

SUSTAINABILITY OF THE ENVIRONMENT AND WATER POLLUTION IN NIGERIA: PROBLEMS, MANAGEMENT AND POLICY OPTIONS

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ABSTRACT

Severe environmental degradation appears to be threatening the long-term development prospects of countries all over the world, particularly the developing ones such as Nigeria. The paper reviews relevant literature and examines the process of environmental degradation via water pollution in Nigeria. While it notes that a careful management of water as a resource is essential for meeting a major demand created by accelerated urbanisation, industrialisation and agricultural development, it highlights loss of revenue and declining health-care as some of the economic implications.

The paper explores the possibility of applying economic instruments to mitigate environmental degradation, with particular reference to water pollution in Nigeria with a view to incorporating environmental costs in the decision-making process of producers and consumers.

The paper posits that water pollution control need to be supported by coordinated policy, adequate legal and institutional framework which are essential tools for sustainable development.

KEYWORDS: Sustainability, Environment, Degradation, Water Pollution, Economic Instruments

INTRODUCTION

Countries all over the world, particularly the developing ones, face severe environmental degradation that appears to be threatening their long-term development prospects. This is so because they rely upon the use of natural resources in their growth and development process. These natural resources are being used up in a manner that appears wasteful and, thereby, forecloses options for development in the future (Oyeranti, 2001). Interestingly, however, the issue of the protection of the environment became a topical debate in Rio de Janeiro, Brazil in June 1992. The World Bank estimates that more than a million people in Sub-Saharan Africa still live in acute poverty and suffer grossly inadequate access to resources required to give them opportunity for economic development. The immediate struggle for basic survival by the poor in various countries undermines the legitimate concerns of environmental protection and leads to consequent pressure on the environment, with attendant pervasive degradations (Hisham, 1993).

Recently, the concern for the environment was re-echoed at the World Earth Summit in Johannesburg, South Africa in August, 2002. As part of the output of the Summit, a blue-print tagged: "The Johannesburg Plan of Action" was adopted. The document prescribed actions for tackling identified social, economic, political and environmental problems. The Action Plan contains among others, a commitment to halve the proportion of people without access to safe drinking water and sanitation worldwide by the year 2015; the same year targeted by leaders at the United Nations Millennium Summit to reduce by half, the number of people living in poverty (Adenuga, 1999).

One important consensus in the literature to date is that, environmental problems – misuse of natural resources and pollution – are rooted in the divergence between scarcity and price, benefits and costs, rights and responsibilities, as well as actions and consequences. This divergence exists because of a combination of market and policy failures that work together and/or independently to encourage a development type that is not sustainable. As soon as environment assumes the character of scarce resources, it suggests that its deterioration

constitutes an economic problem (Hueting, 1980). The need to guard against likely threat arising from future scarcity of environmental resources, following their overexploitation and depletion justifies the preservation of these resources. From the point of view of economics, scarcity of environmental resources will negatively affect three principal functions namely: resource/supplier; life support system; and waste assimilator.

Environmental degradation in form of water pollution is essentially an economic problem, more so that it is a by-product of production and/consumption activities. The resulting environmental ills pose extreme health hazards and loss of income for the growing numbers of people exposed to them. Such conditions threaten to precipitate epidemics and national health crises. In order to meet the expanding need of her citizens, environmental devastation through pollution of water must be halted and the productivity of existing resources so as to benefit more people.

Most developing countries lack essential information for the effective planning, development and management of water resources. Many countries do not have well-articulated goals, objectives and policies to project a long-term resource development and management. Environmental objectives are not defined in required details to guide project planners. Hence, resource control in support of investment decisions cannot be formulated with relative clarity.

The objective of this paper is to explore the role of economic instruments in mitigating water pollution in Nigeria with a view to incorporating environmental costs in the decision-making process of producers and consumers. This would ultimately reverse the tendency to treat the environment as "free goods" and encourage sustainability. Following this introduction as part one, the paper is further divided into four parts. Part two examines what constitutes the environment, reviews theoretical background and relevant literature. Part three discusses environmental degradation, institutional framework and protection policy in Nigeria while Part four analyses economic instruments as tools for environmental management. Part five enumerates some policy options to address water pollution in Nigeria and ends with some concluding remarks.

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DEFINITION, THEORETICAL BACKGROUND AND LITERATURE REVIEW

DEFINITION

Section 38 of the Federal Environmental Protection Agency Act 5 defines environment as: "(including) water, air, land and all plants, beings or animals living therein and the inter-relationships which exist among these or any of them".

This, in essence, indicates that life depends on the environment.

Environmental destruction results essentially in pollution in all its ramifications. Some apparently innocuous activities of man also contribute to the problem – domestic refuse disposed carelessly about residential areas, including aerosol cans of cosmetics and insecticides, discharge of emissions of vehicles, industrial fumes and other effluents into the atmosphere, construction of structures without appropriate authorisation and/or compliance with health regulations, etc. Seldom is the damage viewed in terms of aesthetics of the environment, as where a neighbourhood that should consist of low-density residential buildings of certain specifications, orientation, façade, set back and plot ratio, suddenly becomes a jungle that is an environmentalist's nightmare. These bits and pieces then come together to cause grave environmental problems for the entire country. What then is pollution? According to the World Health Organisation in 1974,

"the environment is considered polluted when it is altered in composition or condition directly or indirectly as a result of activities of man so that it becomes less suitable for some or all of the uses for which it would be suitable in its natural state".

The FEPA Act⁶ also defines pollution to mean:

"man-made or man-aided alteration of chemical, physical or biological quality of the environment to the extent that is detrimental to that environment or beyond acceptable limits and 'pollutants' shall be construed accordingly".

