Journal of Environment and Earth Science
ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online)
Vol.7, No.7, 2017

The Causality of Deforestation in North-Central Nigeria: Case Study of Shendam Urban Area, Plateau State

Buba Y. Alfred [1] Prof. Ayuba K. Haruna[2] Dr. Jibrin Sule[1] Birmah M. Nyadar[1] Nden Timnan[1]
1.Nigerian Building and Road Research Institute, Abuja, 900001, Nigeria
2.Department of Geography (ERM), Nasarawa State University Keffi, Nigeria

Abstract
Deforestation in Africa is a major contributor to global warming, erosion, annual flooding and food shortage in Africa. In Africa, 90 percent of the population uses wood for fuel. Forests provide many products/benefits to the people but these forest resources are depleted continuously without replacement. Shendam District is geographically located between latitude 8º53′43.88″N and longitude 9º27′13.41″S in Shendam Local Government Area (L.G.A) of Plateau State, Nigeria. The research was a case study undertaken to assess the causalities of deforestation and questionnaires were administered in ward A, ward B and Pangwasa ward of Shendam District. Anthropogenic activities is the cause of forest lost in the study area and the major effects outlined in the study area are biodiversity loss, high temperature, soil erosion, migration and flooding. The activities causing damage to roads, culverts and bridges in Shendam District and its environs. Reducing the rates of deforestation and forest regeneration is among the solution to deforestation in Shendam district and its environs. Better management practices requires the need for Public Sensitization on the effects of deforestation, Public Private Partnership (PPP) in tree planting, Rural –Urban Afforestation Programme and the policy of cut-one-tree and plant-five trees instead, should be enforced in Shendam District. Subsidy Reinvestment Programme (SURE-P) should be strengthened for capacity development and human empowerment. The measures will provide alternative means of livelihood and reduce soil erosion, land degradation, flood impact, not only in Shendam L.G.A., but the entire Plateau State.
Keywords: Deforestation, Anthropogenic activities, Capacity development, Tree planting

1.0 INTRODUCTION

In many parts of the world, especially in East Asian countries, reforestation and afforestation are increasing the area of forested lands. The amount of woodland has increased in 22 of the world's 50 most forested nations. Asia as a whole gained 1 million hectares of forest between 2000 and 2005. In the People's Republic of China, where large scale destruction of forests has occurred, the government has in the past required that every able-bodied citizen between the ages of 11 and 60 plant three to five trees per year or do the equivalent amount of work in other forest services. The government claims that at least 1 billion trees have been planted in China every year since 1982, and March 12 of every year in China is the Planting Holiday. (Chaitanya, 2009).

The deforestation taking place in the African rainforests has many causes, including logging, which is responsible for from 20 to 25 percent of the deforestation, cattle ranching, cash crops, construction, population growth, economic development, clearing for cultivation, and by government policy (Branson, 2003). In Africa, 90 percent of the population uses wood for fuel and wood is used in Africa for 52 percent of all energy sources. The deforestation in Africa is a major contributor to global warming, erosion, annual flooding and medicinal compound/food shortage in Africa (Branson, 2003). Branson (2003), mentioned some control measures for deforestation in Africa: The African deforestation problem can be solved by regulating the activity of the logging industry to reduce excesses, creation of forest protections and reserves to minimize the use of the forests, the land ownership in Africa should be restructured. Biodiversity loss accounts for the loss of many life saving medicines which are being destroyed in the deforestation processes (Leah, 2014).

The rapid increase of Nigerian population calls for concern, as more pressure will be on the existing for various demands and needs such as; housing constructions, fuel wood and farming activities. Other States in Nigeria are facing similar consequences of deforestation and this need to be addressed through sustainable measures. The study focused on deforestation causes and effects in Shendam district and since the creation of Shendam L.G.A in 1976, there has been continuous cutting of trees in Shendam and the entire Plateau State. The effects of deforestation in Shendam district and its environs, calls for a global sustainable mitigation measures on deforestation, from the Government, Environmentalists, Institutions Researchers and Stakeholders.

1.1 AIM AND OBJECTIVES OF THE STUDY

The aim of this project is to assess the effects of deforestation activities in Shendam District.
The specific objectives are to:
i. Examine the major causes of deforestation in Shendam District.
ii. Determine various categories of persons involved in deforestation in the area.
iii. Examine the major effects of deforestation in Shendam District and environs.

iv. Assess awareness of the inhabitants on the effects of deforestation in Shendam District.

1.2 SIGNIFICANCE OF THE STUDY

The issue of deforestation in Shendam District is continuous and a lot of trees in Shendam District are being cut down on daily basis with less regard to the effects. The benefit of this study will go a long way to provide alternative sustainable means to ensure continuity of trees in the area. The policy of cutting a tree and planting (3-5 trees) instead, will help in regenerating trees population that will help in regulating the temperature of Shendam District and its environs. Tree provides cover for soil erosion control, retains soil nutrients, regulates environmental temperature making it conducive for living and provides food and shelter to the inhabitants. The study will serve as a roadmap for afforestation programme implementation in Shendam L.G.A., and the whole of Plateau State.

2.0 LITERATURE REVIEW

2.1 GLOBAL CONCERN FOR THE ENVIRONMENT

2.1.1 The Stockholm Conference held in 1972: The Conference was the first major attempt to involve the nations of the world in a concerted, constructive response to environmental problems. It clearly had an international dimension in looking beyond immediate problems to deeper issues, and it succeeded in placing environmental problems, especially pollution, on the international agenda. The Stockholm Conference led to the establishment of the United Nations Environment Programme (UNEP) based in Nairobi, Kenya. UNEP was given the mandate as a governing body on environmental issues within the UN to create wider awareness of the environment, to draw together environmental action within the UN, and to administer a fund for environmental programmes within the UN. (UN, 1992). UNEP played a major role in the production of environmental legislation especially in industrialized countries of the North. It also contributed to the preparations of International Union for the Conservation of Nature (IUCN) which produced the World Conservation Strategy report which was published in 1980. The term "sustainable development" was used here for the first time. (IUCN, 2007).

2.1.2 The Rio Summit took place in 1992: This was the largest world conference ever to take place where over 178 governments and 500 NGOs were present. This Summit came twenty years after the Stockholm Conference. The major areas to be considered by the Conference were conventions on climate change, biodiversity and forests, an earth charter, and a global action plan which was expressed in Agenda 21 (UN, 1992). The key agenda was the issue of forests and deforestation and it was hoped that a legally binding instrument on forests similar to conventions on climate change, biological diversity and desertification could be launched. The major failure of the Rio Summit was a failure to reach firm agreement on targets for reducing emissions and the refusal of the USA to commit to the reduction of carbon dioxide emissions. The Biodiversity Convention discussed at the Summit gave support to the South by asserting that individual states had sovereign rights over their own biological resources, as well as being responsible for maintaining diversity and sustainable usage. Unfortunately, however, this was weakened by the USA whose principle stance was to protect its own biotechnology industry (UNCED, 2000).

2.1.3 The Kyoto Protocol 1997: The protocol was adopted in 1997 although not implemented until 2005. It was a compromise which allocated to the various developed countries emission quotas according to the agreed 1990 emission levels, and which also permitted countries to trade their quotas with countries wishing to exceed their allocated quotas (UNFCCC, 2009). The Kyoto Protocol for the first time adopted mandatory emission reduction targets for the majority of industrialized countries who were supposed to reduce their emissions by 5.2% compared to the 1990 levels between 2008-2012 (UNFCCC, 2009). It also addressed the connections between poverty and climate change which was to facilitate the development of climatic friendly technologies. It was also under Kyoto that new financial resources for technological transfers were agreed (e.g., the Clean Development Mechanism). The withdrawal of the US from the Kyoto Protocol created uncertainty over which measures the US would take to reduce emissions, and consequently about the extent to which greenhouse gases emissions would be reduced between the period 2008-2012.(UNFCCC, 2009).

2.1.4 The Johannesburg Earth Summit 2002: The Summit took place ten years after Rio and there was a general agreement that greenhouse emissions needed to be drastically reduced to avert global warming. However, no framework was established to monitor, assess and control the behaviour of large transnational corporations (TNCs). On the extractive side, the TNCs logged tropical forests in an unsustainable manner and promoted mining in unsuitable places. But the greatest disappointment of the Summit was its unwillingness to tackle global warming and promote cleaner energy options (McDonagh, 2002). Although the Johannesburg Earth Summit was a failure in many respects, nevertheless there was an acknowledgement by the nations involved of the critical nature of environmental destruction. As such, they were looking at ways and means of trying to solve the problems of environmental degradation. It was hoped that the Conference due to take place in Copenhagen in Sweden in December, 2009 would agree on fixed target dates but, once again, this was not to happen. (Patrice,

2010).

2.1.5 The Paris Agreement 2015: The 2015 United Nations Climate Change Conference (UNCCC) , Conference of the Parties (COP 21) or Conference of the Parties (CMP 11) was held in Paris, France, from 30 November to 12 December 2015. It was the 21st yearly session of the COP to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and the 11th session of the CMP to the 1997 Kyoto Protocol. The conference negotiated the Paris Agreement, a global agreement on the reduction of climate change, the text of which represented a consensus of the representatives of the 196 parties attending it (Sutter, 2015).

The agreement calls for zero net anthropogenic greenhouse gas emissions to be reached during the second half of the 21st century. The 1.5 °C goal will require zero emissions sometime between 2030 and 2050, according to some scientists (Sutter, 2015). The participating 196 countries by consensus in Paris, agreed to reduce carbon emissions as part of the method for reducing greenhouse gas, to keep global warming "to well below 2 degrees C" in a 12-page document (Chappel, 2015). In the course of the debates, island states of the Pacific, the Seychelles, but also the Philippines, their very existence threatened by sea level rise, had strongly voted for setting a goal of 1.5 °C instead of only 2 °C. However, no detailed timetable or country-specific goals for emissions were incorporated into the Paris Agreement – as opposed to the previous Kyoto Protocol (Milman, 2015).

