

## **Domestic Water Pollution among Local Communities in Nigeria ----Causes and Consequences**

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### **Abstract**

The paper focuses primarily on the causes, consequences and ways of mitigating the ongoing fresh water pollution problems among Nigerian communities. Adequate supply of safe and sanitised fresh water is an inevitable factor for human and economic development. Although the recent global attention focuses on how the current and foreseeable water crisis and associated consequences would be addressed, lack of education, low budgetary funding, inefficient government policies, corruption, drought and other anthropogenic factors are increasingly contributing to the pollution of domestic water in Nigeria. The homes, local markets, abattoirs, oil and agricultural activities are consistently severing the limited fresh water sources through disposal of harmful wastes. This led to the emergence of several diseases and heavy metals poisoning across the country. The only ways forward are the proper sanitary, awareness and waste management education, adequate funding of water resources and health sectors, effective implementation of judicial measures and adoption of lessons from key developed countries like United Kingdom. A “collective” approach is required for successful implementations.

**Keywords:** Local communities, water, pollution, causes, mitigation, Nigeria.

## 1. Introduction

The significance of water to human and other biological systems cannot be over emphasised, and there are numerous scientific and economic facts that, water shortage or its pollution can cause severe decrease in productivity and deaths of living species (Garba et al., 2008; Garba et al., 2010). Reports by Food and Agricultural Organisation (WHO) of U.S.A revealed that in African countries, particularly Nigeria, water related diseases had been interfering with basic human development (FAO, 2007). The common sources of water that are available to local communities in Nigeria are fast being severed by a number of anthropogenic factors, of which pollution remain the most dominant problem. Water pollution occurs when unwanted materials with potentials to threaten human and other natural systems find their ways into rivers, lakes, wells, streams, boreholes or even reserved fresh water in homes and industries. The pollutants are usually pathogens, silt and suspended solid particles such as soils, sewage materials, disposed foods, cosmetics, automobile emissions, construction debris and eroded banks from rivers and other waterways. Some of these pollutants are decomposed by the action of micro-organisms through oxidation and other processes. The major problem is the reconcentrations of these harmful substances in natural food chain (Osuide, 1990). During the decomposition process, natural bacteria and protozoan in the water source utilise the oxygen dissolved in the water. This could significantly reduced the oxygen level to less than two parts per million (<2ppm), therefore the respiratory conditions of aquatic species would be seriously affected. Consequently, fishes, bottom-dwelling animals and even marine plants can be contaminated and/or killed, creating significant disruption in the food chain. On the other hand, when this contaminated water is directly consumed without proper treatment (a common practice to local communities), spread of diseases such as typhoid, dysentery, cholera, hepatitis e.t.c. will occur.

In Nigeria today research indicates that, majority of the common fresh water sources are polluted, resulting to serious outbreak of these and other diseases. A study by Umeh et al (2004) showed that 48% of the people in Katsina-Ala Local Government area of Benue state are affected by urinary *schistosomiasis*, due to increased in water pollution index. Some previous investigations indicate that 19% of the whole Nigerian population is affected, with some communities having up to 50% incidence. This has raised serious concerns to World Health Organisation, in an attempt to improve cultural and socio-economic standards of people in the tropical region (Okigbo, 1984; Umeh, 1989; Umeh et al., 2004). Recently, Olaoye and Onilude (2009) have documented varying levels of microbial contaminations in drinking water from western parts of the country. Total bacteria and coliform counts were found to be between 2.86 -4.45 and  $\leq 1.62$  log cfu/ml respectively. In addition to microbial infections, heavy metals poisoning through drinking water have also been documented. Nriagu et al. (1997) reported blood lead levels greater than 30  $\mu\text{g}/\text{dl}$  in children from Kaduna states. The elevated levels were linearly correlated with water and air contaminations by lead emissions. Garba et al. (2010) reported a mean arsenic concentration of 0.34 mg/l in drinking water from hand dug wells, boreholes and taps of Karaye Local Government area, Kano state. The arsenic levels are of serious concerns to regulatory agencies because they by far exceed the upper band (0.01 mg/l) recommended by WHO.