Any undesirable change in the natural characteristics of any state of matter is, therefore, pollution or damage.

Man depends on resources in his immediate vicinity for sustenance. As growth in the number of people who demand goods and services rise, so also is the increasing knowledge and technology that makes it possible, including industrial production and trade. This leads to new factories and chemical plants, new sources of resource depletion and pollution. Also growing is the amount of leisure time that people have and spend in fast-growing tourism industry. People have more time and opportunity to encroach upon countryside and beaches, often times, polluting land, air and water, as well as jeopardising plant and animal life in the process. This rather selfish exploitation of natural resources makes the future of world youths and the unborn generation very bleak. Indeed, the old view that development must necessarily be accompanied by resource depletion has given way to the modern view that development should be undertaken without destruction. Mankind has also come to realise that the environment belongs to all generations, present and future.

Theoretical Background and Literature Review

Environmental problems became prominent in economics literature only in the second half of the 1900s.⁷ Prior to that time, Marshall (1890) was the first to analyse environmental degradation by introducing the concept of "external economies". He focused mainly on the benefits that accrue to economic entities through industrial development. The concept contains the key to economic analysis of environmental problems.

Pigou(1920) notes that the concept of externalities "is a double-edged sword" containing not only benefits as

Ricardo(1817) had conjectured, but costs as well. As an example of negative externalities, Pigou "uses" the case of woodlands damaged by sparks from railway engines. He noted that not only could the production conditions of third parties be influenced outside the market, but that the welfare of private persons could also be seriously affected both in costs and in benefit terms.

Externalities can be defined as uncompensated costs or benefits of resource utilization that are borne (or enjoyed, as the case may be) by someone other than the user (Perrings et al 1992). Also, it can be described as the activities of an entity (an individual or a group of individuals) that produce negative or positive effects either on the physical environment or human life without compensation. Externalities are also called "side effects, spill-over effects, secondary effects, and external economies/diseconomies" (Kula, 1992). Externalities occur when economic units, such as governments, organizations, groups and individuals, activities affects the production or consumption of mother units, and where the benefits or costs that accrue to these units do not normally enter into the gain or loss calculations. In other words, although these effects are noticed, they are not usually addressed; hence the bearers are normally uncompensated in the "private market environment". If externalities are priced and the bearers compensated, then they are said to be internalized. Bator (1958) argues that externalities constitute "a mere market failure". Baumol and Oates (1975) observe that market failure, however, is a broad issue that occurs in different areas of economics. They favour the approach that defines externalities in terms of what they do and not in terms of what they are. That means they violate the conditions for optimum allocation of resources in an economy.

Kula (1992:151) identifies private and public externalities. Private externality is typically bilateral, or involves relatively few individuals. In this case, one agent's action affects the action of another agent, but there is no spill-over on other parties. The key characteristic of a private externality is that the external effect must be fully appropriated by the agents involved. A public externality arises when a natural resource is used without payment and its use by one agent does normally reduce the quantity available to others. Water pollution is an example of this kind of externality. In recent time, social scientists have begun to show concern with the existence of, and distinction between, private and public externalities. He observes that the first substantial analysis of externalities was provided by Kapp (1950) who anticipated the far-reaching adverse consequences of economic growth on the environment. The social cost, which is defined as direct and indirect burdens imposed on third parties or the general public by the participants in economic activities, is the central theme in Kapp's analysis. Most costs emanating from productive processes that are passed to the outsiders by way of air and water pollution, harm health, reduce agricultural yield, accelerate corrosion of materials, endanger aquatic life forms, flora and fauna, and creates problems in the preparation of drinking water.

In a competitive world, price system is used to allocate scarce resources efficiently and to decide which goods and services shall be produced, at what prices, costs and profits. In order to reduce pollution, the way commodities are produced should be part of a price mechanism to resolving environmental problems. Cleaning up the environment is a cost which involves scarce resources such as land, air and water, and should therefore enter the cost structure of goods and services.

It has, however, been shown in the economic literature that government failure could also promote environmental externalities. This is because government failure could be manifested in the implementation of inappropriate policies,

ignorance of the effects of policies, incomplete information, etc. (Iyoha, 2000). Market and government failures lead to excessive use of environmental resources, which, consequently, result in degradation with negative economic, social, health and ecological effects. For instance, where natural resources are regarded as public goods or where property rights are not well defined, economic agents usually make excessive use of it. Similarly, the impact of government policy on the environment has been well elucidated in economic literature. Thus, the case of the negative effects of the structural adjustment programme on the environment has also been documented (Poloamina, 1996).

ENVIRONMENTAL DEGRADATION AND PROTECTION POLICY IN NIGERIA

Environmental Degradation through Water Pollution in Nigeria

The earth planet consists of water and it is the abundance of this unique liquid that has made life possible. Water has numerous physical, chemical and biological uses, and it could be used most efficiently when it is in its purest form. This purity, however, is threatened by human activities. In order to avert this trend, several countries instituted minimum water quality standards. Nigeria has not been left behind in this process. The problems of water pollution are enormous. Nigeria has about 5,000 registered industrial facilities and some 10,000 small scale industries operating illegally within residential premises. In places like Kano, Kaduna, Lagos and Port Harcourt, coloured, hot and heavy metal-laden effluents especially from the textile, tannery and paints industries are discharged directly into open drains and water channels,

constituting direct dangers to water users and biota downstream. Also disturbing is the practice whereby some industrial facilities bury their expired and hazardous chemical wastes in their backyard threatening the ground water quality⁸. Water quality standards are not lacking in the country, but despite these, the pollution and degradation of water quality continue unabated due to discharge of untreated effluent from industries, sewers, non protection of water sheds, hydrocarbon contamination of ground water, saline intrusion of ground water and irresponsible mining activities to name a few. This is aggravated by the reckless and unregulated drilling of ground water. The contamination contributes greatly to the spread of infectious diseases. It has been estimated that waterborne pathogens that contribute to typhoid, cholera, amoebic infections, bacillary dysentery, and diarrhea account for 80% of all diseases in developing countries and at least responsible for up to 90% of the 13 million child deaths each year. These trends have to be arrested to ensure sufficient quality water and high standard of living.

