



IMPACT OF POPULATION GROWTH ON BIODIVERSITY LOSS IN BOKI AGRO-ECOLOGICAL RAINFORESTS, CROSS RIVER STATE, NIGERIA

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ABSTRACT

In today's world, the rapid growth of human populations, who rely on forest resources as their primary source of income, is a major source of concern. The impact of population increase on biodiversity loss in the Boki rainforest in Nigeria's Cross River State was investigated in this study. The study looked into the causes of rapid population expansion, the proximate causes of deforestation, the effects of deforestation on biodiversity, and the economic values of rainforests to Boki inhabitants. The study gathered information on the factors that contribute to population growth, the pace of biodiversity loss, the causes of deforestation, and the effects of deforestation on biodiversity in the study area. The findings found that a mix of human influences such as rapid population growth, increasing human activities such as lumbering, fuel wood extraction, settlement expansion, agricultural practices, and construction works had aggravated tropical rainforest degradation in the studied area. These factors have aided in the extinction and depletion of important flora and fauna species in the study area. To maintain the Boki rainforests and its biodiversity, the report suggests population education, research-based innovative forestry and biodiversity policies, and forest restoration efforts such as community-based forest management.

KEYWORDS: Rainforest, Biodiversity loss, Boki and Population Growth

INTRODUCTION

Rapid population increase, with a greater reliance on forest resources as a source of income and livelihood, is a major source of concern in the modern era. Increased human population necessitates increased production of goods and services to meet the needs of the humans. As the world's population continues to grow, so does the need for forest resources and the conversion of forest area to agricultural land (Tailor, Ciren and Stout, 2005; Profoun, 2016). Increasing human population and the quest to maximize satisfaction through food, shelter, roads, schools, industries and energy provision has led to high pressure on the nation's forest resources (Jimoh, 2008; World Bank Report, 2015).

Tropical rainforests play an essential and necessary role in planetary biodiversity, including more than half of all species occupying just around ten percent of the planet's surface land (Anyanwu, 2012). Humans have,

nevertheless, had a considerable impact on land surface features over the previous 10,000 years through altering forest vegetation through habitat fragmentation, forest conversion for farming, settlement growth, and industrial development, among other uses (FAO, 2015). In the tropics, where over 50 percent of the world biodiversity is found, deforestation has now become the greatest threat to the conservation of biodiversity due to loss of habitats (Defries, Answer and Houghton, 2004, Millennium Ecosystem Assessment, 2005).

Globally, more than fifteen million hectares of forests have been converted to other type of land uses in the last couple of decades. Brazil and Indonesia respectively lost 2.6 and 1.9 million hectares of forests annually in the 1990s (FAO, 2013). Africa replaced Brazil and Indonesia as the world's top forest losers between 2000 and 2010, losing 34 million hectares of forest per year. Nigeria's predicament is much more terrifying and worrisome, since the country's forest cover

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decreased by 409,709 hectares per year between 1990 and 2010, a rate of 2.38 percent per year. (Rainforest Analyst at Mongabay.com, 2017). According to Atu and Egbe (2018) Nigeria's forest cover loss is reported to be 3.5 percent equivalent to 350,000 – 400,000 hectare. The rapid increase in human population, which fuels an alarming pace of forest loss, has an impact on the country's wild plants and animals, particularly those that are native to Nigeria, such as the Cross River State Gorilla. Cross River State is home to 40% of Nigeria's surviving Tropical High Forest (THF), and the Boki Forest in the Boki Local Government Area of Cross River State is one of the state's tropical rain forests.

The rainforest (moist tropical forests) of South Eastern Nigeria is recognized as biological diversity hot spots of global importance (IUCN, 2005). Rapid population growth, as well as the population's impact on biodiversity through increased demand for forest resources and overexploitation of forest ecosystems, has had a negative impact on biodiversity. Due to the aforementioned, the focus of this study is on the impact of population growth on biodiversity in the Boki Local Government Area of Cross River State, Nigeria. Excessive exploitation and extraction of forest resources, fuel wood extraction, agricultural operations, and other activities from the forest, which is the essential foundation of livelihood, have all resulted from the high rate of population expansion. All of these actions are concerning since they are carried out indiscriminately, unplanned and without regard for future generations. This study investigated the impact of population increase on biodiversity loss in the Boki rainforests of Nigeria's Cross River State, the proximate causes of deforestation, the causes of rapid population expansion and the effects of deforestation on biodiversity loss in the study area.

