



Assessing the influence of Urban Heat Island Effects on Environment and Human Health in Calabar, Nigeria

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Receive February, 2026, accepted and published April, 2026

Abstract

The study of Urban Heat Island (UHI) has emerged as a major environmental challenge associated with rapid urbanization and climate change in developing countries. It is observed that in Nigeria, medium-sized cities such as Calabar are increasingly experiencing elevated atmospheric and land surface temperatures resulting from land-use changes, population growth, infrastructural expansion, and declining vegetation cover. Qualitative research design was adopted for the study using thematic content analysis. Calabar metropolis was divided into four zones, North, East, South and West. Data was collected using questionnaire. Purposive sampling method was used to select one hundred respondents from each of the zones, making a total of 400 respondents. The administration of instrument was done using accidental procedure. Simple percentage was used to answer the questions on the causes, environmental effects and health effects of urban heat island in Calabar metropolis. The result of the study found that there is a relationship between urban heat island, environmental effects and human health in Calabar metropolis. The result of data analysis further revealed that Urban Heat Island contributes to heat stress, respiratory illnesses, dehydration, cardiovascular complications; poor sleep quality, and environmental discomfort among urban residents. It was concluded that urban heat island affects the environment and health of residents of Calabar metropolis. It was recommended among others that urban greening, climate-sensitive urban planning, sustainable waste management, increased public health awareness, and enforcement of environmental regulations as measures for mitigating UHI effects.

Keywords: *Urban Heat Island, climate change, environmental health, human health, urbanization.*

Introduction

Rapid development and urbanization in recent times has become one of the most significant demographic and environmental transformations of the twenty-first century. Globally, cities are expanding rapidly due to population growth, industrialization, rural-urban migration, and economic development. While urbanization contributes to socio-economic growth and infrastructural development, it also generates various environmental challenges like increased surface and atmospheric heat, pollution, ecological degradation, and climate-related hazards (Wiedmann & Lenzen, 2018; Watts, et al. 2018; UN-Habitat, 2022). One of the most prominent

environmental consequences of urbanization is the Urban Heat Island (UHI) phenomenon. Urban Heat Island refers to the condition whereby urban areas experience higher temperatures than surrounding rural areas as a result of anthropogenic activities and with the concomitant replacement of natural vegetation surfaces with impervious surfaces like asphalt, concrete, and roofing materials (Watts, et al. (2019; Yong & Lim, 2020). These impervious surfaces absorb and retain solar radiation, thereby increasing surface and atmospheric temperatures within cities. Urban Heat Island has become a major concern because of its environmental, economic, and public health implications. Elevated urban temperatures contribute to increased energy consumption, deteriorating air quality, greenhouse gas emissions, and thermal discomfort. According to the Intergovernmental Panel on Climate Change (IPCC, 2021; Watts, et al. 2019; Eneji, et al 2022), urban warming interacts with global climate change to intensify heat-related hazards in cities worldwide.

In developing countries such as Nigeria and other African and Asian countries, rapid and poorly planned urbanization has intensified environmental stress and urban climate vulnerability. Nigerian cities are experiencing increasing land-use changes characterized by vegetation loss, road expansion, industrial growth, and increased population density (Weagle, et al. 2018; Adelekan, 2020). These changes contribute significantly to urban thermal imbalance and declining environmental quality. Although studies on Urban Heat Island have focused extensively on major metropolitan areas such as Lagos, Abuja, and Port Harcourt, medium-sized cities such as Calabar remain relatively under-researched despite increasing urbanization and infrastructural expansion. A study by Abimbola, et al., (2025) found that Calabar, the capital city of Cross River State, has experienced rapid physical development over the last two decades due to tourism, educational growth, commercial expansion, and population increase. The transformation of natural vegetation into built-up environments in Calabar has altered the thermal characteristics of the city. Increasing traffic congestion, deforestation, establishment of

residential facilities, indiscriminate waste disposal, and expansion of road networks have further contributed to environmental degradation and urban warming.

