

Impact of Anthropogenic Activities on Ecosystem Stability in Gashaka Gumti National Park, Nigeria

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Abstract:- This study examined the impact of anthropogenic activities on ecosystem stability in Gashaka-Gumti National Park. The study employed survey research design. Questionnaires were used to solicit information from the respondents. 156 structured 5-point Likert scale questionnaire were administered to 158 staff. However, only 156 were later retrieved and their responses carefully analyzed using IBM-SPSS version 25 software in conjunction with descriptive statistics. The results show that anthropogenic activities have led to the destruction of wildlife, agricultural resource degradation, draining of streams/rivers, destruction of habitat, air pollution and ecosystem instability. The study recommended the need for Federal Government of Nigeria to employ more staff with adequate training for effective policing of the Park as the current number of 259 staff cannot effectively manage the Park which covers 6,731Km² of land area.

Key words:- Biodiversity, Environment, Wildlife, Vegetation and Exploration

I. INTRODUCTION

Anthropogenic activities are the many actions undertaken by man in order to meet his basic needs for food, income, and other essentials of existence. Environmental degradation is brought about by anthropogenic activity, which is defined as the deterioration of the environment caused by the depletion of resources such as air, water, and soil; the loss of ecosystems; habitat destruction; species extinction; and pollution. According to Plumtre et al. (2021), around 3% of the Earth's terrestrial surface is biologically and faunally intact, referring to places with robust populations of native animal species and little to no human footprint. Many of these untouched ecosystems were discovered in indigenous populations.

Humans are responsible for the present quaternary extinction, which has boosted extinction rates from 100 to 1000 times the usual background rate (May, 1998). Though most experts agree that people have exacerbated the rate of species extinction, other researchers believe that if humans did not exist, the Earth's biodiversity would flourish at a rapid pace rather than diminish. (2010) (Sahney et al.). Meat consumption, excess fishing, acidification of the oceans, and

the amphibian crisis are a few bigger examples of a worldwide reduction in biodiversity. Human overpopulation (and continuous population growth) and excessive consumption, particularly among the ultra-affluent, are regarded to be the key drivers of this rapid reduction (Pimm et al., 2014).

Climate change, ocean acidification, permafrost melting, habitat loss, eutrophication, storm water runoff, air pollution, contaminants, and invasive species are among the many problems facing ecosystems. The cumulative effects of these problems, as well as numerous other pressures, can have serious consequences on ecosystem functions.

Despite the Nigerian government's efforts to conserve the natural resources in the study area, the problem persists since enclave settlements exist in and around the Gashaka-Gumti National Park. Farmers, cattle ranchers, honey harvesters, timber harvesters, and miners make up the majority of the population. They rely on the park's natural resources to make a living. Farmers, hunters, cattle ranchers, honey harvesters, and illegal miners all contribute significantly to the ecosystem's destabilization. The increasing reliance on the Park's resources from the local population and migratory herders has put the natural ecology under increasing pressure of degradation and depletion of natural resources. It is against this background that this study examines the impact of anthropogenic activities on ecosystem stability in Gashaka-Gumti National Park.

II. MATERIALS AND METHODS

➤ Description of the Study Area

The Gashaka-Gumti National Park is located between latitudes 7° 56' and 7° 59' N and longitudes 11° 48' and 11° 54' E. The park's entire area is approximately 6,731 km². The park is located in the states of Adamawa and Taraba (Fig. 1). The park's Gumti section is located in Adamawa State, while the Gashaka area is located in Taraba State (Akinsoji et al., 2016). The name of the park was inspired by two (2) of the region's oldest and most historic settlements: Gashaka village in Taraba State and Gumti village in Adamawa State. The Federal Government of Nigeria established the Gashaka-Gumti National Park in 1991 by merging the Gashaka Game Reserve with the Gumti Game Reserve. The park, like any other park in Nigeria, was

formed as a protected area for the purposes of nature protection, recreation, ecotourism, scientific and medical research, and promoting the art, craft, and cultural value of the indigenous people that live in the park's vicinity. The Park's northern, Gumti region is generally flat, whereas the southern, Gashaka sector is more mountainous. This harsh environment is distinguished by steep, densely forested slopes, deep falling valleys, sheer escarpments, and fast-flowing rivers. The altitude ranges from 450 metres above sea level in the plains of the Northern Park sector to the peaks and pinnacles of Mount Gangirwal (Mounting of Death) in the Southern Park sector, which, at a stunning 2,400 metres above sea level, is the highest point in the park, represents Nigeria's highest mountain (Mubi, 2010).