The major issues of national and international interest are how these water pollution problems could be fully assessed and mitigated, proper knowledge and planning are thus essential. This paper therefore explores the pollution of water in Nigerian societies. It gives emphasis to the various sources of pollution to domestic water, which is mostly accessible to local communities for their daily household applications. Associated consequences and the way forward had also been encompassed.

### 1.1. Fresh Water Sources in Nigeria

Although the demand for fresh water is fast increasing at a rate greater than the world's population growth, access to safe water supply is a serious issue across the globe. Recent statistic indicates that 1.2 and 2.4 billion people suffer from lack of safe water supply and secure sanitation respectively. In many developing countries, Nigeria in particular, more than half of the population is affected. Water

resources available in Nigeria can be broadly classified into fresh and marine water resources. The former constitute the fraction that should ideally be accessible to all communities. They comprise of water from lakes, hand dug wells, taps, boreholes, streams, rivers and their plains, wetlands and those available in underground reservoirs. Fresh waters represent the main sources of safe water for household, agricultural and even industrial applications. They are required for drinking, cooking, recreational activities, farming, fishing e.t.c, making them unavoidable for the evolution of society and civilisation (Orubu, 2006). However, in Nigeria today the fresh water sources available to the local inhabitants are either unsafe or difficult to obtain and are severely stressed by poor management (Figures 1-3). These make access to clean water a serious problem, in some instances women and children need to walk for hours to fetch ordinary drinking water. Our preliminary survey between 2007 and 2010 indicates that, there are many villages that have never seen the so called “treated tap water” in their communities. Despite the scarcity and the foreseeable global water crisis as previously warned by the United Nations, the available domestic water in the communities is increasingly polluted daily. The estimated 140 million people are continuously drinking water containing all kinds of germs, heavy metals, bacteria and dust particles capable enough to cause various diseases.

**Figure 1:** Tap water supply, Nigeria



**Figure 2:** Hand dug well water supply, Nigeria.



**Figure 3:** River water supply during dry season, Nigeria.

## 2. Causes of Water Pollution in Nigerian Communities

### 2.1. Home Based Water Pollution

A combination of the increasing population, the flat terrain, and lack of adequate sewage and waste disposal make many localities, potential health hazard areas for their inhabitants. Sanitary and sewage systems are poor, and where they exist, poorly managed. Several of the people do not care how they dispose of their trash, and it is not surprising there are serious pollution problems in the communities. The heavy rainfall, flat terrain, poor drainage (blocked drains due to trash dumps, built up of silt, etc) or lack of drainage system could lead to serious flooding problems even with minimal precipitation. In most houses, only toilet waste is discharged through a septic system and all other household liquids are discharged directly to storm drains where they exist or into the street. In addition, most houses lack indoor plumbing and adequate sources of potable water is limited. The unreliability of water supply from government-owned water board led some of the people to resort to drilling boreholes, or wells. Some buy water from water vendors in tanks. Those who could not afford these obtain their drinking water from shallow wells, less than 5m (16ft) deep. Some of these shallow well waters require treatment before meeting the WHO drinking water standard (Yusuf, 2007).

Lagos like any other coastal region in Nigeria stands the danger of salt-water intrusion. The coastal region of Nigeria consists of Benin and Delta basins, and salt-water intrusion is not closely monitored even though there is reported saltwater intrusion in place like the Lagos metropolitan, Port Harcourt, and Warri areas. Monitoring is limited and the problem is compounded by the uncontrolled development of the groundwater systems. In addition, abandoned boreholes are not properly sealed and ground waters in confined aquifers are corrosive leading to failure of borehole (Oteri & Atolagbe, 2003). Lagos with a population of more than 12 million does not have a central sewage system but rather all waste is emptied into a lagoon. This same lagoon and the sea around is the source for most of the fish that the city consumes.

Land disposal of solid waste creates an important source of ground water pollution. The problem of pollution from refuse heaps is greatest where high rainfall and shallow water table occur. Important pollutant frequently found in leachates from refuse dump includes BOD, iron, manganese, chloride and nitrate (Krist, 2000).

