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Causative Factors on Extent and Rate of Deforestation in Enugu Local Governments Areas, Enugu State, Nigeria

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Abstract
This study assesses the impact of deforestation on disaster risks in the study area. The research sought to examine public awareness, perceptions, and responses to deforestation and associated risks in the study area. The study targeted residents with experience to environmental issues caused by deforestation, enabled a focused and context-specific investigation into the forest loss. The study employed a descriptive survey research design. A sample of 385 respondents was selected using a multi-stage sampling technique. Communities severely impacted by forest loss were purposively chosen, and within these, stratified random sampling ensured diverse representation based on demographics such as age and occupation. Simple random sampling was then used within each stratum to select participants. Data were collected using structured questionnaires that included both closed-ended and Likert-scale questions. The data were analyzed using descriptive statistics, percentages, mean scores, and standard deviations. The study found that deforestation in Enugu significantly determine weak enforcement of forest-related policies, poor public awareness, and illegal logging as major drivers of forest degradation. Respondents recommended strategies such as afforestation programs, strict law enforcement, community-based forest management, and public education to mitigate forest loss and reduce vulnerability. In line with the findings, the study recommended the need for strengthened enforcement of environmental and forestry laws within Enugu Local Government Area and the implementation of community-based forest management strategies.

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Keywords: environment, community, disaster, enforcement, forestry

Introduction

Deforestation is a critical environmental issue that significantly contributes to hydrological disaster risks worldwide. The Food and Agriculture Organization (FAO) estimates that approximately 10 million hectares of forest are lost each year due to deforestation, with devastating consequences for ecosystems and water cycles (FAO, 2020) [17]. Forests play an essential role in regulating the global water cycle by absorbing rainfall, reducing surface runoff, and enhancing groundwater recharge (Bruijnzeel, 2004) [11]. However, large-scale deforestation, particularly in tropical regions, disrupts these functions, leading to increased flood risks, soil erosion, and declining water quality. In Southeast Asia, for instance, studies have linked deforestation to more frequent and severe flooding events, as seen in Indonesia and the Philippines (Huang *et al*., 2018) [25]. Similarly, in the Amazon Basin, forest loss has altered regional precipitation patterns, exacerbating droughts and extreme weather conditions (Lawrence & Vandecar, 2015) [34].

In Africa, deforestation is occurring at an alarming rate, with the continent losing approximately 3.9 million hectares of forest annually (FAO, 2020) [17]. The major drivers include agricultural expansion, logging, and urbanization, all of which contribute to hydrological disasters such as floods and droughts. In West Africa, deforestation has been a significant factor in the intensification of extreme weather events, particularly in countries like Ghana, Nigeria, and Cameroon (Adejuwon, 2016) [1]. For instance, the decline of forest cover in Ghana's highlands has led to increased flood occurrences in lowland areas, as there are fewer trees to absorb and slow down rainwater (Asante & Amuakwa-Mensah, 2015).

In Nigeria, the situation is similarly dire, with forest cover declining at a rate of approximately 3.7% annually, contributing to increased flood risks in major river basins (Ogunwusi, 2012) [45].

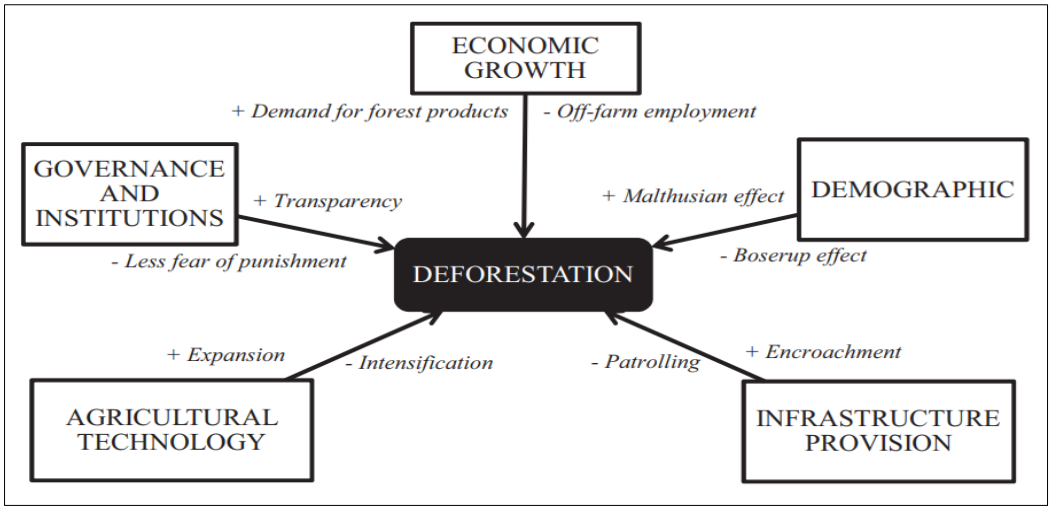
Enugu Local Government Area in Enugu State, Nigeria, is notably vulnerable to the impacts of deforestation on hydrological disaster risks. The area's hilly terrain and proximity to several seasonal streams make it prone to erosion and flooding, particularly during the peak of the rainy season. In recent decades, widespread deforestation in Enugu has been driven by rapid urban expansion, fuelwood harvesting, and agricultural encroachment (Eze *et al*., 2020). The loss of vegetation cover has significantly increased surface runoff, reduced groundwater recharge, and intensified the occurrence of flash floods and gully erosion, posing serious threats to lives and livelihoods. Flood and subsequent erosional events in parts of Enugu metropolis and its outskirts, which displaced hundreds of residents and damaged farmlands and infrastructure, were largely attributed to deforestation and unsustainable land-use practices (NEMA, 2013) [41].