2.2 CAUSES OF DEFORESTATION

Deforestation occurs for many reasons: trees are cut down to be used or sold as fuel sometimes in the form of charcoal or timber, while cleared land is used as pasture for livestock, plantations of commodities and settlements. The removal of trees without sufficient reforestation has resulted in damage to habitat, biodiversity loss and aridity. It has adverse impacts on bio-sequestration of atmospheric carbon dioxide. According to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, the overwhelming direct cause of deforestation is agriculture. Subsistence farming is responsible for 48% of deforestation; commercial agriculture is responsible for 32% of deforestation; logging is responsible for 14% of deforestation and fuel wood removals make up 5% of deforestation.

Plate 2.1 Deforestation in Africa **Source:** (Bernice, 2011)

The spread of agriculture, fuel wood collection, unlawful timber harvesting are the main reasons of deforestation and other causes of contemporary deforestation may include unemployment, rapid population growth, urbanization and failure of Government to regulate and preserve forestlands. Globalization is often viewed as another root cause of deforestation, though there are cases in which the impacts of globalization (new flow of labor, capital, commodities, and ideas) have promoted localized forest recovery.

2.2.1 Farming: The major cause of forest loss is the spread of farming and huge hectares of land are cleared for subsistence and commercial ventures such as rice, sugarcane, coffee, yam, maize and cattle rearing. Commercial agriculture such as sugarcane, coffee and rubber plantation are the principal cause of deforestation in Central America. The same applied to the Amazon Basin, Central Africa and South East Asia where shifting cultivation is being practiced. Nutrients surge occur in the soil when the forest is cut and burned, leading to infertility. The soil is then exposed to sun and rain causing the soil fertility to decline rapidly rendering the area unproductive, in many cases prompting the farmers to slash and burn new forest areas. Many people in the Amazon Basin, Central Africa and Southeast Asia still practice shifting cultivation techniques, allowing fallow periods between cropping for soils to regenerate. This practice becomes unsustainable if populations increase to the extent of

forcing people into smaller areas. Insecure land tenure or fixed land titles may also force overuse of the land.

Plate 2.2 Forest cleared for Farming activities in Amazonia Brazil
(Source Earth Innovation Institute, 2013)

2.2.2 Overgrazing: Overgrazing is more common in drier areas of the tropics where pastures degraded by overgrazing are subject to soil erosion. Stripping trees to provide fodder for grazing animals can also be a problem in some dry areas of the tropics but is probably not a major cause of deforestation. Clear cutting and overgrazing have turned large areas of Qinghai province in China into a desert. Animals remove the vegetation and winds finished the job by blowing away the top soil, transforming grasslands into desert. When a herder was asked why he was grazing goats next to a sign that said "Protect vegetation, no grazing," he said, "The lands are too infertile to grow crops, herding is the only way for us to survive." (Hays, 2008). Large areas of land and tropical forest have been cleared to create a grazing field for farm animals as practiced in Central and South America.

2.2.3 Fuel wood Collection: The felling of trees for fuel has an immersed contribution to deforestation, which is attributed to poverty and most people engaged in such activities as a source of income and lack of affordability in buying alternative sources of energy such as kerosene and cooking gas. Developing countries such as Asia and Africa are faced with these serious problems. The outright destruction of trees for fuel occur mostly around cities, Districts and Villages where commercial markets for fuel wood /charcoal exist and is being carried out by women, children, organized groups and individuals bringing fuel wood by foot, pack animals, carts and vehicles into many Districts and cities, increasing the rate of deforestation. (Plate 2.1, 2.3 and 2.4). Over 100 million people in developing countries cannot meet their minimum needs for energy and close to 1.3 billion consume fuel wood resources faster than they are being replenished. In West Africa some families spend one fourth of their income on wood or charcoal for cooking. (Auerback 2011).

Plate 2.3. Collecting fuel wood in Guinea (Source- Allianz 2016)

Plate 2.4. Gbagyi women carrying fuel wood in Abuja, Nigeria (Source: Jim, 2013)

2.2.4 Logging: Urbanization and Globalization has contributed immensely to the high rate of deforestation in the world. Excessive logging in the humid tropical forest, particularly in Asia, Brazil, America and some African Countries conducted by individuals and multinational corporations for building, construction, manufacturing, furniture and paper production, to generate income or revenue. Logging activities caused a lot of disruption in the ecosystem where many species of plants and animals will migrate or even die off due to exposure to rain and high intensive sunlight. A study in Indonesia revealed that logging operations damaged or destroyed about 40% of trees left behind and roads created by logging operations may encourage farmers and settlers to enter the forest and begin slash and burn agriculture increasing the rate of deforestation. Logging in Southeast Asia is more intensive and can be quite destructive. However, logging provides access roads to follow-on settlers and log scales can help finance the cost of clearing remaining trees and preparing land for planting of crops or pasture. Logging thus catalyzes deforestation (Chomitz et al., 2007). (Plate 2.4).

2.2.5 Initial activities of the Developed Countries: From the perspective of the developing world, the benefits of forest as carbon sinks or biodiversity reserves go primarily to richer developed nations and there is insufficient compensation for these services. Developing countries feel that some countries in the developed world, such as the United States of America, cut down their forests centuries ago and benefited greatly from this deforestation, and that it is hypocritical to deny developing countries the same opportunities: that the poor shouldn't have to bear the cost of preservation when the rich countries created the problem long ago. (UNCED - RIO, 2000).

Plate 2.5 Illegal Logging Activities in Asia (Source: Livescience, 2010)

2.3 THE EFFECTS OF DEFORESTATION

2.3.1 Alteration of Local and Global Climates:

a) **The carbon cycle-** Forests act as a major carbon store because carbon dioxide (CO2) is taken up from the atmosphere and used to produce the carbohydrates, fats, and proteins that make up the tree. When forests are cleared, and the trees are either burnt or rot, this carbon is released as CO2. This leads to an increase in the atmospheric CO2 concentration. CO2 is the major contributor to the greenhouse effect. It is estimated that deforestation contributes one-third of all CO2 releases caused by people.

b) **The water cycle-** Trees draw ground water up through their roots and release it into the atmosphere (transpiration). In Amazonia over half of all the water circulating through the region's ecosystem remains within the plants. With removal of part of the forest, the region cannot hold as much water. The effect of this could be a drier climate. The water cycle is also affected by deforestation. Trees extract groundwater through their roots and release it into the atmosphere. When part of a forest is removed, the trees no longer transpire this water, resulting in a much drier climate. Deforestation reduces the content of water in the soil and groundwater as well as atmospheric moisture. The dry soil leads to lower water intake for the trees to extract. Deforestation reduces soil cohesion, so that erosion, flooding and landslides ensue.

2.3.2 Soil Erosion/ Environmental Degradation: Environmental degradation occurs when nature's resources such as trees, ecological habitats, the land, water and air are being consumed faster than nature can replenish them, when pollution results in severe damage to the environment or when humans destroys the ecosystems in the process of development (Yanez-Arancibia, et al., 2013). With the loss of a protective cover of vegetation more soil is lost and causing silting of water courses, lakes and dams. Deforested areas become sources of surface water runoff, which moves much faster than subsurface flows. That quicker transport of surface water can translate into flash flooding causing destruction of life and properties.

2.3.3 Extinction of species: Deforestation on a human scale results in decline in biodiversity and on a natural global scale is known to cause the extinction of many species. The removal or destruction of forest cover has degraded the environment affecting biodiversity. Forests support biodiversity, providing habitat for wildlife and foster medicinal conservation. Hagan (2006) investigated that as many as 27, 000 species of wild lives may be confined to extinction every year. He explained that the consequence of this extinction is multifold as many plant and animal species of medicinal value would be made to disappear. Invariably, the disappearance of such species of plants has an adverse effects on the population that makes use of them. (Akinbode,2002).

2.3.4 Desertification: The causes of desertification are complex, but deforestation is one of the contributing factors to desertification. The use of affordable energy efficient stove, methane gas or kerosene and Electricity are the alternative means, to the use fuel wood. Decrease in the use of fuel wood and farmland clearing will significantly reduce the rate of deforestation. The negative consequences are many often with catastrophic increases in drought and desertification hazards, crop failures, coastal flooding and the destruction of major vegetation belts (Ajibade, 2003).

2.3.5 Flooding: Flooding occur as a result of heavy rainfall or dam outburst and without protective barriers or forest to reduce the flood velocity. There is high rate of deforestation in Africa and Malawi holds the unenviable accolade for the world's 5th highest rate of deforestation. There was global headlines on the disastrous floods that occurred in Malawi. Lives have been lost, homes and crops have been destroyed, and huge hectares of land lie underwater (Africageographic, 2015). One of the main reasons is the clearing of forest areas for human settlement and agricultural land, coupled with rapid increase in population. The demand for charcoal is high and 60% comes from forest reserves and national parks. This behaviour is unsustainable and it creates pressure on the country's resources, creating a plethora of environmental and economic concerns. The flood in Malawi could have been prevented if more attention was given to the sustainable use of our forest natural resources (Africageographic, 2015). (Plate 2.5).

Plate 2.5 Malawi Flood **Source:** (Africageographic, 2015)

2.3.6 Poverty/ Hunger: The clearance of vegetation cover for slash and burn farming exposes the soil to the intensity of the tropical sunlight and rain (Asthana and Asthana, 2005). This development is capable of negatively affecting the soil by increasing its compaction, reducing its organic materials, leaching out its few nutrients available, increasing the Aluminum toxicity of the soils, thereby rendering it unsuitable for farming with poor yield harvest. In the humid tropics, a large portion of available mineral nutrients are relocated or taken away when the biomass is removed. Consequently and simultaneously, there is further loss of mineral nutrients, Alexander (2002) itemized siltation, soil erosion and flooding as the pronounced biophysical impacts linked with forest depletion.

