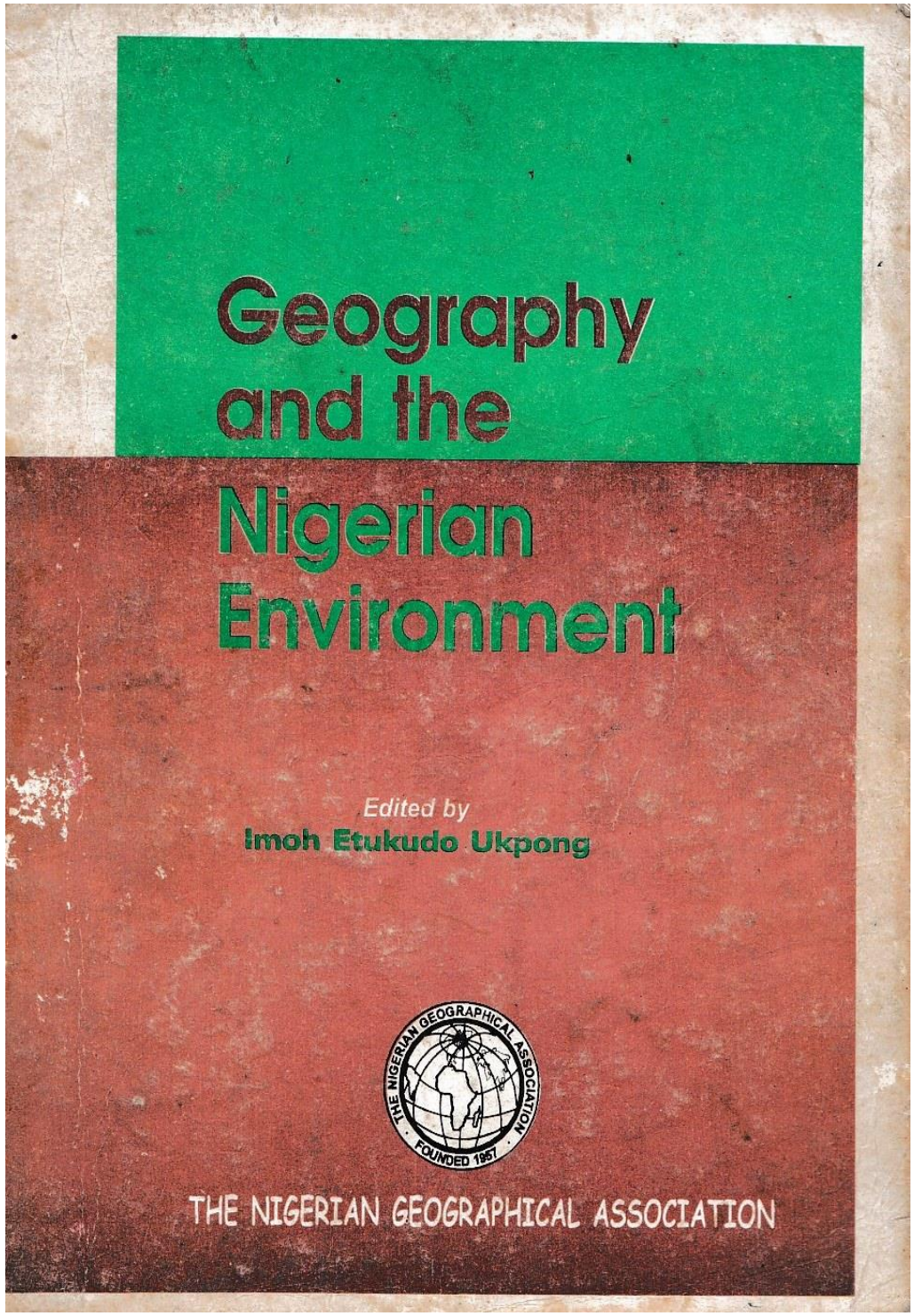

CHAPTER 13

INDUSTRIALISATION AND ENVIRONMENTAL DEGRADATION IN NIGERIA

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INTRODUCTION

Industrial development in the developing as well as less developed countries depend heavily on natural resources . These resources include the soil, water, forests and forest products, animals and fisheries. If these environmental resource-base are mismanaged, these poor economies deteriorate the more. The very fact that the rural sectors of these developing economies are biomass-based calls for care in the exploitation and devastation of the natural resources (Dasgupta and Maler, 1995).