Land-use change, particularly the conversion of forests to farmlands and urban settlements, has significantly intensified hydrological risks in Enugu. Research indicates that between 2015 and 2020, Enugu experienced extensive forest loss due to urban expansion, agricultural encroachment, and fuelwood extraction (Eze *et al*., 2020). The conversion of forested areas into farmlands has led to severe soil degradation, a reduction in vegetation cover, and diminished natural water retention capacity. Rapid urbanization has further compounded the problem, as the proliferation of paved surfaces and poorly planned drainage systems has restricted water infiltration, thereby increasing surface runoff and the frequency of flash floods (Oformata, 2018). These combined factors have made flooding and erosion more frequent and destructive, threatening property, infrastructure, and livelihoods in communities across Enugu metropolis and surrounding areas each year.

Literature Review

Deforestation refers to the large-scale removal or destruction of forested areas, leading to a significant loss of vegetation cover and biodiversity. It is a global environmental issue that has severe implications for climate regulation, water cycles, and biodiversity conservation. According to the Food and Agriculture Organization (FAO, 2020) [17], global forest loss is estimated at 10 million hectares per year, driven primarily by agricultural expansion, logging, infrastructure development, and urbanization. Deforestation is particularly concerning in developing regions such as Africa and South America, where forests play a crucial role in sustaining ecosystems and providing livelihoods for local populations. As forests are cleared, the natural balance of the environment is disrupted, leading to problems such as increased greenhouse gas emissions, soil erosion, and disruptions in hydrological systems (Myers, 2018) [12].

The causes of deforestation vary across regions but generally include human activities such as agriculture, logging, and infrastructure development. Geist and Lambin (2002) [22] argue that deforestation is often linked to socio-economic factors such as population growth, poverty, and weak governance structures. In many parts of the world, forests are cleared for agricultural purposes, particularly for cash crops like soybeans, palm oil, and maize. In Sub-Saharan Africa, shifting cultivation remains a major driver of deforestation, as farmers clear forested land to grow crops and then move to another location after soil fertility declines (Hosonuma *et al*., 2012). Similarly, illegal logging activities, driven by the demand for timber and fuelwood, have exacerbated forest loss, particularly in countries with weak environmental regulations (Laurance *et al*., 2014) [33].



Source: Mahapatra & Kant (2015)

Fig 1: Conceptual framework of Deforestation

The environmental consequences of deforestation are profound, with significant impacts on climate change, biodiversity loss, and hydrological cycles. Forests play a vital role in carbon sequestration, absorbing carbon dioxide from the atmosphere and mitigating the effects of global warming (Pan *et al*., 2011) [46]. When forests are cleared, large amounts of carbon are released into the atmosphere, contributing to greenhouse gas emissions and climate change. Furthermore, deforestation disrupts local and regional rainfall patterns by reducing the amount of water transpired into the atmosphere, which in turn affects precipitation and increases the risk of drought (Malhi *et al*., 2008) [36]. In areas like the Amazon

rainforest, widespread deforestation has led to a decrease in regional rainfall and an increase in temperatures, further exacerbating the impacts of climate change (Lovejoy & Nobre, 2018) [35].

In addition to climate impacts, deforestation significantly affects hydrological systems by altering water infiltration, runoff, and soil moisture retention. According to Bruijnzeel (2004) [11], forested areas act as natural sponges that regulate water flow, reducing the risk of floods and maintaining groundwater levels. When forests are removed, rainwater is less effectively absorbed by the soil, leading to increased surface runoff and a higher likelihood of floods. This is particularly evident in urbanized and deforested areas, where reduced vegetation cover leads to excessive water accumulation and severe flooding (Wang *et al*., 2017) [55]. In Nigeria, rapid deforestation, combined with poor urban planning, has contributed to recurrent flood disasters, particularly in cities like Enugu and Lagos (Adelekan, 2016)

Deforestation also poses a significant threat to biodiversity, as forested areas provide habitats for a wide range of plant and animal species. Wilson (2016) [56] emphasizes that tropical forests harbor over 80% of the world's terrestrial biodiversity, making them critical for global ecological stability. When forests are cleared, many species lose their habitats, leading to population declines and, in some cases, extinction. In Africa, large-scale deforestation has contributed to the loss of key species such as forest elephants, primates, and bird species that depend on dense vegetation for survival (Laurance *et al*., 2012) [33]. Furthermore, deforestation disrupts ecosystem services such as pollination, soil fertility, and water purification, which are essential for maintaining environmental balance and agricultural productivity (Cardinale *et al*., 2012) [12].