The long-term economic and social development of any country requires the effective management and use of its natural resources. A careful management of water as a resource is essential for meeting a major demand created by accelerated urbanisation, industrialisation and agricultural development. Water management policies supported by adequate legal and institutional framework are essential tools for the sustainable development and control of the pollution effect on the environment. Water pollution through sewage leakage, industrial waste, toxic municipal waters, gas flaring and oil spills among others, require proper control at the local, state, national and global levels for a sustainable development. Table 1 below summarises the principal health and productivity consequences of water pollution.

Table 1: Principal Health and Productivity Consequences of Water Pollution

Environmental Problem	Effect on Health	Effect on Productivity
Water pollution and water scarcity	More than 2 million deaths and billions of illnesses such as typhoid, cholera, river blindness and guinea worm are attributable to water pollution a year: poor household hygiene and added health risks caused by water scarcity.	Declining fisheries; rural household time and municipal costs of providing safe water; aquifer depletion leading to irreversible compaction; constraint on economic activity because of water shortages. Reduction in revenue and greater production costs.
Solid and hazardous wastes	Diseases spread by rotting garbage and blocked drains; risks from hazardous wastes typically local but often acute. Contamination of sea food lead to the outbreak of hepatitis A.	Pollution of groundwater resources.

Source: World Development Report, 1992: Development and the Environment (New York: Oxford University Press). Moreover, the Nigerian ecosystem has been degraded by oil spills, gas flaring and sundry activities deriving from oil exploration, production and processing as experienced in the Niger Delta area of Nigeria. Oil spillage is a major and frequent hazard to the economy of the Niger Delta. Conservative estimates put the number of spillage incidents in the oil producing areas between 1970 and 1995 at two thousand nine hundred and seven (2,907)⁹. Available data for 1998 and 1999 depicts the incidents of oil spillage in Nigeria as shown in table 2. The table further shows that the number and volume of oil spills have increased in recent times.

Oil spillage often destroys farm crops and farmlands, aquatic life as well as the flora and fauna of the entire region. Farmers and fishermen in the region depend essentially upon their land and water resources for their sustenance; destruction by oil spillage often spells doom to the people. Apart from their economic mainstay that is badly affected, the health of the inhabitants of the area also tends to plummet because once polluted food is contaminated, including drinking water, the consumers contact various diseases that sometimes lead to

death. In most cases, those who suffer loss from these oil production activities are not usually adequately compensated or not compensated at all. The result of this nonchalant attitude of the oil producers and government have led to frequent agitations by irate youths, unending chaos, riot or anarchy, which is being witnessed over the years in the Niger Delta area. Another major problem associated with oil production is gas flaring, a major effect of which is acid rains, polluted river,

Table 2: Oil Spillages in Nigeria (1998 and 1999)

Month	No of Oil Spills	Volume of Oil Spilled (Barrels)		Operators Involved	
		1998	1999	1998	1999
January	5	-	40,415	-	Shell, Mobil & Others
February	1	13	-	18.4	Chevron
March	7	31	25,000	87.5	Shell
April	-	10	-	331.4	-
May	5	19	72 (Shell)	111.0	Shell & Mobil
June	15	10	306.5	10.0	Shell, Chevron, Agip & Mobil
July	14	-	4,534.2	-	Shell, Chevron & ELF
August	24	-	1,127.8	-	Shell, Chevron, ELF & Agip
September	25	-	652.2	-	Shell, Chevron, Agip, Mobil & ELF
October	4	-	1,050	-	Shell & Agip
November	-	-	-	-	-
December	12	-	1,865	-	Shell, Chevron, Mobil & Agip

Source: The Nigerian Petroleum News, 1998 and 1999 (various monthly issues).

- *Indicates that the quantity of spills for the operator was not reported.
- Shell recorded the highest number of cases in nearly all the months.
- Apart from April, 1998 when the spills occurred as a result of export hose failure; other spills were caused by equipment failure.

streams, etc., which destroys all forms of life and rapidly corrodes galvanized steel roofing sheets. The economic costs in terms of lost incomes and reduction in the standard of living can therefore, be expected to be staggering. According to the NNPC (2003), "a greater proportion of the gas produced in Nigeria is flared" as reflected in Table 3. For example, from 1970 to 1980, gas flared ranged from 91.2% to 99.0%. By

2002 and 2003, gas flared remained as high as 45.4% and 42.7% while gas utilized was 54.6% and 57.3%, respectively.

Apart from being an economic waste, flaring is hazardous to health, because the gas emitted into the atmosphere combines freely with other gases to produce concentrations such as nitrogen dioxide (NO₂), sulphur dioxide (SO₂), carbon dioxide (CO₂) or carbon monoxide which may be fatal to life.