LITERATURE REVIEW

Concept of biodiversity

Biodiversity is an acronym for biological diversity. The United Nations Earth Summit in Rio de Janeiro defined biodiversity as the variability among living organisms from all sources including inter alia, terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part. These include diversity within species, between species and of ecosystems (International Union for the Conservation of Nature, 2008a). Nigeria is counted among the biodiversity "hotspots" of the world and some fauna species are endemic to Nigeria including the drill (Cross River State), Indigo bird (Plateau State) and Waxbill (Anambra State). The current rates of deforestation in Africa including Nigeria are very high and it is known globally to have significant impact on local, regional and global biodiversity.

Impact of population growth and deforestation on biodiversity loss

The impact of population growth on agriculture and natural resources management has long been debated at least from the time of Malthus (Malthus, 1798). Therefore, the fact remains that as the world population increases, greater pressure will continue to be placed on land, water, energy and the biological regions, to provide adequate supply of food while maintaining the integrity of the world ecosystem (Udo, 2012). Population growth

presents major challenges because of the pattern of production and consumption that shape the world as well as the problem of pervasive poverty. Rapid population growth affects the natural resource base, in many ways. Firstly, it causes increased demand for food, water, materials such as timber and fuel wood. Secondly, expanded agricultural activities encourage encroachment into the forests and wetlands (FAO, 2004). In the same vein, increasing population pressure together with scarcity of resources such as agricultural lands, firewood, poles, timber and fodder may result into the encroachment of forests ecosystem.

Despite the global concern, policy reforms and a variety of initiatives, the rates of biodiversity loss remains alarming in Nigeria, 12 percent of species found in Cross River State are endemic (Akintoye 2014) and about 3.5 percent are threatened while others are endangered or extinct. Most of the species are lost to deforestation (UNEP-WCMC, 2004). On the 2008 IUCN Red list for example, one out of every four mammals (IUCN, 2008a), one out of eight bird species (Bird Life International, 2009) and one out of three amphibian species are reported to be endangered (IUCN, 2008b).

Causes of population growth

The world population today has been one of the growing concerns amongst countries as it hinders development to some extent in some countries. Population dynamics is one of the key issues to think about in developmental process (UN, 2016). The world population presently has exceeded seven billion and is still growing at an alarming rate of 1.05 percent annually (UNFPA, 2014). This trend in population growth will continue on the higher side and the earth will reach or even exceed its carrying capacity if not properly checked. Several factors ranging from high birth rate, low mortality rate and improved medical cares etc. have contributed greatly to an average increase in life expectancy which has led to increase in human population (Oduşina, 2020). Currently in Nigeria, there has been a rapid growth in population due to polygamous activities of the people as a result of higher fertility rate. This is due mainly to the traditional belief of many ethnic groups that children are blessings from God, the more children one has, the more hands he has to assist in farm works (Ekpeterere and Ekeh, 2016). In addition, improved medical care, lack of family planning and birth control, population reduction variables such as war and epidemics has been in the decrease, and all of which has resulted in the rise in the country's population (UN, 2016). In Cross River State of which Boki is a part of, population is also on the increase as it has now been projected to increase by 2.8 percent annually (NPC, 2007).

• Improved medical care

Improved and increased medical services which have been put in place over the years have led to the development of curative Medicare for human use. Consequently, this has led to the increase in the use of safer and cleaner sanitation, building of medical centers, ante-natal and pre-natal care, immunization, proper waste disposal facilities among others, which have largely contributed to population growth. This is true because the amount of deaths recorded over the past years as a result of different illnesses such as small pox, chicken pox, typhoid fever and many other communicable diseases has been drastically reduced

and has been attributed to the aforementioned health improvement factors (Elekwa, 2012). Furthermore, there has been increase in the number of health care professionals especially indigenous medical experts have increased phenomenally to take care of the growing population's medical needs.

- Illiteracy

According to Elekwa (2012), lack of education has been a factor responsible for the rapid growth in population in the developing countries. This is because due to lack of education, they fail to realize the outcome of overpopulation as they are not interested in the system of family planning and birth control measures (Ekpeter and Ekeh, 2019). Ignorance of family control and birth control programmes contribute to the rapid growth in the world's population and its associated growth problems. The citizen's lack of interest in family planning programmes and birth control, devices such as condoms, contraceptives, sterilization has led to the increase in the population of the study area as well as the entire Cross River State (Mundi, 2011).

