

Effects of Natural Resources Utilization on the Ecosystem and Its Remedies in Nigeria

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Abstract

The exploitation of natural resources is an essential condition of human existence, throughout the history of mankind; humans have exploited natural resources to produce the materials they needed to sustain growing human populations. Natural resources utilization, mining and processing have caused different types of environmental damages. The environmental damage has in turn resulted in waste of arable land as well as economic crops and trees. This paper reviews the effect of natural resources utilization on the ecosystem and its remedies in Nigeria. Since much of the damage is inevitable if the natural resources must be developed, both the government and the natural resource industry must be involved in taking precautionary and remedial measures that can minimize the negative effects of natural resources utilization.

Keywords: Effects, natural resources, utilization, ecosystem.

I. INTRODUCTION

Nigeria is endowed with abundant mineral resources, which have contributed immensely to the national wealth with associated socio-economic benefits. Mineral resources are an important source of wealth for a nation but before they are harnessed, they have to pass through the stages of exploration, mining and processing (Adekoya, 2003; Ajakaiye, 1985).

The exploitation of natural resources started to emerge in the 19th century as natural resource extraction developed. During the 20th century, energy consumption rapidly increased. Today, about 80% of the world's energy consumption is sustained by the extraction of fossil fuels, which consists of oil, coal and gas (Florent, 2012). In the struggle for survival and development man creates a lot of negative impacts on the environment, these impacts ranges from over-exploitation of resources, destruction of ecosystem and pollution. Often the exploitation of nature has been done in a non-sustainable way, which is causing an increasing concern, as the non-sustainable

exploitation of natural resources ultimately threatens the human existence. One difficult task faced by both developed and developing countries is to guarantee the lasting utilization of natural resources at the lowest possible environmental cost, while still assuring the economic and social development (Klawitter, 2004)

Utilization of natural resources is an essential condition of human existence, throughout the history of mankind; humans have manipulated natural resources to produce the materials they needed to sustain growing human populations. This refers primarily for food production and economic development but many other entities from the natural environment have been extracted. Natural resources are an important material basis for a stable natural economy and social development, they can be divided into two; the exhaustible: such as minerals and the inexhaustible: such as forests and grasslands, with industrialization and urbanization mankind's great demands for natural resources and their large scale exploitation and their consumption has resulted

in weakening, deterioration and exhaustion of these resources (Aina *et al.*, 1992).

Nigeria with its large population and poor economic foundation is engaged in a process of increased urbanization. The traditional mode of resource consuming, development and the current inefficient economy are severely threatening the lasting utilization of natural resources. The rate at which forests are destroyed in the name of furniture making, pulp and paper production and as a source of domestic energy is at alarming rate. Some trends and problems of exploitation of natural resources include; specie extinctions, oil spillage, gas flaring, deforestation, soil erosion, coastal degradation, ozone depletion, ground water contamination among other things (Irina, 2008).

II. EFFECT OF DEFORESTATION

Deforestation is a process where vegetation is cut down without any simultaneous replanting for economic or social reasons. Deforestation has negative implications on the environment in terms of soil erosion, loss of biodiversity ecosystems, loss of wildlife and increased desertification among many other reasons (www.rainforests.mongabay.com). Deforestation also has impacts on social aspects of the country, specifically regarding economic issues, agriculture, conflict and most importantly, quality of life. According to data taken over 2000 to 2005 Nigeria, located in the western region of Africa, has the largest deforestation rates in the world, having lost 55.7% of their primary forests (www.rainforests.mongabay.com).

Mongabay defines primary forests as forests with no visible signs of past or present human activities (www.rainforests.mongabay.com). The annual rate of deforestation in Nigeria is 3.5%, approximately 350,000-400,000 hectares per year (www.fao.org). The Food and Agriculture Organization of the United Nations lists the requirements of sustainable forest management as: extent of forest resources, biological diversity, forest health and vitality, productive functions of forest resources, protective functions of forest resources, socio-economic

functions and a legal, policy and institutional framework. Many aspects of the outline are currently not being met and will continue to have detrimental effects if not quickly addressed.

A lot of damage has been done to Nigeria's land through the processes of deforestation, notably contributing to the overwhelming trend of desertification. Desertification is the encroachment of the desert on land what was once fertile (Omofonmwan *et al.*, 2008). A study conducted from 1901 to 2005 gathered that there was a temperature increase in Nigeria of 1.1°C, while the global mean temperature increase was only 0.74°C. The same study also found in the same period of time that the amount of rainfall in the country decreased by 81mm. It was noticed that both of these trends simultaneously had sharp changes in the 1970s (www.mongabay.com). From 1990 to 2010 Nigeria nearly halved their amount of Forest Cover, moving from 17,234 to 9041 hectares. The combination of extremely high deforestation rates, increased temperatures and decreasing rainfall are all contributing to the desertification of the country. The carbon emissions from deforestation is also said to account for 87% of the total carbon emissions of the country (Akinbami, 2003).