Table 3: Gas Production, Utilization and Flaring in Nigeria (Million Cubic Metres)

Year	Production	Utilisation	(2) as a % of (1)	Flaring	(3) as a % of (1)
	(1)	(2)		(3)	
1970	8,039.0	72.0	0.9	7,957.0	99.0
1971	12,975.0	185.0	1.4	12,790.0	98.6
1972	17,122.0	274.0	1.6	16,848.0	98.4
1973	21,882.0	395.0	1.8	21,487.0	98.2
1974	27,170.0	394.0	1.5	26,776.0	98.5
1975	18,656.0	323.0	1.7	18,333.0	98.3
1976	21,276.0	659.0	3.1	20,617.0	96.9
1977	21,924.0	972.0	4.4	20,952.0	95.6
1978	21,306.0	1,866.0	8.8	19,440.0	91.2
1979	27,619.0	1,546.0	5.6	26,073.0	94.4
1980	24,551.0	1,647.0	6.7	22,904.0	93.3
1981	17,113.0	2,951.0	17.2	14,162.0	82.8
1982	15,382.0	3,442.0	22.4	11,940.0	77.6
1983	15,192.0	3,244.0	21.4	11,948.0	78.6
1984	16,255.0	3,438.0	21.2	12,817.0	78.8
1985	18,569.0	3,723.0	20.0	14,846.0	80.0
1986	18,739.0	4,822.0	25.7	13,917.0	74.3
1987	17,085.0	4,794.0	28.1	12,291.0	71.9
1988	20,253.0	5,516.0	27.2	14,737.0	72.8
1989	25,053.0	6,323.0	25.2	18,730.0	74.8
1990	28,163.0	6,343.0	22.5	21,820.0	77.5
1991	31,587.0	7,000.0	22.2	24,588.0	77.8
1992	32,465.0	7,058.0	21.7	25,406.0	78.3
1993	33,444.0	7,536.2	22.5	25,908.0	77.5
1994	32,793.0	6,577.0	20.1	26,216.0	79.9
1995	32,980.0	6,910.0	21.0	26,070.0	79.0
1996	36,970.0	10,150.0	27.5	26,820.0	72.5
1997	36,754.0	10,207.0	27.8	26,547.8	72.2
1998	36,036.0	10,886.5	30.2	25,150.1	69.8
1999	36,156.0	12,664.6	35.0	23,491.8	64.1
2000	47,538.0	21,945.0	46.2	25,592.0	53.8
2001	57,529.0	29,639.7	51.5	27,890.3	48.5
2002	47,976.0	26,203.4	54.6	21,772.6	45.4
2003	53,379.0	30,580.0	57.3	22,799.0	42.7

Source: Nigerian National Petroleum Company (NNPC)

Other effects of oil operations, including refinery operations on the environment -- mainly associated with water are summarized in table 4.

Table 4: Potential Impacts of Oil Operations on the Environment

	Oil Operation	Potential Impact on the Environment
1.	Geological Survey Drilling	Disturbances of flora habitat. Accumulation of toxic materials from drilling materials. Oil pollution of the sea, beaches or land. Destruction of fisheries production. Destruction of breeding ground for some marine fishes. Alteration of the taste of fisheries. Killing of bottom dwellers. Pollution of underground water (waste pits).
2.	Production/Processing	Water pollution from long-term cumulative effects of produced water (with high salinity). Water pollution from salinity waste, used lubricating oil and solid waste.
3.	Tanker loading, location (onshore and offshore).	Water pollution from ballast and tank washing. Deck drainage, spillage during loading operation with its accompanying effects on the flora and fauna. Disruption of seabed by dredging.
4.	Storage Depot	Destruction of farmland for the establishment of storage depots, and water pollution from effluent water.
5.	Transportation	Disruption of the seabed by dredging for pipeline installation. Sedimentation along pipeline routes. Water pollution from consequences of leaks from fracturing or breaking of pipe caused by metal fatigue, trawlers and dredges or sea floor failures and sabotage. Erosion and flooding of the area drastically affected.

Source: Onwioduokit (1998).

Nigeria's Environmental Policy and Institutional Framework

Historical examination of industrial laws before 1969 reveals a startling absence of any form of statutory regulations aimed at protecting the environment from industrial pollution. The first bold attempt towards environmental protection law was taken in 1968 when Oil in Navigable Water Decree was promulgated, and followed in 1969, by the Petroleum Decree No.51. The 1969 decree specified that oil corporation should adopt all practical precaution... to prevent the pollution of inland water, rivers, water courses... by oil, and, or other fluids or substance which might contaminate the water, and should take prompt steps to control it. A close look at this regulation reveals fundamental loopholes. For example, the regulation did not take into account the onshore operations where oil spillage is likely to affect agricultural lands. Secondly, the decree was silent on the nature of compensation to be made to victims of such disaster. It is therefore left for the oil companies to determine what compensation to pay in the event of any pollution. The immediate implication of this is that oil companies can prefer to contaminate our waters if the cost of preventing it is higher than what they hope to pay as compensation. However, following the dumping of toxic waste in Koko, a seaport in Delta State, in 1988, the government swung into action to deal effectively with the problems of environmental degradation. One of the first steps taken was to promulgate the Harmful Waste (Special Criminal Provisions, etc), Decree 42 in November 1988. The decree prohibits the purchase, sale, importation, transit, transportation, and storage of harmful wastes in the country. Under the decree, the immunity from prosecution conferred on certain persons under the diplomatic immunity and privileges Act 1962 was removed.

