

# The Impact of Public Health on the Nigerian Environment and Communities

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## Abstract

This paper examines the global developments in public health and how the concepts and practices have been changing in Nigeria from pre-independence time to the new millennium. Public Health has emerged into various disciplines with central focus on epidemiology and disease prevention and control. Nigeria has a long history of developments in public health and the creation of Federal Ministry of Environment has broadened the scope. The crisis of environmental exploitation due to industrial revolution and developmental activities has degraded the environment considerably through several policies and international treaties; environment has become an essential part of public health.

## L'impact de la santé publique sur l'environnement et les communautés nigérianes

## Résumé

Ce document examine la santé publique en général et l'évolution dans la façon dont les concepts et les pratiques au Nigeria ont changé de temps avant l'indépendance du nouveau millénaire. La santé publique a émergé dans diverses disciplines en mettant l'accent sur l'épidémiologie et la prévention et le contrôle des maladies. Le Nigéria a une longue histoire de développement en matière de santé publique et la création du Ministère Fédéral de l'Environnement en a élargi la portée. La crise de l'exploitation environnementale due à la révolution industrielle et aux activités de développement a considérablement dégradé l'environnement à travers plusieurs politiques et traités internationaux ; l'environnement est devenu une partie essentielle de la santé publique.

## Public Health and the Environment

Optimal health is possible only when man is in unity with his environment be it physical, biological or social (Figure 1). Nature abhors a vacuum. In the physical, once a vacuum is

created anywhere on the planet, nature will instantly fill it with gas or liquid. Man, at times disturbs this balance by creating a vacuum out of proportion leading to devastating destructions. In the biological world nature abhors pollution.

When putrid organic wastes are deposited on earth, natural biological and chemical actions and reactions immediately activate the decomposition, oxidation and reduction processes thus rendering the waste harmless, inoffensive and return to cycle of life. In the social realm, the process of living together in large numbers creates uncontrolled pollution which brings poverty, misery, nuisance and death.

The natural ability of man to adapt to the environment and his gifted intelligence to adapt his environment in compatibility with a high standard of health has been abused in the name of modernisation or what is generally termed "progress". In the process of adaptation of the environment to suit him, man has harnessed various forms of energy – thermal, wind, electrical and atomic to serve him in his various endeavours (Adeniyi, 1973). However, he has succeeded at this sometimes constructively, but many times, destructively. This modernization has disturbed the unity between man and his environment and man's adaptive capacity has started to fail. There is now a senseless dichotomy of environment and health instead of a profitable move towards 'Ecosystem Health'.

The history of medicine shows that at various points in time, man's efforts to cope with or conquer disease and disability had been focused more or less on different dimensions of his environment. The attendant levels of successes have varied from people to people and place to place. The onset of disease or its absence can be attributed largely to the level of success attained by man in his attempts to adapt to his environment or to adapt the environment to suit him. While a successful adaptation results in good health, failure or breakdown of adaptation, on the other hand, results in ill health.

Environment as a concept came into limelight in 1972 when the United Nations General Assembly held an International Conference on Human Environment in Stockholm. The conference helped to change people's perception on environment and development issues. Environment has been

recognized to provide the human, physical and biological basis for development process, which aims at the improvement of the quality of life. Further, the United Nations Conference on Environment and Development (UNCED) held at Rio de Janeiro, Brazil resulted in the establishment of Global Environmental Facility thereby providing resources solely for environmental issues (WHO and UNICEF, 1978; WHO, 1996a). At this meeting, Nigeria and other countries threatened with drought and desertification were able to obtain the concession that Desertification should be considered as a major ecological problem. Subsequently, the Agenda 21 institutionalised the participatory approach to planning and implementation of environmental programmes. The commission for sustainable development was then created to follow up the implementation of the Rio declaration (Federal Environmental Protection Agency, 1999). Achievements in public health in the 20th century may be traced to improvements in hygiene practices, food handling including refrigeration, water and sewage treatment, and vaccination practices (Lederberg, 2004).

### **Global Developments in Public Health and Environment**

The early concept and development of public health as a branch of medicine can be described in a fairly periodical sequence. The forgotten history of the environment comes as a surprise to many people, but the facts have been there all along, in manuscripts, publications and historical archives. Public health researchers have learned to look under labels like conservation, preservation of nature, smoke abatement, municipal housekeeping, occupational disease, water and sanitation, and air pollution. Public health has had longstanding concerns with modern environmentalism and most of the issues had become an important part of global social fabric. The environmental timeline series since the pre-historic times to date has seen a series of developments which have improved quality of life. The salient features are given below (Table 1).