According to Akinsoji et al. (2016) and Oruonye et al. (2017), Gashaka-Gumti National Park has a good drainage system. Rivers such as the Mayo Kam, Mayo Yim, Mayo Kpa, Mayo Gangam, Mayo Beriji, and Mayo Burtali run through the park, providing habitat for aquatic wildlife as well as a reliable source of water for the neighboring communities. Sedimentary rock makes up Gashaka-Gumti. The region's sedimentary rocks have been mineralized with

lead (pb) and zinc (zn). The pre-Cambrian Basin is also known as the "oldest, crystalline, solid foundation in the country" because it comprises igneous and metamorphic rock. Sedimentary rock can be found in the basins that divide the basement complex continent. The predominant rock type in the area causes erosion and weathering of landforms within the park. Gashaka-Gumti National Park's mountainous terrain provides an ideal landform for the local watershed. The Gumti area has highly fertile soil, which supports diverse agricultural activities of the park's enclave populations. Humic ferrisols and lithosols are generally found at higher elevations, with ferruginous tropical soils and alluvial soils in river basins (Akinsoji et al., 2016). The rainy and dry seasons characterize the climate of Gashaka-Gumti National Park. The park has temperatures ranging from 18°C (64°F) to 36°C (96°F) with an annual rainfall of approximately 1,500mm, with a single rainfall peak in September (Akinsoji et al., 2016). The dry season in the study area starts in November and lasts until March. It is distinguished by a northeasterly or harmattan wind from the Sahara Desert. The average temperature at GGNP is 29 degrees Celsius, with an average humidity level of 38 percent (Mubi, 2010).

