



EFFECT OF ANTHROPOGENIC ACTIVITIES ON SUSTAINABLE MANAGEMENT OF FOREST AND FOREST RESOURCES IN CROSS RIVER NATIONAL PARK

¹Ugbe, J.A., ²Dawaki, S.A. and ^{3*}Japheth, H.D.

¹ Cross River State Forestry Commission, 69 Target Road, Calabar, Cross River, Nigeria.

² Department of Forestry Technology, Audu Bako College of Agriculture Dambatta., Kano State, Nigeria

³ Department of Forestry and Wildlife Technology, Federal University of Technology, Owerri- Nigeria

Correspondent: dauhenry45@yahoo.com

Abstract

Anthropogenic activities pose serious threats to biological diversity and are primary cause of fauna and flora species threaten and extinction crisis in Nigeria. This study was carried out in communities adjoin the boundary of Okwangwodivision of Cross River National Park; with the aim of assessing the effect of deforestation on the environment and biodiversity in the Study Area and recommends profound solutions. The results of this study showed that, youth between the ages of 21-40 years were more involved in anthropogenic activities than any other age while people below the age of 21 are the least in terms of carrying out deforestation activities. Farming was the primary occupation of the people, this implied that more fauna and flora species would be exploiting or clearing for agricultural activities. The loss of forest resources has negative consequences on the quality of the environment and the population of fauna and flora species in the study area. Some of these effects identified were over exploitation, over consumption, soil erosion, affect water cycle, noise pollution to the people, ecological crisis and collapse. The negative implications of deforestation on biodiversity include: mass extinction and loss of biodiversity, destruction of wildlife habitat and loss of tree species that have economic values to rural and urban dwellers. Poaching, logging and agricultural activities (such as land clearing, farming and bush burning among others) were the major threats to the conservation of forest and forest resources in the study area. Therefore, it is recommended that, there should be a strong collaboration between National Parks Service and media to increase public awareness and knowledge on the needs for conservation and sustainable management of forests and its resources. Bottom to top management method should be effectively adopted for easier conservation and sustainable management of the study area

Keywords: Biodiversity, Deforestation, Environmental, Fauna, Flora, Logging, Species

Introduction

The forests of Africa are the most depleted of all the tropical regions with only 30 per cent of the historical stands still remaining (Chidumayo and Kwibisa 2003). Globally, the trend of accelerated environmental degradation in recent times has primarily been driven by land use changes as a consequence of frontier expansion and population growth (Richards *et al.*, 2011).

Biodiversity conservation is a natural resources sustainability issue that has been at the centre of many political and state systems (Tsiet *et al.*, 2013). It is a common concern for all human and an integral part of the development process because of its intrinsic, ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values (Albrechtsenet *et al.*, 2007). Agenda 21 of the United Nation's (UN) convention on Biodiversity 1992 obliges nations of the world to undertake monitoring of biodiversity through sampling and other techniques (Tsiet *et al.*, 2013).

Materials and Methods

The Study Area

The study was conducted at Okwangwo Division of Cross River National Park; the area has an area of about 1000km² which falls within two local government areas of Cross River State namely: Boki and Obanliku. It extended from 6° 4' and 6° 29' North to 9° and 9° 27' East, in the South – East of Obudu with the Eastern boundary extending along the Nigeria – Cameroon border and immediately east of Afi River Forest Reserve, It is bordered on the east by Takamanda National Park, Cameroon, 67 Support zones and 3 enclave communities. The Okwangwo division of Cross River National park is inhabited by notable endemic and endangered species of wildlife and the Okwangwo division of the Park.