Table1: Environmental Timeline -The Global Developments

Period	Major Developments
BC to 1200 AD – Ancient Civilisations	<ul style="list-style-type: none"> <li>• Air pollution was common in large towns; the pollution came from dust, wood smoke, tanneries, animal manure and others.</li> <li>• Water pollution was less severe in some civilisations; e.g. Israeli and Hindu cities tended to have less water pollution due to strict religious codes about cleanliness. On the other hand, ancient Rome was notorious for sewage-filled streets;</li> <li>• Lead poisoning was common among upper class Romans who used lead-sweetened wine and grape pulp sweetened with "sugar of lead" as a condiment.</li> </ul>
1200 to 1750 – Middle Ages and Renaissance	<ul style="list-style-type: none"> <li>• Plague devastates Europe but leads to the beginning of a public health system;</li> <li>• Water pollution tends to be less of a problem for dispersed populations than it would later become.</li> <li>• Occupational diseases are investigated by Bernardo Razzimazi and begin to be recognised as public health problems.</li> <li>• In 1596 Jon Harrington invented water closet at a cost of 6 shillings and 8 pence which was accepted only after 182 years due to “cultural gap”.</li> </ul>
1750 to 1830 – Enlightenment	<ul style="list-style-type: none"> <li>• Reason begins to be better appreciated as an antidote to superstition. Ben Franklin's fight against water pollution, the movement to clean up slums and prisons begins with an enlightenment philosophy that holds individual citizens to be valuable.</li> <li>• Thomas Malthusian population theory- population explosion</li> <li>• New technologies create new pollution, -- Town gas from coal drips tar into the rivers; Vulcanized rubber plants discharge noxious chemicals directly into the streams; Coal smoke chokes the air in big cities. Chemical factories operate without thought to people downwind.</li> </ul>
1830 to 1890 - Industrial Revolution	<ul style="list-style-type: none"> <li>• Living conditions in urban areas horrify reform minded commissions in London in the 1840s and America in the 1850s and 60s. Progress is slow but the common interest in pure drinking water and sanitation is spurred by epidemics of typhoid and cholera.</li> <li>• Water pollution carried disease, but no one knew exactly why until the 1880s. Some concerned reformers didn't wait for exact knowledge: John Snow, a London physician, traced a part of the cholera epidemic to a contaminated water pump in 1855.</li> <li>• Smog episodes begin killing residents of large cities like London.</li> </ul>
1890 to 1920 – Progressive Era	<ul style="list-style-type: none"> <li>• Reform was the common concern, e.g. working conditions, slum housing, food adulteration, sanitation, drinking water, polluting industries and more.</li> <li>• New organisations like the Women's clubs and the Sierra Club help champion natural preservation, conservation and municipal reform.</li> </ul>

Period	Major Developments
1920s to 1930s	<ul style="list-style-type: none"> <li>• National Coast Anti-Pollution League is formed by municipal officials from Atlantic City to Maine who are concerned about oil and sewage pollution detracting from tourism.</li> <li>• "Nothing but a murderer" is the way Harvard M.D. Alice Hamilton privately describes Charles Kettering of General Motors, behind leaded gasoline; leaded gasoline becomes the standard fuel for most of the world.</li> </ul>
1940s to 1950s	<ul style="list-style-type: none"> <li>• Synthetic rubber and chemicals from renewable resources proved vital to winning World War II.</li> <li>• Sand County Almanac by Forrester Aldo Leopold, published in 1948 just after his death, expresses the "expanding sense of human responsibility, not only for each other but also for the earth".</li> <li>• Deadly smog episodes in DonoraPenn. (1948), London (1952, 1956), New York (1953), and Los Angeles (1954) create the perception that an air pollution crisis is underway. In 1955 the first international air pollution conference is held.</li> <li>• Increasing CO<sub>2</sub> buildup is one surprising conclusion of Scripps Oceanographic Institute scientists working on International Geophysical Year projects 1957.</li> </ul>
1960s to 1970s	<ul style="list-style-type: none"> <li>• Rachel Carson's book Silent Spring published in 1962 strikes a deep chord in the rapidly growing concern about the environment.</li> </ul>
1970s to 1980s	<ul style="list-style-type: none"> <li>• A decade of awakening and cleanup begins with the birth of the US Environmental Protection Agency and ends with the Appropriate Community Technology demonstration on the Washington mall.</li> <li>• Air pollution is cut back dramatically through use of catalytic converters on new cars that use only unleaded gasoline.</li> <li>• Water pollution is greatly decreased through a massive sewage treatment expansion programme; Rivers which were once sewers now begin a gradual recovery.</li> <li>• Toxic chemicals become more troubling. LoveCanal and other incidents lead to new regulations in the 1980s.</li> <li>• Energy crisis in oil supply leads to reversals of some restrictions on refinery and oil pollution.</li> </ul>
1980s to 1990s	<ul style="list-style-type: none"> <li>• Industrial disasters e.g. Bhopal mass poisoning in India; the Chernobyl nuclear reactor disaster in Ukraine; and the Challenger shuttle and Exxon Valdez oil spills in the U.S.</li> <li>• Ozone depletion from fluorocarbons and signing the Montreal Protocol in 1987.</li> <li>• Legislation for cleaning up toxic waste passes US Congress.</li> <li>• Environmentalists gather momentum.</li> <li>• Warnings about global climate change become more convincing as evidence mounts.</li> </ul>

Period	Major Developments
1990s to 2002	<ul style="list-style-type: none"> <li>• Global climate change report by the UN and the National Academy of Sciences firmly establishes scientific basis for concern.</li> <li>• Poisoning from leaded gasoline is acknowledged as severe in developing nations by the World Bank and the World Health Organization and a gradual switch to other additives finally gets underway.</li> <li>• World Summit on Sustainable Development, Johannesburg 2002.</li> </ul>

**Source:** <http://www.radford.edu/~wkovar/hist1/12oughties.html>

The picture of the features of the relationship between public health and environment presented in Table 1 depicts a chronological trend of five distinct but inter-related periods: the pre-scientific or age of adoration; the early-scientific or age of observation; the middle-scientific or age of experimentation; the late-scientific or age of exploration; and the modern-scientific or age of holism or ecology (Summers and Pawath, 1991).

During the pre-scientific period, man's attention was dominated by his immediate environment. This age was either “disease free” or man's knowledge and understanding of his environment was not sufficient to comprehend the nature of the onset and causation of disease.