Nigeria's wide biodiversity of 899 species of birds, 274 mammals, 154 reptiles, 53 amphibians and 4,715 species of higher plants will also be strongly affected by the negative impacts of deforestation. The numbers of the rare Cross River gorilla have decreased to around 300 individuals because of poaching by locals and mass habitat destruction (www.mongabay.com). Although much of the motivation of deforestation stems from economic reasons it has also lead to a lot of economic problems in an already unstable country. Along with economic issues, deforestation has made it so that the land is incapable of as much agricultural production which is part of many people's survival. Issues such as these and the subject of the environment itself has contributed to many conflicts in the country and even executions of environmental activists, such as Ken Saro-Wiwa, a Nobel Peace Prize nominee (www.rainforests.mongabay.com).

Much of the allowance for deforestation in Nigeria comes from their demand for fuel wood. 90% of the Nigerian population stated that they relied on kerosene as the main energy source for cooking but because it is expensive and often unavailable, 60% said they used fuel wood instead. The usage of fuel wood for cooking is higher in rural areas of the country where more of the population is concentrated (Akinbami, 2003). There are also incentives to people living in rural areas surrounding the process of deforestation because it is a source of income to many of them. They extremely high levels of poverty in the country are very much connected to the issue of deforestation.

The current state of the environment and has been allowed by the State Department of Forestry who have not implemented any forest management policies in efforts to curb deforestation since the 1970s (www.pgrfa.org). Without any conservation efforts or education, the society is not aware of how to properly treat finite natural resources. Very few steps have been made to try to lower the deforestation rates and to stop illegal logging.

Any solution to the problem of deforestation in Nigeria must be an approach that incorporates and aggressively targets all aspects that are related to the problem. These should include areas of energy alternatives, improved technology, forestry management, economic production, agriculture and security of the locals that are dependent on the land. Energy alternatives include hydro power, solar energy and wind energy. Solar energy is a great option

for Nigeria and will have exceptional results due to its geographical location. Nigeria has already implemented windmills in some of its states but the more this approach is taken on the more energy that will be produced in an environmentally sound and efficient way. Each of these proposals is accepted globally as good alternatives to current energy production methods and has been encouraged by many environmental organizations. Improving the technology of cook stoves will be especially effective for Nigeria which currently has many households that require fuel wood for their cooking methods. In 2005 a group of countries, called the Coalition for Rainforest Nations, developed a program to reduce the rates of deforestation that contribute to CO2 emissions. The program is designed for all developing countries with a rainforest. The developing countries receive money upon successful completion of lowering their country's emissions (www.news.mongabay.com). A similar concept has been designed by REDD, Reducing Emissions from Deforestation in and Forest Degradation in Developing Countries. In REDD the countries are able to receive much more money in the form of carbon credits which can be spent on more environmentally safe practices (www.news.mongabay.com).

Deforestation all over the globe is threatening the sustainability of the environment but has had especially detrimental effects in Nigeria due to their high rates. Deforestation puts at risk all aspects of the environment, the economy and of the citizens of the country.

Table 1: Deforestation Data for Nigeria, 1990-2005

Classification	Area (ha)		Total Change		Percentage (%)
	1990	2000	2005	1990-2005	1990-2005
Period					
Total Forest Area	17,234,000	13,137,000	11,089,000	-6,145,000	-35.66
Other Wooded Land	9,717,000	6,902,000	5,495,000	-4,222,000	-43.45
Primary Forest	1,556,000	736,000	326,000	-1,230,000	-79.05
Plantations	251,000	316,000	349,000	98,000	39

Source: UN FAO, 2005

As of 2005, Nigeria has the highest rate of deforestation in the world according to the Food and Agriculture Organization of the United

Nations (FAO) (www.news.mongabay.com). Between 2000 and 2005 the country lost 55.7% of its primary forests, and the rate of forest

change increased by 31.2% to 3.12% per annum. Forest has been cleared for logging, timber export, subsistence agriculture and notably the

collection of wood for fuel which remains problematic in western Africa.

Table 2: The Worst Deforestation Rate of Primary Forest

Position	Countries	Percentage rate (%)
1	Nigeria	55.7
2	Vietnam	54.5
3	Cambodia	29.4
4	Srilanka	15.2
5	Malawi	14.9
6	Indonesia	12.9
7	North Korea	9.3
8	Nepal	9.1
9	Panama	6.7
10	Guatemala	6.4

Source: FAO, 2005 Deforestation Figures

In 2005 12.2%, the equivalent of 11,089,000 hectares had been forested in Nigeria. Between 1990 and 2000, Nigeria lost an average of 409,700 hectares of forest every year equal to an average annual deforestation rate of 2.38%. Between 1990 and 2005, in total Nigeria lost 35.7% of its forest cover, or around 6,145,000 hectares (www.news.mongabay.com).