The decree prescribes life imprisonment for those who contravene its provisions. This legal sanction was followed a month later by Decree No. 58 of 30th December, 1988 which established a body known as the Federal Environmental Protection Agency (FEPA). The functions of FEPA as spelt out by the decree, include:

- i. The responsibility for the protection and development of the environment in general, and environmental technology, including initiation of policy in relation to environmental research and technology;

- i. Advising the Federal Government on national environmental policies and priorities and/on scientific and technological activities affecting the environment;
- iii. Preparing periodic master plans for the development of environmental science and technology and advising the Federal Government on the financial requirements for the implementation of such plans;
- iv. Carrying out such other activities as are necessary or expedient for the full discharge of the functions of the agency.

For effective implementation of the above functions, Decree 58 of 1988 also allows FEPA to:

- i. Make grants to suitable authorities and bodies with similar functions for demonstration and for such other purposes as may be determined appropriate to further the purposes and objectives of FEPA;
- ii. Collect and make available, through publications and other appropriate means and in co-operation with public or private organisation, basic scientific data and other information pertaining to pollution and environmental protection matters;
- iii. Enter into contracts with public or private organisations and individuals to develop, utilize, co-ordinate and share environmental monitoring programmes, research efforts, basic data on chemical, physical and biological effects of various activities on the environment and other environmentally related activities as appropriate;
- iv. Establish such procedures for industrial or agricultural activities in order to minimize damage to the environment from such activities;
- v. Maintain a programme of technical assistance to bodies (public or private) concerning implementation of environmental criteria, guidelines, regulations and standard thereof;
- vi. Develop and promote such processes, methods, device and materials as may be useful or incidental in carrying out the purpose and provisions of the Decree.

The Decree also provides for the national environmental standards on water quality, effluent limitations, air quality and atmospheric protection, noise control, discharge of hazardous substances and related offences. Within the context of the Decree, FEPA is expected to Co-operate with the Ministry of

Petroleum Resources (Petroleum Resources Department) for the removal of oil-related pollutants' discharged into the Nigerian environment. The Decree also empowered FEPA to inspect, search, seize and arrest offenders. The Decree also provides for general penalties for individuals as well as for companies and firms found liable. Whereas an individual on conviction is liable to a fine not exceeding N20,000.00 or to imprisonment for a term not exceeding 2 years (or both), a corporate body found liable would pay a fine of not exceeding N500,000.00 and compensation commensurate with the breach thereof and restoration of the polluted area to an acceptable level as approved by the agency.

According to Aina (1992), FEPA's effort has resulted in the following:-

- i. The development of a national policy on the environment which was launched on 27th November, 1989;
- ii. The inauguration of a National Council on the Environment on the 27th November, 1989. Part of the Council's responsibilities are to evolve effective solutions to halt further degradation of our environment at local, state and national levels, and also map out an action plan for the attainment of sustainable development in the country;
- iii. The establishment of zonal offices in Kano, Kaduna, Port Harcourt, Benin and Lagos. These zonal offices are involved in the characterization of industrial effluent and collection of baseline environmental data as an initial step towards the determination of the state of the environment in the respective states;
- iv. The establishment of National Environmental bodies;
- v. The establishment of a National Environmental Laboratory complex at Surulere on 5th October, 1990. The Laboratory is made up of six specialized units in the area of water and waste water units; analytical instrument units, toxic chemical unit, air and soil unit, biological unit and general purpose unit, including bioassay techniques; and
- vi. The publication of documents providing guidelines and standards for environmental pollution control in Nigeria. This is in compliance with the mandate of the Statutory Decree, which requires FEPA to establish environmental guidelines and standards for the abatement and control of all forms of pollution.

This publication has become the instrument for monitoring and enforcing standards for the control of industrial and urban pollution problems in the nation. So far, it is clear that the FEPA objectives include sustenance of the quality of environment, conservation of natural resources and promotion of awareness on the need for environmental protection. Besides, the compilation of environmental base line data in 1990, the agency formulated guidelines and standards on pollution control as well as began public awareness seminars, monitored water quality and ensured radiation protection for medical workers. The Bale Convention on the control of trans-boundary movements of hazardous wastes and their disposal was also signed during this period (CBN 1990). The implication of the environmental protection policy aimed at monitoring and sustaining the quality and safety of the nation's environment was contained in this report. In addition to the launching of the National Guidelines and Standards for Environmental Pollution Control, two new regulations were also signed into law. These are:

- i. The National Environmental Effluent Limitation Regulations (1991), which makes installation of anti-pollution equipment mandatory for industrial establishments; and
- ii. The Pollution Abatement Industries and Facilities Generating Waste Regulations (1991), which provides details of acceptable pollution limits.

By collaborating with some non-governmental organisations through seminars, the agency has intensified its public enlightenment campaigns aimed at informing citizens and industrialists on their rights and responsibilities for environmental protection (CBN 1994). In 1993, major environmental degradation continued, particularly with regard to poor industrial/domestic waste disposal, alarming incidence of pollution arising from petroleum exploration, refining and accidental discharge of crude petroleum and gas flares. All these environmental abuses persisted despite the Environmental Impact Assessment Decree No. 88 of 1992, which made studies mandatory for agriculture, airports construction, drainage and irrigation schemes, land reclamation, fisheries, forestry, industry, infrastructure, mining, petroleum related activities, power generation and transmission, quarries, railways, transportation, resort and recreational development, waste treatment and disposal and water supply schemes (FEPA, 1992).

However, in 1994, eight projects were assessed, including EIA technical and procedural guidelines for oil, gas, agricultural and mining sectors, respectively. In order to minimize the hazard posed to environment by indiscriminate dumping of refuse, especially in urban areas, task forces were set up at various local government levels for regular evaluation and disposal of refuse. During this period, fifteen alerts on toxic chemicals were responded to and 31,689,013 metric tons of consignments were inspected and confirmed to be in compliance with FEPA hazardous waste management regulations. A total of 97.7 metric tons of hazardous chemical and recycled wastes were intercepted by FEPA while conducting industrial compliance monitoring. Four compliance monitoring units were created and 73 industrial inspections were carried out nationwide (CBN 1994).