Other factors as reported by Elekwa (2012) include advancement in science and technology, good security networks, abundance of amenities, decline in road accidents owing to the construction and maintenance of durable and pliable roads in Nigeria and other parts of the world compared to centuries ago. Science according to him has also improved other areas of man's dependence such as food, clothing, shelter, and communication among others which have contributed to longer life and comfortable living (Elekwa, 2012).

STUDY AREA

The study area is Boki Local Government Area in Cross River State. The area is located between latitudes $5^{\circ} 56' 3.761''$ and $6^{\circ} 33' 36.441''$ North of the equator and longitudes $8^{\circ} 41' 0.96''$ and $9^{\circ} 20' 1.646''$ East of the Greenwich Meridian. It is bounded by Obudu and Obanliku Local Government Areas to the North, Cameroon Republic to the East, Etung and Ikom Local Government Areas to the South and to the West by Ogoja and Yala. Like most of the Southeastern regions, the climate of Boki is influenced by two prevailing air masses, the tropical maritime air mass that originates from the Atlantic Ocean and the tropical continental air

mass that blows from the Sahara desert. Generally, Boki experiences dry and wet seasons with an annual rainfall of between 2000mm to 4000mm starting from March to November with a peak period in June to July and annual temperature of 22°C to 27°C . Within the forest areas of Boki are trees, herbs, shrubs, climbers, lianas and several other plant species including a great variety of wildlife species such as; gorilla, drill, chimpanzee, a gwantibo, baboons, leopards drill monkeys red foxes buffaloes among others existing in the ecological systems (Review of cross river national park 2017). Several streams and rivers drain the entire areas and empty into Ikom River.

METHODOLOGY

Reconnaissance survey was carried out by the authors from Monday 20th of January to Thursday 24th 2021 to acquaint themselves with the study area. The case study design was adopted in carrying out this study. This enabled the effect of population growth vis-à-vis deforestation on biodiversity loss in Boki Agro-Ecological forest to be studied based on observable impacts and threats posed to biodiversity, the causes of deforestation and the consequences of deforestation on biodiversity in the area.

The methods used for data collection comprised document research at Cross River State Forestry Commission (CRSFC), Cross River National Park (CRNP) and Participatory Research exercise such as historical timeline assessment of deforestation, Focus Group Discussion (FGD), interviews. For the qualitative data, responses from administered questionnaires were entered into SPSS (version 17) for statistical analysis. All variables were coded with measurements defined as nominal/ordinal scales. A total of 300 questionnaires were administered on the sample which consisted of youths, men and women randomly selected from the population of the study area. Purposive sampling technique was adopted in the administration of the questionnaire, where Boki was divided into two units namely; Boki East, 150 and Western Boki 150.

Based on the nature of research questions for the study, data obtained from the field were analyzed using descriptive statistics of tables, simple averages and percentages.

