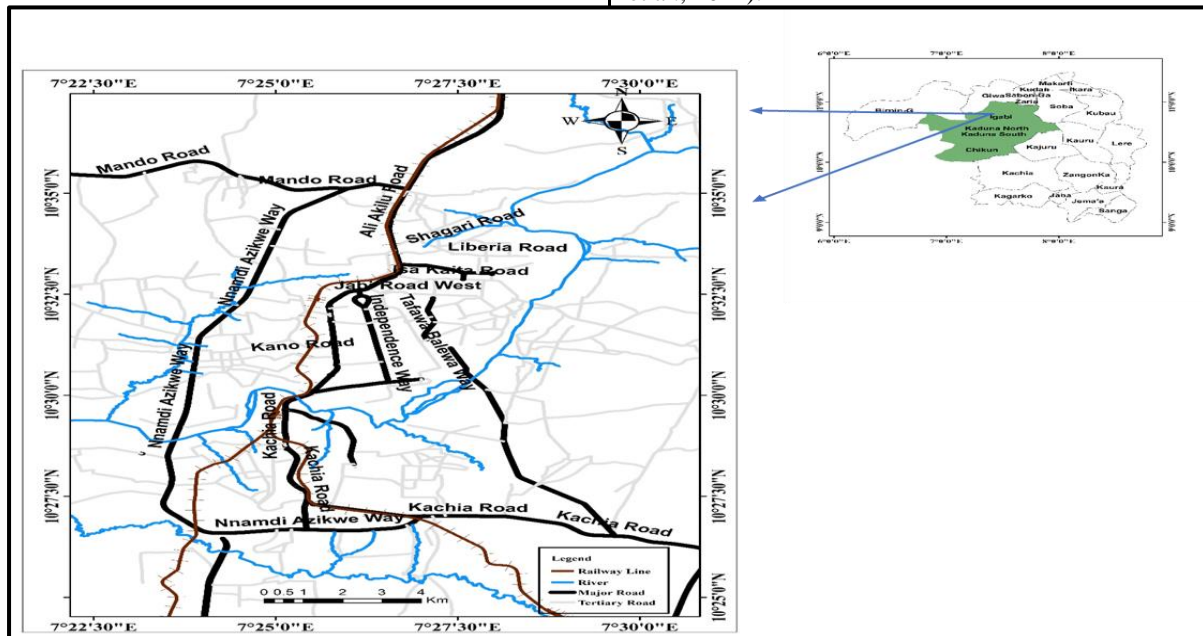


Figure 1: Study Area

Source: Modified from GRID3 - Nigeria, 2024

The terrain is mainly a plain of 600–800 m elevation, broken by stony hills and inselbergs, and drained by the Kaduna and Gurara Rivers (Isa et al., 2023). Soils are largely ferruginous tropical types with varying fertility, while vegetation consists of savanna grasslands with scattered trees and fringe forests increasingly threatened by fuelwood demand (Musa et al., 2022). Kaduna Metropolis is an urbanizing and industrializing metropolis with a population anticipated at over 3.3 million in 2024 (Baba et al., 2022). Its economy is diverse throughout industry, agriculture, trade, education, and hospitality. The presence of industrial zones, agro-processing, cultural markets, hotels, and sports facilities, plus natural and cultural attractions, makes it an important focus for socio-economic activities and tourism in northern Nigeria.

2.2 Methodology

2.2.1 Reconnaissance Survey

A reconnaissance survey was conducted from April 26th to 30th, 2025, to familiarize the researcher with the study area, assess the accessibility of selected tourist sites, and identify potential challenges in data collection. The survey covered some key tourist destinations in Kaduna Metropolis: Murtala Square, Hotel Seventeen, and Fifth Chukker Polo. During the survey, the researcher observed visitor flow, peak visitation hours, infrastructure availability, and environmental and security conditions at each site.



The reconnaissance also involved preliminary interactions with site managers, staff, and a few tourists to understand the operational dynamics of the sites, common environmental challenges, and potential factors influencing tourist behavior. These interactions provided valuable insights for refining the questionnaire, ensuring that questions were contextually relevant and easy for respondents to understand. Information gathered during the reconnaissance survey from 26th to 30th April, 2025, informed the logistical planning of the main data collection, including the distribution of research assistants, allocation of questionnaires, and scheduling of visits to each site to capture both peak and off-peak tourist flows. Conducting the reconnaissance survey allowed the researcher to anticipate and mitigate potential constraints, ensuring that the subsequent primary data collection would be efficient, comprehensive, and representative of tourists visiting Kaduna Metropolis.