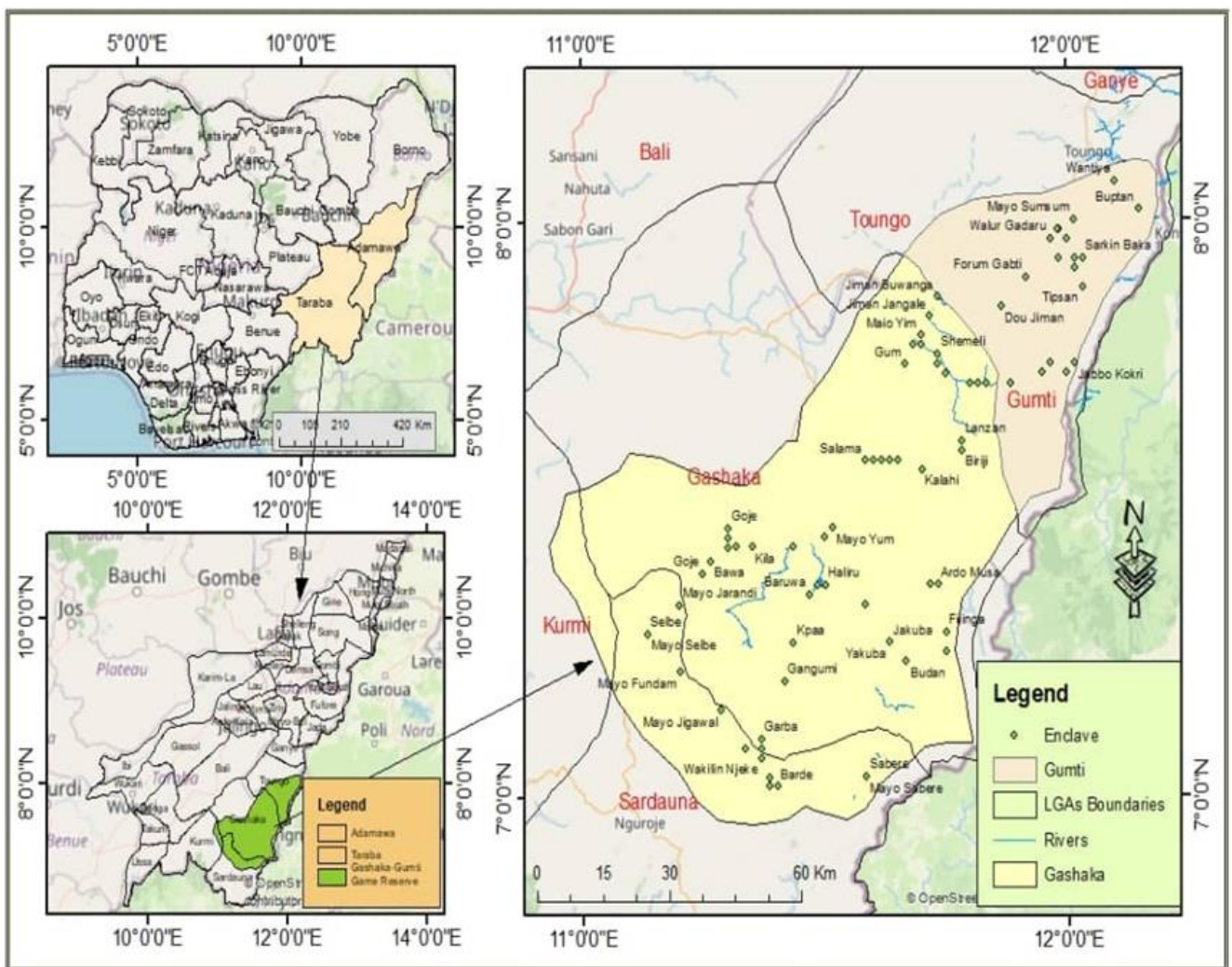


Fig 1 Map of Gashaka-Gumti National Park
Source: Taraba State Geographic information System (2023)

➤ *Sample and Sampling Technique*

Gashaka Gumti National Park has a staff strength of 158 Rangers in the ecological unit of the Park. This population is deemed manageable; hence the entire staff constituted the population of this study. The sample population for the administration of questionnaires was restricted to the Rangers of the National Park because the information required are official and can only be responded to by the staff of the Park. One hundred and fifty eight (158) structured 5-point Likert scale questionnaire were administered to 158 staff. However, only 156 were later retrieved and their responses carefully analyzed.

III. METHODS OF DATA ANALYSIS

➤ *Statistical Package for Social Sciences (SPSS)*

To analyze the data obtained through questionnaire, IBM-SPSS version 25 software was used in conjunction with descriptive analysis tools such as distribution table, mean and standard deviation. This software is a popular statistical application that can do highly complicated data manipulation and analysis using simple instructions.

➤ *Anthropogenic Activities in Gashaka-Gumti National Park*

Gashaka-Gumti National Park was established to conserve wildlife so that the abundance and diversity of their species are maintained at optimum levels

commensurate with other forms of land use in order to ensure the continued existence of wildlife for the purpose of sustainable utilization for the benefit of the people. The law establishing Gashaka-Gumti National Park makes exploitation of wildlife within the Park illegal. Despite this, anthropogenic activities still persist in the Park. These anthropogenic activities include:

- Farming
- Grazing
- Mining
- Lumbering
- Poaching
- Honey extraction

• *Farming:*

With the ever-increasing population in the enclave settlements, there is also a corresponding demand for farm land. This is depicted in Plate 1 where the vegetation has been cleared in preparation for new farming season. Farming activities within the Park alter the land cover nature of the area as it involves clearance of the natural vegetation to pave way for crop plantation. Farming activities is dangerous to the ecosystem as it exposes the surface to various agents of denudation and destroyed soil microorganisms (fig 2)



Fig 2 New Farm Sites in GGNP

• *Open Grazing:*

Grazing reduces vegetation growth, including aboveground biomass, belowground biomass, vegetation cover, and vegetation height. Grazing by livestock can also have a detrimental impact on most soil functional indicators, such as carbon stocks, soil nitrogen and phosphorus, dissolved organic matter, and microbial biomass, resulting in considerable declines in some soil indicators. Furthermore, the shepherds set fire to the bushes on a regular basis to allow grasses to regenerate for the animals to feed on (fig 3).