Despite global efforts to combat deforestation, it remains a major challenge due to weak enforcement of conservation policies, economic pressures, and the growing demand for land and resources. Many international initiatives, such as the REDD+ (Reducing Emissions from Deforestation and Forest Degradation) program, have been implemented to curb forest loss by promoting sustainable land-use practices and providing financial incentives for conservation (Angelsen *et al*., 2018) [6]. However, the effectiveness of such programs has been limited in many regions due to corruption, lack of political will, and conflicts over land ownership (Karsenty & Ongolo, 2012) [31]. In Nigeria, policies such as the National Forest Policy and afforestation programs have been introduced to address deforestation, but poor implementation and inadequate funding have hindered their success (Ogundele *et al*., 2019) [44]. Addressing deforestation requires a multi-faceted approach that includes strong governance, community participation, and sustainable land management practices to ensure long-term environmental stability.

Environmental Degradation Theory

The Environmental Degradation Theory explains the causes, processes, and consequences of environmental deterioration due to human activities and natural factors. It suggests that environmental degradation occurs when the exploitation of natural resources exceeds the regenerative capacity of ecosystems, leading to pollution, loss of biodiversity, and climate change. Scholars such as Paul Ehrlich (1968) and Garrett Hardin (1968) [23] have significantly contributed to the development of this theory, emphasizing the impact of overpopulation and unsustainable resource consumption. The theory is also linked to Thomas Malthus' population theory, which posits that unchecked population growth leads to resource scarcity and environmental crises (Malthus, 1798) [37]. These arguments align with modern concerns about deforestation, industrial pollution, and the depletion of non-renewable resources, which have escalated global environmental challenges.

A central argument of the Environmental Degradation Theory is the relationship between economic growth and environmental decline. Many proponents, including Meadows *et al*. (1972) [38], argue that economic expansion driven by industrialization and urbanization leads to excessive resource exploitation, waste accumulation, and habitat destruction. The Limits to Growth model presented by Meadows and colleagues highlights that continuous economic and population growth is unsustainable due to finite ecological resources. This perspective suggests that unless societies transition to sustainable practices, environmental degradation will reach an irreversible threshold, threatening human survival. In this context, the theory supports calls for renewable energy adoption, conservation efforts, and sustainable development policies.

Another significant contribution to the Environmental Degradation Theory comes from the Tragedy of the Commons, articulated by Hardin (1968) [23]. He argues that when natural resources are freely accessible to all, individuals tend to overexploit them for personal gain, ultimately leading to resource depletion and environmental collapse. This idea is evident in cases of overfishing, deforestation, and carbon emissions, where the absence of strong regulatory mechanisms results in unsustainable exploitation. Hardin's work has influenced policies advocating for environmental governance, privatization of common resources, and stricter regulations on industrial activities to prevent collective ecological harm.

Moreover, dependency theorists critique the Environmental Degradation Theory for neglecting the role of global economic inequalities in environmental problems. Scholars like Escobar (1995) [16] argue that environmental degradation in developing nations is often driven by exploitative global economic structures rather than local mismanagement. They contend that multinational corporations and developed nations disproportionately contribute to pollution and resource depletion while imposing environmental restrictions on poorer nations. This perspective shifts the debate from overpopulation and local resource use to the broader political economy of environmental harm, highlighting the need for equitable global environmental policies.

Disaster Risk Reduction (DRR) Theory

The Disaster Risk Reduction (DRR) Theory provides a comprehensive framework for understanding and mitigating the risks associated with natural and human-induced hazards. It is rooted in the idea that disasters are not just natural occurrences but are significantly influenced by human actions, socio-economic conditions, and environmental factors (Wisner *et al*., 2004) [57]. The theory emphasizes proactive measures such as risk assessment, preparedness, early warning systems, and community resilience-building to minimize disaster impacts. Unlike traditional disaster response approaches that focus on post-disaster recovery, DRR prioritizes prevention and long-term sustainability (UNDRR, 2015) [32]. This shift in perspective aligns with global efforts, such as the Sendai Framework for Disaster