In spite of these efforts aimed at defining useful and effective instruments for controlling the adverse effects of man's economic activities on his natural environment, degradation of the environment has persisted in Nigeria. Government seems to recognise that Nigeria could not sustain further movement on the country's current perilous path of widespread environmental degradation and wanton depletion of resources. In May, 1999, FEPA was transformed into the Ministry of Environment, thus incorporating other Agencies and Federal Departments whose functions involve the protection of the environment. The Ministry now oversees all matters that affect the protection of the environment. Similarly, the State Environmental Protection Agencies have been changed to State Ministries of Environment. There has also been improved participation of the private sector and other stakeholders in the control of environmental pollution. Consequently, environmental considerations in national economic development could be considered mandatory. From the discussion so far, there are various dimensions of the negative effects of oil operations in Nigeria, the issues then are: how do we minimize these negative effects? How do we make the oil-producing firms to internalize these costs? What economic instruments are available for this purpose?. These issues are addressed in the next section.

Economic Instruments as Tools of Environmental Management

Social costs of the negative effects on the environment could be internalised either by regulation, payments of subsidies, charges, fees or fine. More importantly, the use of market-based or economic instruments (EIs) should be encouraged.

Economic instruments provide market signals in the form of a modification of relative prices (e.g., taxation on certain products) and/or a financial transfer (e.g., payment of a charge). The important feature of this approach is that it provides avenue for freedom of choice to economic agents such that a polluter can decide to pay the charge or concentrate on pollution control. This approach is based on two policy instruments – taxes and establishment of markets in property rights and permits. EIs provide the incentive and greater flexibility required to adopt more efficient ways of extracting environmental resources and releasing undesirable pollutants, than under command and control (CAC).

The CAC approach to environmental management succeeds where the wherewithal to combine technical skills, effective administrative infrastructure for monitoring and enforcement is

available. The CAC involves the setting up of rigid input and product standards, as well as input and product bans without sufficient consideration for the costs involved. CAC relies more often on a system of specific administrative rules and regulations. The major challenge is the high administrative cost of enforcing these regulations, particularly in economies where enforcement and monitoring infrastructure is weak, or law abiding and enforcement is yet to take root. With this situation, the basic efficiency criterion which ensures that costs are shared equitably across all producers in the economy is usually not satisfied.

Oyeranti (2001) observes that a developing country, like Nigeria, CAC has not been cost-effective in meeting the desired goals and objectives, and notes that the use of market-based economic incentives are increasingly becoming acceptable among developing countries such as India. Eskeland and Emmanuel (1991), Levinson and Sudhir (1992) developed taxonomy of policy instruments employed in the management of natural resources. These are summarized in tables 5 and 6 below.

Table 5: Classifications of Policy Instruments

	Direct Instruments	Indirect Instruments
Market-based incentives (MBIs)	Effluent charges, tradable permits, deposit refund system	Input/output taxes and subsidies to substitutes and to abatement inputs
Command and Control: CAC	Emission regulation (source specific, non-transferable quotas)	Regulation of equipment, process, input and output
Government production or expenditures	Purification, clean-up, waste disposal, enforcement and agency expenditures	Technological development

Note: A direct instrument is addressing the level of damages or emissions directly, whereas indirect instrument work via other variables.

Source: Eskeland and Emmanuel (1991), p. 3

Table 6: Alternative Policies to Reduce Pollution

		Price	Quantity	Technology
Incentive	Direct	Emissions tax	Tradable emission permits	Technology tax on presumed emissions
	Indirect	Fuel tax	Tradable production permits	Subsidised R & D & fuel efficiency
Non-incentive	Direct	---	Emissions standards	Technical standards
	Indirect	---	Product standards, bans, quotas	Efficiency standards

Source: Levinson and Sudhir (1992), p. 4

Essentially, the economic instruments approach incorporates prices and market fundamentals to the management of environmental resources in order to reflect the true scarcity and the opportunity cost of their uses. As users would be made to pay to use resources, expectedly, such payments would compel them to economise on their use. EIs provide opportunity for firms to continue to identify ways to improve and reduce pollution, leading to pressure of adopting improved technology.

Meanwhile, Panayotou (1991) argues that before these EIs are applied, three sets of policy reforms are required.

1. reduction and eventual elimination of policies (taxes, subsidies, quotas, and public projects) that distort well-functioning markets or exacerbate market failures;
2. correction or mitigation of market failures such as insecure or absent property rights, unpriced resources, externalities through interventions that improve the functioning of the market or result in outcomes superior to those of the free market;
3. consideration and internalization of environmental, social and other side effects of public projects and sectoral and macroeconomic policies.

Hanley et al (1997) categorises EIs into three – price rationing, quantity rationing and liability rules. Price rationing increases the costs of shrinking by setting a charge, tax or subsidy on producer behaviour or products. Emission or effluent charges are the most commonly discussed form of price rationing. Quantity rationing, as an economic incentive, sets the acceptable level of pollution by allocating marketable permits that provide as an incentive to producers with low pollution control costs to reduce pollution and sell their excess permits to producers with high control costs. Liability rules set up a socially acceptable benchmark of behaviour such that, if a producer violates this benchmark, he suffers some financial consequence. Non-compliance fees, deposit-refund schemes and performance bonds represent alternative rules.