2.3.7 Migration / Crime: In Nigeria, the situation relating to deforestation looks pathetic as the most vulnerable groups in the society (female/poor solely depend on the forests for the supply of their fuel wood (Hagan, 2006). Human population increase and agricultural practices were the principal factors responsible for the generation of soil erosion in the country (Ofomata,1987). The pronounced effect of soil erosion in the Northern parts of Nigeria, increased cultivation was traced to high population growth, migration and poverty. In the views of Mortirnore (2000), in consequence, many agricultural lands became less fallow, degraded and less fertile, and have resulted in poor crop yield. Excessive use of the forest lands, with serious consequences on socio-economic, health and the environment leads to land dispute and migration. Due to crowded conditions in cities and farm areas, many people will migrate to areas of marginal fertility to produce sufficient food and clearing more forest. (UNDP 1992).

2.4 SIGNIFICANCE OF TREES AND PLANTS

About one-quarter of the Earth's land, excluding the polar regions, is covered by forests. Every year, deforestation reduces forest cover significantly; Trees are critical to environmental health. They absorb carbon dioxide from the atmosphere, provide habitat for wildlife and anchor topsoil to the ground. Trees are being cut down to clear land for agricultural and commercial development. The effects of deforestation are far-reaching and affect more than just the forested communities. They regulate the temperature of the environment, by absorbing carbon dioxide during the day when the temperature is high and releases oxygen to cool the environment. Their canopies intercept a proportion of precipitation, which is then evaporated back to the atmosphere (canopy interception).

Aesthetically trees add beauty to the environment when they are planted within residential areas and along the street or road giving precision. They act as buffer zone or wind breaker to reduce the velocity of wind and water to prevent flood occurrence. Their litter and other organic residue change soil properties that affect the capacity of soil to store water. Their roots create macro pores (large conduits) in the soil that increase infiltration of water and also contributes to terrestrial evaporation by reducing soil moisture through transpiration. Their leaves control the humidity of the atmosphere by transpiring 99% of the water absorbed by the roots moves up to the leaves and is transpired.

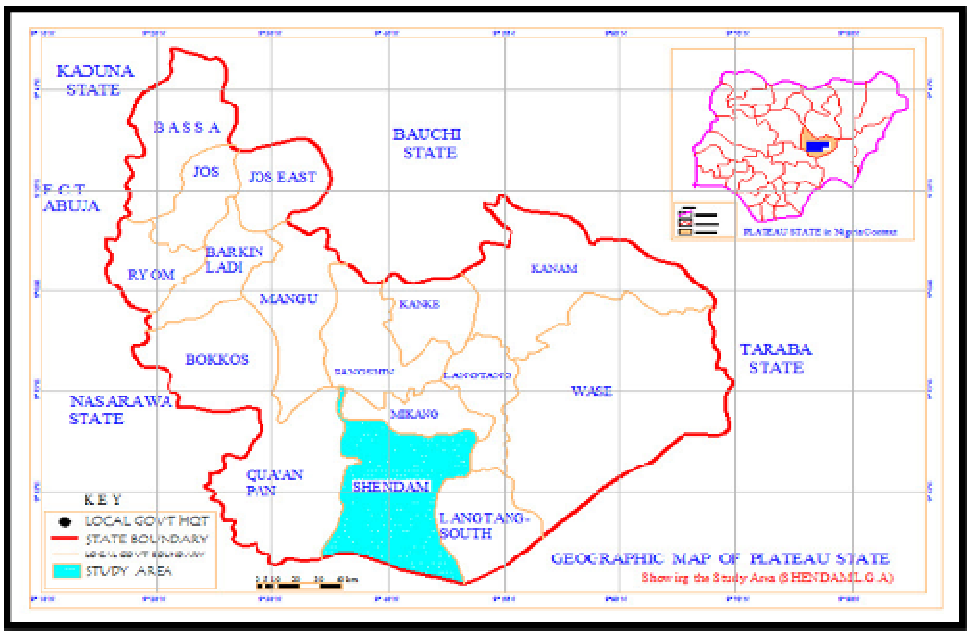
THE STUDY AREA AND METHODOLOGY

3.1.1 THE STUDY AREA AND LOCATION

The creation of Plateau State in 1967, paved way for the creation of Shendam L.G.A and other Local

Government Areas within the State in 1976. Shendam is a district in Shendam L.G.A and is geographical location of Shendam District is between latitude 8º53'43.88"N and longitude 9º27'13 of the meridian covering about 123.35 Km² (12,335 Hectares), out of 2,477 Km² (247,700 Hectares) of the entire Shendam L.G.A. The Shendam L.G.A shares boundaries with Qua'an Pan Local L.G.A to the West, Mikang L.G.A. to the North and Langtang South L.G.A to the East. It also shares boundaries with Ibi L.G.A of Taraba State, and Awe L.G.A of Nasarawa State to the South and South West respectively. The natives of Shendam are the Goemai who originated from the Kwararafa Kingdom of Taraba State. According to the 2006 population census Shendam L.G.A has a total population of 208,017 (109,519 males and 97,498 female) about 2.27% of Nigerian population. Shendam Local Government is under the ruling of the Long Goemai (Chief) who has four districts under his jurisdiction namely; Shendam District, Dorok District, Derteng District and Dokan Tofa Districts. The Shendam District (study area) has three wards namely Shendam Ward A, Shendam Ward B and Pangwasa Ward, all with a population of 61,310 (2006 NPC). (Figures 3.1, 3.2, 3.3 and Plate 3.1).

Figure 3.1 Nigeria showing Plateau State (Latitude 10º 00' N, Longitude 8º 00' E)
Source: Plateau State Ministry of Lands and Survey (**PSMLS**), 2014



Latitude 9º 10' 0"N Longitude 9º 45' 0" E Source: (**PSMLS**), 2014
Figure 3.2 Plateau State showing Shendam Local Government Area (L.G.A)

Plate 3.1- The Long Gamai Palace in Shendam Source: (Field Survey 2014)

3.1.2 TOPOGRAPHY

Plateau State has an elevation of about 1500m – 1800m which descends gradually in a series of steps to the low land area of plateau where the study area is located within the plains of River Benue. The terrain is relatively flat with few dispersed mountains. (Source: Uriah, Ezekiel, Tochukwu & Jesse 2014). The basement rocks are granite, basalt and magmatides, found at 1702 metres deep below the ground surface. Other are sedimentary and metamorphic rocks and the ground level contains water (Aquifer). The soil are ferruginous soils (ferrisols), gravel and sandy loamy soils which is suitable for construction and Agriculture. (Source: Lar Uriah et al. 2014).

3.1.3 CLIMATE

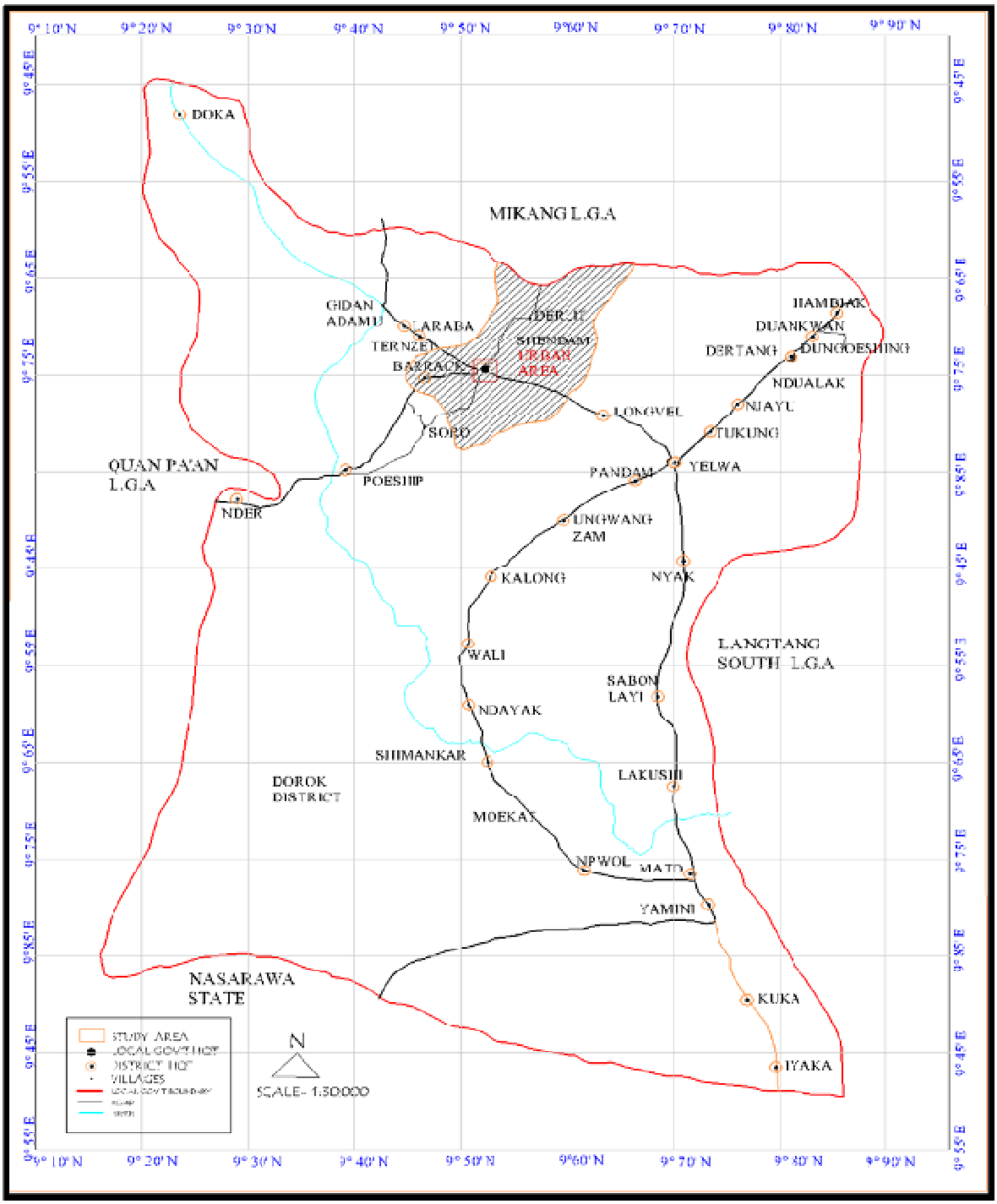
The harmattan period (dry and dusty season) blowing from Sahara Desert from the month of November to March. The wet season (rainy season) starts from the month of March to the month of October. Shendam has an annual rainfall variation between 1000mm to 1450mm with an annual mean of 1250mm. The rainy season peak is in the month of August and September (**Source:** http://en.climate-data.org/location/399975/).

