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Practical Case Study

ENVIRONMENTAL IMPACT OF NATURAL RESOURCES EXPLOITATION IN NIGERIA AND THE WAY FORWARD

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Abstract: Natural resources exploitation, exploration, mining and processing have caused different types of environmental damages which include ecological disturbances, destruction of natural flora and fauna, pollution of air, water and land, instability of soil and rock masses, landscape degradation, desertification and global warming. The environmental damage has in turn resulted in waste of arable land as well as economic crops and trees. 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 ill-effects of natural resources exploitation. Emphasis should shift from waste disposal to waste minimization through sorting, recycling, bioremediation, afforestation, sewage treatment and pollution control, while the government should provide the regulatory legislation with appropriate sanctions or where these regulatory bodies already exist, the enforcement of laws and policy implementation is of paramount importance. The oil and gas industries, mining companies and other natural resources exploitation bodies are expected to carry out mandatory precautions, remedies or compensation for damage done.

Keywords: Damages, minimization, measures, sanctions, waste

INTRODUCTION

Exploitation 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 [1].

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 [2].

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 [3].

IMPACT OF DEFORESTATION

In 1975 the total area of forest of all types in the country was estimated at about 360,000 square kilometer or about one third of the country land area. It was also estimated that annual harvest of sawn timber from high forest was about 1.5 million cubic metre which would take between 25 to 30 years to denude the forest of matured timber, with rapid rise in domestic consumption of timber due to increased rate of building construction resulting from rise in population and urbanization. It will take less than 15 years to exhaust the forest of timber resources [1].

Deforestation is a process whereby trees are felled for several purposes but without replanting to replace the ones felled [1]. Deforestation is dangerous to man, animals and properties. The rate at which forest are destroyed in the name of furniture making, economic development and as a source of domestic energy is at alarming rate, it leads to erosion of soil, loss of biodiversity, land degradation, desertification, draught, flooding, climate change among other effects [1]. Deforestation of secondary tropical peat swamp forest significantly decrease soil $PH_{water,}$ and some soil major macro-nutrients [5].

Table 1: Deforestation Data for Nigeria, 1990 – 2005

Classification	Area (ha)			Total change	Percentage %
Period	1990	2000	2005	1990 – 2005	1990 – 2005
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: forest resource assessment [6].

Deforestation is a serious problem in Nigeria with forest loss occurring at rate of 3.3% per year since 1990, the country has loss over 36% of its forest cover. The most biodiversity ecosystem, the old-growth forests are disappearing at an even faster rate between 1990 and 2005, 79% of the primary forest were lost and since 2000, Nigeria has been losing an average of 11% of its primary forest each year, these figures give Nigeria the highest deforestation rate of natural forest in the world [6].

Table 2: The Worst Deforestation Rate of Primary Forests.

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: Deforestation figures [7].

Nigeria has the highest deforestation rate of primary forest in the world according to the revised figures from food and agriculture organization of United Nations (FAO), between 2000 and 2005 the country has lost over 55% of its primary forest, this could leads to desert encouragement, global warming, food chain depletion, destruction of soil structure, extinction of wildlife, draught and exposes the bush to burning [6].

IMPACT OF MINING ON THE PHYSICAL ENVIRONMENT

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 [8]. 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 [9]. 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 [10]. All these have negative implications for sustainable development and various livelihoods and therefore require urgent attention.

Table 3: Minerals Deposits That Are Currently Being Exploited In Nigeria.

S/N	Mineral Name	Locality	Current Level Of 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	Xenotine	Itagumodi, Birnin Gwari, Dangabala	S
6	Gold	Ishiagu, Engigba, Ameka, Ameru, Anka	Dormant
7	Lead	Ishalagu, Ameka, Ameri, Ashaka, Ewekoro	M, Won As By Product Of Galena Mining
8	Silver	Kalambaina, Igarra, Atte, Ikpeshi, Dangabala, Okpilla	Won As By Product Of Lead Mining
9	Zinc	Barum, Igbetti, Igarra, Jakura, Kwakudi, Okpilla, Ikpeshi	L
10	Lime Stone	Gwoza, Ashaka, Warake, Wurnio, Fika, Ikpeshi, Gusau, Azare, Omi-Adio, Ozubulu, Kano, Ikorudu, Legas, Ire, Naragua	M
11	Marble	Lagos, Ire, Badagry, Igbokoda, Ughetti	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	Jos, Plateau, Akwanga Area	L, M, S
18	Construction Stones (Latarite)	Jos, Plateau	L, M
19	Beryl	Enugu, Niger Delta	S (Mostly Illegal Mining)
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, Benue	L
25	Oil And Gas	Niger Delta	L, M

Source: Journal of Physical Science [9].

L=large scale exploitation, M= medium scale exploitation, S= small scale exploitation

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 [11].

IMPACT OF PETROLEUM EXPLORATION

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 [12]. 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.

Table 4: Environmental Disturbance Factors and Potential Effects of Off-Shore Petroleum Exploration

S/N	Exploration Activity	Environmental Disturbance Factor	Potential Effect
1	Seismic	Air gum discharge, chemical explosives, vessel transits	Displacement or loss of biota, loss of fishing gear
2	Drilling	Discharge of toxic drilling fluids, discharge of fines and solids from drill cuts, noise from drill operation, loss of well control leading to gas oil spills, vessel and aircraft traffic	Loss of habitat, displacement or loss of biota, tainting of fish and shell fish, degradation of beaches, displacement of fishing activities
3	Well suspension and abandonment	Debris, vessel and aircraft traffic	Disturbance of biota, loss of fishing gear, displacement of fishing activities

Source: "Environmental Effects of Petroleum Exploration" Ottawa, Canada KIA OH4 [13].

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 [14]. 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 [15]. 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 [16]. 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 [14].

Table 5: 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	489,294.75
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: The Department of Petroleum Resource [17, 18].

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 [19].

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 benzapyrene and dioxin which can cause health complications [14].

THE WAY FORWARD

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).

CONCLUSION

Extraction, exploration and exploitation of natural resources are the backbone of the national economy. However, the great danger posed by natural resources exploitation is a problem; factors such as economic development, population growth and urbanization invariably place greater demands on the planet and stretch the use of natural resources to the maximum. Use of the natural resources at a rate higher than nature's capacity to restore itself can result to environmental degradation, ecological disturbances, destruction of natural flora and fauna, pollution, global warming and desertification. Everything on our planet are interconnected and while the nature supplies us with valuable environmental services without which we cannot exist, we all depends on each other's actions and the way we treat our natural resources. It's widely recognized that we are overspending our natural resources. Perhaps, we should adopt a holistic view of nature that it is not an entity that exists differently from us, we are an inalienable part of it and we should care for it in the most appropriate manner by development of effective strategies, policy formulation, sustainability and plans to maintain the balance between resource usage and conservation, only then can we possibly solve the environmental problems.

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