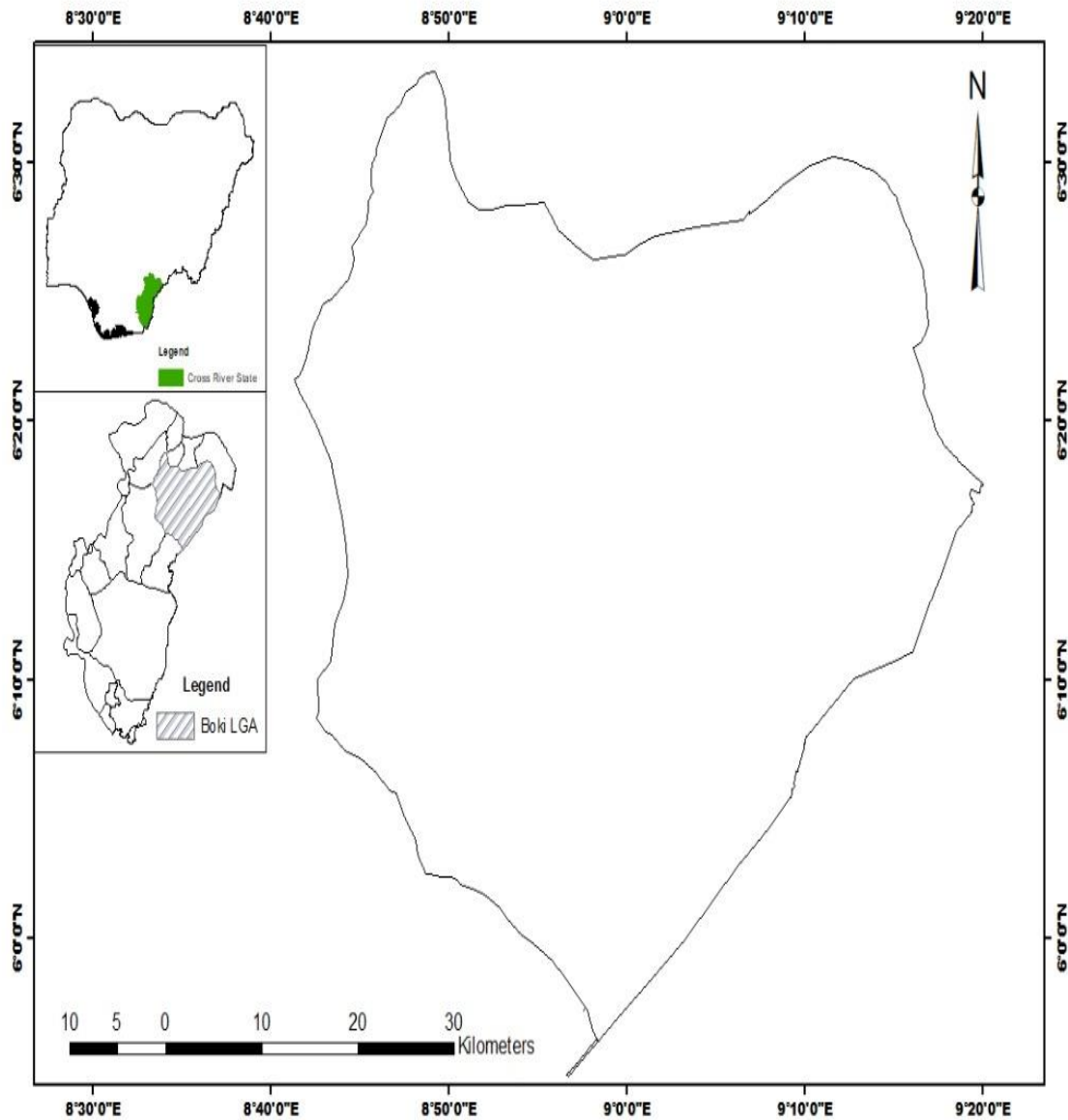


Figure1: Map of Cross River State Showing the Study Area
 Source: Department of Geography and Environmental Science, GIS Unit (2021).

DATA PRESENTATION AND ANALYSIS
Causes of population growth in Boki

Analysis of data on the causes of population growth in the study area revealed that Lack of family planning and birth control are the main factor responsible for population growth in the study area, (Table 1.3).74% of the respondents strongly agreed, 16% agreed while 6% strongly disagreed and 4% disagreed respectively. In the section of Improvements in medical care and health

facilities, 70% of respondents strongly agreed, 22% agreed while 5% strongly disagreed and 3% disagreed. In the category of Decrease in mortality rate as a factor chiefly responsible for the growth in population in the study area, 90% of the respondents strongly agreed, 7% agreed while 2% strongly disagreed and 1% disagreed. Therefore, it is implied that Decrease in mortality rate is a factor chiefly responsible for the growth in population in the study area

Table 1: Causes of population growth in Boki

Causes of population growth	% SA	% A	% D	% SD
Lack of family planning and birth control	74	16	6	4
Improvement in medical care and health facilities	70	22	5	3
Decrease in mortality rate illiteracy	90	7	2	1
Illiteracy				
Advancement in science and technology	46	23	10	21
Abundance of amenities	35	28	28	9

Source: Author’s fieldwork, 2021

CAUSES OF DEFORESTATION IN THE STUDY AREA

Data the causes of deforestation in the study area revealed that the main causes of deforestation in the area are lumbering, agricultural activities, fuel wood

extraction, construction activities, and settlement expansion among others, (Table 2). This is seen in a high percentage frequency of 55.3% obtained across the local government area.

Table 2: Causes of deforestation in the study area

S/N	Options	Frequency	Percentage (%)
1.	Lumbering	26	8.7
2.	Agricultural activities	34	11.3
3.	Fuel wood extraction	30	10
4.	Construction activities	18	6
5.	Settlement expansion	20	6.7
6.	Others	6	2
7.	All of the above	166	55.3
	Total	300	100

Source: Author’s fieldwork, 2021

Consequences of deforestation on biodiversity in Boki rainforests

Analysis of data on the consequences of deforestation on biodiversity in Boki showed that loss of plant species, loss of animal species, loss of wildlife, loss of bird

species and loss of insect species are the major consequences of deforestation on biodiversity in the area under study, (Table 3). This is reflected in the high percentage frequency of 56.3%.