III. EFFECT OF MINING ON THE PHYSICAL ENVIRONMENT

Mining is the extraction (removal) of minerals and metals from the earth. The mining of minerals in Nigeria accounts for only 0.3% of its GDP, due to the influence of its vast oil resources. The domestic mining industry is underdeveloped, leading to Nigeria having to import minerals that it could produce domestically, such as salt or iron ore. Rights to ownership of mineral resources is held by the Nigerian government, which grants titles to organizations to explore, mine, and sell mineral resources.

Although mining provides a variety of socio-economic benefits but its environmental costs, if not well handled can be massive in

terms of land conversion and degradation, habitat alteration, water and air pollution (Adekoya, 2003). In Africa, the mining sector is thought to be the second largest source of pollution after agriculture; the sector is resource intensive and generates high concentrations of waste and effluents (Aigbedion, 2007).

Mining from exploration to the closing stage has a serious impact on the environment. This impact can be direct through the value chain activities, prospecting exploration, site development, ore extraction, mineral dressing, smelting, refining/metallurgy, transportation, post mining activities and indirectly through the impact of the degradation on the socio-cultural development of communities. In general, degradation arising from mining includes; air pollution, water pollution, land and forest degradation, noise pollution, solid and liquid waste disposal of toxic substances, as well as socio-cultural problems such as health complication, conflicts, alcoholism, communal clash and inequality (Twerefou, 2009). All these have negative implications for sustainable development and various livelihoods and therefore require urgent attention.

Table 3: Minerals Deposit Currently Exploited in Nigeria

S/N	Mineral Name	Locality	Current Exploitation
1	Iron	Itakpe, Ajakuta	L
2	Tin	Jos, Plateau, Nasarawa	M, S, M
3	Niobium/Tantalum	Jos, Plateau, Saki, Oro	Won as by product of Tin mining
4	Monazite	Plateau	Dormant
5	Xenotime	Itagumodi, Birni Gwari, Dangaba	S
6	Gold	Ishiagu, Endigba, Ameka, Ameru, Anka	S
7	Lead	Ishiagu, Ameka, Ameri, Ashaka, Ewekoro	Gelana mining
8	Silver	Kalambaina, Igarra, Atte, Ikpeshi	Won as by product of Tin mining
9	Zinc	Barum, Igbetti, Igarra, Jakura, Kwakudi, Okpilla, Ikpeshi	L
10	Limestone	Gwoza, Ashaka, Warake, Wurnio	M
11	Marble	Lagos, Ire, Badagry, Igbokoda, Ughelli	S
12	Field Spar	All part of the federation	S
13	Gypsum	All part of the federation	L
14	Barites	All part of the federation	L
15	Clay	Ijero-Ekiti, Jos, Saki, Iyano, Kwali, Gamboru Ngala	L
16	Glass Sand	Jos, Akwanga	L, M
17	Construction Sand		L, M, S
18	Construction Stones (Laterite)	Jos, Plateau	L, M
19	Beryl	Enugu, Niger delta	S
20	Tourmaline	Enugu, Niger delta	S
21	Sapphire	Enugu, Niger delta	S
22	Ruby	Enugu, Niger delta	S
23	Topaz	Enugu, Niger delta	S
24	Coal	Enugu, Niger delta	L
25	Oil and Gas	Niger Delta	L, M

Source: Journal of Physical Sciences, 2007

Mining is a common practice in Nigeria, the problem with the activity in the country, however, is the inattention of the miners and the government to proper mining practices which makes life difficult for the people. And many people because of their low level of education do not know their environmental obligations under the Minerals and Mining Act, and that the adherence to best global practices in mining is a vital tool for the promotion of sustainable growth in the industry (Ifeanyi *et al.*, 2010)

IV. EFFECT OF PETROLEUM EXPLORATION

The petroleum industry in Nigeria, Africa is the largest industry and main generator of GDP in the continent's most populous nation. Nigeria like most other developing countries in early part of the 70's was engaged in intensive natural resource exploitation as a way of stimulating economic growth, as at 1976 about 20 years after the start of oil exploration, figures available from federal office of statistics stated that oil has come to account for about 84% of the national gross domestic product (GDP) of Nigeria, 95% of the total export and over 80% of

government annual revenue (Mathew, 2004). There is no doubt that the Nigerian oil industry has affected the country in a variety of ways at the same time. On one hand it has fashioned a remarkable economic development for the country, however on the negative side petroleum exploration have adverse effects on the environment of the host communities like: oil spills, extensive deforestation, loss of farms, loss of soil fertility, erosion, gas flaring, intensive exploitation, contamination of streams and rivers, effluent discharge and disposal, conflict between oil companies and host communities.

