Bima Journal of Science and Technology, Vol. 9(2B) Jul, 2025 ISSN: 2536-6041

E-ISSN: 3115-4662 DOI: 10.64290/bima.v9i2B.1303

Impact of Human Activities on Biodiversity in Yola North Local Government Area, Adamawa State, Nigeria

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ABSTRACT

Primary reasons for biodiversity loss are environmental pollution, destruction of natural habitats, overuse of biological resources, and population explosion. This study aimed to ascertain the impact of human activities on biodiversity in Yola North LGA. Descriptive survey research design was employed for the distribution of well-structured questionnaire. The sample for the study comprises 384 residents that was randomly selected from Doubeli, Jambutu, Karewa, Luggere, and Nasarawo Wards of Yola North LGA, Adamawa State. The data was analysed using Statistical Package for Social Sciences (SPSS) version 23.0. The analysis of the impact of population growth on biodiversity showed that majority of the respondents agreed that population affects; air, water and fishing activities, the impact of pollution on biodiversity is shown in the contamination of water bodies, reduced agricultural yield and tree growth. The responses of the respondents showed that majority agreed that habitat loss restrict animals from moving freely and can causes extinction in insect species. The study found that pollution significantly impacts biodiversity, aligning with global studies. Land use change was also found to significantly impact biodiversity, which is consistent with global research. Habitat loss was found to significantly impact biodiversity, which aligns with global studies.

Keywords: Human Activities, Biodiversity, Habitat, Population, Pollution

INTRODUCTION

Human activities encompass the various actions for recreation living or necessity by people. Kaur (2021) described these activities as all the activities performed to enhance; living, profit, entertainment, and mental peace. Similarly, Ono (2020) describe human activities as the various actions for living or recreation that are necessarily done by people. Biodiversity is the variety of different forms of life on earth, including the different plants, animals, micro-organisms, the genes they contain and the ecosystem they form. Rawat and Agarwal (2015) stated that biodiversity refers to genetic variation, ecosystem variation, species variation (number of species) within an area, biome or planet.

The loss to biodiversity is mainly due to habitat destruction, over- harvesting, pollution and inappropriate as well as indiscriminate development and overexploitation of natural resources (Prakash, 2017; Kumar and Verma, 2017). Anthropogenic activities have impacted the planet's biodiversity in multiple ways, both deliberate and accidental. The biggest threat to biodiversity to date has been the way humans have reshaped natural habitats to make way for farmland, or to obtain natural resources, but as climate change worsens it will have a growing impact on ecosystems (The Royal Society, 2022; Prakash and Verma, 2022). Similarly, Barrisford (2021) stated one of the main

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threats to biodiversity was the increased pollution. This loss is driven by a combination of interrelated factors, both human-induced and natural. Among the primary reasons are environmental pollution, destruction of natural habitats, overuse of biological resources, changes in climate, population explosion, and the strain exerted by economic development. This study aimed to ascertain the impact of human activities on biodiversity in Yola North LGA of Adamawa State.

MATERIALS AND METHODS

Study Area

The area of the study was Yola North Local Government Area of Adamawa State. Yola North is one of the 21 Local Government Areas of Adamawa State. Yola North approximately lies between latitude 09^0 13'N and 9^0 20'N and longitude 12^0 20'E and 12^0 30'E (Sahabo and Mohammed, 2016). Yola North LGA has 11 Wards namely: Alkalawa, Ajiya, Doubeli, Gwadabawa, Jambutu, Karewa, Limawa, Luggere, Nassarawo, Rumde, and Yelwa Wards (Sahabo and Mohammed, 2016; Olaitan, 2022). The town has also taken on growing functions in both administration and education and is the site of a federal university (founded 1981) (McKenna, 2019).