2.2.2 Type, Sources, and Purpose of Data

To achieve the objectives of this study, Table 1 presents the types of data, their sources, and

corresponding purposes. Data on the socio-demographic characteristics of respondents, such as age, gender, education, income, and occupation, were obtained through structured questionnaires administered to tourists and residents. This information was used to understand how demographic profiles shape tourism participation and preferences in Kaduna State. Data on major environmental factors affecting tourism destinations, including climate, landscape, vegetation, and pollution levels, were collected through questionnaires to identify and analyze environmental influences on tourism. Similarly, questionnaires were used to generate data on how environmental factors influence tourist choices of destinations, visitation patterns, and seasons of travel, to examine the relationship between environmental conditions and tourist decision-making. Data on the impacts of environmental challenges such as deforestation, flooding, waste management, and biodiversity loss were gathered through questionnaires to assess their effects on the sustainability of tourism. Key Informant Interviews (KIIs) were also conducted with managers of the tourism sites. The study used only primary data, which was obtained directly from the field. The specific data to be collected is presented in Table 1.

Table 1: Type, Sources, and Purpose of Data

S/N	Types of Data	Source	Purpose
1	Socio-demographic characteristics of respondents	Structured questionnaire	To understand how demographics shape tourism participation
2	Major environmental factors affecting destinations	Structured questionnaire	To identify key environmental influences on tourism
3	Environmental factors influencing visitation patterns	Structured questionnaire	To examine how the environment affects tourist choices and seasons

Source: Author’s Compilation, 2025

2.2.3 Sample and Sampling Technique

Since the exact population of tourists visiting Kaduna Metropolis is not known, the sample size for this study was determined using Cochran’s formula for unknown populations. This formula provides a statistically valid minimum sample size based on the desired confidence level, margin of error, and estimated population proportion. The formula is expressed as:

$$no = \frac{z^2 \cdot p \cdot (1-p)}{e^2} \dots \dots \dots 1$$

The total sample of 384 respondents was distributed equally across seven selected tourist sites within Kaduna Metropolis to ensure representativeness. These sites include Bafra Hotel, Hotel Seventeen, Zee Cool Hotel, Jay Hilton Hotel, Green Apple Hotel, Top Galaxy Hotel, and Fifth Chukker Polo. Each site therefore received approximately 55 respondents (385 ÷ 7 = 55).

$$no = \frac{(1.96)^2 \cdot 0.5 \cdot (0.5)}{(0.05)^2} = 385$$

The questionnaires were administered in person at each tourist site. A trained research assistant approaches tourists at entry points, visitor centers, and within recreational areas to distribute the questionnaires and guide respondents through completion. This approach ensures that the responses are collected directly from actual tourists at the sites, capturing accurate and relevant data regarding their perceptions of environmental factors, visitation patterns, and sustainable tourism practices in Kaduna Metropolis.

2.2.4 Sampling Technique

To ensure that the sample of 385 respondents adequately represents tourists visiting Kaduna Metropolis, a combination of purposive and convenience sampling techniques was employed.



Purposive sampling was used to select the seven key tourist sites based on a high number of patrons: Bafra Hotel, Hotel Seventeen, Zee Cool Hotel, Jay Hilton Hotel, Green Apple Hotel, Top Galaxy Hotel, and Fifth Chukker Polo, because these sites are popular, diverse, and representative of the metropolis’s landmark attractions.

Within each selected site, convenience sampling was used to select individual respondents. Tourists were approached based on availability. Every visitor entering the site or within designated areas would participate in the study, provided they confirmed having stayed for 24 hours or more. This method ensures maximum coverage in selection while maintaining practical feasibility, given the flow of visitors at each site.

The number of questionnaires allocated to each site is approximately 55 respondents per site, distributed proportionally to cover peak visitation hours throughout the day. Research assistants were stationed at key points within the sites, such as entrances, ticketing areas, and recreational sections, to engage with tourists, explain the purpose of the study, and guide them in completing the questionnaire.

This sampling approach ensures that the data collected is both representative of the tourist population and captures diverse perspectives on environmental factors affecting sustainable tourism in Kaduna Metropolis. By combining purposive selection of sites with systematic sampling of respondents, the study minimizes selection bias and enhances the reliability and validity of the findings.