3.1.4 TEMPERATURE

The highest mean temperature is in the month of March with an average daily maximum temperature of 36º C. The study area is characterized with abundant sunshine and the lowest temperature is from the month of November to January with an overall annual mean of 23 º C. (**Source:** http://en.climate-data.org/location/399975/).

3.1.5 VEGETATION

Shendam District is within the southern guinea savanna that characterized with dispersed vegetation and relatively uniform carpet of tall grasses, scattered trees, shrubs, oil bean trees, shear butter, locust bean and baobab trees. Many trees shed their leaves but quickly regain their bush appearance at the commencement of wet season. The issue of bush burning is also common. The vegetation of Shendam District and environs is characterized by presence of tall grasses, scattered deciduous tall trees with broad leaves and the grasses are usually very tall. Forests exist along streams and low lying areas where water accumulates, in places known as Fadama low land. (Ogezi A.E, T. Aga, and I. Okafor, 2010). The Crops cultivated in Shendam are; cereals (sorghum, millet, maize, rice), legumes (cow peas and groundnuts) and tuber crops (yam, cassava, sweet potatoes) (Buba, 2014).



Latitude 8°53'43.88"N and Longitude 9°27'13.41" E Source: (**PSMLS**), 2014

Figure 3.3 Shendam (L.G.A)showing Shendam Urban Area

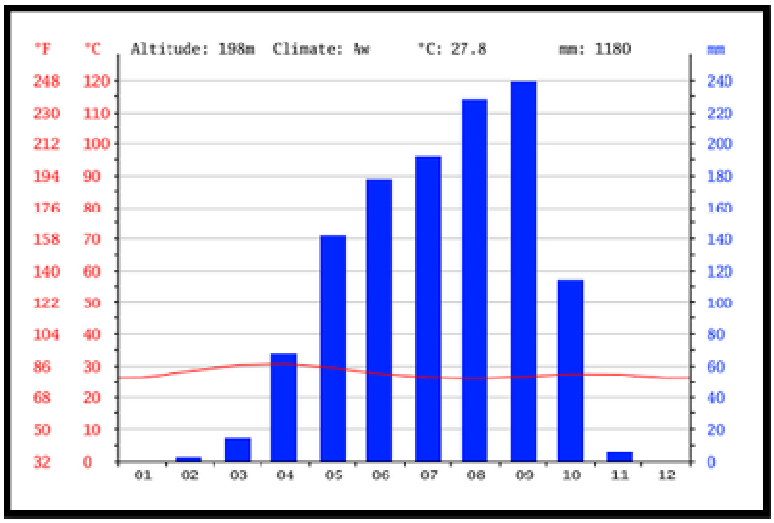


Figure 3.4 Temperature and Rainfall Graph of Shendam L.G.A.
(**Source:** http://en.climate-data.org/location/399975/, 2014)

3.2 RESEARCH DESIGN AND METHODOLOGY

Case study methodology using quantitative technique was used in assessing the causes and effects of deforestation in Shendam District and its environs. Primary and Secondary sources of data were used to address issues of deforestation and information obtained from the questionnaires was derived from the following:

- Age, Gender, Marital Status and Occupation of the people interviewed
- Causes of deforestation and Sources of domestic energy
- Categories of persons involved in deforestation

3.2.1 THE PRIMARY AND SECONDARY SOURCES OF DATA.

i. **Primary sources of data:** Involves visit to study area for first hand information on the topography, people, climate and existing natural vegetation. Questionnaires were administered and Interview was conducted to some selected Government Officials.

ii. **Secondary Sources of Data used:-**

The secondary sources of data involved the review of literature from Journals, Published Thesis and Dissertations, Books written by Scholars, Internet and the use of Google Earth Imagery.

3.2.2 POPULATION PROJECTION

The base year population of 61,310 people, for 2006 National Population Census was projected to 2014 at a given projected population of 77,665 people.

Population Projection formula $P2 = P1\ (1+r)^n$

(Source: Jennifer H. L. et al. 2007)

P1 (Previous year population) = 61,310 (2006 NPC)
P2 (Present year Population) = ? (2014)
r (Growth Rate) = 3.0%
n (Number of years) = 8 years (2006 – 2014)

$P2 = P1\ (1+ r)^n$
$P2 = 61,310\ (1+ 0.03)^8$
P2 = 61,310 x 1.26677008139
P2 = 77,665 Approx. Projected Population 2014.

3.2.2 DATA COLLECTION AND ANALYSES

The structured questionnaire was a self designed instrument and was distributed to the potential respondents at their convenience using simple random technique (Babbie, 1990). The respondents were mostly household heads (farmers and businessmen), fuel wood dealers and Government Officials. The projected population was used to developed questionnaires for the study at a given sample size 310 at 0.4% of the projected population. A total of 310 copies of questionnaires were administered in the study area using random sampling technique and only 294 copies of the questionnaires were retrieved and used for the data analysis. The data collected were analysed and presented using simple distribution tables, pie charts and histograms.

4.0 RESULTS OF THE STUDY

This chapter is mainly concerned with the analysis and presentation of data derived from the questionnaires administered in Shendam District on the effects of deforestation using random sampling. Bar graphs, pie charts and percentages were used for the presentation of data obtained from the field.

4.1.0 SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS

The demographic characteristics refer to gender, age, occupation, marital and educational status of the respondents.

4.1.1 Gender Distribution

Gender distribution in Shendam District indicated 65% are males and 35% are females from the respondents. The majority of the respondents were males who actively participated more in deforestation while the females are mostly engaged in home activities (Figure 4.1).

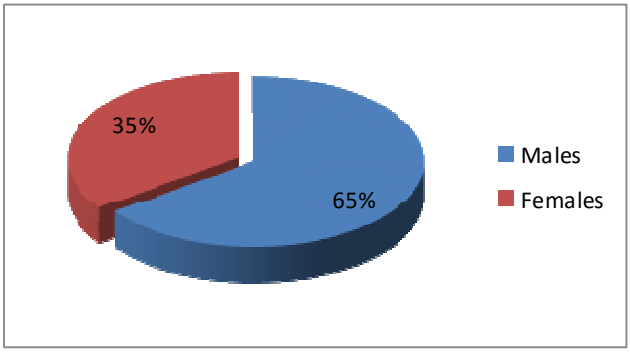


Figure 4.1 Gender Distribution **Source:** (Field Survey 2014)

4.1.2 Age Distribution

The age range of (20 – 39) in Shendam District has the highest respondents accounting for 51% and 48% respectively for both males and females, which comprised of mostly youths that engage more in deforestation (Figure 4.2).

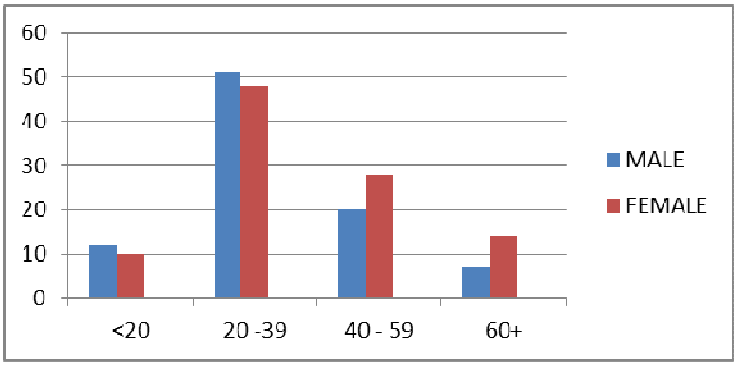


Figure 4.2 Age Distribution **Source:** (Field Survey 2014)

4.1.3 Educational Status

From the field survey majority of the people in Shendam District have attended a particular level of education (Primary, Secondary and Tertiary Education), to determine their level of awareness on the effects of deforestation and forest conservation. However, (Table 4.1) revealed those with secondary education as the highest number of respondents, accounting for 32%.

Table 4.1 Educational Status

Qualification	Frequency	Percentages
Primary	56	19
Secondary	94	32
Post Secondary	71	24
Tertiary	47	16
Koranic	26	9
TOTAL	294	100

Source: (Field Survey 2014)

4.1.4 Occupational Distribution

The occupational distribution (Figure 4.3) revealed that the majority of the respondents are farmers with the

highest percentage (38%), followed by those engaged in business. Some of the commercial activities are located along the road (Plate 4.1).