Recent studies by Eneji, et al., (2022b); Odunsi and Rienow, (2024); Abimbola, et al., (2025) and Oyeniyi et al., (2025) further shows that land-use changes and declining vegetation significantly intensify urban heat effects in Nigerian cities. Similarly, environmental studies in Calabar reveal increasing ecological stress, pollution, and declining environmental sustainability associated with urban expansion (Eneji, et al., 2022a, Eneji, et al., 2025; Ifon et al., 2026). Urban Heat Island also has serious implications for human health. Excessive heat exposure increases the risk of dehydration, respiratory diseases, cardiovascular complications, heat exhaustion, fatigue, and mental stress (WHO, 2021). Vulnerable populations such as children, elderly persons, outdoor workers, and low-income residents are particularly susceptible to heat-related illnesses. The interaction between climate change and Urban Heat Island further intensifies urban health risks. Rising global temperatures amplify local urban warming, thereby increasing the frequency and severity of heat waves and environmental stress (UNEP, 2023; Odunsi & Rienow, 2024; Oyeniyi et al., 2025). Berman et al. (2017) observed that consequently, understanding the relationship between Urban Heat Island and human health has become increasingly important for sustainable urban planning and climate adaptation.

Hardy, et al. (2019) posited that urban heat island refers to the phenomenon whereby urban areas record significantly higher temperatures than surrounding rural environments because of anthropogenic activities and built infrastructure (Weagle, et al. 2018; Yong & Lim, 2020). The phenomenon occurs due to changes in land surfaces, reduced vegetation cover, concentration of buildings, industrialization, and transportation emissions. Furthermore, Lessler, et al. (2018) also observed that urban heat island may occur as Surface Urban Heat Island (SUHI) or Atmospheric Urban Heat Island. Surface UHI relates to elevated land surface temperatures caused by impervious surfaces such as asphalt and concrete, while Atmospheric UHI involves increased air temperature within urban areas (Sobstyl et al., 2017; Lessler, et al. 2018). Urban

Heat Island has become more severe in developing countries where urban growth often occurs without adequate environmental planning. Rapid urban expansion contributes to thermal imbalance, environmental degradation, and climate vulnerability.

In their study, Mohammed and Mustapha, (2026) found that urbanization significantly alters natural landscapes and ecological system's equilibrium. As urban areas expand, vegetation and permeable soils are replaced with buildings, roads, parking lots, and industrial facilities that absorb solar radiation and increase heat retention (Adebayo, 2023). Research in Nigerian cities indicates that urban expansion contributes significantly to increased land surface temperatures (Mohammed & Mustapha, 2026). Odunsi and Rienow (2024) observed that infrastructural development and economic growth intensified surface urban heat effects in Abeokuta, Nigeria. Similarly, Oyeniyi et al. (2025) found that land-use changes and declining vegetation significantly increased urban thermal intensity in Akure and Osogbo. These findings are relevant to Calabar, where increasing urban sprawl has reduced green spaces and altered environmental conditions. Urban Heat Island studies in Nigeria increasingly utilize Geographic Information

Systems (GIS), remote sensing, and satellite imagery to examine urban thermal patterns. Abimbola et al. (2025) reported that urban growth and vegetation decline contributed significantly to increasing thermal discomfort in Lafia, Nasarawa State. Their findings showed a strong relationship between land-use change and urban temperature increase. Studies conducted in Northwestern Nigeria also revealed that declining urban forests intensify thermal stress and reduce climate resilience (Ojerinde et al., 2026). Urban forests therefore play a critical role in moderating urban temperatures. Although studies focusing specifically on Calabar remain limited, environmental investigations reveal growing ecological stress associated with urban development and environmental pollution (Schandl, et al. 2018; Ifon et al., 2026).

Environmental Effects of Urban Heat Island

According to Nchor and Ukam, (2024) urban heat island contributes to numerous environmental problems, including increased air pollution, declining biodiversity, poor

environmental quality, and ecological instability. Elevated urban temperatures accelerate the formation of ground-level ozone and particulate matter, thereby worsening air pollution.

According to Efe (2021), increased urban heat contributes to declining environmental sustainability in Nigerian cities. Urban warming also affects hydrological systems by increasing evaporation rates and altering rainfall patterns. Flooding and water scarcity become more severe in poorly planned urban areas. In Calabar, environmental degradation has become increasingly evident through waste accumulation, declining water quality, and pollution associated with urban growth (Shultz, et al. 2018; Ifon et al., 2026). Urban vegetation plays an essential role in regulating temperature and improving environmental sustainability. Trees and green spaces reduce urban temperatures through shading and evapotranspiration. Akinyemi (2025) found that green infrastructure significantly improves urban thermal regulation in West African cities. Urban forests therefore serve as important climate adaptation tools. Unfortunately, rapid urbanization in Calabar has led to increasing deforestation and reduction in green cover. Construction activities and road expansion continue to replace natural vegetation with heat-absorbing surfaces.