Table 2: Purposively Selected Tourism Sites

S/N	Tourism Site	No of Questionnaire
1	Hotel	55
	seventeen	
	Fifth Chukker	
2	Polo	55
3	Bafra Hotel	55
	Zee Cool	
4	Hotel	55
	Top Galaxy	
5	Hotel	55
	Green Apple	
6	Hotel	55
	Jay Hilton	
7	Hotel	55
	Total	385

Source: Author’s Analysis, 2025

2.2.5 Method of Data Collection

2.2.5.1 Structured questionnaire

A total of seven in-depth interviews were conducted with managers of selected tourist sites within the Kaduna Metropolis.

2.2.5.2 Key Informant Interviews (KIIs)

A total of seven in-depth interviews were conducted with managers of selected tourist sites within the Kaduna Metropolis. Each interview took place at the respective tourism site offices with the informed consent of participants. The interviews lasted approximately 5–10 minutes and were recorded and transcribed verbatim using the Otter.ai application to ensure accuracy. These KIIs provided detailed insights from individuals directly responsible for managing tourism facilities and implementing environmental practices. The transcripts were then analyzed using content analysis using NVivo software, enabling the systematic identification of recurring themes, patterns, and perspectives on how environmental management practices contribute to sustainable tourism development and economic growth in Kaduna Metropolis.

2.2.6 Data analysis

2.2.6.1 Identification of Major Environmental Factors Affecting Tourism Destinations

To identify the major environmental factors affecting tourism destinations in Kaduna State, data from Section B of the questionnaire were analyzed. Quantitative responses from the Likert-scale items were summarized using descriptive statistics, including frequency distributions, percentages, and mean scores, to determine the relative importance of factors such as pollution, biodiversity, climate conditions, waste management, and security. Principal Component Analysis was applied to identify the environmental factors that most strongly influence tourists’ decisions. Given a large set of variables, PCA identifies a small number of linear combinations (components) that retain most of the information of the variables. Suppose we have p variables x_1, \dots, x_p . A PCA analysis would identify z_1, z_2, \dots components that are linear combinations of the original variables,

$$z_1 = \phi_{11}x_1 + \phi_{12}x_2 + \dots + \phi_{1p}x_p \dots\dots\dots 2$$

$$z_2 = \phi_{21}x_1 + \phi_{22}x_2 + \dots + \phi_{2p}x_p \dots\dots\dots 3$$

$$z_3 = \phi_{31}x_1 + \phi_{32}x_2 + \dots + \phi_{3p}x_p \dots\dots\dots 4$$

We will have up to p components (unless the number of observations is less than p), but hopefully the first components will explain most of the information, and we can discard the others. This is why PCA is called a data reduction method.

2.2.6.2 Influence of Environmental Factors on Tourist Choices, Visitation Patterns, and Seasons

To assess how environmental factors influence tourists’ choices, visitation patterns, and seasonal travel, Section C of the questionnaire was analyzed. Descriptive statistics such as percentages, means, and standard deviations were used to summarize respondents’ perceptions of how flooding, poor drainage, climate variability, and environmental cleanliness impact their decisions to visit certain sites. Correlation analysis with

Pearson correlation coefficients was conducted to assess the strength and direction of relationships between specific environmental factors and tourist behaviors. Thematic analysis was applied to open-ended responses to explore how tourists modify their visitation timing and destination choices based on environmental conditions.

3.0 RESULTS AND DISCUSSIONS

3.1 Sociodemographic Characteristics of the Respondents

This section presents the sociodemographic characteristics of the respondents. The result is shown in Table 3.

Table 3: Sociodemographic Characteristics of the Respondents

Gender	Frequency	Percentage
Male	165	45.1
Female	201	54.9
Total	366	100.0
Age Group		
18-24	109	29.8
25-34	124	33.9
35-44	68	18.6
45-54	48	13.1
Above 55	17	4.6
Total	366	100.0
Marital Status		
Single	142	38.8
Married	167	45.6
Divorced	35	9.6
Widowed	22	6.0
Total	366	100.0
Educational Qualification		
Primary	45	12.3
Secondary	85	23.2
Tertiary	201	54.9
Other	35	9.6
Total	366	100.0

Table 3 reveals that the sample is somewhat more female-dominated, with females comprising 54.9% of the sample and males comprising 45.1%. The age structure indicates that most tourists belong to the young and early adult groups. In particular, 33.9% of them are between the ages of 25 and 34, and 29.8% are between the ages of 18 and 24. 18.6% of the respondents were between the ages of 35 and 44, and 13.1% were between the ages of 45 and 54. Only 4.6% of people who answered are older than 55. This distribution indicates that the sample is predominantly composed of younger individuals, with more than 60% of respondents being under 35 years old. A study by Puiu et al. (2022) suggests that young people are more likely to engage in sustainable tourism than older generations.

