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ASSESSMENT OF CONSEQUENCES OF DEFORESTATION IN BAUCHI METROPOLIS

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ABSTRACT

Deforestation is a global ecological disturbance with serious environmental consequences. Nigeria is one of the most deforested tropical country in Africa. Information on environmental effects of deforestation in many cities have not been fully documented in Nigeria. This study investigated the environmental consequences of deforestation in Bauchi Metropolis, Bauchi State, Nigeria in with a view to evaluating the impacted of deforestation on the local ecosystem and community well-being. Data were randomly collected from a sample of 384 respondents, with a response rate of 87.5%. Descriptive statistical tools, including means and standard deviations, were applied in data analyses. Respondents reported climate change, soil erosion and plant extinction, with mean scores of 3.90, 3.84 and 3.81, respectively. The means score are the 3.0 threshold. The findings highlight the severe environmental challenges posed by deforestation in Bauchi Metropolis. Consequently, the study recommends that the Bauchi State government take immediate steps to raise public awareness through orientation programmes on the dangers of deforestation. Community education initiatives should be introduced to sensitize local populations about the broader environmental impacts of deforestation. Eenforcement of stricter environmental protection laws is essential to mitigating on going deforestation activities in the region.

Keywords: Climate change, Deforestation, Biodiversity loss, Soil erosion, Ecosystem restoration

INTRODUCTION

Over the years, man and animals have relied solely on forests for their survival, using them as a source of food, shelter, and other essential resources. Oyetunji *et al.* (2020) noted that forests form a vital part of any country due to their ecological and economic roles. Forest Resources Assignment [FRA] (2015) stated that a forest is defined as a land spanning more than 0.5 hectares with a canopy cover of over 10%, excluding agricultural or urban land use. This definition excludes tree stands in agricultural production systems, such as fruit tree plantations or palm plantations, olive orchards, and agroforestry systems where crops are grown under tree cover (FRA, 2015). It is important to note that forests are home to 70% of the world's plant and animal species. Forests influence local and global climate (Trived, 2019), moderate diurnal ranges of air temperatures, maintain atmospheric humidity levels, absorb atmospheric carbon, and replenish oxygen in the air we breathe. Hassan (2019) also

reported that forests regulate global climate and act as a major agent of carbon exchange in the atmosphere.

Forests reduce soil erosion by slowing water runoff and mitigating flood hazards and siltation in visible rivers and waterways. Well-managed forests regulate soil erosion, reducing sediment loads, resulting in higher quality water with fewer sediments and pollutants compared to other catchment areas. Forests provide a wide range of industrial wood products, such as timber, panels, posts, pulp and paper. In addition to non-timber forest products like fibres, traditional medicine materials, natural organic colouring materials, oxalic acid, tannins, and many other goods. Forests are an important source of foodstuffs, particularly during droughts and famines when agricultural crops have failed (Trived, 2019). Despite the importance of forests to humanity, deforestation has severe environmental impacts, including climate change, global warming, extinction of some plant and animal species, desertification, soil erosion, habitat destruction, and more.

The high demand for timber and other forest products has resulted in high levels of forest encroachment and deforestation (Gana, 2020). Olanrewaju and Ajayi (2019) reported that fuel wood demand, accounting for over 80% of the country's energy consumption, is the main driver of deforestation and forest degradation. Deforestation, the clearing of land of trees either by human action or natural causes, has profound negative effects on the environment, including climate change, desertification, soil erosion, reduced agricultural production, and increased greenhouse gases in the atmosphere (Ibrahim, 2023). Poverty, hunger, illiteracy, availability and cost of fuel wood, and population growth are the main factors contributing to deforestation, which continues to grow. Therefore, this study aims to assess the Consequences of deforestation in Bauchi metropolis, Bauchi State, Nigeria.

