Environtropica, December 2022, Vol. 17, 027 -036 ISSN 1597-815X

# Effects of anthropogenic activities on conservation parameters in Marguba range, Old Oyo National Park, Nigeria

✉**Olumuyiwa A. Akande,[1] Hafiz A. Adeyemi,[1] Adeola A. Lameed,[1] & Oladipo S. Olajesu[2]**

[1]Tourism & Development Programme, Department of Sustainability Studies, Faculty of Multidisciplinary Studies, & [2]Department of Wildlife & Ecotourism Management, Faculty of Renewable Natural Resources & Agriculture, University of Ibadan, Nigeria

✉Corresponding Author: email: bimakand@yahoo.com/muyiwaakande2@gmail.com

*Accepted on December 19, 2022.*

**Abstract**

This research considered the effects of anthropogenic activities within the Marguba range of Old Oyo National Park on several parameters of conservation. Primary information was obtained through questionnaire administered to Park Rangers and local people in the support zones and also focused group discussion. Data obtained were analyzed using descriptive statistics. Secondary data were obtained from past journals at the Administrative Head Office of Oyo National Park, Oyo State. Findings revealed that activities such as grazing (57.1%), wood fuel (55.9%), abetting of poachers by Rangers (48.2%), poverty (43.5%) and destruction of vegetation (51.2%) were the highest activities destroying biodiversity. These have led to consequences such as deforestation, eco-displacement, environmental pollution and reduction in animal population. Therefore, it is recommended that stiffer penalties to prohibit people from destroying the ecosystem to be put in place. Also, there is the need to channel attention of locals to other sources of fuel and this could be through subsidy. There should be replacement of natural resources that have been destroyed by human activities. Also, the Participatory Management Approach should be extended to integrate more of the locals in the protection of the ecosystem.

**Keywords**: National Park, Anthropogenic Activities, Eco-displacement, Participatory Management

## Introduction

Forests play a major role in mitigating climate change and enhancing people's livelihoods as a source of food and water directly and indirectly throughout the globe. Illegal logging threatens 65 percent of trees that have ravaged government forests around the globe, and significant disruptions generally create a chain of responses within the ecosystem because they have not been understood and expected (Areole, 1991). According to the United Nations FAO, 9.9% of Nigeria is forested. Nigeria had 382,000 ha of planted forest. In terms of forest cover, between 1990 and 2010, Nigeria lost an average of 2.38 % per year. In total, between 1990 and 2010, Nigeria lost 47.5% of its forest cover. Nigeria's forests contain 1,085 million metric tons of carbon in living forest biomass. Nigeria has some 1,417 known species of amphibians, birds, mammals and reptiles according to figures from the World Conservation Monitoring Centre.

Of these, 1.2% is endemic and 3.5% are threatened. Nigeria is home to at least 4,715 species of vascular plants, of which 4.3% are endemic. About 3.6% of Nigeria is protected under IUCN (2000) categories I-V. Most forests in Nigeria at a point or the other have suffered cultivation, logging, bush-burning, and poaching of wild animals. The notion of restricting factors and in particular the need to limit the use of natural resources by man is of paramount significance as the rate of replacement of renewable resources is restricted in itself. Roads, firewood collection were recognized as the primary drivers of deforestation (Areole, 1991). The degradation of the forests is attributed to the steady rise in human population depicting upward trend since 1960 (www.livepopulation.com). Forests sustain the livelihood of people as source of wood and non-wood products like herbs, fruits and water catchments.

Rapid population increase exerts pressure on natural resources. According to the demography of 2016 population projection, 67% of people living in Oyo State are below the age of 30, and 89% are below the age of 50 (National Population Commission (NPC), 2016). Vegetation shows continuous change in canopy composition; species density; number of trees per unit region; abundance of tree species per unit region and dominance and species wealth driven by the effect of unregulated human activity (Teller *et al.*, 2012). Natural ecosystem degradation is presently an environmental problem. Conversion of wetlands into farmland, riverbank into cultivation, mountain top for cultivation, and deforestation to pave way for settlement result in the loss of such fragile habitats that should be curbed for sustainable use in the environment (Castri and Younes, 1996).