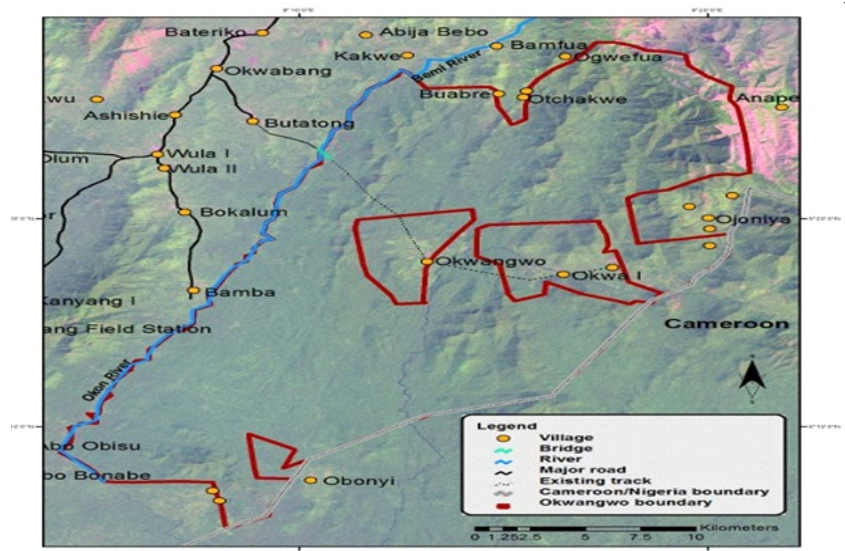


Figure 1: Map of Okwangwo division of Cross River National Park and the support zone Communities.
Source: Wildlife Conservation Society (WCS,1991)

Data Collection and Analysis

A socio-economic study was carried out to gather primary data from people living around Okwangwo division of Cross River National Park. Purposive sampling technique was adopted to sample communities adjoining the boundaries of the division area. Within these communities, simple random sampling was further used to select respondents (members of the communities and Rangers) for interview. Copies of structured questionnaire were administered to 200 respondents across the communities. Information was obtained through questionnaires, interviews, discussions and participant observation. Oral interviews as described by Stafford, (2016) and field observation were used. Rangers at each patrol post were randomly selected and issue one hundred copies of questionnaire (100) on human activities within the study area. Visits was made to the division area to interview and document the various threats such as (farming, hunting, logging, and collection of none timber products) around the study area. Data obtained were analyzed using descriptive statistics (frequency, mean and tables) and based on *Likert scale* (5 rating scale)

Results

Socio-economic Attributes of the Respondents in Okwangwo Division of Cross River National Park

The result of this finding on the socio-economic attributes of the respondents in the study area is presented on Table 1. Based on the result, majority (90%) of the respondents were males, while 10% were females. The result on age category of the respondents in the study area indicated that, majority (31.1%) of the respondents were between the ages of 21 to 30 years of age, followed by 27.8% of the people who had their ages between 31-40 years, 18.3% were between 41-50 years, 15.6% were between 51 years old and above while few (7.2%) of the respondents had their age <21.

The major occupations of the respondents in the study area were civil service, farming, trading and timber business among others. Most of the respondents (55.6%) were more involved in farming, followed by 16.7% who were Civil servants, 11.7% were traders with 2.2% of the people involved in timber business while 13.9% were involved in other occupation which included students and unemployed people.

The respondents' educational status was evaluated and the result showed that, most of the respondents (56.7%) had attained secondary school, followed by 27.2% who attained up to tertiary level and 7.25 attained primary school levels while 8.9% of the respondents had non formal education.

Income of the respondents was evaluated to ascertain the rate of their income per month; based on the result obtained in the study area, their income ranged from <₦18,000 to ₦48,000. Majority of the respondents (44.4%) had a monthly income of ₦48,000, followed by 21.1% who had an income of ₦38,000 to 47,000, 18.3% had ₦28,000 to 37,000, 8.9% had ₦18,000 to 27,000 while few of the respondents (7.2%) had monthly income of <₦18,000. Family size of 5-10 were the majority (57.2% among the respondents, followed by 36.7% who had family size of <5 while 6.1% of the people had a family size above 10.

Table 1: Socio-economic Attributes of the Respondents in the Study Area

Attributes	Frequency	Percent
Sex		
Male	162	90.0
Female	18	10.0
Total	180	100.0
Age category		
<21	13	7.2
21-30	56	31.1
31-40	50	27.8
41-50	33	18.3
>51	28	15.6
Total	180	100.0
Major occupation		
Civil servant	30	16.7
Farming	100	55.6
Trading	21	11.7
Timber dealers	4	2.2
Others	25	13.9
Total	180	100.0
Educational status		
Primary	13	7.2
Secondary	102	56.7
Tertiary	49	27.2
Non formal	16	8.9
Total	180	100.0
Income category (₦)		
<18,000	13	7.2
18,000-27,000	16	8.9
28,000-37,000	33	18.3
38,000-47,000	38	21.1
48,000	80	44.4
Total	180	100.0
Family size category		
<5	66	36.7
5-10	103	57.2
11-15	11	6.1
Total	180	100.0