From arguments in the literature, preference seems to be given to EIs over CAC mechanisms at least from two perspectives. First, is in terms of advantages and the second is precisely the relevance of these instruments in environmental management. The following arguments were in favour of EIs by Panayotou (1991), and Openshaw and Charles (1989).

- i. They achieve the desired objective of environmental protection and/or conservation at the least cost possible, which is vital to developing countries with limited resources and in dire need to maintain competitiveness in the world market. This suggests that EIs guarantee cost effectiveness;
- ii. They are easier to enforce, which is equally important for countries with limited enforcement capacity;
- iii. EIs present fewer opportunities for rent-seeking behaviours than regulations and, therefore, are more likely to be both more effective and more equitable;
- iv. EIs generate revenues that should be welcome by countries facing tight budgetary deficits; and
- v. They ensure that environmental resources will be optimally exploited, particularly given their vulnerability to market and policy failures.

Indeed, it is noteworthy to mention that EIs do have some limitations. One major shortcoming of EIs is the difficulty in devising and/or applying efficient rates that would guarantee the achievement of its objectives whenever taxes and charges are to be used. For Nigeria, arriving at efficient rates is likely to be made difficult owing to the prevalence of institutional, technical and sometimes, political constraints. Problems such as lack of knowledge of abatement cost functions, difficulty in monitoring emissions and adapting rates to geographical conditions, as well as failure to adjust inflation in the rates that are being charged are issues that should be taken seriously.

Other perspectives include inadequate legal system to back up a regime of fines, thereby making collection of taxes problematic, which is a widespread phenomenon in developing countries. The political issues are closely associated to distributive implications of environmental taxes and charges, particularly when rates have regressive impacts on the low-income groups. Unfortunately, low-income population is likely to be more vulnerable to increase in prices of basic commodities, which are often produced from direct consumption of environmental resources.

From the foregoing, it indicates that EIs though highly useful and reliable to induce environmental quality as well as affects consumption of environmental resources in a manner that is

consistent with sustainable development, they will be effective only if regulations and institutions to carry out the instruments are very efficient.

POLICY OPTIONS AND CONCLUSION

Policy Options

Against the backdrop of the analysis above, the following policy options are proposed to ameliorate water pollution and make Nigeria's environment healthier and better:

1. Provision of stable macroeconomic policies, adequate legal and institutional frameworks is essential.
2. There may be need to reform and achieve a proper resource pricing policy, that meets efficiency criterion.
3. Incentives to enhance the purchase of pollution control equipment, such as reduced excise taxes, accelerated depreciation allowance, reduced customs duty, and soft loans and grants for financing pollution control activities, should be introduced.
4. Data collection, analysis and dissemination should be a well entrenched, and a smooth functioning activity of every tier of government with a common environmental data centre for achieving a high degree of standardisation.
5. The use of market-based or economic instruments for ameliorating the negative environmental impact should be encouraged in view of their various merits over direct regulations and other methods of solving the problems of negative externalities. However, there would be need for adequate monitoring and assessment of effectiveness on a regular basis.
6. The link between environmental infrastructure and private investment needs should be adequately addressed. Environmental Impact Assessment (EIA) guidelines should be further emphasized and monitored for investors. Similarly, project approvals by lending institutions should be contingent upon the EIA outcomes.
7. A set of comprehensive goals, objectives and policies pertaining to long-term water resources development should be developed. These should be detailed in the areas of: social well being; environmental quality; national economic development; and international dimensions.
8. There is need for the Federal Government to apply the political will to address problems emanating from water pollution which could be the first step to reversing environmental degradation.
9. The office of the Attorney-General of the Federation and Inspector General of Police who are responsible for prosecution should give more attention to environmental offences, particularly those relating to water pollution.
10. There should be an effective enlightenment campaigns in the states and local governments on how to keep the environment free from pollution and degradation.
11. The strategies for enhancing development initiative towards exploiting environmental challenges and managing the environmental problems should form a comprehensive package of policy perspectives in Nigeria.
12. Programmes to improve environmental conditions are likely to be most effective when they work in tandem with community networks, ensuring that programme design is consistent with both local and national

objectives. The experience of development agencies has demonstrated that grassroots efforts can be more cost-effective because they generally involve the use of low-cost alternatives and provide jobs to local populations.

CONCLUSION

Evidence from the paper has shown that development activities by man in any form could impoverish the environment, particularly through water pollution, if properly articulated resource management plans are not developed.

The future of Nigeria's environment requires strategies to respond to challenges created through water pollution and to curtail their implications for development. Such strategies could include how to manage demographic pressures, implement sustainable methods of chemical, waste and water management efficiently. Also, considering the cross-sectoral nature of environmental issues, an integrated approach using extensive policy dialogue might be useful. The approach should incorporate environmental considerations at an early stage in development planning programmes and projects.

Finally, we advocate for the effective adoption of economic instruments to complement strict regulations in the form of command and control system, particularly for developing economies like Nigeria where enforcement and monitoring abilities are still evolving. It is only when these environmental problems, abuses and challenges are part of the comprehensive planning and development policies that the environment will be made conducive, comfortable, and habitable for Nigerian citizens.