According to the marital status, 45.6% of respondents are married, and 38.8% are not. 9.6% of people are divorced, and 6.0% are widowed. In terms of educational attainment, the majority of respondents (54.9%) held tertiary-level qualifications, showing a reasonably high level of education within the population. Those with secondary education make up 23.2%, while 12.3% have only primary education. Additionally, 9.6% fell under the "other" category, which may include vocational training or non-formal education. This shows that the sample is generally well-educated, with more than half having acquired higher education, which may influence their socio-economic traits and attitudes. The high level of education among the surveyed tourists is similar to the findings of Ejiofor et al. (2012), who found a significant relationship between level of education and tourism. The study further argued that the lower the level of environmental awareness, the lower the residents' commitment to tourism.

3.1.1 Occupation, Monthly Income, and Nationality of the Respondents

This subsection presents the occupation, monthly income, and nationality of the respondents. The result is shown in Table 4.

Table 4: Occupation, Monthly Income, and Nationality of the respondents

Occupation	Frequency	Percentage
Civil Servant	122	33.3
Self-Employed	192	52.5
Unemployed	7	1.9
Student	45	12.3
Total	366	100.0
Monthly Income		
Below 50,000	15	4.1
50,000 - 100,000	76	20.8
100,001 - 200,000	151	41.3
200,001 - 300,000	45	12.3
Above 300,000	79	21.6
Total	366	100.0
Nationality		
Nigerian	282	76.8
British	21	5.7
German	8	2.2
South African	12	3.3
Indian	14	3.8
United States	5	1.4
Chinese	25	6.8
Total	367	100.0

Table 4 revealed that the occupational distribution of respondents indicates that over half (52.5%) are self-employed. Civil servants comprise 33.3% of the sample, suggesting that a substantial number of people rely on public sector employment. Students make up 12.3% of the respondents, whereas those who are unemployed make up only a minor percentage (1.9%). This result is

similar to that of Musa et al. (2023), who found that 30.1% of the residents in Kaduna Metropolis are civil servants.

Regarding income, most respondents fall within the middle-income bracket, with 41.3% reporting monthly earnings between ₦100,001 and ₦200,000. An additional 21.6% earn more than ₦300,000, indicating a significant portion of high-income earners in the sample. Respondents earning ₦50,000–₦100,000 make up 20.8%, while 12.3% reported earnings between ₦200,001 and ₦300,000. Only 4.1% indicated earnings below ₦50,000. This distribution shows a skew toward moderate to high income levels, suggesting respondents have relatively strong purchasing power. According to Zhang (2020), residents with higher incomes have a greater ability to pay for tourism; their disposable income supports tourism spending.

The nationality profile indicates that the majority are Nigerians (76.8%), while foreign nationalities comprise 23.2% of the sample. Among the international respondents, Chinese (6.8%) and British (5.7%) are the most represented groups, followed by Indians (3.8%), South Africans (3.3%), Germans (2.2%), and Americans (1.4%). This implies that although the survey population is largely Nigerian, it also comprises a level of foreign tourists, which may expand viewpoints within the data.

3.2 Major environmental factors affecting tourism destinations in Kaduna Metropolis

This study examined the major environmental factors influencing the choice of tourism destinations in Kaduna Metropolis. The result is shown in Table 5

Table 5: Major environmental factors influencing the choice of tourism destinations

Statement	SD	S	N	A	SA	Mean
The natural scenery influences my decision to visit a destination	25	36	62	151	92	3.83
The availability of clean and well-maintained environments affects my choice of tourism sites.	9	11	31	123	192	4.34
The presence of waste or litter at tourist sites discourages visitation	14	14	22	141	175	4.23
Pollution (air, water, noise) at tourist destinations affects my interest in visiting.	3	10	32	119	202	4.38
Security and safety in the environment influence my choice of tourism destinations	0	0	3	102	261	4.7
Climate conditions (temperature, rainfall patterns) affect my decision to travel to certain sites	8	28	20	122	188	3.87
Biodiversity (the presence of wildlife, plants) attracts me to visit tourist sites	22	29	48	155	112	4.2
Accessibility and infrastructure (roads, signage) in the environment influence my tourism choices	14	10	19	141	182	2.99