The modern environmental movement started over two decades ago in 1970. Economies both developed and developing become interested in abating damages created by industrial activities.. According to Rostow (1992) the industrial sector in general and the manufacturing sector in particular constitute the leading sector of an economy especially during the take-off stage of development. This sector is at this time susceptible to possibilities of innovation or of exploiting new or unexplored resources. The result is a higher growth rate in the industrial sector than in the rest of the economy. Higher growth rate implies higher waste generations, effluent discharge and environmental damage. Nigeria as a developing nation has strived over the years to achieve a desirable level of economic growth and development. In this process, a lot of emphasis and resources have been committed to the industrial sector among other important sectors. Unfortunately, the process of industrial development has tended to have devastating influence on the environment , to the extent that the very essence of industrialisation seems self defeating. This paper discusses the various ways whereby industrialisation deteriorates the environment and consequently the quality of life in Nigeria.

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Conceptual Issues

The Environment

The environment consists of land, water and air in which we operate and from which we tap the resources we need. There exists a dialectical relationship between human beings, other living organisms and animals and the environment in which they live. In which case we influence the environment and it influences us in turn. Such influences may be benefits or costs.

The natural environment can be understood in terms of

i. Dependency, mutual coexistence and healthy competition among species
ii Bioactivity in terms of energy flow, productivity and resource recycling
iii Biomass (iv.) Biodiversity (v) Balance (vi) Stability

As a result of these dynamics, species evolve and ecosystems also evolve, both as a result of their own internal dynamics and as a result of response to stimuli such as climatic cycles, geological processes as well as human impact. In both historic and contemporary spatial terms, the relationship between mankind and the environment has three phases (i) natural mankind-where their habitat demands are in a stable balance with the environment of which they are part. A ready example is the pre-agricultural hunting/gathering societies. (ii) Viable mankind-where their activities maintain an environment that remains viable despite modification e.g. settled hunting and farming societies where productivity is maintained . (iii) Modern mankind-where ecosystems are either degrading towards non-viability or are already unviable as a result of mankind's activities (Ashton Jones, 1994).

Modern mankind therefore has the technology to modify the environment so that its viability could be undermined or enhanced to such an extent that it may diminish or replenish in terms of biodiversity, bioactivity and biomass. Ever since man evolved as a tool-using and innovative animal, he has not ceased to influence the environment. Most of the Nigerian landscape, for instance, have been modified by man in the search for better quality of life and standard of living. Unfortunately most of these activities, especially manufacturing have greatly threatened the validity of the environment. Mining and quarrying are also seen as being among the greatest causesof land and air degradation in Nigeria. Oil spillage is a major culprit in Environmental deterioration of both land and water. Furthermore soil and coastal erosion, due to road construction adversely affect over 30% of the Nigerian land. Human industrial activities adds nitrous oxide, methane gas, chlorofluorocarbons and other heat trapping gases to the atmosphere thereby rendering it grossly polluted.

Industrialization

Capital plays a central role in the process of industrialization and development. Industrialization is a means of achieving a more equal distribution of income between different areas of the world by raising incomes in depressed areas at higher rate than in rich areas. Industrialisation is defined as the increased use of capital by labour both in agricultural and non-agricultural production. Industrialization is inevitable for a developing economy.

The industrial sector in Nigeria is dominated by the following major firms: Steel works, Metal Fabrication and Finishing, Synthetic Fibres and Plastics, Oil service, Oil Industry, Food Processing, Textiles, Petroleum Refineries and Petrochemical Facilities, Paint, Breweries, Fertiliser, Cement, Mining, Natural Gas, Flour Mills, Wood Works, Hygienical Products, Glass. Electronic, Electronical Utilities, etc.

Jaffe et al (1995) distinguishes three categories of industrial pollution in terms of pollution abatement cost. The high pollution industries include: (i) paper and allied products (ii) Chemical and allied products (iii) Petroleum and Coal Products (iv) Primary metal industries The moderate pollution industries include: (i) Furniture and fixtures (ii) Fabricated metal products (iii) Electric and electronic equipment. Lastly, the low pollution industries are made up of the following; (i) Printing and Publishing (ii) Rubber and Plastic products (iii) Machinery, except electrical

Environmental Regulations Pertaining to Industrial activities in Nigeria

The Federal Environmental Protection agency (FEPA) was established by decree No. 58 of 1988. This was immediately followed by the state Environmental Protection Agencies (SEPA) in each state of the Nigerian Federation. The said decree vested in the agency the responsibility for general environmental protection, the initiation of appropriate environmental policies and co-operation with international agencies on environmental matters. This was backed up with the enactment of the Environmental Impact Assessment (EIA) Decree 86 of 1992 and FEPA Decree No 59 Amendment of 1992. These decrees have made Environmental Impact Assessment (EIA) mandatory for new major industries and prescribes the process, follow-up action and conditions.