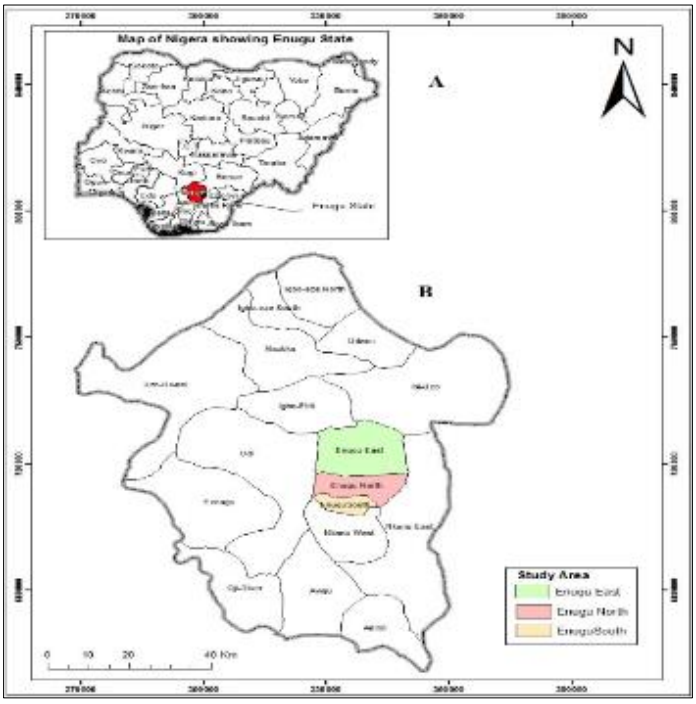
Risk Reduction (2015–2030), which advocates for reducing vulnerability through sustainable development, improved governance, and public awareness.

One of the key proponents of DRR theory is Ben Wisner, whose work on the Pressure and Release (PAR) Model highlights the interaction between hazard exposure and vulnerability (Wisner *et al.*, 2004) [57]. The PAR model explains that disasters occur when natural hazards, such as floods or earthquakes, interact with social vulnerability factors, including poverty, poor infrastructure, and weak governance. By addressing these underlying vulnerabilities, the severity of disasters can be significantly reduced. Similarly, Pelling (2003) argues that disaster risk is a function of hazard, exposure, and vulnerability, reinforcing the need for policies that enhance resilience and adaptive capacity at local and national levels. This perspective underscores the importance of integrating DRR strategies into urban planning, environmental management, and socio-economic development.

Study Area and Methodology

Study area, Location and extent

Enugu Local Government Area (LGA) is the administrative and commercial nucleus of Enugu State, located in the southeastern region of Nigeria. Geographically, it lies between latitudes 6°25′N and 6°30′N and longitudes 7°27′E and 7°35′E, covering an approximate land area of 106 square kilometers. The LGA is bounded by Enugu East to the east, Enugu North to the north, and Enugu South to the south and west, forming the core of the Enugu metropolis. Enugu's location within the Udi-Nsukka Plateau gives it a distinct hilly terrain with elevations ranging between 150 and 500 meters above sea level, which influences its drainage patterns and susceptibility to erosion and flooding. The area enjoys a humid tropical climate characterized by two distinct seasons, a wet season from April to October and a dry season from November to March, with annual rainfall ranging between 1,500 mm and 2,000 mm. Its landscape, marked by steep slopes, lateritic soils, and reduced vegetation cover due to rapid urbanization and deforestation, makes it vulnerable to hydrological disasters such as flash floods and gully erosion. The LGA's strategic location as the state capital and a major transport, educational, and administrative center enhances its economic importance but also intensifies land-use pressures that exacerbate environmental challenges.



Source: Extracted from Geospatial data of Nigeria (2012)

Fig 2: Map of Nigeria showing Enugu State and Enugu Local Government

Climate

Enugu Local Government Area experiences a humid tropical climate that is typical of southeastern Nigeria, characterized by distinct wet and dry seasons influenced by the movement of the Inter-Tropical Convergence Zone (ITCZ). The rainy season extends from April to October, bringing heavy and prolonged rainfall with an annual average ranging between 1,500 mm and 2,000 mm, while the dry season lasts from November to March, dominated by the dry north-easterly Harmattan winds. Temperatures in Enugu are generally warm throughout the year, with mean annual values ranging between 22°C and 32°C, and relative humidity averaging about 70% to 80% during the wet months. The area experiences peak rainfall in July and September, often leading to waterlogging, erosion, and flash floods, especially in areas with poor drainage and vegetation loss. The climate supports tropical rainforest vegetation, although much of this has been cleared due to urban expansion and fuelwood extraction.

Soil and Vegetation

The soil and vegetation of Enugu Local Government Area are strongly influenced by its tropical climate, geology, and human activities. The dominant soil type in the area is ferrallitic or lateritic, characterized by its reddish-brown color, high iron and aluminum content, and formation from

the weathering of sandstone and shale parent materials of the Enugu escarpment. These soils are generally fertile under natural forest cover but become compacted and prone to erosion when disturbed, particularly on the steep slopes that define much of the Enugu landscape (Ezeaku & Ogbodo, 2020) [26].