Anthropogenic activities can simply be referred to as the human engagements carried out by people living around the Park. Most times, these activities lead to the destruction of the Park. Anthropogenic operations are generally performed by individuals residing near the Park. They destroy vegetation and pose threat to the abundance of Fauna in the Park. Man's reliance on biodiversity and excessive use has become unsustainable. These operations were originally used as a source of income and there were no limits for local people as to where they could function. Based on current trends of biodiversity resuscitation and the Park's potentialities, a law had to be enacted to limit individuals from working beyond buffer areas. Despite this attempt, individuals are still maneuvering their methods to destroy flora and fauna in the protected area.

Stability of the natural ecosystem; its resilience often in a complicated interaction is a function of the abiotic and biotic environmental element (Huggett, 2004). Modern human beings transform landscape and decrease the initial habitat to a tiny fraction of their former region, a phenomenon known as housing fragmentation (Lomolino and Brown, 2009). Susceptibility to alterations is one of the most basic characteristics of vegetation, (Teller *et al.*, 2012).

Government develops and implements policies to control the use of forest resources through established organizations such as the Forest Institutes and Federal Ministry of Environment. Meffe and Carroll (1997) claim that effective conservation involves knowledge of what the patches are; how they interact and how fluxes outside the target region affect them.

According to Brodie *et al*. (2015) and Maxwell *et al*. (2016), livestock grazing, logging and poaching are among the primary drivers of biodiversity loss, but their impacts can be both synergistic and contrasting across species. Logging and grazing, for instance, may enhance the food supply of predators but also cause disputes and poaching between human predators (Laurence *et al*., 2008). Livestock grazing causes severe degradation of the landscape and has numerous effects on the distribution of mammals (Karanth *et al*., 2011; Ripple *et al.*, 2014;

2015). Logging involves cutting and processing trees for the production of timber and pulp for furniture, building, paper, etc. Illegal logging in Protected Areas occurs without license from rightful authorities and this is causing serious degradation. Logging simplifies forest ecosystem complexity and decreases the quality of habitat (Müller *et al*., 2019).

This study therefore is conceived with the following specific objectives:
1. To ascertain the anthropogenic activities in Marguba range in Sepeteri Community affecting the conservation of the Park.
2. To identify the factors leading to anthropogenic activities in the study area.
3. To examine how the anthropogenic activities affect conservation in the Park.
4. To find out how the Park is coping with the challenges of anthropogenic activities in the study area.

## Methodology

*Study Area*
The Old Oyo National Park (OONP) is located between latitudes 8° 15' and 9° 00'N and longitude 3° 35' and 4° 42' E. The Park includes an area of about 251,200 hectares making it Nigeria's fourth biggest Park, (Mengistu and Salami, 2007). The study area will be one of the ranges, which is the Marguba range at Sepeteri.

The scope of the study is to examine the effects of anthropogenic activities in one of the ranges of Old Oyo National Park, the Marguba range in Sepeteri Community, Oyo State. Marguba range has the highest number of Rangers (44 Rangers). There are seventeen support zones/villages which covers an area of approximately 189.5 km. The total length of tracks in Old Oyo National Park is 470.5 km (Participatory Management Plan of Old National Park Service, 2018).