To further give legal backing to the requirements of the guidelines and standards for Environmental Pollution Control in Nigeria, the Federal Environmental Protection Agency enacted three regulations in 1991 as follows (i) National Environmental Protection Effluent Limitation Regulation makes it mandatory for industries to install anti-pollution equipment for the treatment of effluents. (ii) Pollution Abatement in Industries and Facilities Generating Wastes Regulation, which stipulates restrictions on the release of toxic substances into the environment, the requirement of environmental audit. and penalties for contravention. (iii) Management of Solid and hazardous Wastes Regulation which provides a comprehensive list of dangerous and hazardous chemicals and wastes, and the prescription for environmentally sound disposal of various categories of wastes.

Industrial Development and Environmental Degradation in Nigeria.

Within the thirty-eight years of Nigeria's independence a lot of resources has been expended by different governments to ensure that the nation emerges as a developed one. One of the major sectors on which development is focused is the industrial sector. These industrial facilities produce waste products which devastate the environment in one way or the other. For example, there are a lot of undesirable environmental impacts of fossil energy resources. According to Igbozurike (1983), mineral exploration, mineral extraction, processing, transportation, storage and consumption causes land disturbance, land degradation and ecosystem destabilisation , gas leaks, oil spills, noise and pollution of the air, soil and water. Table 1 shows the details of the specific impacts of these activities.

Table 1: ENVIRONMENTAL IMPACTS OF FOSSIL ENERGY RESOURCES IN NIGERIA

Mining activity	General Effect	Specific Impact
Exploration	Landscape disturbance	Aesthetic deterioration of land-scape.
Mineral Extraction	Land degradation and ecosystem destabilisation land	Land surface devastation, subsidence, disruption of drainage system, deforestation, excessive water draw down, lowering and contamination of water table
Processing Transportation Storage and Consumption	Gas leaks, oil spills noise and pollution of the air, soil and water.	Thermal loading of water-ways, increase in Co and Co, Ozone layer depletion, acidification of air, soil and water, weather modification, toxicity hazard to plant and animals, death of terrestrial and marine life, loss of crops and livestock, impairment of atmospheric visibility, damage to buildings and machinery, nervous disorders, respiratory disease, cardiovascular illness, cancers and food poisoning.

Source: U.M Igbozurike, "Energy Development and Energy Crises with Special reference to Nigeria'. Department of Geography, University of Nigeria. Nsukka 1983, P. '13

The main states in Nigeria which suffer industrial pollution include Akwa Ibom, Imo, Abia, Rivers, Delta, Cross River, Benue, Edo, Lagos, Oyo, Ogun Kano, Plateau as well as Kaduna (various issues of FEPA quarterly Newsletter). The petroleum exploration and extraction processes in Akwa Ibom , Rivers, Delta, Ondo and Cross River States brings about various undesirable effects on the environment. These include land surface devastation, gas leaks, oil spills, noise as well as soil. water air pollution. Tin mining in the past 8 decades in the Jos Plateau has left the landscape devastated and the ecosystem destabilised. An estimated 325sq.km out of 8,600 sq. km of the Jos Plateau has been damaged by some form of mining or the other, especially the open-cast mining of cassisterite and columbite.

Analysis of the Environmental Impacts of Specific Industrial Activities in Nigeria

Steel Works: The waste water from steel production contains phosphates and phenols. All these contaminate water bodies. Sulphur dioxide and particulate, fumes, benzene, toluene, xylene, naphthalene, ammonia, alkaline oxide, salt flux, slag, Co, Co and iron oxide pollute the air.

Metal Fabrication and Finishing : This activity produce harmful cyanide, metals,oils, caustic soda and acids.

Synthetic Fibres and Plastic; The production of synthetic fibres and plastics emit volatile organic compound (VOC) and other water effluents with high concentration of acids and pigments.

Food Processing: The organic wastes of the food processing industry cause oxygen depletion and turgidity. Other wastes include kernels, cotton seed cake, sugar wastes, grain bran, husks and chips among others.