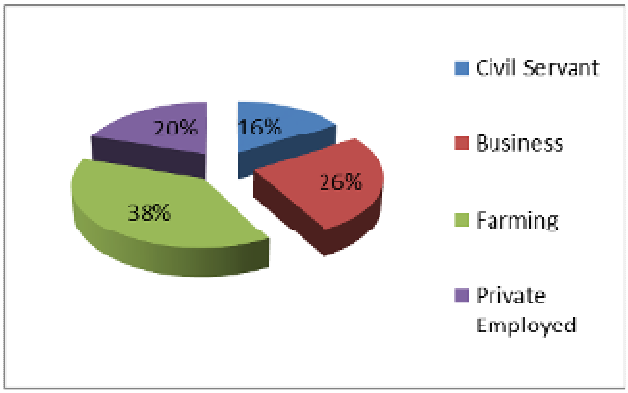


Figure 4.3 Occupational Distribution **Source:** (Field Survey 2014)

Plate 4.1- Commercial Activities in Shendam District **Source:** (Field Survey 2014)

4.1.5 Marital Distribution

From the field survey, those who are single have the highest response with (46%) followed by married couples with few numbers of widow, widower and divorcees engaging in deforestation. Those with single marital status are the youths, who are the active members of the population comprising of both males and females, actively participating in deforestation as a means of livelihood through farming, furniture works and fuel wood collection. Those that are married also contributed to the rate of deforestation in Shendam District through farming, fuel wood collection, building construction and furniture making (Figure 4.4)

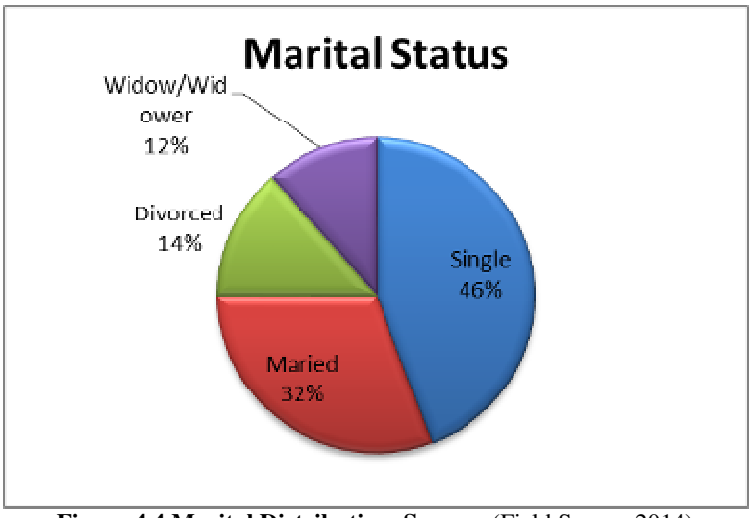


Figure 4.4 Marital Distribution Source: (Field Survey 2014)

4.2.0 Popular Tree Species in Shendam District

During the survey, oral interview was conducted to some selected respondents involving fuel wood sellers, timber shed owners, market women, farmers, agricultural officers and youths living in Shendam District to gather data on trees species, cause of change, type of change and use (Table 4.2).

Table 4.2 Popular Tree Species in Shendam District

Tree Species	Causes of Change	Types of Change	Use
Ebony (*Diospyros spp*)	Deforestation	Decreasing	Wood carving
Mahogany (*Khaya spp*)	Over exploitation	Nearly extinct	Timber, Medicinal
Neem (*Azadirachta Indica*)	Over exploitation	Decreasing	Timber, Medicinal, Bio-pesticide, fuel wood.
Doka (*Isoberlinia spp*)	Deforestation	Nearly extinct	Fruit, fuel wood
Sheanut (*Vitellaria paradoxa*)	Deforestation	Nearly extinct	Fuel wood, fruit, Medicinal
Cassia spp (*Locus bean*)	Deforestation	Nearly extinct	Fuel wood, fruit, shade
Mango (*Mangiferia indica*)	Deforestation	Nearly extinct	Fuel wood, fruit, shade
Oil Palm(*Elaeis guineensis*)	Deforestation	early extinct	Food, Brum

Source: (Field Survey 2014)

4.3.0 CAUSES OF DEFORESTATION IN SHENDAM DISTRICT

4.3.1 Causes of Deforestation

Deforestation occurs as a result of the anthropogenic activities being carried out by humans living within the vegetative areas of the environment. Shendam District has a lot of vegetative cover before but presently most of the trees are gone (Plate 4.2), due to several factors contributing to the alarming rate of deforestation The survey revealed that farming (33%) and selling fuel wood (29%) are the major causes of deforestation in Shendam District (Table 4.3).

Table: 4.3. Causes of Deforestation

Causes of deforestation	Number of respondents	Percentages
Farming	97	33
Selling of fuel wood	85	29
Cattle rearing	18	6
Furniture/ Carpentry	53	18
Timber business	41	14
TOTAL	294	100

Source: (Field Survey 2014)

Plate 4.2 Scanty Trees in Shendam District **Source:** (Field Survey 2014)

4.3.2 Frequency of cutting down trees

Due to the rate of unemployment and poverty in Shendam, makes the people to cut down trees for the purpose of meeting their basic needs. Such activities are clearing more land for agriculture, housing construction and fuel wood collection which is cheaper, compared with using gas and kerosene as sources of domestic energy. The responses from the questionnaires shows that 36% of people cut down tree very often. See table 4.4 Most of the trees within Shendam District are totally gone (Plate 4.2 and 4.3).

Table: 4.4 Frequency of tree felling activity

Frequency	Number of respondents	Percentages
Very often	106	36
Seldom	100	34
Never	56	19
None of the options	32	11
Total	**294**	**100**

Source: (Field Survey 2014)

4.3.3 Means of acquiring additional Agricultural land

Majority of the respondents indicated farmland inheritance as the main source of acquiring additional land in Shendam followed by clearing virgin land. Other sources of acquiring land for the non indigenes is through land purchase, hiring and borrowing, and some of the non indigenes are seasonal farmers who come from the upper part of Plateau state, such as Bokkos, Mangu, Panskin and Kanke Local Government, all contributing to the rate of deforestation in Shendam District and its environs. (Figure 4.5) . A tractor hiring center in Shendam for large mechanize farming and farmland expansion (Plate 4.4).

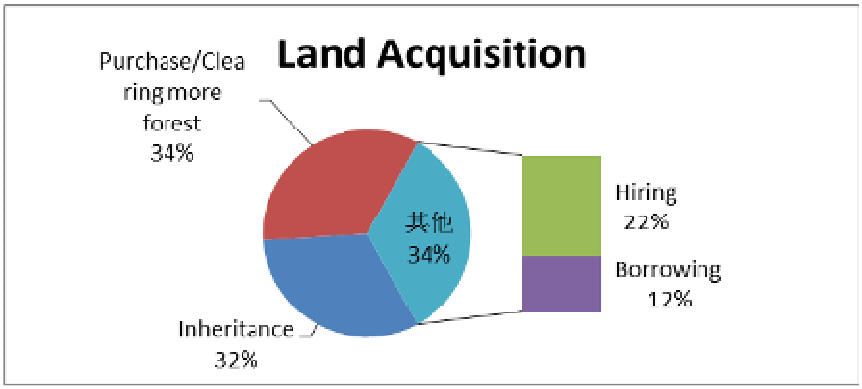


Figure 4.5 Agricultural Land Acquisitions **Source:** (Field Survey 2014)

Plate 4.3- Huge Hectares of forest Land cleared by farmers in Shendam.
Source: (Field Survey 2014)

Plate 4.4 - Tractor Hiring Center for Mechanized Farming in Shendam.
Source: (Field Survey 2014)

4.3.4 Sources of Domestic Energy

The people of Shendam District use alternative means of energy for cooking due to instability of electricity and lack of cooking gas stations in Shendam District, coupled with high cost of kerosene. From the survey, most of the respondents (39%) used fuel wood as their source of energy for cooking which has the highest percentage (Figure 4.6 and Plate 4.5).

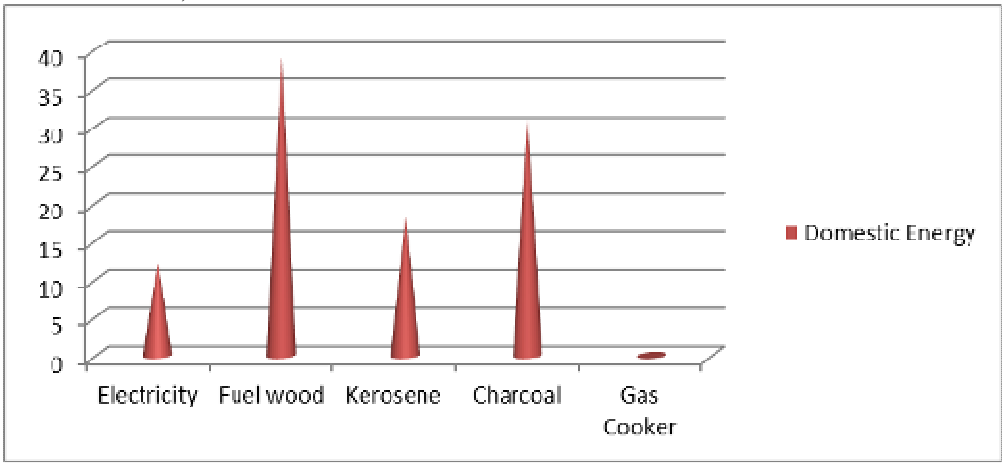


Figure 4.6 Domestic Energy **Source:** (Field Survey 2014)

Plate 4.5 - Indiscriminate cutting down of trees for fuel wood
Source: (Field Survey 2014)

4.3.5 Changes in the Number of Trees

The deforestation activity in Shendam is continuous due to lack of awareness on the effects of deforestation due to the poverty level. (Figure 4.7) revealed the obvious changes on the number of trees.