Extent of Deforestation in the Study Area

This finding evaluated the extent of deforestation in the study area and the result is presented on Table 2. Based on the result of this finding on the extent of deforestation, majority of the respondent (49.4%) never fell down trees or collect resources from the forest area and 33.9% rarely fell down trees and forest resources while 10% of the respondents said they occasionally fell trees and forest resources in the study area and 3.3% of the people said the always and often fell trees and they do collect NTFPs from the forests.

Based on the distance covered from home to forest to fell trees and forest resources on Table 3, the result revealed that most of the respondents (32.8%) covered a distance of <5km from their homes to the adjoining forest area situated in the study area. This was followed by 39% of the respondents who said that they covered a distance between 6 to 10km to most forest situated in the study area; 14.9% covered a distance of about 11 to 15 km while the highest distance of 20km was covered by few (10.1%) of the respondent to fell trees and to gathered forest resources in the study area. Distance covered by the respondents was mostly achieved through transportation such as bicycles and machine bikes.

Table 2: Rate of Harvesting Forests and its Resources in the Study Area

Rates	Frequency	Percent
Always	6	3.3
Often	6	3.3
Occasionally	18	10.0
Rarely	61	33.9
Never	89	49.4
Total	180	100.0

Table 3: Distance Covered between Communities to Forest Areas

Distance (km)	Frequency	Percent
<5	59	32.8
6-10	70	39
11-15	27	14.9
16-20	6	3.4
>20	18	10.1
Total	180	100.0

Deforestation and the Extent of Effects on the Environment

The implications of deforestation on the environment in the study area were evaluated and the result is presented on Table 4. Based on the result of this finding, the respondents said deforestation and exploitation of forests have adverse effects on the environment. Some of these effects identified were over exploitation, over consumption, soil erosion, affect water cycle, noise pollution to the people, ecological crisis and collapse. The result revealed that all the effects as a result of deforestation in the study area had significant high effect in the environment.

Also, the negative implications of deforestation on biodiversity include: mass extinction and loss of biodiversity, destruction of wildlife habitat and loss of tree species that have economic values to rural and urban dwellers. The result revealed that all the environmental effects due to high rate of deforestation and over exploitation in the study area had significant high effects on the biodiversity. This result implied that deforestation and high rate of over exploitation destroy biodiversity habitat, species

Table 4: Effect of Deforestation on the Environment and Biodiversity in the Study Area

Environmental effect	Extent of Deforestation					No. of Resp.	WS	MWS
	Very High effect (5)	High effect (4)	Moderate effect (3)	Low effect (2)	Very Low effect (1)			
Over exploitation	66(330)	29 (116)	17(51)	6 (12)	2 (2)	120	511	4.26*
Overconsumption	6 (30)	7 (28)	4 (12)	1 (2)	1 (1)	19	73	3.84*
Soil erosion	43 (215)	31 (124)	1 (3)	12 (24)	1 (1)	88	367	4.17*
Water cycle	45 (225)	33 (132)	12 (36)	1 (2)	1 (1)	92	396	4.30*
Disturbance of native people	8 (40)	8 (32)	4 (12)	1 (2)	1 (1)	22	87	3.95*
Ecological crisis	64 (320)	44 (176)	9 (27)	2 (4)	1 (1)	120	528	4.40*
Ecological collapse	63 (315)	35 (140)	11 (33)	5 (10)	6 (6)	120	504	4.20*
Mass extinction and biodiversity loss	69 (325)	35 (140)	8 (24)	0	0	112	489	4.37*
Destruction of wildlife habitat	55 (275)	40 (160)	8 (24)	13 (26)	4 (4)	120	489	4.08*
Loss of species of trees	63 (315)	2 (8)	11 (33)	28 (56)	16 (16)	120	428	3.57*

*=significant at 0.005

Threats to the Conservation of Forest and Forest Resources in the Study Area

The major threats to the conservation of forest and forest resources in Okwangwo Division of Cross River National Park were identified and the result is presented on Table 5. Based on the result of this finding, poaching, logging and Agricultural activities (such as land clearing, farming and bush burning among others) were the major threats to the conservation of forest and forest resources in the study area. About 36.7% of the respondents were of the response that yes poaching was a serious threat to the management of forest and its resources in Okwangwo division while 63.3% opined that no, poaching was not a threat to the conservation of the fauna species in the study area.