The early-scientific period marked attempts by man to understand and influence the external forces or his environment and to reconcile them with his existence. This period has recorded the first attempts by man to recognise what was harmful to him and a systematic organisation of what was good or harmful and search for the causes. Hippocrates who pioneered the systematic development of medicine about 2500 years ago wrote: “whoever wishes to investigate medicine properly should proceed thus, in the first place to consider the seasons of the year and what effects each of them produce”. His basic premise is that “climate exerts an influence on human health” (World Meteorological Organization, WMO, 1987). Bernardo Ramazzini (1633-1714), the father of occupational medicine, published *De Morbis Artificum Diatriba* (English title, printed in 1764 was *The Diseases of Artificers*). The book described the hazards of 52 occupations,

including leather tanning, wrestling, and grave digging. "By the 16th century, special provisions for sanitary control and decency had become widespread. Thus, an ordinance was introduced in London which commands that 'no man shall bury any dung or gung within the liberties of the city' nor 'carry any ordure till after nine o'clock in the night'.

The middle-scientific period marked the beginning of modern medicine. Typifying the period were various inventions, the most important of which was the microscope. This led to the “germ theory of disease” and early 19<sup>th</sup> century, concentration on organic etiology. The major technological and scientific breakthroughs of this period are both diagnosis and more effective treatment and prevention of the prevailing infectious and communicable diseases.

The late-scientific period (age of exploration) examined the remarkable achievements of the middle scientific period and scientists soon became stupefied that little progress was made in the control of infectious disease. It was also noticed that the nature and pattern of diseases were constantly changing. The 'germ theory' of disease was no longer adequate because despite the advancement in diagnosis and availability of potent chemotherapy to kill the germs, this has had little impact on morbidity rates. A classic example was the epidemic of pulmonary tuberculosis in urban slum populations following World War I. From this experience, it was realised and accepted that for an effective control of a disease like pulmonary tuberculosis factors such as housing, poverty, cultural beliefs, and attitudes of target populations must be tackled if clinical treatment was to succeed as

a control measure (Lucas and Gilles, 2003).

With the advent of the modern scientific period, the lessons from past failures have propelled man to continue his search for patterns of causal factors that fit together to produce pathology. It is now recognised and accepted that most diseases presenting serious risks are multi-causal in nature and that the causes of diseases are no longer explainable in terms of single etiological agent attacking the organism in the fashion suggested by the classical “germ theory of disease”. Effective eradication or control of most diseases would entail the exploration of a wide range of factors including man's life style and way of living or his interaction with his physical, biological and social environment.

The above historical chronology shows how states of health and illness in man are inextricably woven together with his way of life and why disease causation remained largely implicit and unsystematic until the early 20<sup>th</sup> century.

### **Emergence of Academic Disciplines of Public Health**

Academic disciplines in public health remained largely undeveloped until the last 60 years when public health started to undergo substantial growth in knowledge and technique. Academic public health disciplines have somewhat different labels with terminologies derived from medicalisation of public health sciences as well as the vogue for specialisation among the practitioners. Public health to-day embraces various disciplines from the biomedical, social, educational, communication, health and natural sciences. At the centre is Epidemiology, which aims at targeting health problems to different population groups and provides a basis for differential planning and more prudent use of limited resources, facilities, staff and money (Adeniyi, 1988). Health Economics, and Health Management and Administration provide information on the patterns of distribution and utilisation of health services so that appropriate and quality health care is available, accessible and acceptable to every individual of the community without discrimination. Medical sociology and

anthropology provides information on how states of health or illness in man are extrinsic and woven together with his way of life. Health statistics supplies information on the health system performance and has become a key to the management of limited resources available. Environmental Health on the other hand continues to provide strategies to conquer preventable, industrial, water and food borne diseases. The Biological and Laboratory sciences on their part have opened new chapters in the advancement of immunology for the prevention of most infectious diseases. Health Education which is regarded as the newest member of the family is aimed at creating and consolidating in people an awareness of the full benefits of investing human and material resources in actions and behaviours capable of ensuring high standards of health (Adeniyi, 1988). It is therefore basic to all programmes of curative and preventive medicine and it achieves the most success when developed as an integral part of these programmes.

These academic disciplines have found expression in WHO's definition of health “as a state of complete physical, mental and social well-being, not merely the absence of disease or infirmity”.

### **Public Health and the Nigerian Environment**

As shown in Table 2, Nigeria is not historically isolated from the rest of the world with respect to environment and public health (Schram 1971, Sridhar, 1999). The west coast where Nigeria is a part is considered as “father and mother of all fevers” as said by H. B. Padwick in 1922. Though the Nigerian medicine goes back to the 15<sup>th</sup> century, the expedition of Fernando Gamez resulted in entering a “virtually uninhabited island swamp” which is now called Lagos. Not much progress could be made in health care as the 19<sup>th</sup> century explorers could not penetrate into the Nigerian hinterland because of ravages of malaria, 'black water fever', yellow fever, dysentery and scurvy. On July 20, 1796 Mungo Park described River Niger with ecstasy and made several scientific observations on mosquitoes, guineaworm and smallpox affecting a vast number of populations. He was also responsible

for coining the word “Mumbo-Jumbo” for certain superstitions and practices of the time.