Statement of the Problems

The rate of deforestation has been remarkably high in Nigeria. It is estimated that over 90 per cent of the high forests have been logged since the late 1940s. With current rates of deforestation being 4 per cent in off-reserves and 2 per cent in on-reserves (Tamakloe, 2019), there are varied opinions on the factors accounting for forest loss in Nigeria. For instance, the Food and Agriculture Organization (FAO) argues that excessive logging, unsustainable agricultural practices, bush burning, mining and quarrying, settlement and related infrastructure construction are factors accounting for the change and dynamics of Nigerian forests. It is also indicated that increased population growth and migration in mega cities such as Abuja, Lagos, and Port Harcourt have exerted undue pressure on biological and wildlife populations. According to Ahupatru and Kant (2003), the size of the forest is probably an underlying factor that could influence the process of deforestation. These various perspectives raised questions in the mind of the researcher, hence the need to probe into the consequences of deforestation in Bauchi metropolis.

The significance of this study lies in its examination of the environmental consequences of deforestation in Bauchi Metropolis, Bauchi State, Nigeria by focusing on the impacts of plant extinction, soil erosion, and climate change. Therefore, by providing empirical evidence on the interrelationships between these environmental issues and their effects on local ecosystems and communities, the research highlights the urgent need for awareness and intervention strategies.

Objectives

The aim of this study was to assess the consequences of deforestation in Bauchi metropolis. The specific objectives were to:

i. determine the socioeconomic characteristics of the respondents in the study area.
ii. assess the perception of the community dwellers on effects of climate change based on some elements of weather in the study area.
iii. evaluate the consequences of soil erosion with emphasis on loss of agricultural fertile lands in the study area.
iv. determine the conservation status with emphasis on possible local extinction of some plants due to deforestation in the study area.

MATERIALS AND METHODS

Study Area

The study was conducted at Bauchi metropolis, Bauchi State, North-East, Nigeria, in the Northern Savannah zone between latitude 9°3 and 12°3 North and longitude 8°50 and 11° East. The vegetation in Bauchi Local Government spans of two distinctive zones, namely, the Sudan savannah and the Sahel savannah. The Sudan savannah type of vegetation covers the southern part of the state (BASG, 2024).

Population of the Study

The population of Bauchi metropolis was estimated to be 697,000 according to United Nations, Department of Economic and Social Affairs (UNDESA, 2024)

Sample and Sampling Techniques

The sample size of the study was 384 community members of Bauchi metropolis, Bauchi State. Krejcie and Morgan (1970) Table was used for determining the sample size. While snowballing and random sampling techniques were used in the identification respondents.

Method and Instrument for Data Collection

The instrument for data collection was a structured questionnaire with the title "Assessment of Consequences of Deforestation on the Environment in Bauchi metropolis". The instrument was structured on 21 items which was answered based on the five-point Likert scale: Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D) and Strongly Disagree (SA). This tool ensures easy access to the selected respondents and allows for effective questioning and support quick and informed decision making. A total of 384 questionnaires were distributed and 336 were retrieved and the analysis was based on it; given 87.5% return rate.

Data Analysis

Descriptive Statistics: frequency, percentage, mean and standard deviation were employed in analysing data from responses of the questionnaires. Where five points Likert scale was used. Its statistical rule of accepting or rejecting a hypothesis is, each decision is accepted when it is up to or greater than the average point and the average in the case of this research can be expressed as mean of sum of integers 1-5, which is 3.

RESULTS

Socioeconomic Characteristics of the Respondents in the Study Area

The results in Table 1 elucidated that the gender of the respondents in the study area were dominantly males (60.12%) while female were 39.88%. The respondents range age of 25-30 was least with 6.85% while 31-35 was the highest with 37.79%; in terms of the marital status of the respondents the single comprises 16.97%, married (54.17%), widows (8.33%), widowers (11.01%) and

divorced (9.52%). However, the results show that majority of the respondents in the study area were married. The range household size of 1-2 (30.95%) was mostly reported, followed by 3-4 (27.68%), 5-6 (21.13%), 7-8 (15.48%) while the household size of 9 and was the least with 4.76%.