Human Health Implications of Urban Heat Island

In their respective studies on the effect of urban heat island on human health and the environment, Oita, et al. (2016); Ogbonna and Amangabara, (2021) and Odunsi and Rienow, (2024) found that urban heat island has serious implications for human health and well-being. The authors further posited that prolonged exposure to excessive heat increases the risk of heat stress, dehydration, respiratory diseases, cardiovascular complications, fatigue, and psychological stress (WHO, 2021). Heat exposure particularly affects vulnerable populations such as children, elderly persons, pregnant women, and outdoor workers. Low-income residents living in overcrowded neighborhoods are also highly susceptible to heat-related illnesses. Urban heat also affects sleep quality and productivity. High nighttime temperatures prevent adequate body cooling, resulting in discomfort and mental stress.

Air pollution associated with Urban Heat Island aggravates respiratory illnesses such as asthma, bronchitis, and allergies. Increased temperatures accelerate chemical reactions in the atmosphere, thereby increasing ozone concentration. Ogbonna and Amangabara (2021) observed that environmental pollution contributes significantly to public health challenges in urban areas. Similarly, waste dumpsites and traffic emissions in Calabar contribute to declining air quality and respiratory discomfort among residents. Urban Heat Island increases water demand due to rising temperatures and evaporation rates. Water scarcity therefore becomes more severe in urban areas experiencing thermal stress. Nchor and Ukam (2024) found that reported declining access to potable water in informal settlements within Calabar increases the risks of water shortages combined with excessive heat increasing public health vulnerability and disease transmission.

Not only does urban heat island cause water shortages, there are also the socioeconomic dimensions of urban heat island. Ojerinde, et al. (2026) also found that urban heat island disproportionately affects low-income communities due to poor housing conditions, overcrowding, and inadequate access to cooling systems. Climate inequality has therefore become an important dimension of Urban Heat Island research. Informal settlements often lack green spaces, drainage infrastructure, and environmental protection. Residents in poorly planned neighborhoods experience greater exposure to environmental hazards and heat-related diseases. Climate change intensifies Urban Heat Island effects by increasing global temperatures and heat-wave frequency. Urban warming and climate change interact synergistically to worsen environmental stress and public health risks (Stanaway, et al. 2019; IPCC, 2021; Okeke, 2024).

UNEP (2023) cited in Oyeniya, et al. (2025) noted that cities worldwide are becoming increasingly vulnerable to thermal hazards and climate-related disasters. Developing countries are particularly vulnerable because of weak environmental governance and inadequate infrastructure. Urban planning remains one of the most effective strategies for mitigating Urban Heat Island effects. Sustainable urban planning incorporates climate-sensitive architecture, green infrastructure, drainage systems, and urban forestry into city development. Okeke (2024)

emphasized the importance of climate resilience in urban planning policies within Nigerian cities. Similarly, Akinyemi (2025) advocated increased investment in urban green infrastructure as a strategy for reducing urban thermal stress. Other mitigation measures include cool roofs, reflective pavements, sustainable waste management, and environmental education.

Studies have shown that urban heat island has become a growing environmental concern in many developing countries due to rapid urbanization, climate change, and unsustainable land-use practices (Chaves, et al. 2020; Efe, 2021; Guo, et al. 2022). In Nigeria, urban growth has resulted in increased replacement of natural vegetation with buildings, roads, and other impervious surfaces that absorb and retain heat (Efe, 2021). Calabar, once regarded as one of Nigeria's greenest cities, has experienced substantial environmental transformation due to rapid infrastructural development and population growth. Expansion of road networks, commercial centers, residential buildings, and transportation activities has contributed to increasing thermal discomfort and environmental degradation. Despite the growing evidence of urban warming in Nigerian cities, limited studies have comprehensively examined the relationship between Urban Heat Island and environmental and human health in Calabar. Existing studies have focused primarily on environmental pollution, waste management, and urban development without adequate attention to thermal stress and public health implications (Koko, et al. 2021).

Furthermore, rising urban temperatures increase vulnerability to heat-related diseases, reduce environmental comfort, and threaten sustainable urban living. Poor urban planning, inadequate green spaces, and weak environmental regulations further intensify these challenges. The absence of adequate empirical studies on Urban Heat Island and health implications in Calabar creates a knowledge gap that limits effective policy formulation and climate adaptation planning. This study therefore seeks to address this gap by examining the causes, environmental effects, and human health implications of Urban Heat Island in Calabar, Nigeria.