*Sampling Technique and Sample Size*
Multi-stage sampling technique was adopted for this research work.
Step One:
The purposive sampling technique was used to select 40 Rangers from the Park,
Step Two:
The simple random sampling technique was adopted to select six villages from the support zones. Six villages were needed for the sampling frame.
Step three:
The six selected villages with their population densities were; Kanga (201), Lukutu Nla (4,295), Gaa Baba n'keke (200), Alaparun (750), Imodi (114) and Aba Nla (96).
Step four
Krejcie and Morgan (1970) method was adopted to determine the sample size for the villages. The method was created by Krejcie and Morgan to meet the ever increasing need for a representative statistical sample in empirical research. It has been acknowledged as an effective method in determining sample size of a given population in a tabular form for easy reference.
Step five
Three hundred and fifty one (351) questionnaires were distributed among the villagers as adopted from Krejcie and Morgan (1970).
Step Six
Stratified sampling technique was used to distribute questionnaires among villages as shown in Table 1

**Table 1.** Sampling frame showing the distribution of respondents.

| S/N | Name of villages | Sampling distribution by villages |
|---|---|---|
| 1 | Kanga | 57 |
| 2 | Lukutu Nla | 88 |
| 3 | Aba Mathew | 12 |
| 4 | Aba Alapata | 33 |
| 5 | Imodi | 53 |
| 6 | Aba Nla | 56 |
| 7 | Rangers | 41 |
| | **Total** | **340** |

*Method of Data Collection*

**Table 2.** Procedure for Data Collection.

| Research Questions | | Sampling Technique | Respondents |
|---|---|---|---|
| Research Question one | Questionnaire/Observation | Rangers/Locals | |
| Research Question two | Questionnaire/Focus Group Discussion (FGDs) | Rangers/Locals | |
| Research Question three | Questionnaire, Observation and FDG | Rangers/Locals | |
| Research Question Four | Questionnaire | Rangers | |

This section entails data analysis and presentation of data. Three hundred and fifty one questionnaires were distributed while three hundred and forty (340) copies were retrieved giving a response rate of 96% which is statistically significant for the purpose of this study. Data collected were represented by frequency and percentage distribution using tables and charts. This study employed the descriptive statistical method of data analysis which involves the use of frequency percentage tables, bar charts, and pie charts to describe the collected data. Chi-Square test, a non-parametric statistics was used to test the relationship between anthropogenic activities and increase in population.

## Results

Results as revealed by the socio-demographic distribution of respondents by sex show that majority (82.6%) of the respondents were males while only few were females. Results revealed that majority of the respondents were adults within the age grade of 28-37 years (47.4%). Majority of the respondents (40%) had primary education and 36.8 percent did not have any formal education.

**Table 3.** Anthropogenic activities that are capable of affecting the conservation of Old Oyo National Park in Marguba range.

| **Inimical Activities** | **Strongly agree** | | **Agree** | | **Disagree** | | **Strongly Disagree** | |
|---|---|---|---|---|---|---|---|---|
| | **F** | **%** | **F** | **%** | **F** | **%** | **F** | **%** |
| Effects of Grazing Activities | 194 | 57.1 | 98 | 28.8 | 42 | 12.4 | 6 | 1.8 |
| Wood Fuel as source of energy | 190 | 55.9 | 118 | 34.7 | 27 | 7.9 | 5 | 1.5 |
| Destruction to Vegetation in the Park | 174 | 51.2 | 128 | 37.6 | 32 | 9.4 | 6 | 1.8 |
| Poverty contributes to illegal activities | 141 | 41.5 | 148 | 43.5 | 46 | 13.5 | 5 | 1.5 |
| Rangers aid and abet poachers | 10 | 2.9 | 164 | 48.2 | 55 | 16.2 | 11.1 | 32.7 |

Field Survey, 2019

Table 3 revealed that 57.1% respondents strongly agreed that grazing is one of the worst indirect activities carried out in the buffer zones and even encroaching into the Park. Majority (55.9%) agreed that wood fuel is the major source of fuel for the locals; they cut down trees for the purpose of firewood or charcoal which has been a major issue in conserving biodiversity in the Park. Moreover, 51.2% strongly agreed that the vegetation of the area has been greatly affected, as buttressed by focused group discussion that illegal activities carried out around the Park have greatly affected its vegetation. 43.5% respondents claimed that majority of the locals were poor which encourages propensity to crime and surprisingly, it was discovered that 48.2% agreed that Rangers aid and abet poachers as they hunt, graze and cut down trees.