## 2.2. Local Market Induced Water Pollution

Local markets refer to shops, super markets, road side markets that are consistently battered by the sellers of different food items and cosmetics, other daily markets and the weekly community markets where rural dwellers and their city associates gather for the buying and selling of farm produces, cattles, donkeys, sheeps, poultry and other household materials. For the purpose of this paper abattoirs are included under this category.

These types of markets constitute more than 90% of the markets available in Nigeria, being the only accessible to most poor people, who live below a US dollar daily. During daily operations reasonable quantities of different wastes that are dumped on fresh waterways are consistently generated. Road side sellers, the major culprits, dispose various items such as cans of soft drinks, banana and orange feels, wrappers of sweets, street mechanic dusts e.t.c. Our abattoirs are generally performing opposite (anti-sanitation) function. Blood, feces and related wastes from animal slaughter find their ways into gutters and the so called “drainage system”, the final destinations are rivers, lakes, hand dug wells and reservoirs used by people as sources of household water.

Recently, Chukwu (2008) reported a study on the ground water pollution from abattoir waste in Minna state. The analysed wells showed physical, chemical and organic parameters that exceed the upper boundaries set by WHO. The waters are generally hard, containing elevated concentrations of  $\text{CaCO}_3$ ,  $\text{MgCO}_3$ , sulphates, nitrates, phosphates and heavy metals. Nwanta et al. (2010) reported that a total of 194 kg of solid waste is generated daily in Nsukka metropolitan abattoir, without any hygienic disposal and/or management system. Further studies on the waste raised serious public health concerns, as bacteria such as *E. coli*, *Bacillus* sp, and *Staphylococcus* sp e.t.c. were frequently detected. In addition to these, elevated heavy metals concentration, that is some time more than one thousand (1000) times the permissible limits in drinking water, had been reported from Oko-oba abattoir, Lagos state (Adeleye and Adebisi, 2003). “Abattoir to water” pollution is a great problem with common phenomenon across the country.

## 2.3. Oil Spill Based Water Pollution

Oil spillage is a result of leakage of hydrocarbon from the pipes. To a large extent, poor maintenance of oil pipelines and poor monitoring of pressure regimes of the fluids with respect to the strength of the pipe are the main causes. Production of oil and gas is usually accompanied by substantial discharge of wastewater in the form of brines. Constituents of brines include sodium, calcium, ammonia, boron, trace metals, and high total dissolved solids (TDS).

In Nigeria the oil must flow at any cost? Yes, it seems so. The local people of the oil rich Niger-Delta, including women and children who are mostly victims of oil spills and other environmental hazards caused by the oil companies, in their own voices, they recount horrifying scenes of killings by agents of the state, destruction of the ecosystem, desecration of sacred sites and the neglect and impoverishment of the people whose lands produce the wealth that sustains the Nigerian nation-state (Krist, 2000).

The environmental problem in Nigeria poses much threats to life than poverty to the extent that rain water is no longer fit for human consumption due to the contamination of rain (acid rain) and ground water by the activities of Nigerian Liquefied Natural Gas Company (NLG) in Bonny, owing to gas flaring and other oil companies. Government approach to this problem is most worrisome; excessive bureaucracy is weighed down their approach. Thus, their environmental policies have not been implemented to the latter. The duty of the Federal Ministry of Water Resources to provide safe water to the people has not been implemented.

Objections raised by the people of this area on the environmental impacts assessment (EIA) shows a disappointing approach to even reduce the problem. Reports from experts have declared both ground water and rainwater unsafe for consumption. A lot of money is drawn from this place through



the exportation of crude oil and gas living this people suffering and dying, their life span has been reduced because of environmental pollution and poverty.