Textiles; Fibre residues make textile waste water high in suspended solids. Other chemicals include dyes, surfactants, oxidising and bleaching agents, silicates and inorganic salt. Effluents from textile factories often contaminate water with oils, greases and wastes. The process of dying produces chromium, lead, zinc and copper to waste water. The effect of these is aquatic pollution

Paint: The waste product of this industry include pigments, metals, resins, solvents, additives and sludges.

Breweries: Organic waste product of the brewing industry include sugar, yeast, beer and malt residue. Other organic waste in the effluent are caustic soda, hypochlorites and peroxides.

Fertilizer: The production of fertilizer emit nitrogen compounds like nitric oxide, ammonia etc.

Cement: The major waste products of the manufacture of cement are dust, particulates, Co, So , No , hydrocarbons, aldehydes and ketones.

Petroleum and Petrochemical industries: Oil exploration , refining and storage has carried with it the following environmental problems especially in the Niger Delta region (Rivers, Bayela, Akwa Ibom, Edo, Delta and Imo States).

(i) Oil Spillage; Oil Spillage causes loss of fish and other aquatic animals, eutrophication of water bodies, abandonment of fishing grounds, and associated livelihood pursuits, devegetation and other forms of ecological damage.

Table 2

OIL SPILLAGE IN DELTA STATE (1991 -1994)

	ALL COMPANIES'		SHELL[2]	
	No of Spills	Quantity spilled (Barrels)	No of Spills	Quantity spilled (Barrels)
1991	78	950	50	705
1992	129	12,232	55	1220
1993	116	909	58	617
1994	-	-	59	515
Total	323	14,091	222	3,057
Average/Year	107	4,697	56	764
Average M^3/yr		746		

Sources

1. NNPC
2. SHELL PETROLEUM DEVELOPMENT COMPANY

Table 3
OIL SPILLAGE IN DELTA STATE (1991 -1994)

	ALL COMPANIES'		SHELL[2]	
	No of Spills	Quantity spilled (Barrels)	No of Spills	Quantity spilled (Barrels)
1991	98	5,103	86	4,214
1992	223	21,480	143	1,390
1993	232	8,101	248	3,251
1994	-	-	203	18,527
Total	552	29,679	680	27,382
Average/Year	184	9,893	170	6,845
Average M³/yr		1,571		

Source: Shell Petroleum Development Company

Tables 2 and 3 above indicate the amount of oil spilled in Delta and Rivers States of Nigeria between 1991 and 1994. Table 2 shows that in Delta State alone there was a total of 323 spills of 14,091 barrels of oil by all the oil companies operating in the area. Of the above stated total, Shell Petroleum Development Company contributed 222 spills or 3,057 barrels of oil within the period. The average yearly spill amounted to 107 and the average yearly quantity of oil spilled amounted to 4,697 barrels by all the oil companies operating in Delta State.

Table 3 shows that all the oil companies, during the period 1991 - 1994, contributed a total of 552 spills in Rivers State. This figure amounted to 184 spills yearly on the average. The quantity of oil spilled during this four year period was 29,679 barrels. This averages 9,893 barrels per year. Shell Petroleum Development Company contributed a total of 680 spills, averaging 170 a year and 27, 382 barrels averaging 6845 barrels of oil spill yearly.

Table 4 GAS FLARING IN PORT HARCOURT AND WARRI (1991-1994)

YEAR	FLARED GAS (MILLION M³/YEAR PORT HARCOURT (RIVERS STATE)	WARRI (DELTA STATE
1991	7072	-
1992	7439	-
1993	7139	3728
1994	6217	3925
AVERAGE	6967	3826

Source: Shell Petroleum Development Company

According to Table 4 above, a yearly average of 6967 million cubic metres and 3826 million cubic metres of gas was flared in Port Harcourt and Warri respectively within the four year period 1991 - 1994. The environmental and socio-economic impacts of gas flaring in Nigeria include atmospheric pollution by combustion contaminants, thermal pollution of the air, land and water, destruction of vegetation and wildlife, damage to buildings and other structures by acid rain and soil and crop damage by heat.