The natural vegetation originally comprised luxuriant tropical rainforest with tall hardwood trees, thick undergrowth, and diverse plant species that provided soil protection and facilitated infiltration. However, rapid urbanization, agricultural encroachment, and widespread fuelwood collection have drastically reduced forest cover, leaving behind fragmented secondary vegetation and savanna-like grasslands in many areas (Eze *et al*., 2023) [26]. The decline in vegetation has significantly altered the soil's physical properties, increased surface runoff, and heightened the risk of gully erosion and flooding. This degradation of the soil–vegetation system underscores the close interrelationship between land-use practices, ecological stability, and hydrological hazards in Enugu Local Government Area.

Topography and Drainage

The topography and drainage of Enugu Local Government Area are defined by its location within the Udi-Nsukka Plateau, which gives rise to a rugged and undulating terrain characterized by hills, escarpments, and valleys. Elevations in the area range from about 150 to over 500 meters above sea level, with steep slopes dominating many parts of the landscape. This hilly topography influences settlement patterns, transportation networks, and the direction of surface water flow across the LGA (Ikejiofor & Nwosu, 2022) [26]. The drainage pattern is largely dendritic, consisting of several seasonal streams and rivulets such as the Asata, Ekulu, and Idaw Rivers, which serve as the main outlets for stormwater within the Enugu metropolis.

During the rainy season, these drainage channels often overflow due to heavy rainfall and poor maintenance, resulting in flash floods in low-lying areas such as Uwani, Ogbete, and Independence Layout. The combination of steep slopes, deforestation, and inadequate drainage infrastructure exacerbates surface runoff and soil erosion, contributing significantly to the area's vulnerability to flooding (Oformata, 2021) [26]. Consequently, the topographical and drainage characteristics of Enugu LGA play a central role in shaping its hydrological behavior and environmental challenges.

Geology

The geology of Enugu Local Government Area is predominantly sedimentary, forming part of the extensive Anambra Basin, which is one of Nigeria's major geological formations. The area is underlain primarily by the Enugu Shale and the Mamu Formation, both of which date back to the Late Cretaceous period (Nwajide, 2013) [26]. The Enugu Shale is composed largely of dark grey to bluish-black shales, mudstones, and occasional sandstone interbeds, while the

Mamu Formation consists of alternating layers of shale, coal seams, and sandstone. This geological structure explains the presence of substantial coal deposits, which have historically earned Enugu its nickname, "Coal City" (Reyment, 2019) [26]. The coal seams are found mainly around Iva Valley, Onyeama, and Okpara mines, contributing significantly to Nigeria's early industrial development. The region's sedimentary rocks are generally soft and easily weathered, influencing soil formation and the prevalence of erosion, especially in areas where vegetation cover has been removed. Additionally, the geological formations play an important role in groundwater occurrence, as the porous sandstones serve as aquifers that support domestic and industrial water supply in Enugu and surrounding areas.

Population, People and Economic Activities

Enugu Local Government Area is one of the most populous and economically active regions in Enugu State, serving as the political, cultural, and commercial hub of the state. According to the National Population Commission projection (2023) [26], the LGA has an estimated population of over 1 million people, with a high density concentrated in urban centers such as Enugu metropolis, Independence Layout, and Uwani. The people are predominantly of the Igbo ethnic group, known for their strong entrepreneurial spirit, communal lifestyle, and cultural vibrancy. Christianity is the dominant religion, and Igbo is the primary language of communication, though English is widely spoken for official and educational purposes.

The local economy is diversified, with key sectors including commerce, transportation, education, public administration, and small-scale manufacturing. Agriculture also plays a significant role, particularly in peri-urban and rural communities, where crops such as cassava, maize, yam, vegetables, and palm produce are cultivated for both subsistence and trade. In addition, Enugu hosts a thriving informal sector with numerous artisans, traders, and service providers contributing to its economic dynamism (Okeke & Eze, 2022) [26]. The presence of government institutions, private businesses, and higher educational establishments, such as the University of Nigeria Enugu Campus (UNEC), has further stimulated population growth, urban expansion, and infrastructure development, although these have also placed increasing pressure on land use, vegetation, and drainage systems, thereby heightening the area's vulnerability to flooding.

Methodology

Research Design

This study adopted a descriptive survey research design which is appropriate for capturing and analyzing the opinions, perceptions, and experiences of a broad population concerning on deforestation disasters. The descriptive approach allows the researcher to systematically collect data without manipulating any variables. This design help to gather empirical data that reflect the real-world environmental conditions and policy implications in the study area, and facilitating a comprehensive understanding of the extent and consequences of deforestation in the study area.

Sources and Types of Data

The study employs primary data as its principal source of information, obtained directly from respondents through the administration of structured questionnaires. These questionnaires were designed to elicit first-hand information on respondents' perceptions of deforestation, forest conservation practices and policy implementation in Enugu Local Government Area. The data collected were encompass both quantitative and qualitative components. Quantitative data include numerical responses suitable for statistical

analysis, such as frequency counts, percentages, means, and standard deviations derived from Likert-scale items. These variables were focus on key areas such as the impact of deforestation on environment, the effectiveness of existing environmental policies, and respondents' recommendations for sustainable management strategies.