Theoretical Framework

This study is anchored on the Classic Urban Ecological Theory, propounded by Robert E. Park and Ernest W. Burgess in 1920. The theory posits that cities function similarly to natural ecosystems and biological environment. The theory further explains the interaction between human activities and environmental systems within urban areas. The core principles of the theory are:

- a. struggles for land, urban structures and neighborhood dynamics are consequences of competition for limited valuable urban land
- b. succession and land invasion: just as plant species compete for sunlight and water, human group compete for urban spaces- dominant group take the most desirable areas, causing weaker groups to be pushed to other zones.
- c. Concentric rings- competition and movement shapes the city into five distinct sequential concentric zones radiating outwards from the central business districts (CBD) or downtown (DT). Moving from the factory zones to working –class homes and eventually to affluent commuter suburbs.

Urban Ecological Theory posits that urbanization alters ecological balance through land-use transformation, industrialization, and environmental exploitation. The theory is relevant to this study because it explains how anthropogenic activities in Calabar contribute to increased urban temperature and environmental degradation. It also provides insight into the relationship between urban growth, environmental stress, and human health challenges.

Objectives of the Study

The main purpose of this study is to examine Urban Heat Island, environmental and human health effects in Calabar, Nigeria.

The specific objectives are to:

1. Examine the causes of Urban Heat Island in Calabar, Nigeria.
2. Assess the environmental effects of Urban Heat Island in Calabar.

3. Determine the human health implications associated with Urban Heat Island in Calabar.
4. Recommend strategies for mitigating Urban Heat Island effects in Calabar.

Research Questions

1. What are the major causes of Urban Heat Island in Calabar?
2. What environmental effects are associated with Urban Heat Island in Calabar?
3. What human health problems are linked to Urban Heat Island in Calabar?
4. What mitigation measures can reduce Urban Heat Island effects in Calabar?

Research design and Methods

The research design adopted for this study is the qualitative research design, using content analyses. The study area is Calabar Metropolis, the capital city of Cross River State, Nigeria. Calabar is located within the tropical rainforest zone and experiences high humidity and substantial annual rainfall. The city consists primarily of Calabar Municipality and Calabar South Local Government Areas. Calabar has experienced rapid urbanization due to commercial activities, tourism, educational development, and infrastructural expansion. The researchers divided Calabar metropolis into four zones, North, South, East and West. From Anantigha to Duke town and Egerton represent West, from Goldie to Atimbo represent South. From Scanobo to MCC represent North, while from Akansoko to Idundun and Jonthan Bypass represent East. A purposeful sampling of 100 respondents from each zone was done, where a total of four hundred respondents were selected for instrument administration. Data were obtained through the analysis of contents of published works. A structured questionnaire was also used for data collection. Simple percentage was used to answer the research questions.

Results and Discussion

Causes of Urban Heat Island in Calabar

The result of simple percentage analysis shown on table 1 indicates that 378 respondents representing 94.5% agreed that the items listed in section 1 of the questionnaire and presented on the result are the major causes of urban heat island in Calabar metropolis, while 22 respondents

representing 5.5% disagreed that these may not necessarily be the causes of urban heat island in Calabar metropolis(see table 1, section on causes).

Environmental effects of urban heat island

On the issue of the environmental effects of urban heat island, 389 respondents representing 97.3% agreed that the items listed on table 1 transferred from the questionnaire, section 2 are some of the effects of urban heat island on the environment. While 11 respondents representing 2.7% disagreed that these might not necessarily be the environmental effects of urban heat island in Calabar metropolis (for detailed result see table 1, section 2). According to the items listed as environmental effects of urban heat island, loss of vegetation, water shortages, increase ambient temperature, loss of biodiversity, pollution, urban slum, indiscriminate waste dump, increased heat waves, and exposure of more persons to vulnerable situations among others.