Table 5 illustrates respondents' assessments of environmental elements that influence their tourist decisions. The results reveal that natural scenery is a significant factor in visitation, with a majority either agreeing (41.3%) or strongly agreeing (25.1%) that it influenced their decision, while only a small fraction disagreed. Similarly, the availability of clean and well-maintained landscapes, such as parks, paths, and picnic areas, is a major motivator, with 86.6% of respondents agreeing or strongly agreeing, and only a small minority expressing disapproval. Waste management also appeared crucial, as 86.5% of respondents agreed or strongly agreed that the presence of waste or litter hinders their visit. Likewise, pollution (air, water, or noise) is considered a substantial barrier, with 87.7% agreeing or strongly agreeing that it impacts their interest in visiting areas. This reveals a clear concern for environmental quality among travelers.

Security and safety were considered as the most decisive considerations, with practically all respondents (99.2%) agreeing or strongly agreeing that

these influence their choice of travel destinations. This suggests that safety is a non-negotiable necessity for travel selections. Climate conditions also have a considerable effect, as 84.4% agreed or strongly agreed that weather patterns affect their travel choices, highlighting the importance of ideal climatic conditions for tourism. Biodiversity was also shown to be an important attraction, with 72.8% agreeing or strongly agreeing that the presence of wildlife and plants draws them to destinations; however, a small percentage remained indifferent or disagreed. Finally, accessibility and infrastructure (such as roads and signage) were regarded as key issues, with 88.1% of respondents affirming their influence on tourism decisions. Tangban et al. (2025) reported that in forest communities, wildlife watching gives tourists the opportunity to see and photograph animals in their natural habitats.

3.2.1 Principal Component Analysis

This study used the PCA to examine the dominant environmental factors influencing tourism in Kaduna Metropolis. Three principal components (PC1, PC2, PC3) were identified. The values indicate the strength and direction of association. These are: PC1 (Environmental–Safety Factor, 51.3% variance), PC2 (Nature & Scenery Factor, 33.1% variance), and PC3 (Cleanliness vs. Waste Trade-off, 15.6% variance). The factor loading is shown in Table 6.

Table 6: Principal Component Analysis - Factor Loadings (PCA, 3 components)

Variable	PC1	PC2	PC3
Natural scenery	-0.11	-0.96	0.24
Clean environment	-0.38	0.21	-0.87
Waste discourages	-0.46	0.09	0.88
Pollution effect	-0.46	0.11	0.88
Security & safety	-0.53	-0.12	-0.17
Climate conditions	-0.46	0.02	-0.17
Biodiversity	-0.12	-0.97	0.14
Accessibility	-0.46	0.07	-0.2

Source: Author's Analysis, 2025

Table 6 revealed that the Principal Component Analysis (PCA) found three underlying dimensions that account for the differences in the factors that affect environmentally friendly tourism. The first part (PC1) has a lot of negative loadings on safety and security, pollution, discouraging waste, climate conditions, and accessibility. Suggesting that various variables change together and make up a single underlying construct. This can be seen as the environmental management and safety underpinning of tourism sustainability. In practice, this implies that tourists think of safety, nice weather, easy access, and low pollution/waste as factors that are all connected and indicate whether a place is beneficial for the environment.

The second part (PC2) has a strong and harmful effect on natural scenery and biodiversity. This suggests that there is a separate nature and ecological attraction dimension. PC1 is about safety and infrastructure, while PC2 is about the value of the natural environment in tourism. The availability of beautiful landscapes and a wide range of species, which are the area's real natural capital, has a big effect on tourists. This finding shows that people see landscape and biodiversity as two different things that can help make tourism more sustainable, in addition to the safety and infrastructure conditions shown by PC1.

The third component (PC3) exhibits large positive loadings for waste discouragement and pollution effect, and a high negative loading for a clean

environment. This discrepancy shows a cleanliness and trash management impression element. Essentially, when tourists regard waste and pollution as discouraging, they also place a higher value on the presence of a visually clean environment. PC3 consequently indicates how visitors assess the negative impacts of pollution against the favorable benefits of environmental purity. This distinction suggests that waste management and cleanliness efforts are not only aesthetic concerns but also play a crucial role in shaping attitudes towards sustainable tourism. This finding aligns with those of Perkumienė et al. (2023), suggesting that enhancements in sustainable waste management can have a positive impact on both tourism and environmental sustainability.