In addition, qualitative data were obtained from open-ended questions and field observations which provide deeper insights of the local experiences, attitudes, and contextual factors influencing forest and flood management practices. The integration of both data types is expected to offer a comprehensive and balanced understanding of the environmental challenges and policy gaps associated with deforestation risk in the study area.

Sampling Technique and Procedures

The study adopted a multi-stage sampling technique to ensure a representative and reliable selection of participants from Enugu Local Government Area. In the first stage, purposive sampling was used to identify and select specific communities within the LGA that are most affected by deforestation. These communities were chosen based on prior environmental reports, local knowledge, and observable signs of forest depletion. This approach has allowed the study focus on areas where the effects of deforestation are most evident, thereby improving the relevance, depth, and contextual accuracy of the data collected.

In the second stage, the study employs a combination of stratified and simple random sampling techniques. The population within the selected communities will be stratified according to demographic factors such as gender, age, and occupation to ensure equitable representation across different social and economic groups. Within each stratum, respondents will be randomly selected using a simple random sampling method, ensuring that each participant has an equal opportunity to be included in the study. In total, 385 respondents will be sampled, a number considered adequate for statistical reliability and generalizability of the findings across Enugu LGA. The integration of these sampling techniques will enhance the validity, objectivity, and credibility of the study, ensuring that the data accurately reflect the perspectives and experiences of residents affected by deforestation in the area.

Population, Sample Size Determination

The population for this study comprises all residents of Enugu Local Government Area, which, according to the 2006 National Population Census, had a total population of 722,664 people. This population encompasses a diverse group, including farmers, traders, traditional rulers, local government officials, and other community members who either directly or indirectly depend on forest resources for their livelihoods. It also includes individuals from various communities within the LGA who have firsthand experience or awareness of environmental challenges such as land degradation and fluctuations in water availability. The selection of this population is informed by the need to capture localized perspectives and lived experiences on how deforestation influences the frequency and intensity of hazards within the area. Insights obtained from these respondents has form the empirical foundation for evaluating the environmental and socio-economic consequences of forest loss in Enugu Local Government Area, thereby contributing to a deeper understanding of deforestation risk in the region.

Sample Size Determination

The purpose of sampling is to narrow down the study population to a manageable size while ensuring the research is completed within the specified timeframe. In selecting the sampling technique for this study, the researcher considered the technical complexity of the investigation and the need for responses from individuals with sufficient and relevant knowledge of the subject matter. In determining the sample size, the study adopted the Taro Yamane formula as follows: Population size of (722,664), error margin of $(0.05)^2 = 0.0025$ and sample size is 400. Therefore, the Sample Size for this study is 400

Method of Data Collection and Analysis

The method of data collection employed in this study were administered through structured questionnaires to selected sample of respondents within Enugu Local Government Area. The questionnaires were systematically designed to produce relevant information on key issues such as deforestation, the effectiveness of existing environmental policies, challenges hindering policy enforcement, and possible strategies for forest conservation. This structured approach on collected data has provide comprehensive, consistent, and directly aligned knowledge of the study area. The data collection process involves direct distribution of questionnaires to participants, allowing respondents to provide answers based on their personal experiences, observations, and perceptions of environmental changes within their communities. The questionnaire has adopted a Likert-scale format for most items, facilitating quantitative assessment of respondents' levels of agreement and attitudes toward deforestation in the study area. This method is particularly suitable for the study because it allows for the collection of standardized and quantifiable data from a relatively large population within a short period. The approach has provided a robust dataset for statistical analysis and enable the derivation of meaningful conclusions regarding the environmental and socio-economic implications of deforestation in Enugu Local Government Area.

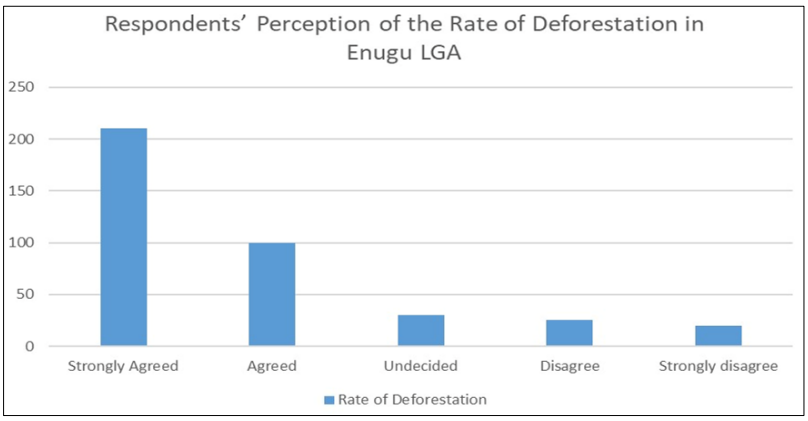
Method of Data Analysis

The data collected were analyzed using both descriptive and inferential statistical techniques to ensure a comprehensive understanding of the deforestation risk in Enugu Local Government Area. Responses obtained from the structured questionnaires were first coded and entered into the Statistical Package for the Social Sciences (SPSS) for analysis. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize and present respondents' views on key issues like deforestation trends and policy enforcement.