Oil spill incidents have occurred in various parts and at different times along Nigerian coasts. Some major spills in the coastal zone are the GOCON's Escravos spill in 1978 of about 300,000 barrels, SPDC's Forcados Terminal tank failure in 1978 of about 580,000 barrels and Texaco Funiwa-5 blow out in 1980 of about 400,000 barrels. Other oil spill incidents are those of the Abudu pipe line in 1982 of about 18,818 barrels, The Jesse Fire Incident which claimed about a thousand lives and the Idoho Oil Spill of January 1998, of about 40,000 barrels (Peter and Olusegun, 2006). The most publicised of all oil spills in Nigeria occurred on January 17 1980 when a total of 37.0 million litres of crude oil got spilled into the environment. This spill occurred as a result of a blow out at Funiwa 5 offshore station. Nigeria's largest spill was an offshore well-blow out in January 1980 when an estimated 200,000 barrels of oil (8.4million US gallons) spilled into the Atlantic Ocean from an oil industry facility and that damaged 340 hectares of mangrove (Nwilo and Badejo, 2005).

According to the Department of Petroleum Resources (DPR), between 1976 and 1996 a total of 4647 incidents resulted in the spill of approximately 2,369,470 barrels of oil into the environment. Of this quantity, an estimated 1,820,410.5 barrels (77%) were lost to the environment. A total of 549,060 barrels of oil representing 23.17% of the total oil spilt into the environment was recovered. The heaviest recorded spill so far occurred in 1979 and 1980 with a net volume of 694,117.13 barrels and 600,511.02 barrels respectively.

Available records for the period of 1976 to 1996 indicate that approximately 6%, 25%, and 69% respectively, of total oil spilled in the Niger Delta area, were in land, swamp and offshore environments. Also, between 1997 and 2001, Nigeria recorded a total number of 2,097 oil spill incidents.

Thousands of barrels of oil have been spilt into the environment through our oil pipelines and tanks in the country. This spillage is as a result of our lack of regular maintenance of the pipelines and storage tanks. Some of these facilities have been in use for decades without replacement. About 40,000 barrels of oil spilled into the environment through the offshore pipeline in Idoho.

Sabotage is another major cause of oil spillage in the country. Some of the citizens of this country in collaboration with people from other countries engage in oil bunkering. They damage and destroy oil pipelines in their effort to steal oil from them. SPDC claimed in 1996 that sabotage accounted for more than 60 percent of all oil spilled at its facilities in Nigeria, stating that the percentage has increased over the years both because the number of sabotage incidents has increased and because spills due to corrosion have decreased with programs to replace oil pipelines (SPDC, 1996).

Pirates are stealing Nigeria's crude oil at a phenomenal rate, funnelling nearly 300,000 barrels per day from our oil and selling it illegally on the international trade market. Nigeria lost about N7.7 billion in 2002 as a result of vandalism of pipelines carrying petroleum products. The amount, according to the PPMC, a subsidiary of NNPC, represents the estimated value of the products lost in the process.

Illegal fuel siphoning as a result of the thriving black market for fuel products has increased the number of oil pipeline explosions in recent years. In July 2000, a pipeline explosion outside the city of Warri caused the death of 250 people. An explosion in Lagos in December 2000 killed at least 60 people. The NNPC reported 800 cases of pipeline vandalization from January through October 2000. In January 2001, Nigeria lost about \$4 billion in oil revenues in 2000 due to the activities of vandals on our oil installations. The government estimates that as much as 300,000 bbl/d of Nigerian crude is illegally bunkered (freighted) out of the country.

In Nigeria, fifty percent (50%) of oil spills is due to corrosion, twenty eight percent (28%) to sabotage and twenty one percent (21%) to oil production operations. One percent (1%) of oil spills is due to engineering drills, inability to effectively control oil wells, failure of machines, and inadequate care in loading and unloading oil vessels (Peter and Olusegun, 2006).

## 2.4. Agricultural Pollution

Agriculture, as the single largest user of freshwater on a global basis and as a major cause of degradation of surface and groundwater resources through erosion and chemical runoff, has caused to be concerned about the global implications of water quality. The associated agro food-processing industry is also a significant source of organic pollution in most countries.