Study Population and Sampling Technique

The study population was estimated at 247,892 residents from the 11 wards; Alkalawa (28,804 residents), Ajiya (17,949 residents), Doubeli (38,846 residents), Gwadabawa (26,511 residents), Jambutu (22,476 residents), Karewa (27,784 residents), Limawa (18,116 residents), Luggere (19,817 residents), Nassarawo (19,864 residents), Rumde (14,366 residents), and Yelwa Wards (13,359 residents) (Mohammed and Sahabo, 2015). Purposive sampling was used to select five (5) wards, which comprises of; Doubeli, Jambutu, Karewa, Luggere, and Nasarawo Wards.

Sample Size

The sample size was determined using Krejcie and Morgan Table (Krejcie and Morgan, 1970). Based on the population of these selected wards, 383 residents was randomly selected from each of the selected wards in Yola North LGA, Adamawa State

Instrument for Data collection

The instrument that was used for collecting data for this study was a Likert scale questionnaire; this is a very common summated scale that includes five terms to describe a research participant's level of agreement to a particular statement: Strongly Agree, Agree, Neither Agree nor Disagree, Disagree, and Strongly Disagree. These terms are referred to by Dillman *et al*. (2014) as vague quantifiers.

The questionnaire comprise of two sections: Section A containing the personal data of the respondents and Section B containing items designed in five sub-sections to elicit responses on impact of human activities on biodiversity in Yola North LGA of Adamawa State. The response options was based on a five-point Likert scale and defined as follows:

Strongly Agree	(SA)	……	5points
Agree	(A)	……	4points
Undecided	(UD)	……	3points
Disagree	(D)	……	2points
Strongly Disagree	(SD)	……	1point

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Validation of the Instrument

The instrument was validated by senior researchers in the Department of Zoology, Modibbo Adama Unversity Yola. They examined the questionnaire with respect to its clarity, ambiguity of questions, excessive wordiness, difficulty of vocabulary, number of items and construct, appropriateness of language, ability to elicit accurate information and suitability for the purpose of the study. Their corrections, comments, and modifications were incorporated into the final instrument.

Ethical Consideration

A letter of introduction was obtained from the Department of Zoology, Modibbo Adama University, Yola. Permission was obtained from the ward councilors of Doubeli, Jambutu, Karewa, Luggere, and Nasarawo Wards. Verbal informed consent was obtained from each respondents and respondent's right to refuse participation in the study or withdraw at any time during the course of the interview was respected. Maximum effort was made to maintain confidentiality of the information obtained.

Method of Data Analysis

The data that was collected for this study was analysed using Statistical Package for Social Sciences (SPSS) version 23.0. While Analysis of Variance (ANOVA) single factor was used to test the level of significance.

RESULTS

The Impact of Population Growth on Biodiversity in Yola North LGA

The analysis of the impact of population growth on biodiversity showed that majority of the respondents agreed that population affects; air, water and fishing activities. They also agreed that it increases resources consumption and increases demand for shelter. On the other hand; the majority of the respondents disagreed that the population causes land pollution, emergence of pandemics and bring about extinction of wildlife. They also disagree that population can cause the shrinking of natural habitat due to increased farming activities. The ANOVA analysis showed that there is a significant difference between the responses at p=0.05 (Table 1).

Table 1: Impact of Population growth on biodiversity in Yola North LGA of Adamawa State.

Variables	SA	A	ND	D	SD	Mean (X)	Remarks
Growing levels of air pollution	102	187	82	12	0	4.26	Agreed
Growing levels of water pollution	48	253	70	12	0	3.99	Agreed
Growing levels of land pollution	89	198	84	12	0	3.88	Disagreed
Increased demand for shelter leading to habitat loss	106	199	54	20	4	3.95	Agreed
Increased fishing activities leading to extinction of marine	140	163	54	22	4	4.00	Agreed
Increased resource consumption	78	227	53	25	0	4.08	Agreed
Shrinking of natural habitat due to increased farming	62	202	93	12	14	3.75	Disagreed
Emergence of new pandemics	68	226	63	16	10	3.85	Disagreed
Extinction of wildlife	38	224	99	0	22	3.67	Disagreed

Source: Field survey, 2024.