Results

Extent and rate of Deforestation in Enugu local government area were presented through the findings in figure. 3 which show a significant majority of the respondents 210 individuals, representing 54.5%,

strongly agreed, and another 100 respondents, representing 26%, agreed that deforestation is occurring at an alarming rate. This means that over 80% of the total participants recognize deforestation as a major and ongoing problem in their environment. Only 30 respondents, making up 7.8%, were undecided, while 25 (6.5%) disagreed and 20 (5.2%) strongly disagreed. These results reflect a shared concern among the population regarding the rapid depletion of forest resources and the visible impacts of environmental degradation.



Source: Field Survey, 2025

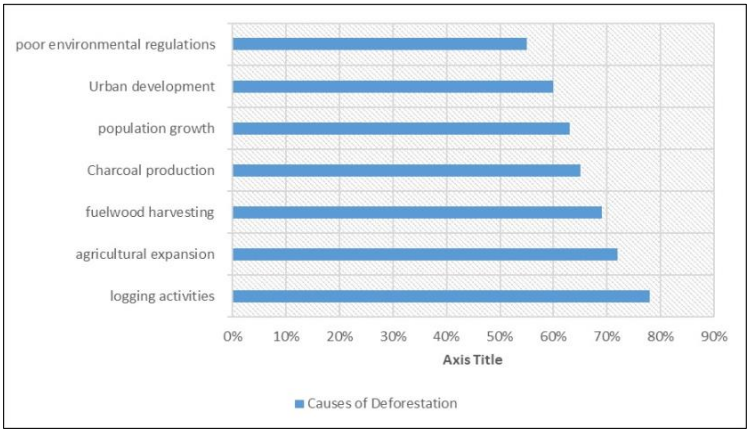
Fig 3: Respondents' Perception of the Rate of Deforestation in Enugu LGA

This widespread agreement among respondents indicates that deforestation is no longer a distant or abstract issue in Enugu but a lived experience, observable through consequences such as loss of vegetation, irregular rainfall patterns, soil erosion, increased temperatures, and reduction in farmland productivity. The few respondents who were undecided or disagreed may not have felt the impact as severely or may lack sufficient environmental awareness, which in itself highlights the need for intensified public sensitization. The perception that deforestation is happening at an alarming rate serves as a wake-up call to both policymakers and environmental stakeholders. It points to the urgent need for proactive forest management strategies, the enforcement of environmental protection laws, and the promotion of sustainable land-use practices in Enugu LGA.

Furthermore, the overwhelming agreement from the public demonstrates a readiness for community participation in conservation efforts. When people understand the problems in their environment, they are more likely to support and even participate in solutions. Moreover, environmental degradation may lead to forced migration from rural to urban areas, compounding pressure on urban infrastructure and increasing the risk of poverty. The findings call for urgent policy interventions that integrate environmental sustainability with rural development programs, thereby reducing the dependence of local communities on forests for survival.

Contributing Factors to Deforestation in Enugu Local Government Area

Figure 4: reveal that the contributing factors of deforestation in Enugu Local Government Area are multi-faceted and deeply rooted in socio-economic realities. Based on responses collected, logging activities emerged as the leading driver of deforestation, identified by approximately 78% of the respondents. This is followed closely by agricultural expansion (72%) and fuelwood harvesting (69%), both of which reflect the population's dependence on land and forest resources for subsistence farming and domestic energy needs. Charcoal production (65%) and population growth (63%) also featured prominently, suggesting that the growing demand for energy and livelihood opportunities is placing unsustainable pressure on forest resources. Urban development (60%) and poor environmental regulations (55%) round out the major drivers, highlighting how infrastructural expansion and weak enforcement mechanisms further exacerbate forest loss.



Source: Field Survey, 2025

Fig 4: Causes of Deforestation in the Study Area

These findings have far-reaching implications. The dominance of logging and agricultural expansion suggests that economic survival in Enugu is heavily dependent on natural resource exploitation. This poses a serious challenge to sustainability, as continuous forest clearance without reforestation efforts leads to loss of biodiversity, disruption of water cycles, and increased greenhouse gas emissions. The heavy reliance on charcoal and fuelwood also indicates a lack of affordable and accessible alternative energy sources. This not only contributes to forest degradation but also has health implications due to indoor air pollution from burning biomass. Additionally, weak enforcement of environmental laws allows for illegal logging and unregulated land conversion, while rapid urbanization eats into green spaces that could otherwise be preserved for ecological balance.

