



Analysis of Level and Extent of Anthropogenic Activities in and Around Protected Areas (PAs): Case of Baturiya Wetlands, Jigawa State Nigeria

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Authors' contributions

This work was carried out and published in agreement among the researchers. Author HZH performed the project work. Author JG designed the first draft of the manuscript, created the study area map and also performed the statistical analysis. Authors BZ and YAY provided the support, guidance towards the completion of the project while author ILM assisted during the field data collection. All authors read and approved the final manuscript.

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ABSTRACT

Wetlands are transitional points of habitats that are normally situated between a water body, vegetation cover and dry land. Human activities and climate change influence, the net loss of natural features in global wetlands. However, in the earlier 1990s, people began to understand the benefit of wetlands. The main objective of this study was to evaluate the level of anthropogenic activity in and around Baturiya wetlands and also to provide information on the extent of

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exploitation on Baturiya wetland. A questionnaire was designed and administered according to the objectives of the study. The result shows that a majority of the anthropogenic activity was conducted by men within the age range of 21-50 years. About 92.5% of the respondents are aware of the effect of the serial disturbances on vegetation resources. The exploitation was mainly for the massive use of energy, income generation, medicinal use and constructional materials. There is a strong need from the management and stakeholders to formulate a deliberate strategy for the provision of an alternative source of energy, health facilities, and a systematic awareness through training to the local communities around the Protected Areas (PAs) on wetland values, sustainable use of wetland resources and conservation strategies.

Keywords: Protected area; wetland; biodiversity and conservation; illegal activities; exploitation.

1. INTRODUCTION

Wetlands are one of the world's most important environmental assets containing a disproportionately high number of plant and animal species compared to other areas of the world [1,2]. They are vulnerable to exploitation due to the abundance of energy source, food, and water resources. Wetlands are among the world most productive environment, they produce numerous products for man, wildlife and contribute significantly towards a number of the Biodiversity Targets, and play a vital role in achieving Sustainable Development Goals (SDGs) [3].

Nigeria is endowed with inland wetlands (northern part) and coastal wetlands in the southern part, occupying a total land surface of about 3%. Nigeria is uniquely bestowed with freshwater wetlands and the coasted saline wetlands [4]. These wetlands are in general uses such as economic, scientific, recreational and socio-cultural significance. However, Nigeria's wetlands are currently being threatened by certain anthropogenic and biogeophysical factors which include population pressure, construction of dams, urbanization, overgrazing, logging (exploitation), mining, farming, transportation routes, desertification, droughts, climate change and other physical infrastructure [5]. Apart from flood protection, wetlands also maintain streamflow during both rainy and dry season in the semi-arid region of northern Nigeria [6,7].

Conservation of habitat does not always mean that people are not allowed to live, work and make use of the specific environment, it aims at making sure that people do not over-exploit the environment, the risk of degradation and biodiversity loss resulting from urbanization, climate change and mineral exploitation and processing so that the environment can keep on

self-renewal and regenerate for present and future use [5,8]. The Baturiya wetland (BW) currently supports a population of about 1.5 million people engaged in various forms of livelihood such as fishing, farming, and grazing. The area supports rich fisheries of which about 40 million Naira worth of fish has produced annually, according to 1989-90 estimates [9]. Human anthropogenic actions destroyed more than a third of the large proportion of some type of ecosystem leaving behind fragments [10]. Human action along Hadejia-Nguru wetlands affect the natural habitats about birds diversity, such as exploitation of mature trees, hunting, and farming [11]. The insignificant relationship between the communities' population size and illegal activities in the protected area [12]. Exploitation and refining of wetlands resources, as well as the availability of transportation access, illegal marketing, illegal storage site on the use of trees products, made rapidly the decline of wetlands resources in conservation and biodiversity of resources in Nigeria [13].