The department of petroleum resources estimated 1.89 million barrels of petroleum were spilled into Niger delta between 1976 and 1996 out of a total of 2.4 million barrels spilled in 4,835 incidents (John, 2010). A UNDP report

states that, there have been a total of 6,817 oil spills between 1976 and 2001, which account for a loss of 3 million barrels of oil which more than 70% was not recovered, most of these spills occurred offshore (69%), a quarter was in the swamps and 6% spilled on land (Fawundu, 2006). The NNPC places the quantity of petroleum jettisoned into the environment yearly at 2,300 cubic metres with an average of 300 individual spills annually. (Brown, 1999). However, because this amount does not take into account “minor” spills, the World Bank argues that the true quantity of petroleum spilled into the environment could be as much as ten times the officially claimed quantity; oil spill has a major impact on the ecosystem and the human health (John, 2010).

Table 4: Oil Spill Data

S/N	Year	Number of Spill incident	Quantity Spilled (Barrels)
1	1976	128	26,157.00
2	1977	104	32,876.25
3	1978	154	489,276.25
4	1979	157	694,117.13
5	1980	241	600,511.02
6	1981	238	42,722.50
7	1982	257	42,841.00
8	1983	173	48,351.30
9	1984	151	40,209.00
10	1985	187	11,876.60
11	1986	155	12,905.00
12	1987	129	31,866.00
13	1988	208	9,172.00
14	1989	195	7,628.161
15	1990	160	14,940.816
16	1991	201	106,827.98
17	1992	367	51,131.91
18	1993	428	9,752.22
19	1994	515	30,282.67
20	1995	417	63,677.17
21	1996	430	46,353.12
22	1997	339	59,272.30
23	1998	390	98,345.00
Total		5,274	2,571,113.90

Source: Department of Petroleum Resource, 2010

Considering the possibility of environmental incidents arising from deliberate acts of sabotage, extensive contamination of soil and water is to be expected. With frequent rains and a high water table, the oil contamination could have been carried further down the delta through the creeks contaminating surface water and river sediments. The contamination of soil, surface water and ground water in turn would have adverse socio-economic impacts on agriculture and fisheries (United Nations Environmental Program, 2007).

Nigeria also flares more natural gas associated with oil exploration than any other country in the world and it releases toxic components into the atmosphere and contribute to climate change. Gas flares have potentially harmful effects on the environment, health and livelihood of the communities as they release a variety of harmful and poisonous chemicals including nitrogen dioxides, sulfur dioxide, and volatile organic compound such as benzene, toluene, xylene and hydrogen sulfide as well as carcinogens like benzopyrene and dioxin which can cause health complications (John, 2010).

V. THE REMEDIES

Sustainable development is a dynamic process and it necessitates continual adjustments to cope with changes in the economy and the environment. It is recommended that to ensure environmental sustainability and sustainable development in the exploitation of natural resources, the concept of material stewardship should be adopted and implemented.

To encourage study and adapt techniques for risk assessment, resource pricing and exploitation which are favorable to the environment. Environmental Impact Assessment (EIA) should be well documented, guide lines for implementation should be put in place and undertake monitoring and evaluation of environmental degradation and carryout environmental reports so that natural resource exploitation bodies should carry out mandatory precaution, remedies or compensation for damage done. The oil and gas sector should ensure the integrity of their pipe lines; follow the guideline policy of gas flaring and in times of oil spillage the best industrial technology should be employed to effect remediation.

To establish a system for continuous monitoring of natural resources by the government and social groups in order to encourage public participation in the activities aimed at sustainable development of natural resources like: recycling, waste reduction, afforestation, pollution control, bioremediation and game reserves, and to set up a mechanism for coordination or elimination of discrepancies arising during the implementation of some policies related to utilization of natural resources and provide appropriate sanctions.

To establish an information system related to the management, protection and rational utilization of natural resources under the direction of government and in collaboration with environmental expert, academia, research institutes, and international organization such as; United Nations Development Program (UNDP), Millennium Development Goals (MDG's), World Health Organization (WHO), Environmental Protection Agency (EPA).

VI. CONCLUSION

The utilization of natural resources has caused different types of environmental damages which include ecological disturbances, destruction of plants and animals, pollution of air, water and land, instability of soil and rock masses, landscape degradation, desertification and global warming. Therefore, it's imperative for government and individuals to shift emphasis from waste disposal to waste minimization through sorting, recycling, bioremediation, afforestation, sewage treatment and pollution control. The government should also provide the regulatory legislation with appropriate sanctions or where these regulatory bodies already exist, the enforcement of laws and policy implementation should be enacted.

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