Respondents with primary schools certificate were 14.58%, S.S.C.E were 24.11%, tertiary educational Qualification were highest with 58.63% while non-formal education was the least with 2.68%. This implied that the majority of the respondents have had the tertiary educational Qualification and this signifies they could reason positively in terms of the consequences of deforestation. In respect to the occupational status of the respondents, the employees amongst them were 20.24%, unemployed were 15.77%, farmers were 29.17% while students were 34.82%. This elucidates that the majority of the respondents in the study area were learned people and also have idea on the environmental consequences of deforestation.

The longest length of stay by respondents in Bauchi metropolis was 11-15 years with 30.36%, followed by 16-20 was 24.41%, then 6-10 was 23.51% and 1-5 was 18.75% while 21 years and above was the least with 2.97%. Cumulatively, more than half of the respondents (57.74%) have stayed longer in the community from 11 years to 21 years and above, hence, have clear picture of the rainfall, erosion and plants existence and extinction in the study area.

Table 1: Socioeconomic characteristics of the respondents in Metropolis of Bauchi State, Nigeria

Socioeconomic characteristics	Frequency	Percentage (%)
Gender		
Males	202	60.12
Females	134	39.88
Total	336	100
Age		
25-30	23	6.85
31-35	127	37.79
36-40	82	24.41
41-45	75	22.32
46 and above	29	8.63
Total	336	100
Marital status		
Single	57	16.97
Married	182	54.17
Widow	28	8.33
Widower	37	11.01
Divorced	32	9.52
Total	336	100
Household size		
1-2	104	30.95
3-4	93	27.68
5-6	71	21.13
7-8	52	15.48
9 and above	16	4.76
Total	336	100
Educational Qualification		

Primary certificate	49	14.58
S.S.C.E	81	24.11
Tertiary	197	58.63
Non formal education	9	2.68
Total	336	100
Occupational status		
Employed	68	20.24
Unemployed	53	15.77
Farmer	98	29.17
Student	117	34.82
Others	0	0.00
Total	336	100
Period spent in the community (years)		
1-5		
6-10	63	18.75
11-15	79	23.51
16-20	102	30.36
21 and above	82	24.41
Total	10	2.97
	336	100

Source: Field survey, 2024

Perception of the Community dwellers on Effects of Climate Change Based on Some Elements of Weather in the Study Area

The results in Table 2 elucidate the mean scores of all the items on consequences of climate change and were above 3.0. The mean scores of items were between 3.84 and 3.95. The grand mean of 3.90 and standard deviation of .929 was obtained. The grand mean is above the benchmark of five points Likert scale. The results indicated community members in the study area indicated that climate change consequences on the environment on the environment in Bauchi metropolis of Bauchi State, Nigeria is high.

Consequences of Soil Erosion with Emphasis on Loss of Agricultural Fertile Lands in the Study Area

The mean scores of reported consequences of deforestation in Bauchi metropolis are between 3.63 and 4.2, with a grand mean of 3.81 and standard deviation of 0.360. The grand mean is above the benchmark of five points Likert scale. The results indicated that the respondents agreed with the statements of environmental consequences of soil erosion on the environment.

Conservation Status with Emphasis on Possible Local Extinction of Some Plants Due to Deforestation in the Study Area

The results in Table 4 reveal the mean scores of all the items on consequences of plant extinction were above 3.0. The mean scores of items were between 3.67 and 4.00. The grand mean of 3.81 and standard deviation of .360 was obtained. The grand mean is above the benchmark of five points Likert scale. The results community members in the study area agreed with the statements of items measuring local plant extinction as a consequences of deforestation in Bauchi metropolis of Bauchi State, Nigeria.

Table 2: Consequences of climate change in metropolis of Bauchi State, Nigeria

Item	M	SD	Remark

Wind patterns can be impacted by climate change, leading to more frequent and severe storms due to deforestation.	3.89	.943	Agreed
Wind can damage buildings, bridges, and other structures, leading to economic losses and safety risks due to deforestation.	3.90	.965	Agreed
High temperature can cause heat stress, leading to health issues and even death in humans and animals due to deforestation.	3.93	.896	Agreed
High temperature can lead to drought and water scarcity due to deforestation.	3.92	.866	Agreed
Warm temperatures can increase the spread of diseases among humans, animals, and plants due to deforestation.	3.84	.993	Agree
Heavy rainfall can lead to flooding, damaging infrastructure, crops, and houses due to deforestation.	3.95	.901	Agree
Drought conditions can lead to an increased risk of wildfires.	3.88	.936	Agree
Grand Mean	**3.90**	**.929**	**Agree**