Commercial exploitation of plants for medicinal and other uses has important implication for their conservation. The surge in public interest in the use of the plant as medicines has been based on the assumption that the plants will be available continuously. Human activities on the environment need to be controlled or minimized to protect and conserve for biodiversity and sustainable use [14]. Firewood is transported out of most Nigerian wetlands by porters using many means at earlier evening or earlier morning, with at least two truckloads daily. The large quantity of firewood taken from Baturiya wetlands by villages is transported to the cities of Kano and Maiduguri [15]. Conservation involves protection and establishment of plants in a location of their natural occurrence. This method is feasible when pressure on the natural forest is light and endangered species of climax vegetation do not regenerate naturally and cannot be cultivated

with present knowledge [16]. It is quite unfortunate that despite the importance of this resource and the consequences of its deterioration, effort on its conservation has not been yielding a positive result [17]. This largely may be due to lack of up to date information on the extent, rate, and nature of depletion [18]. Challenges in wetlands conservation are mostly due to the lack of monitoring and sustainability measures from researchers and government and lack of awareness of the inhabitants living around [19] and due to the lack of modern technology among wetlands staff and management in monitoring and conservation of resources such as application of remote sensing and GIS to support conservation affect Baturiya wetlands. The assessment of the anthropogenic factors will highlight the basic information of Baturiya wetland and possibly provide the major strategic tool for its sustainable use and management strategy for stakeholders and management of the wetland for decisions making in the future conservation of Baturiya wetlands (BW). This

study was to investigate, and provide information on, the level of anthropogenic activities on Baturiya wetland and evaluate the extent of ecological exploitation and conservation. Recommendations are also made for the future conservation of biodiversity resources to ensure healthy and maintainable use of resources in Baturiya wetland.

2. MATERIALS AND METHODS

2.1 Study Area

Baturiya wetland is a part of Hadejia–Nguru wetlands, which are located in the North-Eastern part of Nigeria. The wetland is geographically located between latitude 12°15'00" and 12°45'00" N and longitude 10°15'00" and 10°45'00" E, approximately 320 square kilometres, located 20 km away from Hadejia town of Jigawa State. Baturiya wetland is on the list of Ramsar wetlands of international importance, which was gazetted in 1985. It acquired its name from European lady (Baturiya in the Hausa language)