Human health effects of urban heat island

Table 1: Causes of UHI, Environmental and Health Effects of Urban Heat Island in Calabar

S/N	Variable	Respondents		Percentage	
		Yes	%	No	%
Causes of urban heat island (Section 1)					
1	Urban infrastructural development	308	77	92	23
2	Replacement of vegetation	344	86	56	14
3	Transportation systems	377	94.3	23	5.7
4	Domestic heating and cooking	389	97.3	11	2.7
5	Industrial activities	356	89	44	11
6	Waste generation and indiscriminate waste disposal	344	86	56	14
7	Agricultural activities	377	94.3	23	5.7
8	Mining activities and others	399	99.8	1	0.02
9	deforestation and bush burning	378	94.5	22	5.5
10	climate change and methane formation	378	94.5	22	5.5
	Total	3650	91.27	350	8.73
Environmental effects of urban heat island (Section2)					
1	Loss of vegetation	378	94.5	22	5.5
2	Water shortages	388	97	12	3.0
3	Increase ambient temperature	383	92.8	17	7.2
4	Loss of biodiversity	399	99.8	1	0.02
5	Pollution generation	378	94.5	22	5.5
6	Urban slum	366	91.5	34	8.5
7	Indiscriminate waste dump	288	72	112	28

8	Increased heat waves	278	69.5	122	30.5
9	Increased vulnerability	308	77	92	23
10	Others	389	97.3	11	2.7
	Total	3555	88.59	445	11.39
	Human health effects of urban heat island (Section 3)				
1	Dehydration	398	99.8	2	0.02
2	Increased vulnerability	308	77	92	23
3	Poor living conditions	344	86	56	14
4	Respiratory tract diseases	377	94.3	23	5.7
5	Bronchitis	389	97.3	11	2.7
6	Pulmonary tract infections	356	89	44	11
7	Nasal congestions	344	86	56	14
8	Cardiovascular diseases	377	94.3	23	5.7
9	Dermatitis and skin infection	399	99.8	1	0.02
10	Sun burn	289	72.3	111	27.7
11	Others	366	91.5	34	8.5
	Total	3947	98.7	453	11.3

Looking at the human health dimension of urban heat island in Calabar metropolis, 366 respondent representing 91.5% agreed that dehydration, increased vulnerability, poor living conditions, respiratory tract diseases, bronchitis, pulmonary tract infections, nasal congestion, cardiovascular diseases, dermatitis and skin diseases, sun burn among others are some health effects of urban heat island in most cities including Calabar metropolis. While 34 respondents representing 8.5% disagreed that most of these are not the effects of urban heat island on human health (see table 1, section 3).

Discussion of Findings

Urban infrastructural development, replacement of vegetation cover with impervious surfaces, transportation systems, domestic heating and cooking, industrial activities, waste generation and indiscriminate disposal, agricultural activities, mining activities and others and climate change and ozone formation including methane production from waste dump site. From the analysis, these are some of the major causes of urban heat island in most major cities of the world, Calabar inclusive. These findings agree with Odunsi and Rienow (2024), who reported that urban expansion and infrastructural growth intensify thermal stress in Nigerian cities.

This result is similar to that of Yong and Lim, (2020), whose work on urban heat islands: beating the heat with multi-modal spatial analysis, listed the causes of urban heat island to include both natural and manmade to include anthropogenic activities and other geothermal activities result from tectonic disruption, volcanic activities and earthquake. The authors listed urban development and transformation. Mining and exploration activities, including transport and heat generating activities which supports the rapid growth of urban heat island. In a similar vein, Okeke, (2024) also listed agricultural activities, bush burning and deforestation, urban heating and cooling systems, urban transport system, energy production and consumption, industrial production of goods and services including resources use in urban area as being part of the causes of urban heat island. This result also buttressed the findings of Oyeniya et al., (2025) who found that urban heat island is caused by removal of green vegetation and replacing them with impervious hard surfaces which absorb heat during the day and releasing them in the night. To these authors, local energy production and consumption causes urban heat island.

This result also confirmed the earlier finding of Odunsi and Rienow, (2024) on estimating surface urban heat island effects of Abeokuta within the context of its economic development cluster in Ogun State, Nigeria, the authors said urban heat island is caused by different factors such as human and anthropogenic factors- mining and urban development, waste production and indiscriminate disposal, formation of surface ozone, methane production from waste dump and resource use. Other causes of urban heat island include thermionic emissions from hard surfaces like tar, concrete and asphalt surfaces, methane from fermented fields among others. However, results like those of Sobstyl, et al., (2017) did not see any of these as causes of urban heat island, in their study, the authors affirmed that urban heat island is a natural occurrence without any human influence. To them, urban heat island is a natural phenomenon devoid of human interference.