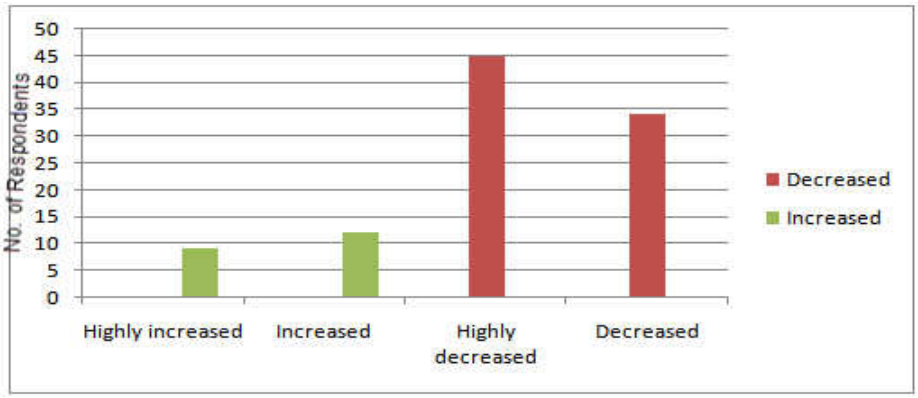


Figure 4.7 Changes in the number of trees **Source:** (Field Survey, 2014)

4.4.0 THE EFFECTS OF DEFORESTATION IN SHENDAM DISTRICT

The effects of deforestation in Shendam District and its environs, covers the environmental, economic, political and social life of the people living in Shendam. The responses gathered from the survey during the oral interview and the use of questionnaires gave more information on the effects of deforestation in Shendam District. However several factors were responsible for the deforestation activities causing serious effects in the study area.

4.4.1. Effects of Deforestation on the Environment

Deforestation has a lot of consequences on the environment and the study clearly revealed that soil erosion (34%) and high temperature have the highest percentage (35%) followed by poor crop harvest (25%). From the responses derived from the questionnaires clearly shows that they knew about the implication of cutting down trees without replacement and nothing could be done due to lack of sustainable alternatives. (Figure 4.8).

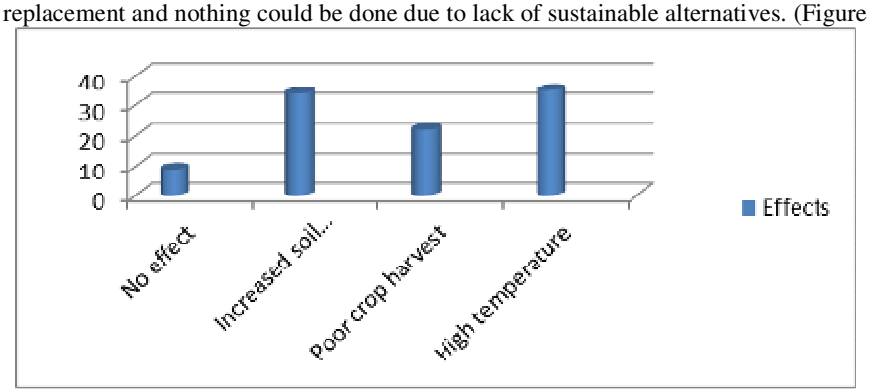


Figure 4.8 Effects on the Environment **Source:** (Field Survey 2014)

4.4.2 Effects of Deforestation on Socio-economic activities.

Shendam District is a center for socio-political and commercial activities where people from the neighboring local governments come to engage in different activities. However the continuous deforestation activity hinders the existence of medicinal plants and animal species, thereby exposing the soil to erosion. Such activities further result in poor harvest of crops affecting business activities and increasing the rate of poverty. From the respondents 32% strongly agreed, that deforestation has effects on socio-economic activities (Table 4.5 and Plate 4.6).

Table 4.5 Deforestation effects on Socio-economic

Responses	Respondents	Percentages
Strongly agree	94	32
Agree	80	27
Disagree	44	15
Strongly disagree	35	12
No idea	41	14
Total	294	100

Source: (Field Survey 2014)

Plate 4.6 Shendam District Market **Source:** (Field Survey 2014)

4.4.3 Effects of Deforestation on Livelihood resulting to Migration

The diverse effects of deforestation also affect human existence in many ways namely: soil erosion, poor harvest, high temperature of the low land area, unemployment and poverty resulting to migration of people to other urban centers and State Capitals to add more to the urbanization problems in cities, such as over-stretching of facilities, utilities and services, squatter settlements, slum generation, crime and prostitution. From the responses 29% strongly agreed and 33% agreed that deforestation affects livelihoods and migration (Figure 4.9 and Table 4.6).

Table 4.6 Deforestation is responsible for migration

Responses	Respondents	Percentages
Strongly agree	85	29
Agree	97	33
Disagree	35	12
Strongly disagree	47	16
No idea	30	10
Total	**294**	**100**

Source: (Field Survey 2014)

Plate 4.7 Street in Shendam District without trees **Source:** (Field Survey 2014)

4.4.4 Effect of Deforestation on Human Health

During the survey most respondents indicated high temperature increase as one of the factor affecting human health which occurs as a result of deforestation in Shendam District and environs. The excessive heat caused discomfort, inhibits plants growth and force people to migrate to other cities in search of better means of livelihood. From the response 27% strongly agree, 31% agree, while 16% strongly disagree, 12% disagree and 14% of the people responded no idea (Table 4.7 and Figure 4.9)

Table 4.7 Deforestation effects on human health

Responses	Respondents	Percentages
Strongly agree	79	27
Agree	91	31
Disagree	36	12
Strongly disagree	47	16
No idea	41	14
Total	**294**	**100**

Source: (Field Survey 2014)

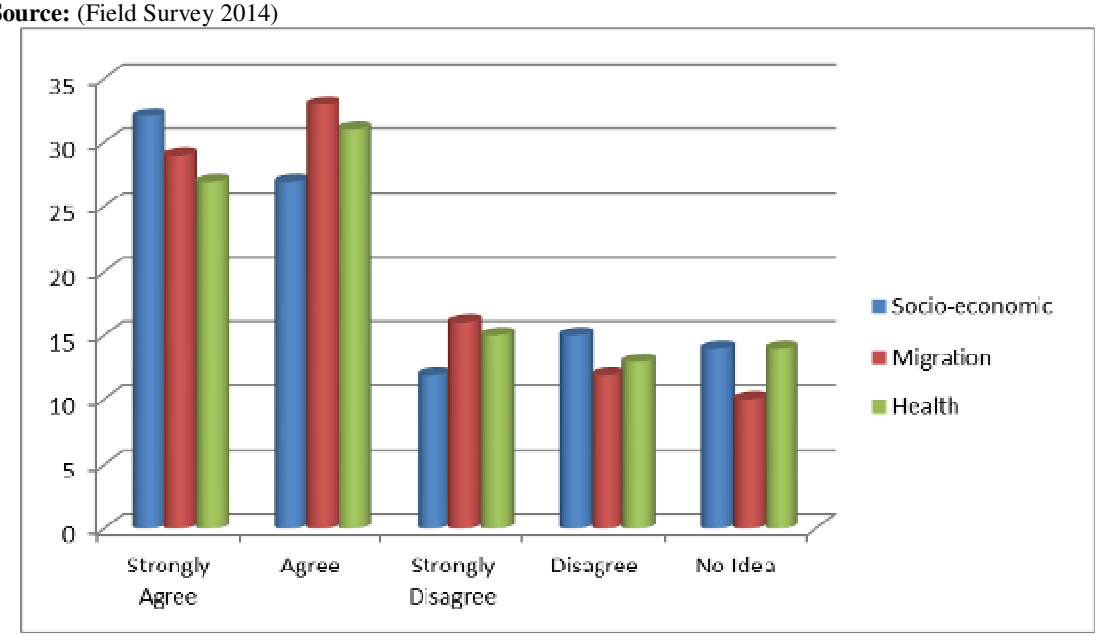


Figure 4.9 - Effect of Deforestation on Socio-economic, Health and Migration
Source: (Field Survey 2014)

4.5.0 CATEGORIES OF PERSONS INVOLVED IN DEFORESTATION ACTIVITIES

Shendam District and its environs is inhabited with people of different professions with diverse sources of income as a means of livelihood and life sustenance. These include hunters, farmers, civil servants, business men/women, fuel wood sellers and different artisans.

4.5.1 Category of people that contributed to deforestation in Shendam District

The field survey (Table 4.8) clearly depicted farmers and fuel wood sellers ranking highest 26% and 24%, followed by charcoal sellers. Farming and fuel wood selling contributed to the high rate of deforestation due to means of livelihood in Shendam District.

Table: 4.8 Categories of people involved in Deforestation

Participants	Respondents	Percentages
Charcoal sellers	41	14
Farmers	76	26
Civil Servants	29	10
Timber shed owners	35	12
Fuel wood sellers	71	24
All of the above	21	7
None of the above	21	7
Total	**294**	**100**

Source: (Field Survey 2014)

4.5.2 Participation of men /women in farming and selling fuel wood in Shendam District

From the field survey, (66%) of men participated more in farming activities than women (24%). The farming activities include cultivation and clearing of more farmlands resulting to increase in the rate of deforestation. However, (78%) of women participated more in commercial activities such as fuel wood selling, than the men (22%) who mostly engaged in farming and other activities (Figure 4.8).