Keys: Strongly Agree (SA) Agree (A) Neither Disagree nor Agree (ND) Disagree (D) Strongly Disagree (SD)

Decision-weighted average = 3.94

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The Impact of Pollution on Biodiversity in Yola North LGA

The responses from the respondents showed that majority agreed that the impact of pollution on biodiversity is shown in the contamination of water bodies, reduced agricultural yield and tree growth. They also agreed that it causes harm to marine habitat and it pollute the environment. But they disagree that pollution causes; acid rain, respiratory challenges and changes the chemical in the soil. The majority of the respondents are of the notion that pollution does not increase plant diseases, cause global warming and skin diseases for humans. Neither does pollution bring about soot in the atmosphere of death of crops. The ANOVA analysis showed that there is a significant difference between the responses at p=0.05 (Table 2).

Table 2: Impact of pollution on biodiversity in Yola North LGA of Adamawa State.

Variables	SA	A	ND	D	SD	Mean (X)	Remarks
Acid rain	138	110	121	14	0	3.97	Disagreed
Respiratory challenges	114	205	64	0	0	4.13	Disagreed
Contamination of water bodies	109	246	18	10	0	4.19	Agreed
Changes in chemical composition of soil	102	247	24	10	0	4.15	Disagreed
Reduction in agricultural crop yields	191	166	16	10	0	4.40	Agreed
Reduced growth of trees	167	182	24	10	0	4.32	Agreed
Increase in plant diseases	129	193	33	18	10	4.08	Disagreed
Global warming	97	225	33	18	10	3.99	Disagreed
Skin diseases	129	186	29	10	19	4.06	Disagreed
Soot in the atmosphere	121	217	26	10	9	4.13	Disagreed
Death of crops	133	197	44	0	9	4.16	Disagreed
Harm to marine life habitat	178	170	26	0	9	4.33	Agreed
Environmental pollution	178	170	26	0	9	4.33	Agreed

Source: Field survey, 2024.
keys: Strongly Agree (SA) Agree (A) Neither Disagree nor Agree (ND) Disagree (D) Strongly Disagree (SD)
Decision-weighted average = 4.17

The Impact of Habitat Loss on Biodiversity in Yola North LGA

The responses of the respondents showed that majority agreed that habitat loss restrict animals from moving freely and can causes extinction in insect species. Majority of the respondents disagreed that habitat loss causes; displacement of wildlife, extinction in plants and animals species. They also disagreed that the spread of pest and diseases, negative environmental changes and poor climate are tied to habitat loss. The ANOVA analysis showed that there is a significant difference between the responses at p=0.05 (Table 3).

Table 3: Impact of habitat loss on biodiversity in Yola North LGA of Adamawa State.

Variables	SA	A	ND	D	SD	Mean (X)	Remarks
Restriction of movement of animals	180	144	47	12	0	4.28	Agreed
Displacement of wildlife	71	207	85	20	0	3.86	Disagreed
Extinction of animal species	78	162	101	42	0	3.72	Disagreed
Extinction of plant species	104	152	97	22	8	3.84	Disagreed
Extinction of insect species	99	198	66	0	20	3.93	Agreed
Poor climate regulation due to absence of trees	82	171	110	0	20	3.77	Disagreed
Spread of pests	87	192	84	0	20	3.85	Disagreed
Spread of diseases	52	237	82	0	12	3.83	Disagreed
Negative environmental changes	72	206	81	12	12	3.82	Disagreed

Source: Field survey, 2024

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keys: Strongly Agree (SA) Agree (A) Neither Disagree nor Agree (ND) Disagree (D) Strongly Disagree (SD)
Decision-weighted average = 3.88.