Fig 3 Cattle Grazing in GGNP

• **Mining:**

Excavation and removal of overburden (layers) in the underground and open-pit surface mining are popular mining methods in the area. These processes have a deleterious impact on the structure and composition of the soil. As a result, several mining techniques render the land infertile and unfit for wildlife. Mining activities cause deforestation and significant damage to soil, plant, and grassland near pits, altering the topography of the area (fig 4).



Fig 4 Mining Sites in GGNP

• **Lumbering:**

Pterocarpus erineceus (Madrid) is abundant in Gashaka-Gumti National Park. This and other tree species are being logged for foreign exchange and other purposes. This is one of the reasons why biodiversity and habitat damage are prevalent in the Park, resulting in wildlife migration, increased soil erosion, deforestation, land degradation, and vegetation structure change (fig 5).



Fig 5 Lumbering in GGNP

• *Poaching:*

The growing prevalence of wild animal poaching derives from people's desire to supplement their protein intake with bush meat while also earning a living. However, uncontrolled hunting of wild animals endangers their survival. Poachers' activities have had a significant impact on the diversified existence of animals in various habitats in the Park. When any living item or native species that contributes to an ecosystem becomes extinct, the entire ecosystem suffers and can be permanently affected. Poaching is a severe problem in the Park, as evidenced by the number of arrests and charges made within four (4) years (2015-2019). During this time, around 57 people were apprehended and prosecuted.

• *Honey Extraction:*

Perpetrators of this business in the Park usually cut down the trees which the bees are housed before extracting the honey. This practice negates the principles of a protected area as wildlife are destroyed in the process (fig 6).



Fig 6 Honey Harvesting in GGNP

➤ *Impact of Human Activities on Ecosystem Stability in GGNP*

Table 1 depicts the details of information on the impact of human activities on ecosystem stability as acquired through the administration of questionnaire. The statement 6 on the questionnaire which says “logging is one of the serious challenges in the Park caused by people within and outside the Park” had the highest mean score of 4.23 and standard deviation of 0.891, followed by statement 7 “cattle rearing within the Park is destructive to the ecosystem (mean=4.21; standard deviation=0.873), and the least was statement 10 “Bush burning constitutes a threat to the ecosystem stability in the Park” (mean=3.60; standard deviation=1.230).

Table 1 Impact of Human Activities on Ecosystem Stability in GGNP

Statements	N	Mean	Std. Deviation	Decision
Agricultural activities of the people have led to the destruction of wildlife	156	3.74	1.198	Accepted
Agricultural resources degradation has also resulted from activities of the people.	156	3.72	1.107	Accepted
Deforestation is a serious problem in the park especially with the high demand for “Madrid” wood or rosewood	156	4.19	1.104	Accepted
Draining streams/rivers and destruction of critical freshwater aquifer recharge areas is caused by the different activities of the populace.	156	3.99	1.023	Accepted
Diverse existence of animal and plant species in different habitats has been widely affected by overhunting and overexploitation.	156	3.93	1.038	Accepted
Logging is one of the serious challenges in the park caused by people within and outside the park	156	4.23	.891	Accepted
Cattle rearing within the park is destructive to the park ecosystem	156	4.21	.873	Accepted
Invasive species can cause havoc in an ecosystem and send a parks native residents toward extinction	156	4.06	.827	Accepted
Air pollution in the park can poison plants and choke off views	156	3.79	1.037	Accepted
Bush burning constitute a threat to the ecosystem stability in the park	156	3.60	1.230	Accepted
Activities of poachers is a serious risk to the existence of mammals in the parks	156	4.12	.964	Accepted
Human settlement encroachment and other activities around the park boundaries constitute a challenge to the survival of Wildlife	156	4.21	.861	Accepted

Note: a mean score above 3.5 is acceptable threshold for each statement.

Source: Researcher’s Fieldwork 2022

IV. DISCUSSION

➤ *Impact of Human Activities on Ecosystem Stability in GGNP*

Statement 1 on the questionnaire puts it that agricultural activities led to wildlife destruction. The result shows this statement was accepted with a mean average of 3.74 and a standard deviation of 1.198. This proves that agricultural activities such as crop and animal productions have serious negative effect on ecosystem stability in the study area.