James Boyle, a naval Colonial Surgeon at Sierra Leone in 1931 gave one of the first systematic accounts of tropical diseases: hepatitis, dysentery, leprosy, yaws, “craw-Craw, and guineaworm. Cholera was also mentioned though it was not unique

to tropical climate. A significant milestone in the sanitisation of the Nigerian environment from 1796 to 1999 was the creation of the Federal Environmental Protection Agency in 1988. After this, Nigeria started to make tremendous inputs in various international conventions from waste disposal to climate change.

Table 2: Nigerian Environmental Timeline

Period	Major Developments
1472	Portuguese explorers entered Benin Empire
1796 (July 20)	MungoPark explored River Niger; described some prevalent diseases without adequate interpretation.
1807	Abolition of slave trade by William Wilberforce of Britain
1843	Dr. James Ormiston McWilliams took samples of River Niger and found that fresh specimens did not contain H <sub>2</sub> S but corked samples did indicating the degree of pollution due to organic matter;
1852	Dr. Irving praised the country side of Lagos to Ibadan as “very beautiful, water by numerous clear running streams, cultivated fields, luxuriant vegetation and graceful palm trees;
1857	Bowen observed that in Ogbomosho, there were fewer epidemics, no cholera or plague. Blindness was common along with guineaworm;
1867	Horton, the first Nigerian Doctor noted the severe lack of sanitation in the cities of West Africa; urged the creation of Public Health Inspectors; emphasised the need for drainage and sanitation for the healthy growth of a community;
Many years later	Anna Hinderer at Kudeti (Ibadan) lamented the dirt, noise and dangers of the town (Ibadan) and considered Lagos, better;
1877	Sanitary Reforms commenced in Lagos with the appointment of first Inspector of Nuisances;
1897	Lagos had both a medical and a sanitary Department; Dr. H. Strachan was appointed as Chief Medical Officer, Mr. W. M. Mackisen as Sanitary Engineer and W. F. Lumpkin as Inspector of Nuisances; the ‘nightsoil’ controversy began and no satisfactory solution was found for Lagos till today in spite of several proposals in 1916, 1926, 1928, and 1956;

Period	Major Developments
1899	Sir William MacGregor was appointed as Governor and is considered as 'Golden Age';
1900	Simpson expressed satisfaction on the eastern towns which were kept clean and sanitary; compelled to bury the dead instead of throwing into bush or rivers as practiced earlier;
1924	Bubonic plague hit Lagos and slum clearance and town planning began
1957 - 1976	Establishment of Public Health Laws in various regions in the country: Lagos (1958), Western Nigeria (1959), Northern Nigeria (1963), Bendel State (1976);
1960	Nigeria's Independence and beginning of establishment of various Decrees and participation in International Conventions;
1988	Establishment of Federal Environmental Protection Agency by Decree 58 and amended in 1999 by a Decree 59; Hazardous Wastes (Criminal Provision) Act;
1989	Formulated a National Policy on Environment
1999	Creation of Federal Ministry of Environment (July); Revised National Policy on Environment;

Sridhar, 1999

## The Crisis of Environmental Exploitation

### (i) *The global scenario*

Human societies around the world are increasingly experiencing a growing sense of environmental crisis. Environmental deterioration is being accelerated and "natural" environment is fast becoming a "man-made" environment. No nation rich or poor, escapes these realities. The high income industrialised nations face the reality that both the structure for their productive systems and the patterns and levels of their material consumption are dependent on the extravagant exploitation of non-renewable resources. Realising that such resources can hardly be sustained, even in the short run, their slogan changed from one of environmental exploitation to environmental improvement and then to environmental conservation (Adeniyi, 1983).

The low-income, pre-industrial nations on their own part face the reality of poverty resulting from rapid urbanisation, and high population growth rates which put a combined stress on their fragile ecosystems. Lacking money and technological know-how, they grope in disease and squalor and leave not much hope for succeeding generations.

Partially industrialised nations like Nigeria face the dilemma of both the industrialised and the pre-industrialised nations. While a small segment of the population enjoys some level of affluence of questionable sustainability, majority live in dehumanising poverty. Total population in Nigeria living in poverty has shot up by 66% (67 million) in 1996 as compared to 28% in 1980 (Egun, 1996; WHO, 1966b). At least 89 million Nigerians are now living below the international poverty benchmark of \$1 a day



(From a presentation in 2003 by Alhaji Hassan Lawal, Employment, Labour and Productivity Minister, Abuja). With some education and enlightenment, these so-called developing countries consider advancement as a basic human right. However, because they base their plans on the structures of the industrialised nations which are no longer sustainable, they open their national gates to exploitation through a technological dependence on industrialised nations. Thus, their existing health problems are complicated by emerging hazards of environmental pollution, which they are ill-equipped to handle. These new hazards of environmental retrogression or pollution are increasingly endangering the inherited genetic makeup of the human race.

That environmental health is the challenge of our time, therefore, cannot be denied. Concern about the preservation and improvement of man's environment is replacing an admiration of the claims of modern inventions. In some directions technological advances are being questioned, voluntarily suspended (as in nuclear weapons) or they are being critically examined and modified to reduce their dangerous effects on the environment. Environmental impact assessment in all developmental activities is a right step in the right direction.