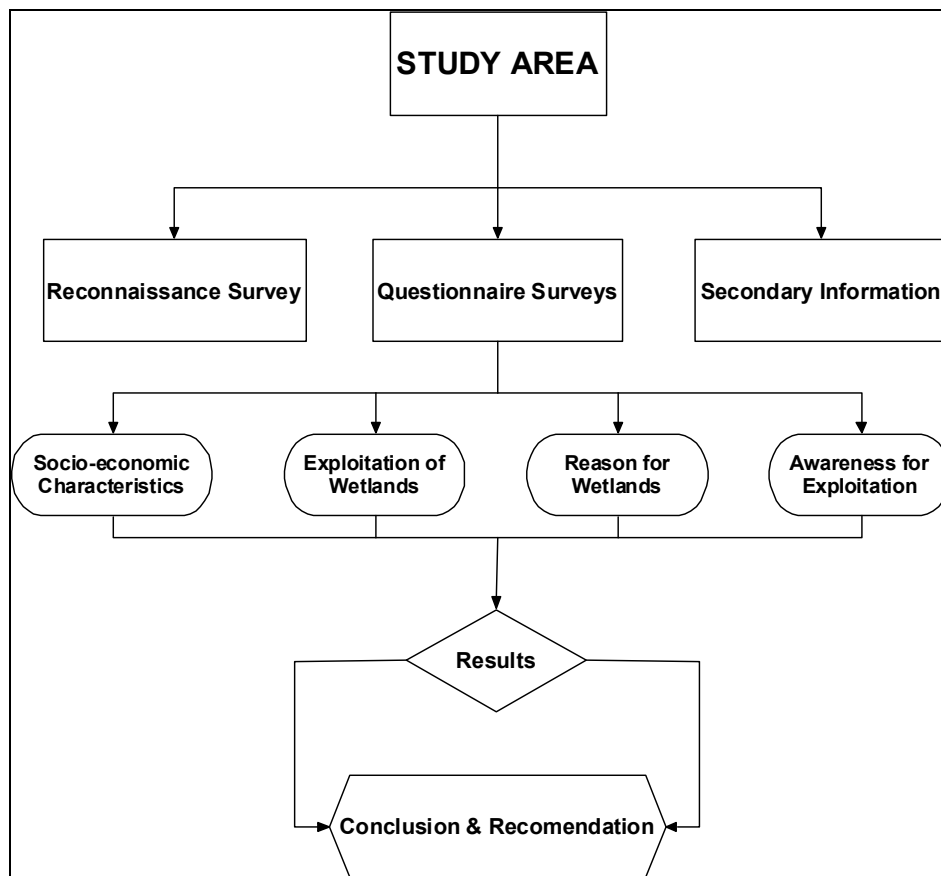


Fig. 1. The methodological workflow of the study

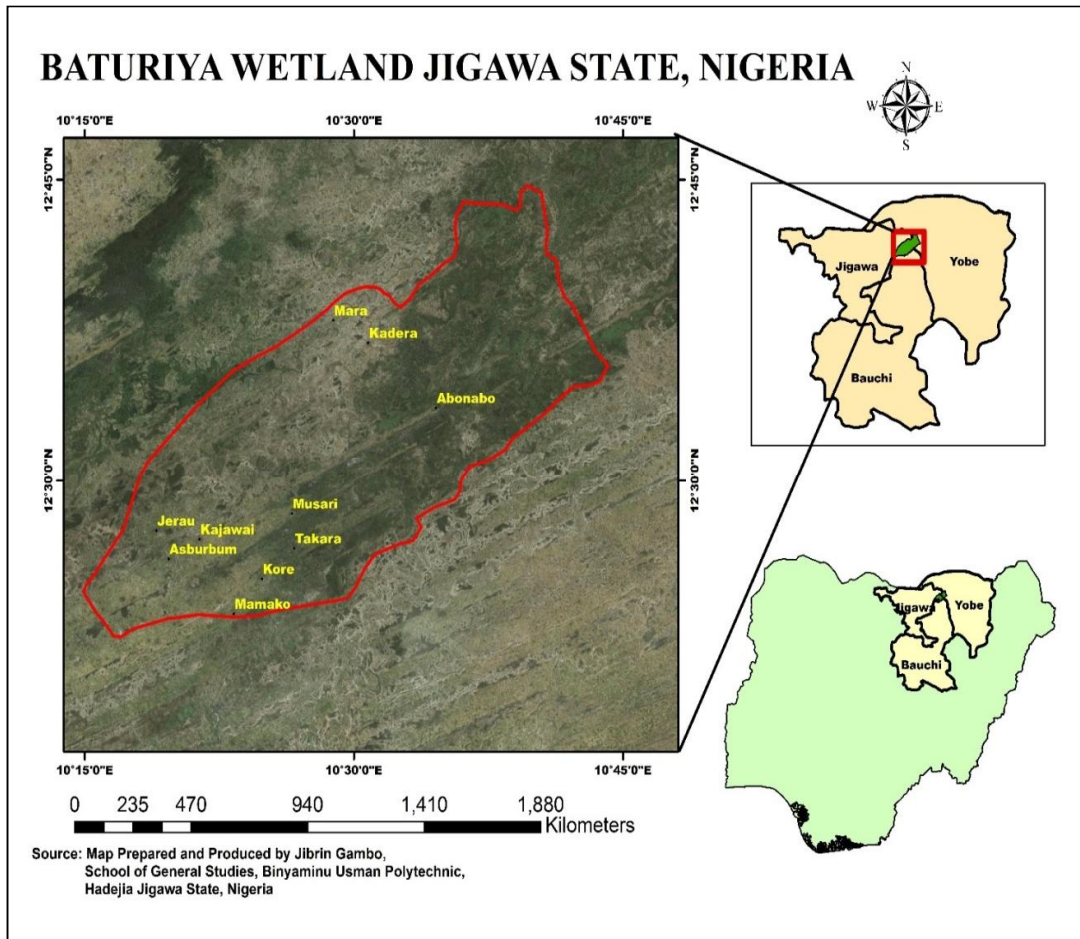


Fig. 2. Map of Baturiya wetland

The boundary shapefile of the study area was downloaded through the planet website @ www.protectedplanet.com