These findings are in line with those of Olorunfemi and Adetunji (2018) [45], who in their study on deforestation patterns in North-Central Nigeria found that agricultural practices and fuelwood collection were the leading causes of forest loss. Their study emphasized the role of poverty and energy insecurity in driving deforestation and called for integrated rural development programs to reduce forest dependence. Similarly, Olagunju (2015) [45] in his analysis of land use and deforestation in Nigeria, reported that logging and weak institutional frameworks were among the most significant contributors to forest cover decline. He recommended that environmental policies must be backed by community engagement and strict enforcement mechanisms if deforestation is to be effectively curbed.

Assessment of Implementation and Enforcement and policy in the study area

The assessment of policy implementation and enforcement in Enugu Local Government Area on table 1 reveals a general perception of weak institutional effectiveness. Only 38.4% of respondents acknowledged regular monitoring by authorities, with a modest mean score of 3.2. This suggests inconsistency in oversight and surveillance, reinforcing findings by Adewuyi and Olofin (2017) [44] who emphasized that the success of environmental policy in Nigeria is often undermined by irregular and underfunded monitoring systems. Without consistent enforcement, deforestation drivers such as illegal logging and unsustainable farming practices flourish unchecked. Prosecution of environmental offenders appears notably weak, as only 26.5% of respondents reported observing such legal actions. The mean score of 2.8 confirms a lack of deterrence within the system. This echoes the conclusions of Agwu *et al*. (2018) [44] who observed that enforcement frameworks often lack the legal teeth and bureaucratic commitment needed to follow through with prosecutions, especially at the local government level. In this context, non-compliance becomes normalized, and environmental degradation continues largely unchallenged.

Table 1: Respondents' Assessment of Implementation and Enforcement of Policies in Enugu LGA

Indicator	Frequency	Percentage (%)	Mean	Std. Deviation
Regular monitoring by authorities	148	38.4%	3.2	1.08
Prosecution of environmental offenders	102	26.5%	2.8	1.14
Community involvement in enforcement	127	33.0%	3.1	1.02
Funding support for policy implementation	135	35.1%	3.3	0.95
Government responsiveness to deforestation	119	30.9%	3.0	1.10
Collaboration between implementing agencies	141	36.6%	3.2	1.00

Scale 1 = Strongly Disagree, 5 = Strongly Agree
Source: Field Survey, 2025

A significant 33% of respondents acknowledged community involvement in enforcement, suggesting that citizen participation is present but not widespread or institutionalized. With a mean of 3.1, this reveals an opportunity for deeper grassroots integration. Eguavoen and Schulz (2011) [50] noted that when local communities are excluded from decision-making and implementation processes, the sustainability of forest and water conservation policies is compromised. Community engagement is thus not only a moral imperative but a practical necessity for effective enforcement.

Regarding funding support, 35.1% of respondents agreed that policies receive adequate resources, which remains below the threshold for effective implementation. The average score of 3.3 suggests sporadic or insufficient financial support, which aligns with findings by Olorunfemi and Adebayo (2012) [45] who documented how underfunding hinders policy execution, leading to poorly staffed agencies and limited outreach operations. This is particularly problematic in areas like Enugu, where environmental pressures are acute and require sustained intervention. Government responsiveness to deforestation issues was perceived as low, with only 30.9% agreement among respondents and a mean score of 3.0. This reflects the wider sentiment of bureaucratic inertia, as observed in Ite and Ibok (2013) [44], who found that while Nigerian environmental policies are comprehensive in design, they are often reactive in practice and lack long-term institutional commitment. This results in delayed responses to environmental crises, such as deforestation and hydrological disruptions. Finally, 36.6% of respondents recognized collaboration between implementing agencies, indicating a moderate level of inter-agency coordination. While the mean score of 3.2 is relatively positive, it still reveals a need for stronger institutional synergy. This aligns with the work of Orubu and Awopegba (2020) [44], who argue that fragmented responsibilities between ministries and departments create administrative bottlenecks that undermine environmental governance.

Conclusion and Recommendations

This study has critically examined the impact of deforestation disaster risks in Enugu Local Government Area, Enugu State, revealing a strong correlation between forest loss and changes in the water cycle. The analysis demonstrated that deforestation contributes significantly to environmental degradation. Respondents' views reinforced that unregulated tree felling, agricultural expansion, and infrastructural development are among the primary causes of forest

depletion in the area. These human activities, when combined with weak enforcement of environmental policies, have left communities more vulnerable to the effects of climate variability and extreme weather events.

Based on the findings of the study, the following were recommended:

1. There is a need for strengthened enforcement of environmental and forestry laws within Enugu Local Government Area.
2. The study recommends the implementation of community-based forest management strategies, where local residents are actively involved in protecting and restoring forest areas.
3. Public awareness and environmental education programs should be expanded to enlighten residents on the impacts of deforestation and the importance of forests in controlling hydrological disasters.

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