### *(ii) The developing countries*

It is well-known that in the industrialised world, great improvements in health care were made in the 19<sup>th</sup> century by what might be called "Engineering Methods". Safe water supply and sewage systems were built. Engineering services provided cheap, potable water as a means to promote high standards of hygiene particularly in the urban population (Diamant, 1984). As a result, water-borne diseases and those associated with poor standards of environmental sanitation were reduced to the barest minimum. In these industrialised countries, the first 60 years of the 20<sup>th</sup> century witnessed an unprecedented "Medical Era" which was marked by the introduction of 'modern health technology' and an extensive use of complex drugs and antibiotics. The irony of this is that in the developing countries the medical era is being pushed ahead of the

engineering era, which is a misplaced priority. When attempts to follow the same order that was used in the industrialised countries which provided lasting solutions to most of the communicable diseases were started in the developing countries, they were abandoned half-way for the reason that the economic systems of these countries are too weak to support such expensive programmes.

As an example, the Malaria Eradication Programme was abandoned to give way for Malaria Control Programmes because the former placed a greater emphasis on the perfection of treatment than preventive technology. In the same way, the resolutions of the United Nations Water Conference held in Argentina in 1977 which requested a commitment of all national governments to provide all people with water of safe quality and adequate quantity together with basic sanitary facilities by the year 1990 and which led to the declaration of 1981 to 1990 as the National Drinking Water and Sanitation Decade is also beset with the same problem of cost. The interest of funding agencies declined because it has not been possible to show immediate results and benefits of such ventures to the health of the people of developing countries. Therefore, new priorities which cannot be faulted because they are based on the over-whelming evidence of high infant mortality rate and increase in maternal mortality rate, have been set. New programmes to promote the health of the mother, the role of women in health development and child survival now constitute the major areas of national and international financing.

Although many maternal diseases are being prevented and more babies are surviving, they are all surviving in an environment where the web of life that sustain Ecosystem Health – earth, water, air, plants and family – is unsafe and being destroyed for temporary sustenance and survival as a result of pressing forces of foreign debt and corruption.

### *(iii) The Nigerian situation*

#### *(a) Rural areas*

In most rural areas of Nigeria, the predominant problem is the biological pollution of water and soil and the faeco-oral transmission of infections

through fleeces, flies and low personal hygiene. Due to lack of adequate human wastes disposal facilities or failure to accept them, human wastes such as faeces and urine are deposited indiscriminately on the soil and are sometimes washed into ponds and streams which constitute the main source of water supply. The contaminated water is consumed without any form of treatment to make it safer (Adeniyi, 1983). Human faeces may contain pathogenic organisms of diseases like cholera, dysentery, diarrhoea and typhoid, eggs and infective larvae of intestinal worms such as hook-worm, round worm and others as well as viruses of infective hepatitis and polio, all of which are highly prevalent among the rural populations.

Similarly, human urine discharged or washed into streams is known to spread schistosomiasis and in Nigeria, one in seven children is a silent carrier.

Ground water resources are also not spared due to passive pollution from illegal refuse dumps, drains and inappropriate toilets (Ikem *et al*, 2002). Food is contaminated through excreta and sullage waters deposited on soil where food crops are grown which are known to spread diseases when eaten undercooked or raw (Sridhar *et al* 1981; Sridhar, 1995). Food is also contaminated directly with soiled hands or flies which breed in the decaying organic wastes in the dwelling places.

A new form of water and soil pollution arose in the oil producing rural areas of Nigeria as the petroleum wastes have contributed to substantial levels of toxic chemicals in rivers, creeks, estuaries and coastal and marine environment. Vast farm lands are also destroyed (Sridhar, 1992). The rural environment also offers a more suitable habitat for rodents and mosquitoes. Other vectors abound which transmit diseases like onchocerciasis and guineaworm (Brieger *et al*, 1990; Adeniyi *et al*, 1991). Added to this was the dumping of foreign toxic wastes at the Koko port in Delta State in Nigeria in 1988.

#### (b) Urban areas

The urban situation had attracted the attention of successive Federal Military Governments of

Nigeria in the past. The urban areas witnessed a rapid and phenomenal expansion in the last decade and the resultant high density of population has disrupted essential environmental health facilities which have become grossly inadequate to handle the wastes generated by the teeming population (Mabogunje, 1963). The urban growth in Nigeria has resulted in a population of 49,050,000 as compared to the rural which stood at 62,456,000. The population growth rate is estimated at 2.4%. Now 19 Nigerian Cities accommodate over one million people each, 40 Cities have ½ million people each. The urbanisation rate is growing at 5.5% whereas the economic growth is growing at 4.2%.

New infrastructure has not kept pace with population growth (Sridhar and Omishakin, 1985). The traditional or core areas of the cities lack modern sanitary facilities and even the new ones have acquired the semblance of potential slums. In the cities, the slums of tomorrow are fast growing in number due to absence of efficient and virile urban planning. Lagos has turned into a mega city with an estimated population of over 12 million. Potable water supply has become unavailable to most cities. Urban taps always remain dry and there are no suitable sites for wells and the well yields are dwindling. The city population resorts to polluted streams and ponds. Water vending has become an order of the day and these waters particularly the 'packaged waters' have become sources of disease as they are tapped from doubtful sources (Enabor 1998; Adekunle *et al*, 2004).

The process of rapid industrialization has also brought a wide variety of chemical pollution (nitrate, lead and hydrocarbons) and increasing noise levels (Sridhar and Arinola, 1991, Omokhodion and Sridhar, 2003). High deposits of industrial wastes – heavy metals and plastics - are dumped along the highways, into streams and drains. Open places are filled with leaves, paper, plastics and nylon, and human excreta. Drains get clogged leading to perennial flooding and roads are sometimes blocked with refuse.