Statement 2 states that aquatic resource degradation has resulted from agricultural activities of the enclaves. This was accepted by the respondents with a mean value of 3.72. Various agricultural activities of the enclave dwellers such as farming and fishing have degraded aquatic resources.

The respondents agreed with statement 3 which states that the high demand for “Madrid” wood led to increase in deforestation in the Park. The sudden high demand and the economic benefits attached to “Madrid” wood attracts a lot of people from the neighbouring communities into the Park to harvest the woods. This action resulted in the depletion of the forest and destruction of wildlife habitat.

Statement 4 states that different activities of the population led to the destruction of freshwater aquifer recharge areas. The statement was accepted with a mean score of 3.99. Different activities such as mining and farming expose the surface to some agents of denudation like wind and water. This in turn led to pollution and siltation of the freshwater channels.

On whether or not over exploitation affects plants and animals species as contained in statement 5, the statement was accepted with a mean value of 3.93 and standard deviation of 1.038. Over exploitation in the area of hunting, deforestation and mining has hindered ecosystem stability to a great extent. This is because most of the wildlife are lost forever during the process.

Statement 6 regarded logging as a serious challenge in the Park caused by people within and outside the Park. This statement was again accepted with a mean value of 4.23. Logging activities is termed illegal within the Park. However people within and outside the park still engage in this illegal act. Their activities have so much affected the stability of the Park.

Statement 7 states that cattle rearing within the Park is destructive to the ecosystem. The statement was generally accepted by the respondents with a mean value of 4.21. Cattle rearing affects vegetation growth, exposes the surface to erosion and destroys the soil microorganisms. Livestock grazing have a negative effect on vegetation growth, that is, aboveground biomass, belowground biomass, vegetation cover, and vegetation height.

Statement 8 on the other hand, states that invasive species can cause havoc in an ecosystem and send the Park’s native residents towards extinction. This statement was mostly accepted by the respondents with a mean score of 4.06. Invasive species, when introduced into an ecosystem, tend to dominate and send away the local species therefore altering the composition of the ecosystem. Invasive species are introduced by moving species from other parts of the world, either purposefully or unintentionally. This can be damaging to existing species since invading species are introduced at a much faster rate than evolution over longer time periods..

Statement 9 states that “Air pollution in the Park can poison plants and choke off views”. This statement was accepted by the respondents with a mean of 3.79. This agrees with the study of Warrent (2004) who found that air quality problems can choke off views, poison plants, and even foul water.

Statement 10 which states that bush burning is a threat to the ecosystem stability in the Park was also accepted with an average mean of 3.60. Bush burning affects the ecosystem negatively as it leads to the death of many plants. It destroys animal habitat and slows down plant growth to a great extent.

Statement 11 states that activities of poachers is a serious risk to the existence of mammals in the Park. This statement was generally accepted with a mean score of 4.12. Many of the mammals in the Park have gone extinct due to this as many of them have been killed for meat over the years. Also, due to frequent disturbance, many of them left the Park for a safer zone

Statement 12 states that “Human settlement encroachment and other activities around the Park boundaries constitute a challenge to the survival of the wildlife”. This statement was accepted by the majority of the respondents with a mean of 4.21. With increase in human population, there is also a corresponding increase in demand for land for living and other agricultural activities. With these developments, the Park continues to shrink as the ecosystem are being lost.

V. CONCLUSION

This study examined the impact of anthropogenic activities on ecosystem stability in Gashaka-Gumti National Park. The study employed the use of questionnaire to solicit information from the respondents. The findings of the study revealed that the continuous existence of enclaves within and around the Park constitute a serious threat to the survival of the Park. This is because their various livelihood activities such as farming, poaching, lumbering, mining, honey harvesting, open grazing, fishing and bush burning are affecting the development of the Park in one way or the other.

RECOMMENDATIONS

The study recommended the need for Federal Government of Nigeria to employ more staff with adequate training for effective policing of the Park as the current number of 259 staff cannot effectively manage the Park. Also, the Federal Government may have to consider resettling the enclave communities out of the Park. This can bring to the barest minimum the rate of anthropogenic activities going on within the Park

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