Logging or indiscriminate trees harvest and processing was believed to be a threat by 18.2% of the respondents while 81.85 said no, logging was not a significant threat to the conservation and sustainable of forest and forest resources and to the management of the Okwangwo division. Majority (94.4%) of the respondents had the believed that farming activities was the major threats to the conservation of the flora and fauna species in the study area with 5.6% of the respondents who reported no, that farming activities was not among the major threat to the conservation of biodiversity in the study area.

Table 5: Major Threats to the Conservation of Forest and Forest Resources in the Study Area

Identified Threats	Opinion	Frequency	Percentage
Poaching/Hunting	Yes	33	36.7
	No	57	63.3
	Total	90	100.0
Logging/tree felling	Yes	16	18.2
	No	72	81.8
	Total	88	100.0
Farming activities	Yes	85	94.4
	No	5	5.6
	Total	90	100.0

Discussion

Socio-economic Attributes of the Respondents from Communities Adjoining Okwangwo Division of Cross River National Park

This result was an indicative that males perform more in this survey than females; this implied that males are more involve in over exploitation and deforestation of forests and forest resources in the study area. The result on age categories explains the range of age that participated more in this research work, and it was observed from the result that respondents between the ages of 21-40 years were more involved in forest resources exploitation and deforestation than any other age while people below the age of 21 are the least in terms of carrying out deforestation activities.

The major occupation of the respondents in the study area was found to be farming, this implied that more tree species, forests and forest resources would be exploiting or clearing for agricultural activities. This result on educational status revealed that majority of the people in the study area attained secondary school and tertiary levels; this implied that the people were literate with little or more knowledge on environmental and climate change effects as a result of deforestation. The educated man is also conscious of his environment and tends to preserve forest or wooded vegetation land. The educated farmer also has better understanding of the importance of forest to the environment (Desai and Mellor, 1993).

Extent of Deforestation in the Study Area

The result of this finding on the extent of deforestation in the study area revealed that most of the respondents never fell trees and its resources from the forest estates. This implied that majority of the respondents do not participant in deforestation or exploitation of the forest situated within the study area. This could be as a result of their awareness on the effects of deforestation and exploitations of forests and its resources; it could also be as a result of their educational level and knowledge on climate change on the environment and biodiversity. The respondents that always fell down trees and collect resources from the forests could be those respondents that have major occupation as timber dealers. Such people are always mindful of what they will benefit from forests products without considering the implications or effects of such exploitation to the environment and mankind.

Based on the result on the distance covered from home to forest area in the study area by the respondents revealed that majority of the respondents lived relatively closed to the forest estates situated in the study area, depending on the community or village. This implied that the surrounding villages/communities in the study area can even trek to the forest reserve in the area since the longest distance was about 20km. Etteret *et al.* (2006) posited that the human impact on forest resources are majorly influenced by spatial characteristics such as proximity to roads and settlements, distance to forest edges, soil fertility, rainfall pattern, topography, and population growth and density.

Njana (2008) reported that an increase in distance between homestead and the Miombo woodland constrains the woodland's contribution to the livelihood of local communities. Similarly, Grundy *et al.* (1983) recorded the spatial effects of Miombo woodland resource use in Zimbabwe and showed that an increase in distance from homestead to the woodland raised costs of resource collection and vice versa. McGregor (1995) in a study

conducted Shirungwi in Zimbabwe, also argued that rising scarcities of woodland resources caused increase in distance to woodland food resources.

Deforestation and the Extent of Effects on the Environment

Skole and Tucker (1993) asserted that the tropical forest is home to more than half of all plants and animal species despite the fact that it occupies less than 7% of the terrestrial surface. Deforestation poses a serious threat to biological diversity and is a primary cause of the present extinction crisis (Wilcove, 1986; Wilcox & Murphy, 1985).