The cities witness daily traffic jams and motor cars emit dangerous gases most importantly lead

and hydrocarbons (Sridhar, 2001). In the USA, 60% of the atmospheric pollutants are attributed to motor cars and the situation in some Nigerian cities might already have been worse than that of USA. It has been estimated that carbon monoxide emitted by cars could convert 1-6% haemoglobin of all exposed population to carboxyhaemoglobin (Oluwande, 1979). It is not out of the way to assume that those who spend a lot of time in the commercial areas of cities are exposed to this danger.

Food hygiene standards have fallen in the cities. Food safety is threatened by food additives, chemicals and adulteration. Adeniyi (1993) showed that less than 10% of the food preparing and selling premises in Lagos meet the necessary hygiene standards. While this situation remains unchanged, the vogue today is the fast food chain which is growing at an uncontrollable rate. Unless health authorities ensure high standards of hygiene by the vendors, the fast foods may turn to fast deaths.

Nigeria as a whole is already facing the dangers of industrialisation before the benefits are realised. It will be a disaster if the country is to follow the process experienced by Europe where the rapid growth of unsanitary cities led to the occurrence of massive epidemics and towns became “incubators of diseases”. In the words of Burchill (cited by Adeniyi, 1995) “the poor were crowded into filthy tenements, with meagre supplies of water, most of that polluted; people live like pigs and died like flies”.

As far back as 2000 years ago, Rome had eleven aqueducts which carried about 200 million gallons of water into the small city every day. It had sewers lined with concrete. Yet today much of the human wastes in our cities are dumped in open places. In Nigeria, gourds, jars, buckets and drums of dirty water are carried on the head and in the boots of cars. The rainy season runs to almost eight months in a year and yet rain harvesting is not practiced at a national level. Even the recent National Water Policy has been silent on rain water harvesting and ground water recharge.

It has been estimated that diseases associated with poor standard of environmental health account for over 70% of all the causes of

morbidity and more than 50% of all the causes of mortality in this country. Children under one year of age die at a rate which is more than 10 times as that in the more developed countries. For children aged 1-5 years, this rate is doubled while for pregnant women, it is tripled. In some sections of Nigeria over 90% of the people are infested with one or more of the intestinal parasites transmitted through human excreta. About 20% of the city population has no facilities for disposal of excreta. The primary and secondary schools are devoid of any meaningful sanitation and almost half of them have no toilets. Today Nigeria's health indicators have fallen sharply compared to other neighbouring countries. Going by DALE (Disability Adjusted Life Expectancy), Nigeria ranked 163 position of the 191 countries in 2002 and was 141 in 2004 followed by the Gambia 143, Congo 150, Ghana 149, Republic of Benin 157, and Togo 159. Nigerian health indicators show the following figures: DALE, 38.3; Life Expectancy, 53.0; Crude Death Rate, 14 per 1000; Maternal Mortality Rate, 704 per 1000 live births; Infant Mortality Rate, 105 per 1000 live births; and Under 5 Mortality Rate, 178 per 1000 live births (World Health Report 2000).

### **Past Public Health Measures**

#### ***(i) Enforcement of Environmental Laws and Regulations:***

The earliest known personnel in charge of environmental health in Nigeria called “Sanitary Inspectors” were first appointed in 1877 (Akinbola and Bashua, 1993). The Sanitary inspectors of old had their achievements and pitfalls, most of which could be attributed to the level of their training and the poor conditions of their service. The last military regime brought again into limelight, the popularity of sanitary inspectors, now changed to Environmental Health Officers (EHO). Schools of Health Technology were established throughout the country to train EHOs who are more qualified and better equipped for their jobs than the sanitary inspectors of old.

To back this up, a programme for the training of Public Health Superintendent Tutors was

established at the University College Hospital in Ibadan in 1976 (now they are referred to as Environmental Health Officer Tutors). The centre has produced over 300 tutors to date. Similarly, the University of Ife started a B.Sc. degree programme in Environmental Health and this has turned out many graduates. A disturbing question is the use to which these personnel are being put. Environmental health is presently managed by medical doctors whose allegiance and commitment cannot be expected to be total because they are naturally bound to be biased in favour of their own profession. Hence, much of their service remained a lip-service.

A two year professional Master of Public Health in Environmental Health was started in 1993 at the College of Medicine, University of Ibadan, the first of its kind in the country. Over 120 students have already obtained their degrees which are equivalent to M. Phil. The environmentalists and other cadres who are expected to oversee the environmental health services of this country are constantly being denied of the necessary support (financial, equipment, facilities, employment, good service conditions and recognition) which they need to make their presence felt. While the government is doing its best in manpower development and training, it is being denied of reaping the benefits because of a discriminatory administrative system which makes preventive services to be subservient to the curative, instead of both being organised as partners in progress.

The sanitary inspector of yester years did not enjoy much good will from the public because he was a law-enforcing agent. The laws themselves were unpopular because many citizens did not understand why they should pay a fine because the water which is stored in their pots for daily use bred mosquitoes. Much as the mosquito ordinance was useful in controlling malaria, Nigerians did not appreciate it and the law was regarded as arbitrary (Adeniyi, 1981). Today, the public is more enlightened and the public health laws are being revised and updated to effectively deal with offences committed by individuals and owners of factories, industries and other establishments. To this end, the creation

of Ministries of Environment at State and Federal level is a point in progress.