Table 3: Consequences of deforestation on biodiversity in Boki rainforests

S/N	Options	Frequency	Percentage (%)
1.	Loss of plant species	42	14
2.	Loss of animal species	28	9.3
3.	Loss of wildlife	12	4
4.	Loss of bird species	24	8
5.	Loss of insect species	20	6.7
6.	Others	5	1.7
7.	All of the above	169	56.3
	Total	300	100

Source: Author’s fieldwork, 2021

Importance of forests to the residents of Boki

The data on the benefits of forest resources in Boki revealed that the major benefits of forest to the Boki

inhabitants are sources of food, herbal medicine, bush meat, fresh water protection, energy and timber (Table 4). This is reflected on the highest value of 57.3%.

Table 4: Importance of forests to the residents of Boki

S/N	Options	Frequency	Percentage (%)
1.	Source of food	30	10
2.	Source of herbal medicine	20	6.7
3.	Source of bush meat	24	8
4.	Fresh water protection	10	3.3
5.	Source of fuel wood	28	9.3
6.	Source of timber	16	5.3
7.	All of the above	172	57.3
	Total	300	100

Source: Author’s fieldwork, 2021

DISCUSSION OF FINDINGS

The findings from the study revealed that lack of family planning and birth control, improvements in medical care and facilities, decrease in mortality rate, illiteracy and advancement in science and technology are the major factors responsible for population growth in the study area. This finding lend credence to the works of Ekpeterere and Ekelu,(2019).Further finding revealed that forest is a major source of food, herbal medicine, bush meat, fuel wood and a medium for fresh water protection in Boki. This implies that the residents of the study are depending heavily on the remaining patches of rainforests in the area for their livelihood. Their overdependence in forest resources overtime culminated to various levels of impacts on biodiversity mainly through deforestation which are manifested via habitat fragmentation and loss, settlement expansion, fuel wood extraction, lumbering and agricultural activities in the area. These findings corroborate the submission of Millennium Ecosystem Assessment (2005) which investigated the anthropogenic factors of biodiversity loss and reported habitat change as the most pervasive anthropogenic causes with habitat fragmentation and resource exploitation at Boki being the next most common drivers. The finding is also in agreement with the finding of Omofonmwan and Osah-Edoh (2008) who reported that loss of habitat due to forest clearing is majorly responsible for biodiversity loss. In the same vein, studies carried out by WWF (2016) equally confirms that fragmentation and deforestation of habitat has severe, negative effects on biodiversity through decreasing the extent of habitat ranges. The finding is also in line with the view of Anyanwu (2012) who observed that environmental degradation such as soil erosion, water and air pollution are usually preceded by deforestation.

CONCLUSION

In the Boki Local Government Area of Cross River State, population growth and its effect on deforestation have been recognized as the primary cause of biodiversity loss. The residents of the Boki rainforest rely largely on the forest for their livelihood, according to the study. This has culminated to the loss of forest areas, habitat fragmentation, soil degradation, depletion of biomass and associated species loss. In the light of this, deforestation is linked to biodiversity loss, species endangerment and possible extinction of endemic species in Boki Local Government Area of Cross State, Nigeria.

RECOMMENDATIONS

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

1. Population education should be conducted to educate couples on the need of having a family size that they can support.
2. The government should establish legislation requiring parents to have the number of children they can sustain.

3. Rigid research-based innovative forestry and biodiversity policies and programs, as well as community-based forest management initiatives, should be implemented.

4. Boki rainforest should be conserved from extinction and biodiversity loss, via controlled logging, prohibits bush following agriculture, and manages settlement expansion.