Agriculture was a major source of income to Nigeria before oil was discovered in 1950s but still is the major source of income to majority of populace in the Northern part of the country who mostly rely on rivers, streams and boreholes water as their source of drinking water. A wide range of contaminants can reach these rivers, lakes and streams either by groundwater or through drainage ditches including artificial fertilizer residues, insecticides, herbicides, pesticides and farmyard waste all of which are potentially very harmful.

The primary agricultural pollutants are nutrients (particularly nitrogen and phosphorus), sediment, animal wastes, pesticides, and salts. Agricultural sources enter surface water through direct surface runoff or through seepage to ground water that discharges to a surface water outlet. Various farming activities result in the erosion of soil particles. The sediment produced by erosion can damage fish habitat and wetlands and, in addition, often transports excess agricultural chemicals resulting in contaminated runoff. This runoff in turn affects changes to aquatic habitat such as temperature increases and decreased oxygen. The most common sources of excess nutrients in surface water are chemical fertilizers and manure from animal facilities. Such nutrients cause eutrophication in surface water. Eutrophication is thus depriving the river of oxygen (called oxygen debt). As algae dominates and turn the water green, the growth of other water plants is suppressed; these die first disrupting the food chain. Death of invertebrates and fishes follow on and their dead remains in turn lead to excess bacterial activity and fishing is an occupation to some of the populace in the country (Nigeria) especially areas where they are blessed with rivers, lakes and dams while some eat the aquatic organisms most especially the fishes

Pesticides used for pest control in agricultural operations can also contaminate surface as well as ground-water resources. Return flows, runoff, and leachate from irrigated lands may transport sediment, nutrients, salts, and other materials. Finally, improper grazing practices in riparian, as well as upland areas, can also cause water quality degradation.

Undiluted animal manure (slurry) is about one hundred times more concentrated than domestic sewage and can carry a parasite called *Cryptosporidium* which is difficult to detect. Silage liquor (from fermented wet grass) is even stronger than slurry with a low pH and higher BOD (Biological Oxygen Demand). With a low pH, silage liquor can be highly corrosive, it can attack synthetic materials causing damage to storage equipments and leading to accidental spillage.

Nitrates also soak into the ground and end up in drinking water. Health problems can occur as a result of this and they contribute to methemoglobinemia or blue baby syndrome which causes death in infants. Ammonia, pesticides as well as oil, degreasing agents, metals and other toxins from farm equipment harm and kill aquatic life and animals and cause health problems when they get into drinking water. Bacteria and parasites from animal waste can get into drinking water which can cause illness and death.

## 3. Consequences of Water Pollution

The major consequences of water pollution in Nigerian communities are socio-economic, health and environmental problems. On one side the government is experiencing terrible and devastating cost inconsistencies. Polluted water containing sediments and parasites is very expensive to be treated to the desired standard for any household or even industrial application. This can also be coupled with the financial implications of eradicating the associated diseases. In turn, children and new born babies are mostly affected by these severities, as can be seen from the high infant mortality rate in the country (Figure 4). The adults are also not exceptions as they are suffering from associated “killer-poverty”

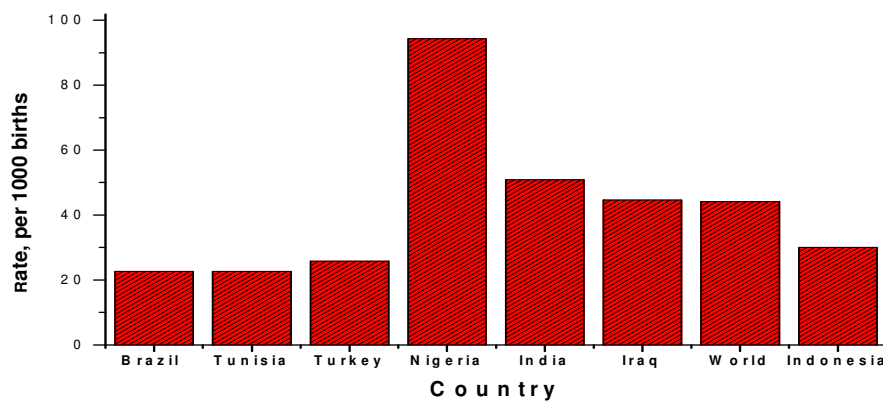
(Table 1), especially in the northern region. For full and effective malaria eradication up to N880, 801 millions are required per year. This figure represents about 12.0% of the Gross Domestic Product (GDP). Malaria burden alone is therefore enormous and devastating enough to cripple economic growth (Jimoh et al., 2007). Billion of US dollars that can be used by international organisations and non-governmental agencies for improving the wellbeing of local inhabitants are necessarily diverted for water-borne diseases eradication.