Table 4 shows that, 70% respondents agreed that lack of basic infrastructures were factors leading to anthropogenic activities in the study area. 66.5% also agreed that inadequate involvement of the locals in the decision making of Park matters had led to increased anthropogenic activities and made them play minor role in the conservation of biodiversity despite the efficiency of the buffer zone,

On mining activities, Table 5 shows that the respondents affirmed that it leads to land degradation (53.2%), eco-displacement (52.4%) and alteration of landscape (31.5%). Bush burning results in deforestation (45.3%), eco-displacement (59.4%), bio-diversity loss (77.6%), environmental pollution (45.0%) and famine (69.7%). Farming activities lead to bio-diversity loss (66.2%), habitat alteration (32.1%), deforestation (41.8%) and environmental pollution (61.8%). Tree felling brought about biodiversity loss (42.1%), habitat alteration (75.6%), deforestation (35.0%) and eco-displacement (52.4%). Hunting of games within the Park according to respondents may result in conflict between foresters and communities (48.8%), habitat alteration (49.7%), environmental pollution (49.1%), reduction in animal production (67.1%).

**Table 4.** Factors leading to anthropogenic activities in the study area.

| **Factors** | **Strongly agree** | | **Agree** | | **Disagree** | | **Strongly Disagree** | |
|---|---|---|---|---|---|---|---|---|
| | **F** | **%** | **F** | **%** | **F** | **%** | **F** | **%** |
| Inadequate Infrastructure | 23.8 | 70 | 87 | 25.6 | 5 | 1.5 | 10 | 2.9 |
| Inadequate involvement of Locals in Park management | 5 | 1.5 | 22.6 | 66.5 | 92 | 27.1 | 17 | 5 |
| Buffer zone meets the needs of Locals | 102 | 30 | 71 | 20.9 | 109 | 32.1 | 58 | 17.1 |
| Rangers suffer attack from Locals | 21 | 6.2 | 262 | 76 | 35 | 10.3 | 22 | 6.5 |
| Increase in population causes conflict | 150 | 44.1 | 128 | 37.6 | 47 | 13.8 | 15 | 4.4 |
| Presence of poverty in buffer zone | 11 | 3.2 | 114 | 33.5 | 118 | 34.7 | 97 | 28.5 |

Field Survey, 2019

The respondents disagreed that the presence of the Park has not met their needs. This suggests that perpetrators of anthropogenic activities are the only ones profiting from the crime, with convincing 76% respondents who affirmed that Rangers were being attacked by invaders of the Park. There is likelihood of exchange of fire between invaders and Rangers especially when the invaders want to escape at all cost. Increase in population is a major cause of anthropogenic activities. As population rises uncontrollably, pressure on social amenities is unavoidable and destruction of natural resources is imminent. The rates of poverty in the buffer zone have contributed greatly to anthropogenic activities in the study area.

Table 6 presents the response of Rangers when asked on how the National Park has been coping with anthropogenic challenges. Majority (62.5%) agreed to involvement of members of neighbouring communities in the affairs and decision making of Park matters like bush burning for clear visibility of games. Sixty percent respondents disagreed that the Park provides empowerment and opined that it scarcely generates employment for the locals. Also, 52.5% affirmed that the Park do organize periodic educational and sensitization programmes on conservation and benefits of the project to the people and environment. 95% of Rangers agreed that the Park has created direct employment to locals.

## Discussion

The research identified anthropogenic activities affecting conservation in the Park, grazing, wood fuel, vegetation, poverty and Rangers abetting poachers were identified as major activities leading to the destruction of the Park ecosystem. As corroborated by Lomolino and Brown (2006), man transforms landscape and decreases the initial habitat to a tiny fraction of their former region. Due to ignorance on the part of the majority of community residents, and illicit gains of others, trees were felled without permission, while new ones were not replanted.