who at one time paid a visit to the area. Fig. 2 shows a map of the study area. There are three seasons in a year, the rainy season starts from May to September which may extend to October and the dry season from September to April and the harmattan season that occurred in the middle of dry season between November to February because of the tropical continental air mass from Sahara desert of North-eastern part of Africa. The wetland has a world distribution of protected area (WDPA) id of 7872 with the International Union for Conservation of Nature (IUCN) management category id IV [20].

2.2 Reconnaissance Survey

A reconnaissance survey was carried out in early April to end of May 2016, and May to end of June 2017 for easy accessibility. The systematic

sampling method was employed to select the communities for data collection.

2.3 Questionnaire Surveys

A structured questionnaire was designed and administered in four communities, which were selected by systematic sampling, it was designed in four sections and two hundred copies were administered. It was assumed that different socio-cultural background within each community can influence their general view on the exploitation of the wetland.

The questionnaires were administered in the Hausa language with the help of the technical staff of the wetland. The district head of four communities was also administered with the questionnaires. Fig. 1 shows the general methodological workflow.

Table 1. The details of the questionnaire

Sections	Purpose
A	Socio-economic characteristics
B	Exploitation of wetland
C	Awareness of exploitation
D	Reasons for exploitation

2.4 Data Analyses

Data were analyzed using basic statistical methods (percentage's and charts).



Fig. 3. Images of exploitation and its consequences of the wetland

3. RESULTS AND DISCUSSION

Table 2 shows the age range of the respondents, it indicated that most of the respondents were between the ages of 21-39 years (42.5%) and between 40-49 years of age (32.5%) while only 10% of the respondents were less than 20 years. This indicates that people of this age (21-39 years) are the ones taking part in active interaction with the wetland because it entails laborious work; similarly, low involvement of respondents of ages 50 years and above was unconnected with the fact that people in this age class cannot function actively in the interaction with the wetland resources. It also indicates that adults were more interested in the wetland than children of the same communities; this may not be unconnected to the fact that children are less concern about income generation and most of the exploitation exercise is laborious.

During the reconnaissance survey, illegal human activities were observed from both sample communities within Baturiya wetland. Fig. 3 shows some images taken during the reconnaissance surveys. Images (A) and (B) show human exploitation by both men's and women's activities around the study area; while (C) shows the effects and consequences of exploitation within the wetlands by creating gully erosions and other environmental hazards.

Table 2. Age range of the respondents

S/N	Age range (years)	Frequency	Percentage (%)
1	≤20	20	10
2	21 – 39	85	42.5
3	40 – 49	65	32.5
4	50 above	30	15
Total		200	100%

The gender distribution (Table 3) shows that 65% of the respondents were males while 35% were female. It indicated that most of the respondents were men because economic activities within the wetland appear to be mainly in the hands of men. This may be because the prevailing culture of the area requires men to be the ones to cater for the family.

However, Fig. 4 indicates that almost 92.52% of the respondents are aware of the massive exploitation taking place in the Baturiya wetland, while only 7% of the respondents were not aware of the exploitation on the wetland. Such respondents can be aware, but may not know the implication of doing so for the exploitation effects.