Table 5 FLARING OF NATURAL GAS IN MAJOR PRODUCING COUNTRIES (% OF GROSS PRODUCTION IN 1991)

USA	0.6	OPEC COUNTRIES	
Holland	0.0	Nigeria	76.0
Britain	4.3	Libya	21.0
Ex-USSR	1.5	Saudi Arabia	20.0
Mexico	5.0	Iran	19.0
		Algeria	4.0
		OPEC Total	18.0
		World Total	4.8

Source; Escravos staff Appraisal Report, 1993

Gas flaring increases global warming Nigeria flares more gas than any other country in the world. Table 5 shows that 76% of gross production of gas by Nigeria is flared. In 1989 alone. Nigeria flared 617 million cubic feet of associated gas and in the process released about 30 million tons of Co In 1994, the total Co emission from gas flaring in Nigeria rose to 35 million tons (World Bank. 1995)

(b) **Industrial Emissions**

Industries produce localised pollution of the air in Nigeria. For instance, cement industries in Calabar, Warri, Port Harcourt and Kaduna emit multiple pollutants while steel works in Aladja, Asaba and Sapele emit sulphur dioxide.

TABLE 6 ESTIMATED AIR EMISSIONS FROM INDUSTRIES IN PORT HARCOURT AREA

Total No.	Particulates Tons/year	Nitrogen Oxides tons/year	Nmvoc tons/year
41	10,496	779	152

Source: World Bank Report, No. 14266-UNI

TABLE 7 NIGERIA: CO_2, EMISSIONS FROM INDUSTRAL PROCESSES 1993 (000 METRIC TONS)

Solid	Liquid	Gas	Gas Flaring	Cement manufacture	Total	per capita Co_2 emissions (metric tons)
180	37,285	9,405	47,896	1,744	96,513	0.8

Source: World Bank Report, No. 14266 - UNI

Table 6 indicates that a total of 41 industries in Port Harcourt area emit 10,496 tons of particulates. 779 tons of nitrogen oxides and 152 tons of non-methane volatile organic carbons into the air yearly. Table 7 further indicates that in 1993, 96, 513 metric tons of Co was emitted from industrial process in Nigeria, giving per capita Co emissions of 0.8 metric tons.

Other industries emit fumes and gases which are hazardous to human and animal health for instance sulphur bring about respiratory illnesses while lead can cause mental disjunction and poisoning.

(c) **Industrial Waste**

Table 8 shows that, for instance, a total of 33 industrial enterprises discharge an estimated 127 tons of hazardous wastes and 13,617 tons of hazardous sludge yearly on the average in Port Harcourt area

Table 8 ESTIMATED WASTE GENERATION FROM INDUSTRIES IN PORT HARCOURT AREA

Total No. of Enterprises	Total Putrescible waste tons/yr	Total non-hazardous waste tons/yr	Total hazardous waste tons/yr	Total non-hazardous waste tons/yr	Total hazard waste tons/yr
33	6,495	1,796	127	990	13.617

Sources: World Bank Report, No. 14266-UNI.

Given the prevailing problems in the disposal of industrial wastes, the environment suffers degradation and deterioration , with attendant negative effect on societal well -being.

RECOMMENDATIONS

In the light of the consequence of environmental degradation on the Nigeria economy as well as the societal well being, the following recommendations are put forth to help find a way out of the tragedy into which we have put our once natural ecosystem.

(i) Ecology, climatology, geography, ecophysiology, soil science and other resource based disciplines must play greater roles in sustainable industrial research and development.

(ii) there is need for the strict enforcement of existing environmental protection regulations especially those pertaining to the production of hazardous wastes, Environmental Impact Assessment (EIA) and Land Use.

(iii) There is need for government as well as other non governmental organisations and international environmental agencies to enforce stricter policies aimed at making industrial ventures to internalise their negative externalities (waste products) which constitute cost to the society. this can be done by imposing tax per unit of waste product produced e.g hazardous gas emissions, gas flaring, production of hazardous chemicals and particulates. The enforcement of existing environmental regulations call for the establishment of environmental protection courts at all levels of government to convict and penalise offenders.

(iv) The environment needs to be monitored and protected from damage at all levels of governance (village, ward, local government, zone, state, region and nation). Nigerians must be re-oriented towards the consciousness of a stable environment through the integration of environmental issues and concepts into our popular culture.

(v) Our waste management must be commercialised at all tiers of government especially at the state and local government levels. Such commercialisation could be done using the "polluter-Pays-Principle' (PPP)

If industrialisation must achieve the goal of enhancing the quality of human life in Nigeria, we rest our submission by saying that the hazardous waste products of industrial activities must be minimised and internalised by the producer while environmental protection should be an integral part of our nations' industrialisation policy.

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