Teller (1992) corroborated this assertion by stating that basic characteristics of vegetation are susceptible to alteration when felled trees are not replanted. Deforestation, habitat alteration and conversion are therefore the resultant features of vegetation change.

**Table 5.** Percentage distribution showing anthropogenic activities in the community affecting the Park.

| **Respondents' Responses on implication of mining activities** | | | | |
|---|---|---|---|---|
| | **Frequency** | | **Percentage** | |
| **Responses** | **Strongly Agree** | **Agree** | **Disagree** | **Strongly Disagree** |
| Land degradation | 181 (53.2%) | 159 (46.8%) | 0 (0%) | 0 (0%) |
| Eco displacement | 178 (52.4%) | 92 (27.1%) | 68 (21.0%) | 2 (.6%) |
| Alteration of Landscape | 103 (30.3%) | 107 (31.5%) | 60 (17.6%) | 70 (20.6%) |
| **Respondents' Responses on implication of bush burning** | | | | |
| Deforestation | 5 (1.5%) | 154 (45.3%) | 117 (34.4%) | 64 (18.8%) |
| Eco-displacement | 25 (7.4%) | 202 (59.4%) | 98 (28.8%) | 15 (4.4%) |
| Bio-diversity loss | 5 (1.5%) | 264 (77.6%) | 59 (17.4%) | 12 (3.5%) |
| Environmental pollution | 153 (45.0%) | 145 (42.6%) | 36 (10.6%) | 6 (1.8%) |
| Famine | 63 (18.5%) | 237 (69.7%) | 34 (10.0%) | 6 (1.8%) |
| **Respondents' Responses on implication of farming activities within the Park** | | | | |
| Bio-diversity loss | 115 (33.8%) | 225 (66.2%) | 0 (0%) | 0 (0%) |
| Habitat alteration | 109 (32.1%) | 91 (26.8%) | 54 (12.9%) | 96 (28.2%) |
| Deforestation | 91 (26.8%) | 142 (41.8%) | 102 (30.0%) | 5 (1.5%) |
| Eco-displacement | 210 (61.8%) | 34 (10.0%) | 96 (28.2%) | 0 (0%) |
| **Respondents' Responses on falling of trees within the Park** | | | | |
| Bio-diversity loss | 71 (20.9%) | 143 (42.1%) | 115 (38.3%) | 11 (3.2%) |
| Habitat alteration | 257 (75.6%) | 76 (22.4%) | 7 (2.1%) | 0 (0%) |
| Deforestation | 119 (35.0%) | 91 (26.8%) | 109 (32.1%) | 21 (6.2%) |
| Eco-displacement | 160 (47.1%) | 178 (52.4%) | 2 (0.6%) | 0 (0%) |
| **Respondents Responses on implications of hunting of games within the Park** | | | | |
| Conflicts between foresters and community | 169 (49.7%) | 166 (48.8%) | 5 (1.5%) | 0 (0%) |
| Habitat alteration | 169 (49.7%) | 171 (50.3%) | 0 (0%) | 0 (0%) |
| Environmental pollution | 167 (49.1%) | 133 (39.1%) | 30 (8.8%) | 10 (2.9%) |
| Reduction in animal population | 228 (67.1%) | 112 (32.9%) | 0 (0%) | (0%) |
| **Respondents responses on implication of grazing within the Park** | | | | |
| Habitat destruction | 204 (60.0%) | 138 (40.0%) | 0 (0%) | 0 (0%) |
| Bio-diversity loss | 148 (43.5%) | 192 (56.5%) | 0 (0%) | 0 (0%) |
| Introduction of invasive species | 170 (50.0%) | 166 (48.8%) | 3 (0.9%) | 0 (0%) |
| Eco displacement | 167 (49.1%) | 173 (50.9%) | 0 (0%) | 0 (0%) |