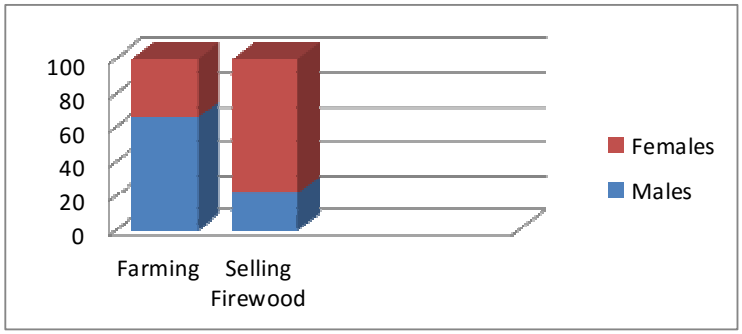


Figure 4.8 Men/Women Participation in Farming and Selling fuel wood
Source: (Field Survey 2014)

4.6.0 RESIDENTS AWARENESS ON DEFORESTATION EFFECTS

The awareness on the management and regulations of deforestation in Shendam are the principal socio-economic factors impacting the rate of deforestation. These factors are deeply rooted in the daily needs of communities, in terms of forest products that cater for the growing population rather than awareness of forest resources depletion and its consequences. The view of the people on forest consumption, impacts and management needs to be assessed.

4.6.1 Awareness on the implications of cutting trees without replacement.

The act of cutting down of trees without replacement is a continuous activity in Shendam District due to poverty, demand for furniture, constructions, demand for more agricultural land and the absence of affordable alternative for fuel wood such as gas, kerosene and electricity for cooking purpose. 14% of the respondents claimed ignorance to the implication of cutting down trees without replacement while 86% of the respondents are aware of the implication of deforestation (Figure 4.10).

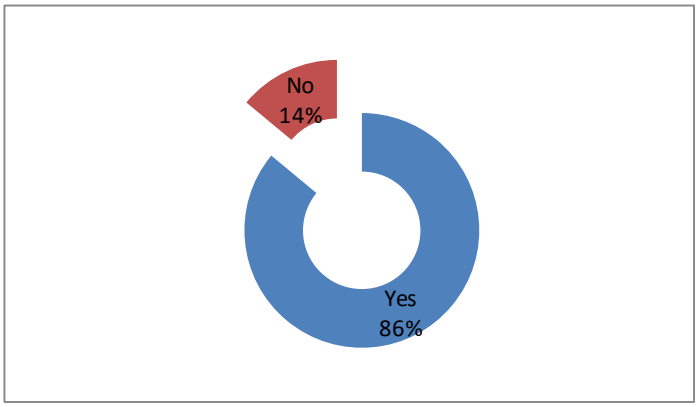


Figure 4.10 Implication of cutting down trees
Source: (Field Survey 2014)

4.6.2 Awareness on the importance of conserving the forest resources

From the questionnaires administered 78% are aware of the importance of conserving the forest resources because of their level of education. Some of them got the information through radio and television programmes on the danger of global warming, while 22% responded not aware of the importance of conserving the forest resources in Shendam. The tree conservations are also found in secondary schools in Shendam District. (Figure 4.11 and Plate 4.8).

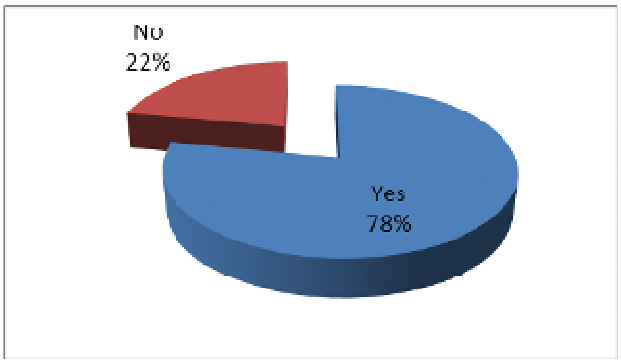


Figure 4.11 Awareness on forest conservation **Source:** (Field Survey 2014)

Plate 4.8-Available trees in G.S.S Goepal Shendam **Source:** (Field Survey 2014)

Plate 4.9- Part of Shendam district showing scanty trees **Source:** (Field Survey 2014)

4.6.3 Knowledge of Environmental law and regulations protecting the use of forest resources.

From the survey 72% of the respondents are not aware of any laws / regulations guiding the use of forest/trees in Plateau State, but 28% of the respondents are aware of such Environmental laws and regulations guiding the use of forest resources and they are mostly Agricultural Officers, School Teachers and other Government workers in Shendam (Figure 4.12).

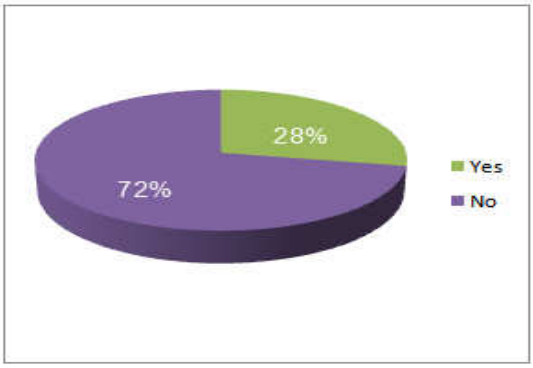


Figure 4.12 Knowledge of Environmental Laws/ Regulations **Source:** (Field Survey 2014)

4.6.4 Participation in tree planting

Most of the people are not aware of any management practices in forest sustainability and from the information gathered most the respondents never participated in tree planting or forest regeneration in Shendam. From the survey 93% never planted trees while 7% planted trees as schools tree planting and individual homes tree planting for the provision of sheds within the compound (Figure 4.13).

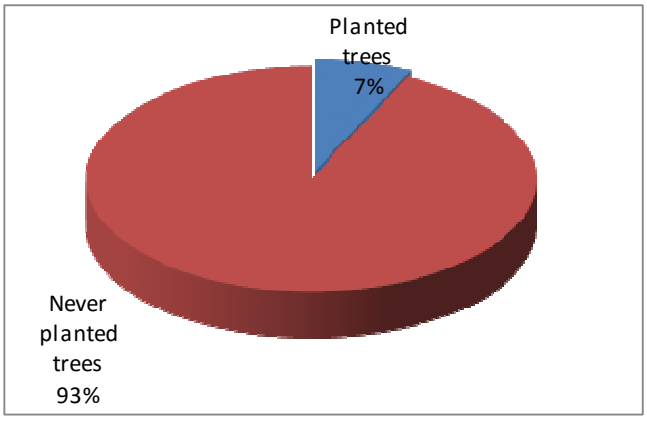


Figure 4.13 Participation in Tree Planting **Source:** (Field Survey 2014)

4.6.5 The benefits derived from conserving trees

Generally majority of the people living in Shendam are educated and have attained a particular level of education. Positive responses were given on the significance of trees within the environment. From the survey the benefits derived are Reduce Temperature (19), Improves Rainfall Pattern (16%), Reduce Soil Erosion (18%), Enhance Biodiversity Existence (16%), All of the above (24%) and None of the above (7%) (Table 4.9).

Table 4.9 Benefits of conserving trees

Benefits	Respondents	Percentage
Reduce Temperature	56	19
Improves Rainfall Pattern	47	16
Reduce Soil Erosion	53	18
Enhanced Biodiversity Existence	47	16
All of the above	70	24
None of the above	21	7
Total	**294**	**100**

Source: (Field Survey 2014)

4.6.6 Timber Consumption in Shendam

There are three timber sheds in shendam, one from each ward and most of the timber shed owners have been in business for more than twenty years. The responses obtained during the interview from the timber shed owners, revealed that people in building constructions purchased timber more than those in furniture making business. Due to the inadequacy of trees they do order for timbers such as Mahogany, Obeche, Sapele and Ebony from lafia in Nasarawa State. The construction involved housing, wooden bridges, scaffolds (Ward- A 58%, Ward -B 62% and Pangwasa Ward 68%) while Furniture use involves table, chairs, beds, cushions, hangers, ward-drops and art works (ward -A 42%, ward- B 38% and Pangwasa ward 32%). (Figure 4.14 and Plate 4.10).

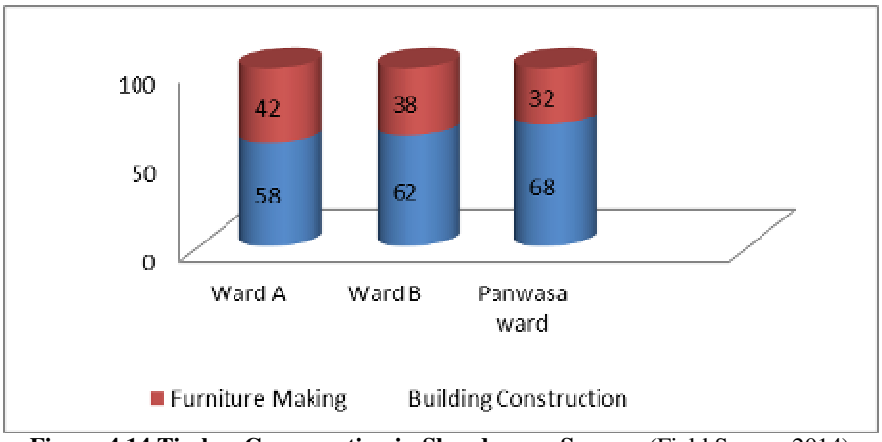


Figure 4.14 Timber Consumption in Shendam **Source:** (Field Survey 2014)

Plate 4.10 Timber Shed in Shendam **Source:** (Field Survey 2014)

4.7.0 THE PHYSICAL OCCURANCE OF FLOODING IN SHENDAM 2012

Heavy rain descended on the southern zone of Plateau State in the month of August, 2012, at the same time when Lagdo Dam in Cameroun was released. From the central fringe of Kanam, to Wase, Shendam, Mikang, Langtang North and Langtang South Local Government Areas, heavy floods swept some villages, submerging their homes and thousands were rendered homeless while their farmlands, trees were completely washed away. Beside the farmlands and homes, the bridges linking communities and even with neighboring states were pulled down, with some completely washed away. For instances, residents of Shendam District communicate with their relations on phone as the only bridge linking one end of the District to the other at Total Filling station (Pangwasa Ward) was washed away by the flood. Residents now have to manoeuvre the still raging flood by canoes to get to the other side (Buba, 2012). (Plate 4.11, 4.12 and 4.13).