Source: Field survey, 2024

Table 3: Consequences of Soil Erosion in the Study Area

Item	**M**	**SD**	**Remark**
Soil erosion brings about loss of fertile land	3.63	.059	Agree
Increased sedimentation in water ways is as a result of soil erosion caused by majorly deforestation	3.78	.032	Agree
Soil erosion decreased the quality of natural surface water bodies	3.79	.084	Agree
Soil erosion increased risk of water pollution	3.71	.132	Agree
Damage to infrastructure, roads, and buildings are partly caused by soil erosion as a result of deforestation.	4.13	.972	Agree
Soil erosion decreased soil water-holding capacity which could lead to stunted growth in plant	4.21	.843	Agree
Soil erosion increased risk of desertification as a result of deforestation	3.63	.059	Agree
Grand Mean	**3.84**	**.312**	**Agree**

Source: Field survey, 2024

Table 4: Consequences of Plants Extinction in the Study Area

Item	M	SD	Remark
Plant extinction affects economic impacts of industries like Agriculture, Forestry and Horticulture.	3.67	.153	Agree
Plant extinction contributes to negative impacts on wildlife such as habitat degradation and food scarcity for many animal species.	3.72	.140	Agree
Extinction of plants reduces medicinal options for new medicine and treatment as a result of deforestation	3.76	.150	Agree
Plant extinction affect ecosystem service like oxygen production, soil erosion prevention, and water filtration	3.82	.085	Agree

Plant extinction leads to decreased climate resilience	3.78	.064	Agree
Plant extinction contributes to negative impacts on human health	3.92	.983	Agree
Plant extinction can alter ecosystem process like pollination, seed dispersal and decomposition	4.00	.942	Agree
Grand Mean	**3.81**	**.360**	**Agree**

Source: Field survey, 2024

DISCUSSION

Climate change was a crucial consequence of deforestation on the environment (Table2). The finding is in concord with findings of Jagermeyr (2020) who reported that climate change is indeed a cross-cutting issue affecting many sectors and connected to other global challenges, such as the twin challenge of promoting sustainable water use and ensuring food security. In the same trend, this study is similar with the study of Balasha and Nkulu (2021) reported that the occurrence of extreme climatic events and unpredictable rainfall patterns leads to more frequent and intense droughts and floods. Also, the finding of this study is in tune with the findings of Rasul (2021) who conducted a study and reported that, climate change impact on cropland degradation is expected to compromise households' food security and the gross domestic production of many countries and that in marshy landscapes, heavy rains accentuate flooding and excessive deposits of sediments, pollutants and other wastes, thus compromising the sustainability of these fragile ecosystems.

The significant influence of soil erosion consequences on the environment in this study (Table 3) corroborates with the study of Ifeakor (2023) who found that soil erosion is not only an environmental issue rather it also causes huge losses to the economy. Similarly, the study agrees with the findings of Oljirra (2019) who stated that the reason that the potential for frequent occurrence soil erosion during construction is much higher than for agricultural land. Also, erosion, land degradation, and sediment-related damages can occur both on and off the construction sites; the finding is in relation with the findings of Lasanta et al. (2017) who found that, specific construction activities, such as grading and filling, can have negative economic impacts on soil quality and if left unprotected, construction sites may also be further degraded by soil erosion and start having significant environmental effects.

The results in Table 4 indicated that there is a significant influence of plant extinction consequences on the environment. This is in consonants with the finding of Sharrock et al. (2018) who reported that when plant species disappear due to deforestation, it will lead to the subsequent loss of various animal species too. In same light, it corroborates with the study of Zizka et al. (2021) that found that one plant species that will be negatively affected by climate change is the harebell. In the same vein, the finding is in tune with the finding of Govaerts et al. (2021) that conducted a study and reported that, the local extinction of plants can lead to a chain reaction of other extinction events as a result of deforestation.