**Table 6.** Percentage distribution showing perception of Rangers on coping strategies.

| **Respondents' Responses on coping strategies** | | | | |
|---|---|---|---|---|
| | **Frequency Percentage** | | | |
| **Responses** | **Strongly Agree** | **Agree** | **Disagree** | **Strongly Disagree** |
| Involvement of members of neighboring communities in the affairs and decision making of Park matters | 0 (0%) | 9 (22.5%) | 25 (62.5%) | 6 (15.0%) |
| Providing and implementing empowerment to members of the neighboring communities to the Park | 0 (0%) | 24 (60.0%) | 16 (40.0%) | 0 (0%) |
| Periodic educational and sensitization programme in the neighboring communities on conservation and benefits of the project to the people and environment. | 21 (52.5%) | 19 (47.5%) | 0 (0%) | 0 (0%) |
| Providing direct employment to members of the communities in the Park | 38 (95.0%) | 2 (5.0%) | 0 (0%) | 0 (0%) |
| Full time surveillance by the Park Rangers | 21 (52.2%) | 19 (47.5%) | 0 (0%) | 0 (0%) |
| Arrest of offenders and meting out punitive measures as deterrent | 10 (25.0%0 | 30 (75.0%) | 0 (0%) | 0 (0%) |

Mining leads to land degradation, eco-displacement and alteration of landscape. Also, the implications of bush burning on the Park identified were deforestation, eco-displacement, biodiversity loss, environmental pollution and land degradation. Farming activities brought about biodiversity loss, habitat alteration, deforestation and environmental pollution. Tree felling was seen to cause biodiversity loss, habitat alteration, deforestation, and eco-displacement, while hunting of games within the Park caused conflict between foresters and communities in respect of habitat alteration, environmental pollution, and reduction in animal production. Finally, the respondents identified grazing in the Park as being responsible for habitat destruction, biodiversity loss, introduction of invasive species and eco-displacement. According to Brodie *et al*. (2015) and Maxwell *et al*. (2016), livestock grazing, logging and poaching are among the primary drivers of biodiversity loss, but their impacts can be both synergistic and contrasting across species. Logging and grazing, for instance, may enhance predators' food supply but also cause disputes and poaching between human predators (Laurence *et al.,* 2008).

The coping strategies adopted in the Park were involvement of locals in the affairs and decision making on Park's matters. The Parks do organize periodic educational and sensitization programmes on conservation and benefits of the project to the people and the environment.

More effort needs to be seen on the part of the Park administration in the area of empowerment and skill acquisition for members of the communities. Scholarships could also be awarded to them to help reduce or even eradicate mass illiteracy. There is full time surveillance by the Park Rangers, arrest of offenders, and applying punitive measures to serve as deterrent. In the

year 2018, 138 arrests were made from January to December. This indicates that the Park has had arrests and prosecutions to serve as deterrent.

## Conclusion and Recommendations

The Park is an embodiment of flora and fauna resources that helps in securing the ecosystem. Human activities in previous and recent times have been an issue in the conservation of these natural resources. The increase in human population and abject poverty have led to the opening up of new sites for human activities to take place. This has caused issues to the conservation of the biodiversity. It was discovered that many were aware of the consequences of this devastating activities but still engage in it as a means of livelihood.

Based on the findings of this study, the following recommendations are made.

i. There is need to intensify the arrest and prosecution of culprits so as to prohibit people from destroying the eco-system.
ii. Ranching of cattle should be encouraged, according to global best practices, cattle rustling has become a thing of the past.
iii. There is need to channel attention to other sources of fuel and giving out subsidy to shift attention from the use of wood for fuel.
iv. There is urgent need to replace the natural resources that have been destroyed by human activities.
v. The Park should find means to integrate the locals in the protection of the ecosystem.
vi. There should be continuous education and sensitization of the locals towards conservation.
vii. Empowerment programmes and vocational skill acquisition should be encouraged through sponsorship to the locals.
viii. There should be more collaboration with international organisations to access grants and adopt global best practices for the development of the Park.