But while public health laws are necessary and may be easy to comply with, they do not always provide all the answers. In the first place, many of the causes of diseases cannot be eradicated by legislation. Secondly, a law can only be enforced if majority of the people are in favour of it; otherwise the breakers will always enjoy public protection. Thirdly, if a law is unpopular, the agents of that law will be unpopular. Fourthly, a law becomes arbitrary when it does not apply equally to individuals and while certain individuals have the means to comply with the law and others do not. For example, if the laws on disposal of refuse are to be effective, there must be authorized places where refuse bins are placed and these places must be easily accessible and acceptable to the users. Similarly, a law banning urinating in public places is useful if only public urinals are provided.

#### ***(ii) Environmental Health Education***

Failure of some of the measures has sometimes been attributed to lack of public awareness. Health education is usually used to raise people's awareness of the consequences of their unsanitary actions as well as the benefits of sanitary behaviour but it is useless when this awareness cannot be channeled to a desirable action. The correct target of these efforts, for example, is not the people who rent houses but the landlords who ought to have provided facilities which are needed for maintaining a high standard of environmental health in the residence. The owner of a house should provide basic amenities like toilet, bathroom, kitchen, water supply and dustbin if the occupants are to maintain a high standard of hygiene. In this case, both the landlord and the tenants are targets for health education.

The central theme of public awareness should be collective responsibilities for a healthy environment. When one's house is clean and the neighbour's backyard is full of rubbish, it must be appreciated that flies from such dumps will not respect such physical boundaries.

Unfortunately measures that are designed for

the benefit of entire community as a whole are always less popular and sometimes do not receive as much attention as those which directly benefit the individual. Public health can create community awareness of the need for community members to cooperate among themselves, with the government and its agencies in order to ensure a high standard of environmental health. Health education can inculcate a spirit of self-help and self-reliance among communities for the promotion of environmental health. People should be aware that a healthy man will be found in a healthy community and a healthy community in a healthy environment. Therefore, health, and indeed environmental health, is community oriented.

### **(iii) Environmental Health Projects**

Two environmental health projects, one urban and one rural are described.

#### **(a) The Ibadan Wastes Disposal and Drainage Project, WHO Project 3303 Nigeria**

Ibadan, the capital of Oyo State of Nigeria, today must be having an estimated 2 million population projecting from 1963 census figures. It also enjoys the pride of having the largest indigenous population in Africa. The city presents a typical picture of many African cities, each known for its contrasting features of the 'old' town area with its over-urbanized community encircled by a ring of some well-planned residential dwelling units (The Ibadan Wastes Disposal and Drainage Project 3303, Nigeria (1969).

#### **The Old Town "Inner Core"**

The old town or "inner-core" area of Ibadan is inhabited by the indigenous population and is highly congested and over-crowded. There are on the average about 150 persons and 10-16 housed per acre of land. Since the area is unplanned, the major portion of the inner-core has only a few narrow streets and alleys. Human wastes disposal facilities are very inadequate and thousands of persons have no sanitary facilities other than vacant land, road paths, open public drains and stream banks. Waste water from household kitchen and bathrooms is discharged into open drains and domestic refuse could be seen in huge dumps on

public streets and undeveloped land. Most of the residents belong to the low-income group and are illiterates. It is estimated that they constitute 70% of the total population of Ibadan.

#### **The Suburbia "Periphery"**

The suburbia periphery presents a contrasting picture of the old town in that both residential and commercial houses are most times properly laid out. Beautiful flowers sometimes adorn the spacious green lawns around the houses. Liquids wastes are mostly disposed into underground septic tanks, drains are kept clean, dustbins are emptied of garbage and refuse disposed of at fairly regular intervals. The residents are mostly educated and business elites who are middle-class and enjoy a relative degree of affluence.

#### **Problem diagnosis**

As part of a United Nations/World Health Organization (UNDP/WHO Development Programme, a study of the Ibadan Wastes Disposal and Drainage problems was carried out between 1969 and 1973. The study showed that in the old city area of Ibadan, private sanitary conveniences such as aqua privies, pit latrine and pail latrines were very few although a few public ones have been provided in markets and other public places. It was estimated that approximately 30 to 40 percent of the population did not have any form of facility. The city of Ibadan had grown at a fast rate because new industries and amenities such as water and electricity had attracted the rural populations to seek employment in the city. The provision of adequate safe water and facilities for the disposal of human wastes could not keep pace with the growing population and existing services were over-stretched.

In the inner core, the provision of adequate water supply and modern sewage was adversely affected by the lack of planning which had characterised the old town.

The additional water supply from Asejire did not provide much relief due to poor distribution systems and there was the phenomenal increase in the demand of water for domestic, industrial and agricultural use. Therefore, the use of polluted wells and streams was still rampant in many areas of the city.

***Plan of operation***

Any plan for improved sanitation in the old town must therefore include the provision of new facilities for excreta disposal, water supply and waste water collection and disposal. This task was to be accomplished by the Ibadan Wastes Disposal and Drainage Project. The Ibadan Wastes Disposal and Drainage Project otherwise known as WHO Project 3303 Nigeria was an outgrowth of the studies from 1969-73 which revealed the need for a large scale feasibility project to determine the most effective way to implement a Wastes Disposal and Drainage Programme in the city of Ibadan. This Project which was jointly financed by the UNDP/WHO and the then Western State Government started in late 1969. At its inception the staff included a professional strength of 16 which comprised of a WHO Sanitary Engineer as Project Manager, 8 Western Government Engineers, a sub-contractor team of 5 Engineers, one Management Specialist and a health education specialist. The Department of Preventive and Social Medicine, University of Ibadan, provided technical advice which was coordinated by the authors.