CONCLUSION

The current study empirically investigated consequences of deforestation on the environment in Bauchi metropolis of Bauchi State, Nigeria. The study established climate change, soil erosion and local plant extinction as consequences of deforestation on the environment of Bauchi metropolis. Therefore, the ecological disturbances associated with deforestation will reduce drastically if deforestation is well regulated.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made:

i. Bauchi State government should device a serious means of public orientation on the plant extinction, soil erosion and climate change consequences on the environment.

ii. Community members should be made aware of consequences of deforestation through public enlightenment.

iii. There should be consistent law enforcement on mitigating deforestation in the study area.

REFERENCES

Ahupatru, M., and Kant, R. (2003). Forest dynamics in Nigeria: Underlying factors of deforestation. *International Journal of Environmental Studies*, 60(3): 315-329.

Bauchi State Government of Nigeria [BASG]. (2022). Bauchi State Diary retrieved from the archives of www.archives-bau-history-climate-24n34423.gov.ng

Forest Resources Assignment (2015). Terms and Definitions. PDF. Retrieved March 10, 2017

Gana, A. M. (2020). Impact of deforestation on the environment and rural livelihoods in Northern Nigeria. *Journal of Environmental Management*, 272: 111070.

Govaerts , L., Bardsley, D. K., and Suh, J. (2021). Integrating local perceptions with scientific evidence to understand climate change variability in northern Ghana: a mixed-methods approach. *Appl. Geogr*. 1(30):102440

Hassan, B. A. (2019). Forests as carbon sinks and climate regulators. *Journal of Sustainable Forestry*, 38(7): 635-652.

Ifeakor, C. (2023). The Impact of Deforestation and the Question of Logging on The Environment: An Analysis. *International Journal of Environmental Pollution and Environmental Modelling*, 6(1): 28-33

Jagermeyr, J. (2020). Agriculture's historic twin-challenge toward sustainable water use and food supply for all Front. *Sustain. Food Syst.* 4: 3-5.

Lasanta, T., Arnaez, J. and Nadal-Romero, E., (2019). Soil degradation, restoration and management in abandoned and afforested lands. In Advances in chemical pollution, environmental management and protection. 4:71-117.

Nkulu J., and Balasha, W. (2021). Rapid least concern: towards automating Red List assessments. *Biodiversity Data Journal* 8: e47018.

Olanrewaju, S. A., and Ajayi, A. O. (2019). *Fuel wood consumption* and *forest degradation in Nigeria: Drivers* and *challenges*. *Journal of Sustainable Energy and Environmental Protection*, 39(4):413-429.

Oljirra, A., (2019). The causes, consequences and remedies of deforestation in Ethiopia. *Journal of Degraded and Mining Lands Management*, 6 (3):17-47.

Rasul, R. P. (2021). Periodontitis: An oral disease with severe consequences. *Applied Biochemistry and Biotechnology*, 195 (1):17-32.

Sharrock, S., Hoft, R. and Dias, B. F. S. (2018). An overview of recent progress in the implementation of the

global strategy for plant conservation – a global perspective. *Rodriguesia* 69: 1489–1511.

Tamakloe, K. S. (2019). Deforestation trends in West Africa: An analysis of underlying causes and impacts. *Journal of Environmental Policy and Planning*, 21(5): 663-677.

Trived, P. (2019). The ecological importance of forests: A comprehensive overview. *Global Ecology and Conservation*, 18, e00647.

Oyetunji, O. A., Adeyemi, O. O., and Yusuf, A. A. (2020). Economic and ecological roles of forests in Nigeria. *International Journal of Environmental Sciences,* 15(2):178-192.

United Nations, Department of Economic and Social Affairs. (2024). Population Prospects 2019: Data Booklet. ST/ESA/SER.A/425

Zizka, A., Silvestro, D., Vitt, P and Knight, T. M. (2021). Automated conservation assessment of the orchid family with deep learning. *Conservation Biology* 35: 897–908.