## References

Areole, O. (1991). The Ecology of natural resources in Nigeria. (a monograph) University of Ibadan. Ibadan, Nigeria. Pp 123.

Brodie, J.F., Giodarno, A.J., Zipkin, E.F., Bernard, H., Mohd-Azlan, J., Ambu, L., (2015). Correlation and persistence of hunting and logging impacts on tropical rainforest mammals. *Conserv. Biol.* 29, 110-121.

Castri, F. D. and Younes, T. (1996) Biodiversity, Science and Development: Towards a New Partnership. *Paris: IUBS*. Page 646

Huggett, R. J. (2004). Fundamentals of Biogeography. Routledge, London. DOIhttps://doi.org/10.4324/9780203356586**.** pp 200

IUCN (2000). International Union for the Conservation of Nature and Natural Resources - IUCN Red List of Threatened Species IUCN, Gland, Switzerland .xviii+61

Karanth, K.U., Gopalaswamy, A.M., Kumar, N.S., Vaidyanatham, S., Nichols, J.D., Mackenzie, D.I., (2011). Monitoring Carnivore populations at the landscape scale: occupancy modeling of Tigers from sign surveys. J. Appl. Ecol. 48, 1048-1056.

Krejcie R.V., Morgan D.W.,(1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*. 1970;30(3):607-610. doi:10.1177/001316447003000308

Laurence, W.F., Croes, B.M., Guissouegou, N., Buij, R., Dethier, M., Alonso, A., 2008.Impacts of roads, hunting, and habitat alteration on nocturnal mammals in African rainforests. *Conserv. Biol.* 22, 721-732.

Lomolino, M. V., & H. Brown, J. (2009). The reticulating phylogeny of island biogeography theory. *The Quarterly Review of Biology*, *84*(4), 357-390.

Maxwell, S.L., Fuller, R.A., Brooks, T.M., Watson, J.E.M., (2016). The ravages of guns, nets and bulldozers. Nature 536, 143-145.

Meffe, G.K and Carroll, C.R. (1997). Principles of Conservation Biology. (2nd Ed,). Sinauer Associates Inc. Sunderland, Massachusetts. 729pp.

Mengistu, D. A. and Salami, A. T. (2007). Application of remote sensing and GIS inland use/land cover mapping and change detection in a part of south western Nigeria. *African Journal of Environmental Science and Technology*, *1*(5), 99-109.

Müller, J., Noss, R. F., Thorn, S., Bässler, C., Leverkus, A. B., & Lindenmayer, D. (2019). Increasing disturbance demands new policies to conserve intact forest. *Conservation Letters*, *12*(1), e12449.

National Park Service. (2018). Old Oyo National Park: Annual Report.2010-2014.

National Population Commission (NPC) Population Projection, (2016), Nigeria Participatory Management Plan of Old Oyo National Park 2010-2014.

Ripple, W.J., Estes, J.A., Bieschta, R.L., Wilmers, C.C., Ritchie, E.G., Hebblewhite, M., Berger, J., Elmhagen, B., Lentic, M., Nelson, M.P., Schmitz, O.J., Smith, W.D., Wallach, A.D., Wirsing, A.J., (2014).Status and ecological effects of the World's largest carnivores. *Science*, 343, 1241484.

Ripple, W. J., Newsome, T. M., Wolf, C., Dirzo, R., Everatt, K. T., Galetti, M. and Van Valkenburgh, B. (2015). Collapse of the world's largest herbivores. *Science advances*, *1*(4), e1400103. Page 113

Teller, A. (1992). Responses of Forest Ecosystem to Environmental Changes. Elsevier Applied Science. London. Page 16-30

Teller, A., Mathy, P., & Jeffers, J. N. R. (Eds.). (2012). *Responses of forest ecosystems to environmental changes*. Springer Science & Business Media, pp 16.