REFERENCES

- Adenuga, A. O., 1999. "Petroleum Industry and Environmental Protection: The Nigerian Experience", *Bullion: Publication of the Central Bank of Nigeria*. Volume 23, No.4, October/December.
- Adeyuyi, A. O., 2001. "The Implications of Crude Oil Exploitation and Export on the Environment and Level of Economic Growth and Development in Nigeria". *Proceedings of the Nigerian Economic Society*.
- Aina, E. A. O., 1992. "Keynote Address: Nigeria's Environmental Balance Sheets", In Aina, E. A. O. and N. O. Adedipe (eds.) *Environmental Consciousness for Nigerian National Development (Monograph 3)*. Lagos: Federal Environmental Protection Agency.
- Ajomo, M. A., 1994. "An Examination of Federal Environment Laws in Nigeria", *Environmental Law and Sustainable in Nigeria*,
- Ajomo, M. A. and Omobolaji Adewale (Eds.), *NIALS Conference Series No.5*.
- Akande, J. O., 1994. "An Examination of Federal Environment Laws in Nigeria", *Environment Law and Sustainable in Nigeria*,
- Ajomo, M. A. and Omobolaji Adewale (Eds.), *NIALS Conference, Series No.5*.
- Arunsi, S. I., 1993. "The Impacts of Development Activities on the Nigerian Environment", *Proceedings of the Nigerian Statistical Association*, Uyo, Akwa Ibom State.
- Bator, M. F., 1958. "The Anatomy of Market Failure". *Quarterly Journal of Economics*, 72, pp. 351-379.
- Baumol, W. J. and W. Oates., 1975. *The Theory of Environmental Policy*. Prentice-Hall, Engle-Wood Cliffs, New Jersey.
- Edwards, K. A. et al., 1983. "The Water Resource in Tropical Africa and its Exploitation", *International Livestock Centre for Africa (ILCA) Report No.6*. PP.53-54.
- Eskeland, G. S. and J. Emmanuel., 1991. "Choosing Policy Instruments for Pollution Control". *Working Paper Series 624*. The World Bank, Washington, D. C.
- Guardian., 2002. "Delegates Differ on World Summit's Success", September 6.
- Hanley, et al., 1997. *Environmental Economics in Theory and Practice*. Oxford University Press, New York.
- Hisham, M. M., 1993. "Development of the Environment and the Environment for Development", *Organisation of Petroleum Exporting Countries (OPEC) Bulletin*, February, p. 6.
- Huetting, R., 1980 "New Scarcity and Economic Growth: More Welfare through Less Production?" North-Holland, Amsterdam.
- Iwayemi, A., 1992. Economic and the Challenge of Environmental Change in Nigeria: A Policy Research Agenda". Paper presented in the Department of Economics, University of Ibadan, March 8.
- Iyoha, M. A., 2000. "The Environmental Effects of Oil Industry Activities on the Nigerian Economy: A Theoretical". A commissioned paper presented at the National Conference on Management of Petroleum and Energy Resources for Sustainable Development in the Niger Delta in the 21st Century, held in Delta State University, Abraka, September.
- Job, S., 1993. Statistics of the Environment: Concepts and Methods, Proceedings of the Nigerian Statistical Association, Uyo, Akwa Ibom State.
- Kula, E., 1992. Economics of Natural Resources and the Environment. Chapman and Hall, London.
- Kapp, K. W., 1950. The Social Cost of Private Enterprise. Cambridge University Press, Cambridge.

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- Levinson, A. and S. Sudhir., 1992. Efficient Environmental Regulation: Case Studies of Urban Air Pollution in Los Angeles, Mexico City, Cubato and Ankara". Working Paper Series 942. The World Bank, Washington, D. C.
- Marshall, A., 1890. Principles of Economics. Macmillan Press, London.
- Ogunsanwo, B., 1994. Liability and Compensation for Environmental Damage", Environment Law and Sustainability in Nigeria, Ajomo, M. A. and Omobolaji Adewale (eds.). *NIALS Conference, Series No.5*.
- Ojo, M. O., 1991. The Effectiveness of Agricultural Policies on Nigeria's Economic Development. In: *The Nigerian Economy at the Crossroads: Policies and their Effectiveness*. Ndebbio, J. E. U. and A. H. Ekpo, eds. Calabar.
- Onwioduokit, E. A., 1998. An Alternative Approach to Efficient Pollution Control in Nigeria. In: *Current Issues in Nigeria Environment*. Oshuntokun, Akinjide, eds. Davidson Press, University of Ibadan.
- Openshaw, K. and F. Charles., 1989. Fuel wood Stumpage: Financing Renewable Energy for the World's Other Half. Working Paper Series 270, The World Bank, Washington, D. C.
- Oyeranti, O. A., 2001. Economics and Management of Environmental Resources: Theory and Policy Issues. Proceedings of the Nigerian Economic Society.
- Panayotou, T., 1991. Economic Incentives in Environmental Management and the Relevance to Developing Countries. In: *Sous la Direction De (OECD), Environmental Management in Developing Countries*. Development Centre of the Organisation for Economic Cooperation and Development, Paris.
- Perrings et al., 1992. The Ecology and Economics of Biological Diversity: Elements of a Research Agenda. *Beijing Discussion Paper Series*. E International Institute of Ecological Economics.
- Pigou, A., 1920. *Income*. Macmillan Press, London.
- Poloamina, I. D., 1996. Macroeconomic Policies and Environment". In: *Environmental Policy Plan*. Egbon, P. C. and Morvaridis, B. eds. *NCI* Ibadan.
- Ricardo, D., 1971. Principles of Political Economy and Taxation. Pelican Books, London.
- Todaro, M. P. and Smith, S. C., 2003. Economic Development. Eight Edition, Delhi: Pearson Education, Inc.
- Ukpak, N., 2001. Man, Development and the Environment: The Case of Nigeria. Proceedings of the Nigerian Economic Society.
- World Development Report., 1992. Development and Environment, The World Bank. Oxford University Press.