REFERENCES

- Anyanwu, J. C., 2012. Impact of deforestation on soil conditions and biodiversity in Anambra State of Nigeria. Ph.D thesis, Department of geography and Meteorology, Faculty of Environmental Science, Nnamdi Azikiwe University, Akwa. Unpublished.
- Birdlife International, 2009. Birds in the IUCN Red list.http://www.birdlife.org/action/science/species/global/species_programme/redlist.htm1. Download and February 2014.
- Atu and Egbe, 2018. Influence of Deforestation on Biodiversity in Owai Rainforest, Cross River State, Nigeria.
- Odušina, E.K et al, 2020. Fertility Preference among couples in Nigeria; a cross sectional study. *Reproductive Health* 17; 92p 5-6.
- Boki Blog, 2017. Review of Cross River National park in Boki LGA. <http://www.bokiblog.com.ng/2017/10/review-of-cross-river-national-park-in.html?m=1>.
- UNFPA, 2014. State of the world population. New York refreind www.unfpa.org.
- Defries, R. S., Answer, G. P. and Houghton, R., 2004. Tradeoffs in land use decisions: Towards a framework for assessment multiple ecosystem response to landuse in ecosystems and landuse changes in R. S. Defries, G., P. Answer and R. Houghton (eds.) AGU, Geographical Monograph, 153: 1-9.
- World Development Report, 2015. Mind, Society, and Behavior.
- FAO, 2015. The state of food and Agriculture, social protection and agriculture: breaking the cycle of rural poverty.
- Ekpeterere, O. K. and Ekelu, O. F., 2019. Impact of population increase on agricultural productivity in Kwali Area Council, Abuja, Nigeria., 2007 – 2016. *Global Journal of Advanced Research*, 6(4), 135-146.

- Elekwa, U., 2012. Desired fertility and the impact of population policies. *Population and Development Review*, 1(20).
- Food and Agricultural Organization (FAO), 2010. World Deforestation decreases but remaining alarming in many countries. <http://www.fao.org/news/story/en/item/40893incode/> Retrieved 10-5-2020.
- <http://newmongabang.com2007/1205-gorriilashtml> Retrieved 16-01-2015.
- IUCN, 2008a. An analysis of mammals on the 2008 IUCN Red list www.iucnredlist.org/mammals. Downloaded on August 17, 2016.
- IUCN, 2008b. An analysis of amphibians on the 2008 IUCN Red List; IUCN Convention.
- Food and Agricultural Organization (FAO), 2010. Global Forest resources assessment: options and recommendations for a global remote sensing survey of forest
- Jimoh, S. M., 2008. Forest resource depletion in Edo State: A case study of Auchu forest reserve. M.Sc. thesis, Department of Geography and Regional Planning, Ambrose Ali University Ekpoma. unpublished
- Millennium Ecosystem Assessment, 2005. Millennium Ecosystem Assessment. Ecosystems and human well being. Biodiversity synthesis, World Resources Institute, Washington DC.
- IUCN, 2005. The IUCN programme 2005-2008: many voices, on earth, adopted at the world conservation congress, Bangkok, Thailand, 17-25 November.
- Mundi, R., 2011. Urbanization in a development context: Patterns, problems and prospects in Nigeria. Annual Conference of the Nigerian Economic Society, 11-37.
- UNEP-WCMC, 2004. Protected areas and biodiversity: an overview of key issues.
- Akintoye, O. A., 2014. Forest Resources of Cross River State: their potentials, threats and mitigation measures.
- National Population Commission (NPC, 2007). Federal Republic of Nigeria 2006 official population census provisional result, NPC, Calabar.
- Omofonmwan, S. I. and Osa-Edoh, G. I., 2008. The challenges of environmental problems in Nigeria. *Journal of Human Ecology*, 23(1), 53-57.
- Profound, T. P., 2016. Impact of deforestation on agricultural production in Ekeremor Local Government Area, Bayelsa State. An unpublished PGD thesis, Department of Geography and Regional Planning. Ambrose Alli University Ekpoma.
- Taylor, Cirean and Stout, 2005. In Frofoun 2016 impact of deforestation on Agricultural production in Ekeremor Local Government Area, Bayelsa State. An unpublished PGD thesis in the Department of Geography and Regional Planning Ambross Ali University, Ekpoma, 1-5.
- Udo, R. K., 2012. Population pressure and the Nigerian environment. In Math F. A. Ivbijaro and Festus Akinbola (Eds.) Sustainable environmental management in Nigeria. 2nd edition. Ibadan: Book builders editions Africa.
- United Nations, 2016. Human population and the global environment. *United Nations Journal on Human Environment*, 97, 123-133.
- World Resources Institute, 2000. Data for 1998-1999 World Bank Report 106-108.
- World Wide Fund, 2016. The link between reducing deforestation, forest degradation and biodiversity conservation. Lexeme Consulting Gland.
- FAO, 2004. The state of food insecurity in the world (Sofi).
- KT Ogeh, S. O. Jimoh and OI Ajewole, 2000. Utilization of mangrove forest resource for human livelihoods in uzere, Delta state, Nigeria.