The result of deforestation and the extent of effects on the environment and biodiversity in the study area is in line with the report of Anyanwuet *al.* (2013), who reported that deforestation leads to increased human encroachment upon wild areas, increased resource extraction, threats to biodiversity, soil degradation and extinction of species. They further reported that erosion, loss of soil fertility, loss of forest products like medicinal plants and fruits, extinction of species, changes in climatic conditions, and displacement of indigenous people are other problems associating with deforestation. Clearance of forest for the purpose of agriculture has exposed the soil to erosion and leaching of nutrients. This has led to low farm productivity as complained of by most of the farmers. Low farm productivity in turn results in low farm income or poverty. Thus, poverty is a serious problem in these studied communities.

Soil erosion is the most pronounced form of environmental degradation all over the country today which is directly linked with deforestation. Soil erosion is generally brought about by the action of water or wind when vegetation cover is removed such that all the physical protection offered by the vegetation is also removed. Deforestation impact on water resources is very important in views of the fact that it poses serious water resources problems resulting from the extensive destruction of watersheds. Results of hydrological investigations from tropical Asia have shown the significance of forest cover in proper and efficient management of soil and watershed resources (Adeofun, 1991). Deforestation often leads to the permanent lowering of the water table, especially when such deforestation is permanent and irreversible such as in the case of the semi-arid regions of Nigeria.

Studies have shown that the loss of forest resources has negative consequences on the quality of the environment (Ludekeet *al.*, 1990; Angelsen&Kaimowitz, 1999; Goldewijk&Ramankutty, 2004). The need for social, economic and cultural development by man may cause a stress on environmental resources. Geist and Lambin (2004) observed that deforestation is an important contributor to global environmental change. Tropical deforestation, often depicted as an important environmental concern, is the cause of biodiversity and ecosystem loss, soil degradation and vulnerability of people and places to climate change and socio-economic disturbances (Lambinet *al.*, 2003).

Socio-economic Attributes that Influence Deforestation in Okwangwo Area Division

The socio economic attributes (such as age, family size, occupation and income) were some of the attributes that influence deforestation in the study area. Based on the result of the respondents' income in the study area, the people have a low monthly income, this is an indicative of poverty where the people in the study area hardly earned up to ₦1,600 per day, in case of outbreak or emergency need, such people cannot meet up through their financial need especially those that were within the income category of <18,000 to 47,000 per annul. This result is in accord with the report of Anyanwuet *al.* (2013), who reported that poverty is an important factor of deforestation in most African countries. The New York Times (2009) reports that among countries with a per capita GDP of at least US\$4,600, net deforestation rates have ceased to increase.

Farming as the major occupation in the study area could be one of the major factors influence deforestation of forest estates through land clearing for the purpose of cultivation of crops. This greatly contributes to deforestation and soil degradation. Farming activities is regarded as the overwhelming cause of deforestation in most areas in African countries. As a result of increase in population due to large family size in Nigeria, people resort to clearing of forest to provide shelter and to plant crops either for subsistence or for commercial purpose in order to make a living. The high level of unemployment and poverty in the area has forced people to exploit forest resources in an unsustainable way and to clear the forests for agricultural purposes. This areal expansion of agricultural land has impacted negatively on the biodiversity and soil condition in the state. A lot of those with one form of employment or the other also take to farming as a way of supplementing the meager resources from their regular jobs.

Educational status of the respondents also influences deforestation as revealed from the results of this finding. The fact that most of the people attained secondary school was an indication that they may not have the knowledge of new farming techniques that lay more emphasis on organic farming through agroforestry practices, contour plowing to control erosion, and adoption of intensive farming rather than extensive farming to control deforestation and prevent loss of valuable species of economic values. Their academic attainment may

also make it difficult for the people to see the relationship between clearing forests and contemporary issues of climate change and global warming. It was generally acknowledged that education is perceived as being among the factors that influence an individual's perception on disturbance. According to Mitinjeet *et al.* (2007), education is normally considered as the key to improved opportunities for development and accessibility to information and services.

Result on family size of the respondents implied that the people in the study area had a large family size; this was an indicative that more pressure would be mounting upon the available forest resources and forest estates situated within the study area. Large family size couple with low income over a period of time can lead to high rate of poverty and high exploitation of forests and its resources.