**Table 1:** Regional Poverty in Nigeria, 2010.

Geopolitical Zone	Percentage poverty, %
North West	71.2
North East	72.2
North Central	67.0
South West	43.0
South South	36.1
South East	26.7

See; Central Bank of Nigeria, Annual Report and Statement of Accounts.

**Figure 4:** Infant mortality rate for some countries in the world, 2009.



Source: CIA, 2010.

On the other hand, health deteriorations have seriously raised concerns due to persistent human and animal’s productivity declination. Water related diseases are the most common causes of illness and death, affecting mainly poor inhabitants in the local communities. Several cases have been reported. In October 2010, 29115 cases involving 1191 deaths of cholera have been reported in just 15 out the 37 states including Federal Capital Territory. The figure increased from 1616 and 126 deaths in 2004. It was observed that the outbreak is still in existence in new areas due to continuous water pollution. Pond water constitutes more than 70% of total water used in Idere community of Oyo state. A pollution assessment in the early 80’s revealed no proper sanitary methods for the disposal of human waste, making the ponds the immediate receivers. The level of pollution was linearly correlated with guinea worm infections in the community. The contaminated ponds were found to be the main chain for the transmission of *Dracunculus medinensis*, other helminth parasites and bacterial enteric infections (Ilegbodu et al., 1987). In a related development, survey carried out by World Health Organisation showed about 96000 guinea-worm infections in 1991, with Nigeria being among the 13 key African countries where continuous drinking of polluted water in the rural communities have accounted for the disease spread. In May 2009, the Society for Gastroenterology and Herpetology in Nigeria (SOGHIN) revealed very high prevalence rate of Hepatitis with 19 million people, mostly poor, being infected. Hepatitis B and C remain the silent killer and dominant hepatitis infections that are lately diagnosed in Nigeria. This have in most cases lead to liver cancer and liver siroccos,



requiring transplant, which hectic enough, cannot be carried out in the country. In essence, the poor have been dyeing of this disease.

In 2001, Rahman et al. reports that, between 1984 and 1999, 954 children below the age of 15 years were diagnosed with typhoid fever in western region, among which 108 had ileal perforation confirmed at surgery. The figure represents about 52% of all documented cases of typhoid fever in adults and children. Reports from three different health institutions in Lagos state showed serious cases of multi-drug resistant *Salmonella typhi* in young adults between the age of 16 and 30, with 635 cases diagnosed in just 15 months (i.e. May 1997 to July 1998). Recently, Akinyemi et al. (2007) reports an incidence of 441 patients infected by the same disease in the same area. A major concern is most of the patients are also suffering from other pollution bearing diseases such as malaria, cholera e.t.c.

Heavy metals poisoning is also a serious health and environmental problem, that in most Nigerian reports, results from absorption in contaminated water or via associated food. Recently Ibeto and Okoye (2010) conducted a study on 240 people, comprising of children, pregnant/nursing women and men in Enugu state. Nickel, manganese and chromium were detected with concentrations exceeding the allowed limits permitted by WHO, in the blood samples of the respondents. The poisoning was generally believed to be occupational and water-based. In a related development, more than 400 children from seven villages around Gummi and Bukkuyum Local Government areas of Zamfara state, died from Lead poisoning within just six months in 2010. Medical experts' reports from the state Ministry of Health and Medecins Sans Frontieres (MSF) described the affected children to show devastating symptoms such as;

*“gastro-intestinal upsets, skin rashes, changes of mood; some were lethargic, some partially paralysed, some had become blind and deaf. The worst affected were coming into the small Ministry of Health clinic with seizures that could last for hour and would sometimes lead to coma and then often to death.”*

The poisoning which is primarily associated with mineral exploitation, consumption in water and food and air-based inhalation, have so far affected 3,600 children, with further expectations that 180 villages covering around 30,000 people may be affected. Numerous of these cases are available today in various Nigerian and international publications, the major concern remains how the problems could be fully addressed.