Plate 4.11 Collapsed Shendam Bridge Source: (Buba Y. Alfred 2012)

Plate 4.12 Bridge linking other Villages Source: (Buba Y. Alfred 2012)

4.7.1 Causes and Mechanisms of Shendam Bridge Collapse

The Shendam bridge collapse was attributed to natural hazards (flood and scour) and man-made factors such as; design and construction error, heavy truck load and lack of inspection / maintenance from the Government Officials. Scouring with flooding was responsible for the shendam bridge failure and Scour is a phenomenon where by the level of river bank becomes eroded, leading to the exposure of bridge foundations. The scour phenomena depend on the flow rate, speed and type of flood. Most bridges experience progressive deterioration and when it exceeds a certain threshold level, it can cause bridge collapse (Plate 4.11 and 4.12). However, the risk of bridge deterioration cannot be completely eliminated, but a good maintenance culture coupled with routine inspection will mitigate or minimize the effects of flood.

Plate 4.13 People Crossing with Canoes Source: (Buba Y. Alfred 2012)

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY

The study clearly revealed indiscriminate cutting down of trees in Shendam District and its environs. The major actors participating in deforestation are farmers (33%), mostly men including the migrants from the neighboring local governments in search of fertile land for farming based on leasing or hiring agreement. The women also farm but they engaged more in felling trees for charcoal and fuel wood collection to meet their basic needs. Poverty is the main cause of fuel wood and charcoal consumption due to lack of affordability of alternative sources domestic energy sources like gas, kerosene and electricity. The study also revealed that an average person, indigene or migrant in Shendam have attended at least primary education and youths (20 – 39 years of age) comprising of males 51% and females 48% as the majority of age groups, who are the active groups of the population participating more in deforestation in Shendam and 72% of the respondents are not aware of any forest laws or regulations. Presently there is high temperature in Shendam and is due to the absence of adequate trees to help in regulating the climate by absorbing carbon dioxide and releasing oxygen to cool the environment. The process of deforestation is continuous on daily basis without replacement, and the few existing species of trees will soon be extinct in Shendam District.

5.2 CONCLUSION

This study further clarified and revealed the factors responsible for deforestation in Shendam District and its environs. They are individuals / government sponsored projects which require clearing more land, poverty related issues and population growth. Others activities are farming, construction and fuel wood collections, are the principal socio-economic factors impacting the quality and regeneration of forest. Forest resources depletion is grossly affected by rising population and its demand, with only few portion of the population are awareness of its consequences. The resulting effects of deforestation in the environment to some extent, is far more than the immediate economic and social gains.

5.3 RECOMMENDATIONS

From the conclusion, there is need for sustainable measures to address the means of livelihood, identified and implemented in Shendam, such as alternative sources of energy, sustainable farming practices, diversification of income sources and good governance for the benefit of all the youth and the marginalized members of Shendam. Further recommended means are:

- There should be Rural/Urban Afforestation Programmes equipped financially to carry out tree planting and also educate the people on the significance of tree planting in the urban centers and villages.
- The Afforestation policy of cut one- plant five trees should be enforced and rewards system for environmental services should be implemented for compliance and partnerships and co-operation among stakeholders on overall management.
- Promote agreement among stakeholders on the need for forest protection/ conservation and also

strengthen enforcement capacities on National forest law and regulations, made known to the general public with no exemption; that offenders will be fined and punished accordingly.

- The governments should train/employ more staff in forest management and formulate policy measures on forest management.
- The policy of cut-one-tree and plant five trees stead, should be made mandatory and the Government should ensure that law breakers are punished accordingly.
- Poverty Alleviation Programmes (PAP) should be strengthen and embrace Subsidy Reinvestment Programme (SURE-P) Entrepreneurship Initiatives for human empowerment should reach the local governments, since poverty is a major cause of deforestation and the result is biodiversity loss, efforts should be made to satisfy the basic needs of the people.
- The Government should provide stable electricity readily accessible and affordable by the community through public private partnership (PPP), to control the use of fuel wood.
- The Government and the Private Sector should form a join collaboration on sensitizing the public on the effects of deforestation such as land degradation, flood, high temperature, erosion and migration among others.

REFERENCES

Africageographic (2015): Malawi Floods at the hands of Deforestation. Retrieved from https://africageographic.com /blog/malawi-floods-at-the-hands-of-deforestation/

Ajibade, L.T. (2003);"Techniques of Environmental Monitoring and Compliance," NathadexPublishers,Ilorin, pp 170-189.

Akinbode, A.(2002).Introductory Environmental Resource Management. Ibadan, Daybis Ltd

Allianz (2016) Top ten Drivers of Deforestation. Retrieved from https://www.allianz.com/ en/about_us /open-knowledge/topics/environment/articles/150329- 2016

Asthana, D.K. and Asthana, M. (2005): Environment: problems and Solutions; S. Chand and Co. ltd, Ran Nagar, New Delhi.

Auerbach P.S.(2011) Widerness Medicine: Expert Consult Premium Edition.

Babbie (1990), In: John W. Creswell. Research Design Qualitative and Quantitative Approaches. SAGE Publications.

Bernice Agyekwena (2011) "Sheanut Tree, The Wonder Tree" Retrieved from https://berniceagyekwena.wordpress.com/category/agriculture-2/

Borenstein, Seth (29 November 2015). "Earth is a wilder, warmer place since last climate deal made". Retrieved 29 November 2015.

Branson (2003) Deforestation and Desertification. Retrieved from http://www.lotsofessays.com/viewpaper /1702941.html

Buba Y. Alfred (August 2012) Shendam flooding: Cutting off Roads and Bridges

Chaitanya Iyyer (2009) Land Management. Retrieved from https://books.google.com.ng/books

Chappel, Bill (12 December 2015). "Nearly 200 Nations Adopt Climate Agreement At COP21 Talks In Paris". NPR. Retrieved 12 December 2015.

Chomitz et al.,(2007) Retrieved from http://cdn.intechopen.com/pdfs-wm/36125.pdf Earth Innovation Institute (2013)

Assessment 2005: Progress towards Sustainable Forest Management.FAO Forestry Paper 147. Rome, Italy: FAO.

Girard, P. 2002. Charcoal production and use in Africa: What future?Unasylva 211: 30-35.

Google Earth (Satellite Imagery, 2014)

Hagan K.I. (2006):" Deforestation; an international analysis"; Unpublished Research paper; Numberx2l, Unemoni, XDEFOR.

Hays, (2008). Retrieved from http://cdn.intechopen.com/pdfs-wm/36125.pdf

IUCN (2007). "Three new sites inscribed on World Heritage List,"27 June , News - Press Release. www.iucn.org/.../news/?.../three -new-sites-inscribed on - world heritage-lis

Jim O'Neil (2013) The Telegraph (Economy) Retrieved from http://www.telegraph.co.uk/finance/economics /10121179/Investors-cant-afford-to-treat-all-emerging-markets-the-same.html

Lar Uriah, Yenne Ezekiel, Ozoji Toochukwu, Jibo Jesse (2014) Assessment of Some Heavy Metals Distribution and their Possible Human Health Risks : A Case Study of Parts of Langtang South Area, Middle Benue Trough, Nigeria. American Journal of Environmental Protection. Special Issue: Integrating Earth Materials, Diet, Water and Human Health. Vol. 3, No. 6-2, 2014, pp. 54-65. doi: 10.11648/j.ajep.s.2014030602.1

Leah Gainey (2014) Study on the Medicinal Potentials of Amazonian Plants. Celestial Green Ventures

Livescience (2010) Retrieved from http://www.livescience.com/10733-illegal-logging-report-reveals.html

McDonagh, S. (2002). "Johannesburg 2002 did little for the poor and the earth",Doctrine and Life, Dublin:

Columba Press.
Milman, Oliver (12 December 2015). "James Hansen, father of climate change awareness, calls Paris talks 'a fraud'". The Guardian. London, England. Retrieved 14 December 2015.
Ofomata, G.E.K. (1987). Soil Erosion in Nigeria. The Views of a Geomorphologies Inaugural Lecture Series No. 7 University of Nigeria, Nsukka, Nigeria.
Ogezi A.E, T. Aga, and I. Okafor (2010) Geotourism Resources for Sustainable Development and Recreation, Plateau State Case Study. Department of Geography and Mining University of Jos. Retrieved from http://www.akamaiuniversity.us/PJST11_2_610.pdf
Patrice Shawa (2010) Deforestation in Mwekera National Forest No. 6: An Ethical Evaluation. Retrieved from http://dspace.unza.zm:8080/xmlui/bitstream/handle/123456789/1030/
Sutter, John D.; Berlinger, Joshua (12 December 2015). "Final draft of climate deal formally accepted in Paris". CNN. Cable News Network, Turner Broadcasting System, Inc. Retrieved 12 December 2015.
UN, (1992), Agenda 21, http://www.un.org/esa/dsd/agenda21/res_agenda21_00.shtml
UNDP (1992) Introduction to Hazards."Use Energy, Get Rich and Save the Planet", *The New York Times*, April 20, 2009.
UNCED (2000) Sustainable Development, From Brundland to Rio 2012. Retrieved from http://www.un.org/wcm/webdav/site/climatechange/shared/gsp/docs/GSP1-6_Background%20on%20Sustainable%20Devt.pdf
UNEP (2009) The World's Forests from a Restoration Perspective, WRI United Nations Environment Programme, Paris.
UNFCCC (2009) "Kyoto Protocol: Status of Ratification" *(PDF)*. United Nations Framework Convention on Climate Change. 14 January 2009. Retrieved 6 May 2009.
Yanez-Arancibia A, Raymundo D., John W.D, Enrique R.(2013) Ecological Dimensions for Sustainable Development. WITpress Southampton, Boston. Retrieved from https://books.google.com.ng/