The results of the Key Informant Interviews (KIIs) revealed the major environmental challenges affecting tourism destinations in Kaduna Metropolis. These are summarized in Table 7.

Table 7: Thematic Analysis of Major Environmental Factors Influencing Tourism

Theme	Sub-themes
Major environmental factors influencing tourism in Kaduna Metropolis	Insecurity Waste Management Seasonal variations Pollution and Infrastructure Problems

Source: Author's Analysis, 2025

a. Insecurity

Most of the stakeholders consistently identified insecurity as a primary barrier that affects business operations and deters tourists from visiting the region. For example, P1 said:

"Insecurity for sure, because, like every other business, once that environment is not secured, certainly the business will be affected. Insecurity, for sure, is a global issue. Coming down to Nigeria is a national problem, and every stakeholder in the world has to work out how they can solve the security one. Security is a woman's business. You get in our own little way. We provided security for our business and our customers who come around."

This point was buttressed by another manager (P2), who added,

"The major challenge is the insecurity. I come from a place

where 80% of the income of the country comes from tourism.”

This aligns with the findings of Shenpam and Dangle (2024), who found that insecurity makes tourism in Nigeria very hard because it scares away tourists, lowers the number of people who come, and makes people less likely to invest in tourism infrastructure because they are worried about safety. Specifically, it confirms the findings of Tume (2024) that insecurity hurts Nigeria's hotel industry a lot since it makes customers less confident, which leads to a big drop in occupancy rates and income, more operational costs for better security, and a general drop in tourism and investment in the industry.

b. Waste Management

The stakeholders believe inadequate waste management presents another significant challenge, particularly affecting hotels and restaurants due to inadequate drainage systems and poor government-managed waste disposal, which negatively impacts the visual appeal and overall tourist experience. For example, one of the managers (P3) said,

“... this waste management and pollution, you cannot have a hotel, for example, and then there's a poultry farm or there's a factory close to you. You know, you have this awful smell. It will not be possible to conduct business in that kind of environment. That is one. Then, this waste management can be a problem, because outside the compound, you don't really have control over what is happening there.”

This point was buttressed by another (P1) manager,

“In hospitality and coming down to hotel, you know, we do lot of food provision, where we have a lot of gatherings, restaurants, and you, the business attract a lot of waste to that aspect, because you do the kitchen management, where after every day, after the cooking, lot of leftovers and the rest will always try to forget to dispose them off. At times, you see the areas we have designated for waste to be dumped, and they get filled, waiting for proper collection. You can see them spilling over, overwhelmed by the quantities of this waste. But the government has done an excellent job because they have the agents that want to keep them around.”

This result aligns with the findings of Lagasi et al. (2019), who revealed that 55% of the volume of waste generated is from food. Folalu (2017) reported that food wastage in the hotel industry was caused by improper storage for raw materials, and can arise due to overproduction of food in the kitchen.

c. Seasonal Variations

Variation in the seasons also influences tourism patterns, with the rainy season affecting outdoor tourism activities while benefiting the environment through lush greenery, whereas the dry season poses resource challenges. One of the managers (P3) said,

“Our own facility is closed. So, we hardly, we are not really affected by these changes in season, but you see, if you consider tourist facilities that are open spaces, or we call them open-roof sites, then they're significantly affected. But mostly our kind of guests are not influenced by changes in season, because they come during dry season, they come during wet season, and so on.”

Another manager (P1) confirmed that these challenges are more prominent.

“Tourism is a very big business, and it's very vast. You know, we have the outdoor aspect of tourism, right? We have an open space way that attracts activities that have to do with pleasure. Where you have open space, once it's the rainy season, certain people don't want to expose themselves to the rain. But for those who operate a closed space within our tourism business does not really affect their business. For example, okay, ours is largely a closed space, except for the crew that is open. So, sure, it might affect the open space area for business. But for the close is that the halls, the rooms, the restaurants keep operating because we. We have shelter over our customers where they are located.”

This result agrees with the findings of Oladeji et al. (2019) and Segun (2015) that changes in rainfall patterns, increased sunlight and heat, and heavy wind affect patronage to tourism destinations.

d. Pollution and Infrastructure Problems

According to the stakeholders, air pollution from industries and the presence of other businesses, such as poultry farms or factories creating unpleasant odors, directly impacts tourist satisfaction and business operations. One of the managers (P3) said,

“Tourists are actually interested in things they see, even on the road getting to the facility, not just what is in your facility. So, they are not interested in the tourist site alone. They are also interested in the surroundings. Yes, waste management can actually negatively affect.”