DISCUSSION

Human Activities and Their Impact on Biodiversity

Understanding how people perceive biodiversity loss is crucial to educate them about its consequences and to implement effective behavioral interventions in biodiversity conservation. The present study shows that human population has negative impact on biodiversity; this finding is consistent with global concerns about the detrimental effects of high human activities on biodiversity (Dirzo *et al.,* 2014). Due to high population, human activities; ranging from industrialization and urbanization to agriculture and deforestation, have been altering natural habitats and ecosystems at an unprecedented rate, leading to habitat loss, pollution, climate change, and overexploitation of species, among other impacts (Ellis, 2011). These changes have been driving declines in biodiversity worldwide, threatening not only the survival of countless species but also the integrity of ecosystems and the services they provide, this is agrees with the report of Cardinale *et al.* (2012).

The finding in the present study on the impact of population on land and water pollution showed some similarity with findings of Jackson (2003) who reported that water pollution can disrupt aquatic ecosystems, affecting both flora and fauna, but a slight contrast from the finding of Jones and Bennett, (2014) that opined that both land and water pollution has adverse effects on biodiversity, where the accumulation of solid waste can contaminate soils with heavy metals and other toxic substances, affecting the health of soil fauna and flora (Alloway, 2013).

Impact of Pollution on Biodiversity

This finding in the present study aligns with global trends, as pollution, often resulting from domestic or industrial activities, is a major environmental issue that can have significant impacts on biodiversity causing biodiversity loss (Gibson *et al.,* 2011; Newbold *et al.,* 2015); a similar finding was reported by Holland *et al.* (2005). As reported by Bobbink *et al.* (2010) pollution can affect a wide range of organisms, from plants to animals, and can disrupt ecosystems by altering soil and water chemistry. For instance, pollutants such as sulfur dioxide and nitrogen oxides can lead to acid rain, which can acidify soils and water bodies, affecting their ability to support life (Likens *et al.,* 1996). Moreover, airborne pollutants can directly affect the health of wildlife. For example, heavy metals can accumulate in the tissues of animals, affecting the respiratory systems of animals (Künzli *et al.,* 2001) and can cause mortality (Beyer, 1995).

The present study resonates with the work of Lal (2010), who documented the negative impacts of various forms of pollution, including air, water, and soil pollution, on agricultural yields. Specifically, acid rain can alter the chemical composition of the soil, rendering it less conducive for crop growth (Likens *et al.,* 1996). Von Sperling (2017) and Wu *et al.* (2020) also reported that pollution can lead to significant changes in water and soil quality, respectively, with potential adverse effects on biodiversity. Contamination of water bodies can disrupt aquatic ecosystems, affecting both flora and fauna (Vörösmarty *et al.,* 2010). Similarly, changes in the chemical composition of soil can affect plant growth and, by extension, the organisms that rely on these plants for survival (Doran *et al.,*

E-ISSN: 3115-4662 DOI: 10.64290/bima.v9i2B.1303

2018). This phenomenon has been observed in various regions worldwide, underscoring the global relevance of our findings (Doran *et al.,* 2018). The majority of the respondents in the present study contradict the World Health Organization's (2022) assertion that air pollution is linked to respiratory diseases.

Impact of Habitat Loss on biodiversity

Habitat loss is one of the greatest drivers of biodiversity loss. It has a direct link with human population increase. Loss of habitat is more witnessed in an area where population is high and most areas rich in biodiversity are prone to high population levels (Cincotto and.Engelman, 2000). The present study confirmed the report of Fahrig (2003) who stated that habitat loss can lead to the displacement of wildlife, the disruption of ecological communities, and the extinction of species. This could come in different ways, for instance, the conversion of natural habitats to agricultural lands or urban areas can lead to the loss of native plant and animal species, as these species may not be able to survive in the altered environments. Moreover, habitat loss can disrupt ecological networks, altering species interactions and potentially leading to cascading effects on ecosystem function (Tylianakis *et al.*, 2008).

CONCLUSION

The study found that pollution significantly impacts biodiversity, aligning with global studies. Land use change was also found to significantly impact biodiversity, which is consistent with global research. Habitat loss was found to significantly impact biodiversity, which aligns with global studies. Lastly, the study found that population growth significantly impacts biodiversity, which is consistent with global research. These findings underscore the need for sustainable practices and conservation efforts to safeguard biodiversity in the region.

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