Table 3. Gender distribution of the respondent in Baturiya wetland

S.N	Gender	Frequency	Percentage (%)
1	Male	130	65
2	Female	70	35
Total		200	100

Fig. 5 indicates that the exploitation of the wetland occurs mostly due to the massive need for energy through firewood; however, the exploitation of the wetland can also be attributed to the recurrent needs for medicinal aspects of plants. Other reasons behind the exploitation are the need for constructional materials for building houses, and income generation through the sale of firewood, fruit collection, or forest food resources that are the economic push factors. The reasons given for exploitation of the wetland revealed that the respondents in the study area are in one way or the other engaged in cutting trees for firewood purpose, medicinal purpose, fruit collection, constructional work, and income generation. There is a considerable number of medicinal plants used for treating various disease but the parts exploited for treatment and the parts used and the method used for exploiting them are not sustainable [21]. However, firewood purpose has the highest number of respondents (42%) followed by medicinal purpose (28%). According to Amoah, et al. [22] more than 90% of trees cut in Africa were burnt as firewood; similarly, in Sub Saharan Africa every nine out of ten people, around 760 million individuals, rely on firewood and charcoal as their primary source of energy for cooking, heating and other uses [23,24]. This result implies that exploitation of firewood and the medicinal plant can lead to a total reduction of several species, whereas in some parts of the Baturiya wetland certain tree species have been removed down to the roots level; and this indicated a higher level of exploitation because the plants are becoming overstressed and cannot regenerate easily. Similarly, the species whose stem or barks were extracted are not allowed to attain reproductive stage; they are usually subjected to inimical conditions. Species of economic importance, such as those with medicinal and aesthetic values, can be kept in perpetuity in a well-preserved forest [25,26].

Fig. 6 shows the possible outcome for the exploitation of Baturiya wetlands. The results show that the exploitation of the wetlands

destroys animal's breeding places (especially migratory birds) and extinction of some important plants that possess medicinal as well as environmental protection value. More so, the exploitation would lead to changes in the period of bird's migration and environmental hazards such as surface runoff, soil erosion, and desertification. According to Abubakar, et al. [27], there is an increasing inclination in both water and air temperature in the wetland during the period of his study which has a direct relation with exploitations of vegetation resources within the wetland. The result shows 2% of the respondents believed in a reduction in the size of the wetland due to human disturbances. Such illegal activities impact wildlife species and their territorial areas within PA. Community living around the wetlands damage the indigenous tree species as well as the migrant tree that normally exist within the wetlands due to annual flood that occurred yearly. These challenges were, however, classified as ecological changes that have been happened. Illegal activities such as exploitation of important tree, hunting of both local and migrants birds and land clearing are the major interest in the conservation of natural resources because their ecological impacts lead to declines in species richness and genetic diversity. These would support the findings of Babura, [28] that indicate a decline in vegetation cover within Baturiya wetlands affected the spatial movement of both migrant and local bird species, especially when research studies used data gathering such as a Checklist of Bird Species. Furthermore, Babura also recommended that a ten-year interval pattern of surveys of bird species and vegetation monitoring should be a continuous process.

During the data collection, it confirmed that the occurrence of high disturbances of mature trees. The villagers may be aware of the exploitation but unaware of the fact that serial disturbances and hindering of the old trees to reach maturity stage and produce seed are the cause of the reduction in the wetland vegetation.