This result is in line with the study conducted in Uluguru forest in Tanzania by Mtinjeet *et al.* (2007) who argued that household size, education and farm land size contribute significantly to the degradation of forest resources. Also, Richard *et al.* (2011) reported that household size, education and distance from homestead to the forest reserve are the factors influencing deforestation in the reserve. Nduwamungu (2001) and Madulu (1996) reported a strong relationship between household size and environment degradation.

Threats to Conservation and Sustainable Management of the Study Area

The major threats to conservation and sustainable management of forest and its resources in the study area were identified. Agricultural (farming) activities were the most threatened factor to conservation and sustainable management of forest and its resources in Okwangwo division area. This was followed by poaching and logging as other major threats to the conservation of the fauna and flora species by the management of Okwangwo division of Cross river national park in Nigeria. This result was in line with the report of hunting and habitat degradation as the main threats to fauna species (such as drill monkeys), which are currently listed as Endangered on the IUCN Red Data List (Oates and Butynski 2008, Bethanet *et al.*, 2013).

The law (prohibition of trees felling) protecting this study area could be the major reason that reduces disturbances from farming and logging activities (such as fuel wood collection, charcoal production, timber exploitation and poaching, among others). This was also observed and reported by Sagaret *et al.*, 2003; Hooper *et al.*, 2005 and Spiegelbergeret *et al.*, 2006; land use changes are responsible for decrease in fauna and flora species richness and diversity.

Clearance of forest for the purpose of agriculture has exposed the soil to erosion and leaching of nutrients. Deforestation (such as logging), poses a serious threat to biological diversity and is a primary cause of the present extinction crisis (Wilcox and Murphy, 1985). Anyanwu *et al.* (2013), reported that deforestation (logging and anthropogenic activities) lead to increased human encroachment upon wild areas, increased resources extraction, threats to biodiversity, soil degradation and extinction of species.

Uncontrolled logging of tree species result to high rate deforestation which often leads to the permanent lowering of the water table, especially when such deforestation is permanent and irreversible such as in the case of the semi-arid regions of Nigeria. Lowering of water table has great impact on the population growth and distribution of fauna species.

The result of this finding is also in line with the report of Edetet *et al.*, (2005), who reported that fauna species (primates) are widely spread but no longer safe as a result of intensive anthropogenic impacts such as poaching, indiscriminate collection of non-timber forest products (NTFPs), unsustainable agriculture, felling of wild trees for timber, indiscriminate bush burning. Growing human populations which are expanding into forest habitats, and clearing of forests for agriculture are the major causes of forest loss (Cowlshaw and Dunbar, 200; Danielet *et al.*, 2016). The uses of heavy equipments, machineries and weapons for farming and poaching activities are an empirical evidence of man ruining what nature has bestowed to his care for sustainability. Fauna species are especially vulnerable to this form of hunting (Gadsby 1992). The population of most fauna and flora species are under pressure from hunting, even within protected areas. Especially damaging is the practice of using dogs to track and kill fauna species in large numbers (Astaras 2009).

The reduction in the faunas' range could be due to hunting pressure, increased fragmentation, habitats destruction and loss of forest resources. IUCN's red listing of fauna species as Endangered (Oates and Butynski 2008) was based on species being thought to have undergone a decline well exceeding 50% over the past few years, due to high hunting pressure and continuing habitat loss.

Conclusion

The result on the effect of anthropogenic activities on sustainable management of forest and forest resources in Okwangwoarea division revealed that, fauna and flora species population was declining as a result of habitat loss, fragmentation and degradation as the results of some anthropogenic activities; these activities include:

poaching, logging and farming activities. Anthropogenic activities were the major threats to conservation and sustainable management of the study area as revealed by this study. Poachers in the study area used different kind of weapons. These include traps, gunshots, poisons and hunting with dogs, particularly when used to target monkeys and hares. Logging and poaching signs were evident in all the surveyed blocks and there were strong market forces driving much of these activities. Therefore, it is recommended that, there should be a strong collaboration between National Parks Service and media to increase public awareness and knowledge on the needs for conservation and sustainable management of forests and its resources. Bottom to top management method should be effectively adopted for easier conservation and sustainable management of the study area. Also, there should be good relationship between the surrounding communities adjoining the boundaries of the division area for strong support for the conservation and sustainable management of the forest and its resources.

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