This aligns with the findings of Kukoyi and Ezenagu (2013) that pollution is bad for hotel businesses because it makes guests unhappy, drives away potential

staff, raises costs of doing business, and lowers profits and brand reputation.

3.3 Influence of environmental factors on tourist choices of destinations, visitation patterns, and seasons of travel in Kaduna Metropolis

This section of the chapter examined the influence of environmental factors on the choice of destination and the pattern of visitation in Kaduna Metropolis. The result is shown in Figure 2.

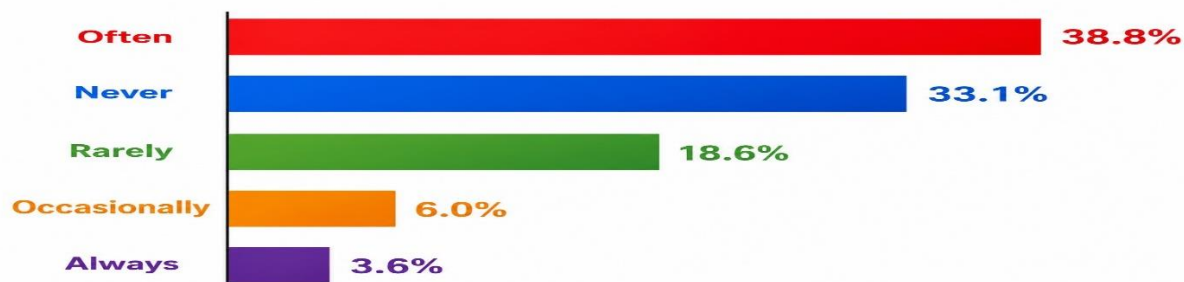


Figure 2: The influence of environmental conditions on visitation

Figure 2 revealed that 33.1% believed environmental concerns, such as flooding, heat, or poor drainage, never prohibit them from visiting destinations; the majority experienced varied degrees of interruption. Specifically, 18.6% responded that such situations rarely hinder them, and 6.0% reported being occasionally discouraged. Notably, a significant number of the respondents, 38.8%, believed that they are often prohibited from traveling due to unfavorable environmental conditions, while 3.6% answered that they are always affected.

3.3.1 Change of Plans due to environmental factors

This subsection presents the responses of the respondents on how often they change their tourism plans based on environmental conditions. The result is shown in Figure 3.

Figure 3: Change of Plans due to environmental factors

The findings from Figure 3 reveal that the majority of respondents (63.7%) modify the schedule of their trips based on environmental factors such as seasonal differences between rainy and dry periods. This implies that climatic circumstances greatly impact travel behavior, with most tourists choosing to visit sites during periods viewed as more pleasant or convenient. On the other hand, 36.3% said that they do not adjust their vacation patterns owing to environmental circumstances, suggesting that for certain visitors, travel plans are less subject to climatic or seasonal fluctuations.

3.3.2 Influence of Climate and Environmental Hazards on Tourism

This subsection examined the influence of seasonal variability and the occurrence of environmental hazards on tourism in Kaduna Metropolis. The result is shown in Table 8.

Table 8: Influence of Climate and Environmental Hazards on Tourism

How strongly do the following factors influence your visitation pattern	Not at all	Slightly	Moderately	Strongly	Very Strongly
Seasonal climate (rainy/dry season)	22	38	60	141	105
Presence of natural hazards	2	0	28	81	255

Source: Author's Analysis, 2025

The results from Table 8 suggest that both seasonal climate and the existence of natural hazards exhibit considerable influence on visiting patterns, though to varying degrees. For seasonal climate (rainy/dry season), a majority of respondents reported being either significantly (38.5%) or very substantially (28.7%) influenced, while 16.4% claimed moderate influence.

Only a tiny proportion claimed slight (10.4%) or no influence at all (6.0%). This illustrates that changes in meteorological conditions strongly affect when travelers choose to go, indicating the relevance of seasonality in tourism planning.

The presence of natural dangers appeared as an even stronger factor in tourism. An overwhelming majority

of respondents (69.7%) claimed that natural risks very significantly influence their travel patterns, while 22.1% reported a strong influence. Moderate influence was reported by 7.7%, while just a tiny fraction (0.5%) claimed no influence at all. These findings agree with Shimizu et al. (2023), who implied that safety concerns associated with natural hazards hold more weight in tourists' decisions than seasonal climate variations, underscoring the crucial importance of environmental risk management in sustaining tourism.