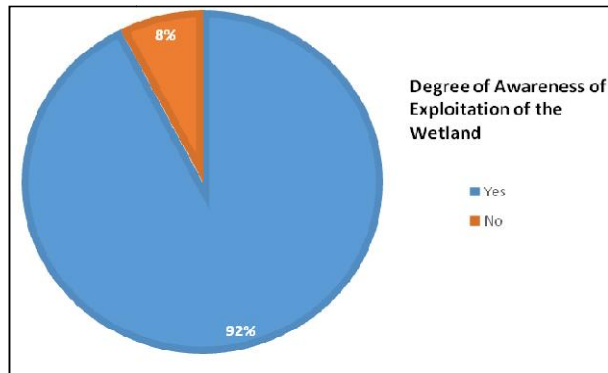


Fig. 4. Degree of awareness of the extent of wetland exploitation

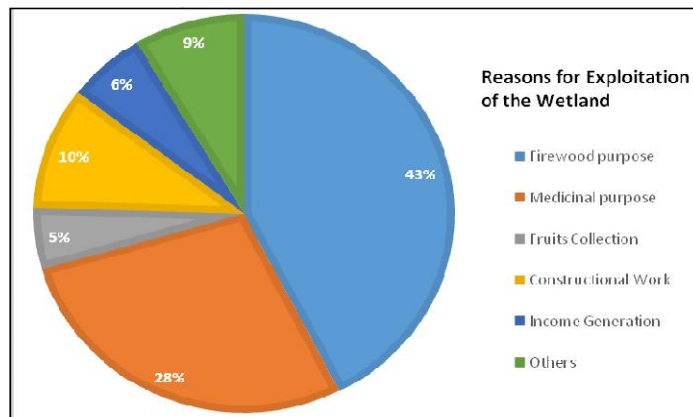


Fig. 5. Reasons for the exploitation of Baturiya wetlands

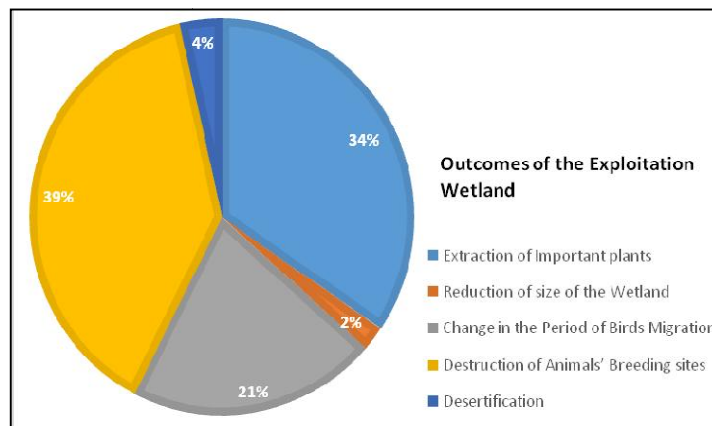


Fig. 6. The outcome of Baturiya wetland's exploitation analyses

4. CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The rapid global increase in population growth and global recessions especially in developing

nations push the local community to overexploit vegetation resources and also resulting in people from nearest regions into the Baturiya wetland to engage in wetland resource exploitation. Human activities in and around protected area resulted in a decline in wetland size, an increase in the human encroachment and an effect on the

ecological balance of the study areas. From the research results, it is clear that plant species were exposed to a great threat of exploitation, and the level of anthropogenic activity is high, especially for financial gain. Conservation of the diverse species in which the area is rich is limited. Similarly, in many wetland ecosystems, human activities appear to be necessary to maintain the wetland character and thereby protect species typical of such habitats.

4.2 Recommendations

The right legislation and policy framework has to be put in place and enforced to safeguard the wetland from ongoing wanton destruction. The federal and state governments need to maintain the plant resource and utilize them sustainably and mitigate the existing socioeconomic problems, the recommendations are as follows: Declaration of a strict nature reserve and frequent vegetation surveys during all seasons are also recommended. People's attitudes need to be changed through awareness campaigns to the communities by encouraging natural tree regeneration to reach a maturity stage. The wetland reserve lacks the services of trained personnel; there is a strong need for the staff to be exposed to global best practices in the management of wetlands. There is also a need for adequate funding by the government for proper management. Multiple uses of concepts in forest management will provide a way of regenerating the forest to provide for the people on sustainable bases. The country's wetland resources, in general, need to be properly identified and mapped. Moreover, the right legislation and policy framework has to be put in place and enforced to safeguard the wetland from ongoing wanton destruction. The socio-economic activities of the communities living around the Baturiya wetland (forest reserve) should be given appropriate attention by creating buffer zones where they can easily utilize their forest reserve unhindered without harming it. The government needs to provide an alternative source of energy such as solar, kerosene, biogas, etc. to the rural communities. The work of Naibbi, et al. [29] recommended that there needs to be an engagement in aggressive afforestation, conservation education and training, and provision of funding to support sustainable livelihood practices in Nigeria's protected areas.

5. FUTURE RECOMMENDATION

This study evaluated the level of illegal activities within Baturiya wetlands in details. However,

going forward, the extent of vegetation exploitation can be identified in terms of area and variation between study periods by the use of modern technological applications including remote sensing and geographical information system (GIS) in the future.

CONSENT

As per international standard written participant consent has been collected and preserved by the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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