#### **4. The Way Forward**

It has clearly been established that, pollution of domestic water is an ongoing problem in most Nigerian communities, especially the government-ignored villages. The tragedy is seriously crippling human development, proper identification of preventive and control measures would be very useful. The key ways forward in this respect are the proper education of local people on the important of water sanitation and good waste disposal methods, establishment of water treatment plants and good regulatory strategies. Adequate budgetary funding is therefore necessary. In the early democratic days (1946-1956), up to 15.1% of the national budget is expended on water supply by the colonial administration. With the exception of 1994, when 14.9 % was allocated, the percentage expenditure fell drastically (Table 2). Although there are signs of improvement under the current Millennium Development Goals (MDG), low financing of water sector, in a country where 69 and 103 million people (more than half of the population) lack safe drinking water and adequate sanitation facilities respectively, is a great mistake with crippling consequences for human development and economic growth.

**Table 2:** Annual federal budgetary allocation to water supply, Nigeria.

Year	Amount Allocate (N million)	Percentage of Annual Budget, %
1991	83.8	0.02
1992	71.7	0.01
1993	63.6	0.12
1994	197.5	0.6
1994	2,579.4	2.1
1996	2,195.1	14.9
1997	2,786.2	1.5
1998	3,843.4	1.5
1999	N.A.	N.A.
2000	14,318	2.2
2001	64,761	7.2
2002	30,200	3.3

**Source:** Orubu, 2006. *See also* Central Bank of Nigeria, Annual Report and Statement of Accounts.

Oil pollution problems could be successfully addressed by ensuring that corruption-free “safety and operability procedures” are fully implemented by all oil stakeholders, lessons and program development options from United Kingdom (UK) offshore and onshore safety strategy would be very useful. Companies operating offshore are the major water polluters; they should therefore be forced to be practicing safety procedures similar to those in UK, where “safety case” and Health and Safety Executive (HSE) policies are efficiently applied. Where oil spill has already taken place, the best management and recovery options to ensure that reasonable risk assessment is carried out by experts and emergency procedures, involving the use of approved international techniques and equipments should be adopted.

Lack of efficient law-enforcement instrument has significantly resulted to waste disposal into fresh waterways by sellers of different food and cosmetics in our markets. This could be fully addressed by improving awareness and ensuring total compliance with the applied laws and practices. Prosecution of defaulters would be very important here.

As the current agricultural and environmental policies are either deficient on the laws governing the disposal of agricultural wastes by farmers or lack good enforcement mechanisms, the three tiers of government in the country should ensure that “effective agricultural waste disposal methods are promulgated”. Farmer education through extension services and attractive media forums are required. Judicial measures could similarly be employed in certain complex cases. Fishers that adopt chemicalised-fishing system, polluting rivers and lakes, should be educated, treated with warm cautions and legal actions for defaulting.

Regarding the diseases infection issues, adequate funding and proper health education in all communities are necessary. The current state of the system, involving very few “Community Health Extension Workers (CHEW)” per locality should be fully funded and enhanced by ensuring that, many youths enrolled into community health studies. This could be achieved by standardising Schools of Health Technologies, Nursing and Universities at large. A decision by UNICEF and many non-governmental organisations gave emphasis also to improved water and environmental sanitation program. For example, diarrhoea infection, the most childhood killer disease in Nigeria, can be successfully reduced by 50% if water quality is improved. Coupling sanitation (proper disposal of human and animal faeces) with health education, improved water quality measures, enhanced hygiene techniques and adequate funding the disease could be a history.

Conclusively, none of the aforementioned measures could yield any positive result, except the serious corruption problem in the country is addressed with full implementation, involving not only the poor but the leaders, wealthy and their associates (i.e. collective approach).

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