3.3.3 Specific Tourism Sites Avoided due to environmental conditions

This subsection examined the tourism sites abandoned by tourists due to environmental conditions. The result is shown in Figure 4.

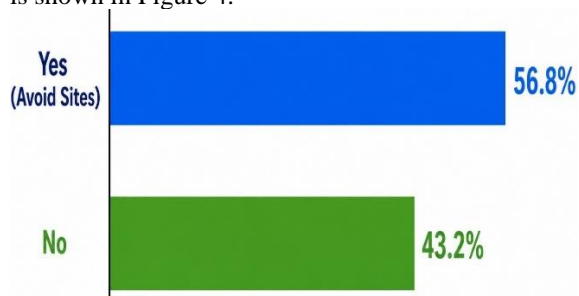


Figure 4: Specific Tourism Sites Avoided due to environmental conditions

The result from Figure 4 reveals that a majority of respondents (56.8%) reported avoiding certain areas in Kaduna Metropolis owing to adverse environmental conditions, while 43.2% answered that they do not avoid any sites for similar reasons. This agrees with Baloch et al. (2022) that tourists are deterred by environmental difficulties such as flooding, heat stress, poor drainage, rubbish accumulation, or insecurity at certain attractions. The research demonstrates the extent to which environmental circumstances can severely affect tourism participation, lowering the attractiveness and accessibility of specific destinations.

4.0 DISCUSSION

This study emphasizes the importance of environmental issues in determining tourist sustainability within the Kaduna Metropolis. The result that security is the most influential variable is consistent with prior research in sub-Saharan Africa, where insecurity has been demonstrated to dissuade both domestic and international visitors (Oluwafemi et al., 2025; Omodero, 2024). The presence of insecurity near tourism locations in Kaduna highlights the need for improved institutional and community-based security frameworks to protect the sector.

This study's emphasis on waste management and environmental cleanliness is similar to previous studies

in Ghana and Kenya, where inadequate sanitation has been highlighted as a major impediment to site attractiveness (Hadassa, 2024; Van Minh & Hung, 2011). In Kaduna, inadequate waste management not only degrades the visitor experience but also accelerates environmental degradation, jeopardizing the ecological assets on which tourism relies.

Climatic variability, notably seasonal rainfall and harmattan-induced haze, was found to influence visiting patterns. This finding, which is consistent with research in Tanzania and Ethiopia (Mwongoso et al., 2023; Tadesse, 2023), implies that climate-sensitive planning, such as creating all-weather tourism facilities and diversifying off-season activities, is critical to lowering vulnerability to climatic extremes.

The study emphasizes the importance of biodiversity and natural scenery as attractions, mirroring Uboegbulam's (2024) findings that biological features remain key to Kaduna's tourism appeal. However, increased deforestation, overexploitation of vegetation, and urban expansion endanger these resources, necessitating the immediate inclusion of conservation techniques into tourism planning.

From a theoretical standpoint, the PCA findings improve our understanding of environmental-tourism interactions by categorizing the drivers into three dimensions: safety and management, natural attractions, and cleanliness trade-offs. These characteristics reflect the "triple bottom line" approach to sustainable tourism, in which environmental integrity, social well-being, and economic viability must all be pursued concurrently (UNWTO, 2019). Overall, this study adds to the evidence that environmental quality is a key driver of tourism competitiveness, particularly in fast urbanizing African contexts like Kaduna Metropolis.

5.0 CONCLUSION

This study looked at environmental elements that influence tourist sustainability in the Kaduna Metropolis, Nigeria. The findings demonstrated that security, waste management, climatic conditions, biodiversity, and pollution all have a significant impact on tourists' destination preferences, visitation patterns, and seasonal behavior. PCA reduced these to three main dimensions: safety and environmental management, natural landscape and biodiversity, and waste-cleanliness trade-offs.

The findings underline the importance of enhancing environmental safety, protecting ecological assets, and resolving seasonal issues for Kaduna's tourism development to be sustainable. Policymakers and stakeholders should consequently embrace a comprehensive approach that strengthens security,

improves waste and pollution management, and promotes biodiversity protection while updating tourism infrastructure. This would not only increase tourist satisfaction and competitiveness but would also establish Kaduna Metropolis as a viable tourism destination in Nigeria and abroad.

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