Nchor and Ukam, (2024) carried out a research on decreasing access to water and coping strategies for shortage in the informal settlements of Calabar, Nigeria. The authors posited that

one major causes of water shortages and lack of access to portable water in urban centers is urban heat island, their reasons is that urban heat island reduces the volume of water by drying up surface water which are usually evaporated when the temperatures and het becomes high in the night. This result also supports the finding of Efe, (2021) on urban climate and environmental sustainability in Nigerian cities, the author found that urban climate are generally influenced by urban heat island, once this begins to manifest, the local climate of the urban area is seriously affected, there is biodiversity loss due to infrastructural development, there is decrease to the water budget of the area and this also affects the water footprint of the area too. Once deforestation appears consistently in an urban area, the entire climate of the area is exposed to harsh environmental conditions. Climate change naturally sets in.

The study revealed several environmental effects associated with Urban Heat Island in Calabar, including increased air pollution, declining environmental comfort, poor water quality, biodiversity loss, flooding risk, and thermal discomfort. Respondents indicated that highly urbanized areas with heavy traffic and poor drainage systems recorded higher temperatures than suburban neighborhoods. These findings support Ifon et al. (2026), who identified increasing ecological degradation and pollution associated with urban development in Calabar.

While looking at urban dynamics and climate change in Nigeria, Adelekan, (2020) found a disturbing fact, which has been variously linked to urban heat island, the author found that urban dynamics has to do with changes to the urban environment- development which are experienced in the urban centers- housing unit construction, public facilities like schools, aerodrome, amusement centers, markets and other vegetation areas which are usually being replaced by hard impervious surfaces, attracting head during the day time and remitting them out during the night making the urban centers unnecessarily warm at night. Authors have found compelling evidence suggesting that actually these are some of the effects of urban heat island in most urban cities especially Calabar, Nigeria (Adelekan, 2020; Akinyemi, 2025; Ifon, et al. 2026).

There is a similarity between this result and that of Ewusie and Bassey, (2024) whose work on public health vulnerability and climate stress in coastal Nigerian cities found that climate change affects human health in diverse perspective. Some causal factors of climate change include urban heat island, which is also an effect of climate change. People are exposed to harsh and adverse environmental conditions. Heat burn, heat waves, dehydration, respiratory diseases, shortage of water for human consumption, sanitation and hygiene are all caused by climate dynamics. This work also supports the work of Ifon, et al. (2026) found that climate dynamics causes about 8 different health complications associated with environmental vulnerabilities within the urban centers. Human health is affected by urban heat island, heat stress,, dehydration, water shortages, development of urban slum, exposure to different water, sanitation and hygiene related diseases are all attributed to urban heat island.

Findings showed that residents experience various heat-related health problems, including heat stress, excessive sweating, dehydration, respiratory difficulties, headaches, fatigue, and sleep disturbance. About 69% of respondents reported experiencing excessive heat discomfort during dry seasons, while 88% indicated increased respiratory problems associated with poor air quality. These findings support Adebayo, (2023) who emphasized that excessive heat exposure contributes significantly to public health challenges in urban areas. The findings demonstrate that Urban Heat Island has become an important environmental and public health challenge in Calabar. The replacement of vegetation with impervious surfaces has altered the thermal characteristics of the city. Rapid urbanization without adequate environmental planning contributes to increased heat retention, pollution, and ecological stress. Human health is particularly affected through heat-related illnesses and environmental discomfort. The study further reveals that climate change and local urbanization interact to intensify thermal stress in tropical urban environments such as Calabar.

Conclusion

Arising from the study, it was concluded that there is a strong relationship between urbanization and urban heat island formation increasing the temperature of the city. The result also revealed that Urban Heat Island represents a significant environmental and public health challenge in Calabar, Nigeria. Rapid urbanization, vegetation loss, poor waste management, and infrastructural expansion have intensified urban temperature conditions within the city. The study established that Urban Heat Island contributes to environmental degradation, thermal discomfort, air pollution, and several human health problems among residents. The study also revealed a strong relationship between urbanization and urban temperature increase. Addressing Urban Heat Island requires integrated urban planning, climate adaptation strategies, environmental education, and sustainable development policies.

Recommendations

Deducing from the result of the finding, the following recommendations are made to guide policy directions thus:

- a) Urban planners should ensure environmental green spaces are providing when planning a new city. Government should intensify urban greening and tree planting programs within Calabar. Green roofs and reflective building materials should be encouraged
- b) Urban planners should incorporate climate-sensitive designs into urban development projects.
- c) Waste management systems should be improved to reduce environmental pollution.
- d) Public awareness campaigns on heat-related health risks should be intensified.
- e) Drainage systems should be improved to reduce environmental stress and flooding.
- f) Environmental regulations on land-use conversion should be strictly enforced.

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