***Programme objectives***

According to the operational terms, the project was established “to assist the Government of the Federation of Nigeria in undertaking engineering and feasibility studies necessary with regard to the preparation of master plans and phased investment and construction programmes for sewage, drainage and solid waste assistance for the city of Ibadan, Western State of Nigeria, as well as inter-related legal, managerial and financial matters”.

***Technical options***

After a detailed study of the existing environmental sanitation problem in the Old Town of Ibadan, the Project team concluded that to meet all the provision of improved sanitation facilities in the old town including excreta disposal, water supply and waste water collection and disposal, the “Comfort Station” be employed as the major element from the improvement of environmental conditions in the Old Town. As regards refuse

disposal, refuse depots would be constructed and located in places where they could be accessible to vehicles for timely removal and for final disposal. The design would ensure a time-saving device for the evacuation of refuse. An “elevated refuse depot” was designed by engineers to serve this purpose.

***Ibadan Comfort Stations***

A Comfort Station is a building designed to provide toilet, bathing and clothes washing facilities for family groups of from 300 to 600 persons in congested areas of the city.

Design and construction plans were made by the personnel of the Ibadan Wastes Disposal and Drainage Project after the family providing the building site had selected the design that they and the engineering staff felt would best suit the needs and resource of their compounds. Labour was supplied by the family and project personnel provided necessary technical supervision. The Site was determined by the particular needs of each family. The initial demonstration Comfort Station required a plot 2 feet x 40 feet and contained ten toilets, eight showers and the laundry room. The cost varied depending on the size of the station as determined by the number and kinds of components. The demonstration Comfort Station required family cash and kind expenditures of about N800 and a project grant of about ₦ 4,000 in 1969. Construction time was variable as it depended on the design chosen, size, efficiency of labour, availability of materials, etc. Under ideal conditions, a Comfort Station designed to accommodate 300 persons could be completed in less than four months. The Comfort Stations once completed were the property of the family or community group which provided the building site and built the station. A list of family members, was compiled before a grant was made, have exclusive rights to the station. Proper operation is essential and daily care and maintenance of the station is the responsibility of the owner family who must ensure that toilets, showers and the laundry room are kept clean and that repairs are made before they become major problems.

### ***Elevated Refuse Depot***

Unlike the Comfort Station, the Elevated refuse depot was a public facility. Sites which must be located on motorable roads were chosen by the Project staff after consultation with the local communities. The project bore all the costs of the depot which is a structure standing on a concrete base near a motorable road and elevated to the level equal to the height of the floor of the refuse collection van. Refuse was to be deposited on the floor of the depot after a person has climbed a number of steps. The design was to allow easy removal of refuse to the van.

### ***Achievements***

On the success side, the project can claim a modest beginning of one comfort station owned by the Egbodi family which spread to the NW3 Ward which today will boast of having 8 Comfort Stations. The Comfort Station was later introduced in 10 other Wards in the inner-core, SW4, SW1, S6, SW2, E2, NW4, SW6, SW5 and E4 with 29 completed and 8 under construction making a total of 45 (8+29+8) Comfort Stations spread over 11 out of 46 Wards in Ibadan at the end of 1982. Between 1970 and 1975 there were 22 elevated refuse depots spread over the 11 Wards and some peripheral areas of the city.

### ***Shortcomings***

On the failure side, we will sadly say that the last 11 Comfort Stations started were later abandoned and uncompleted. Out of the remaining 34, only 7 or (19%) could be rated as always properly maintained, 10 or (27%) as sometimes properly maintained and the remaining 17 or (54%) have been closed down completely. None of the 22 elevated refuse depots is today functioning according to design.

### ***Major Constraints***

Soon after the Comfort Stations and the elevated refuse were put into use, operational and maintenance constraints of technical and behavioural nature started to emerge. These constraints which were noted as far back as 1973 (Ademuwagun, 1975) could not be solved by

the Wastes Disposal Board which managed the programme through the State Ministry of Works and sadly the initial success of the programme which was achieved through community self-help and health education strategy was reverted to a downward trend. These constraints may be sued up as follows:

*Administrative:* Soon after the external agencies WHO/UNDP pulled out their staff (one of whom was the Project Manager) there was a power tussle for leadership among the national staff which diverted the attention of the Wastes Disposal Board;

*Technological:* This applies to the design of both the elevated refuse depots and the Comfort Stations. The engineering design of the elevated refuse depot was to cater for the easy removal of the refuse from the depots into the refuse vans. This implied that in order to dump refuse the person must first climb a staircase. This is alien to the cultural practice of refuse dumping and constitutes a great inconvenience to the users of the depot. Therefore, rather than climb the stairs, the refuse was usually deposited around the depot. Disposing of refuse culturally belongs to children in the family. The elevated refuse depot was not an appropriate technology for the traditional method of disposal although it might assure easy evacuation.

As to the Comfort Station, since it is an aqua privy toilet, the pit must maintain a minimum level of water constantly for efficient running. The problem of intermittent supply of water was not taken into consideration in the design of the Comfort Station. Therefore, only the Comfort Stations which enjoyed sufficient supply of water could function effectively.

*Economic.* The Comfort Station was designed to be used by a low-income community. Because of its design, especially the large number of people it is meant to serve and the services provided such as laundry and shower baths, the Water Corporation treated it as an industrial unit and metered it for the purpose of billing. The bill for water was sometimes too high for the people and besides this, they developed a negative attitude to these

charges which do not free them of their obligations to pay a yearly water-rate. The Water Corporation therefore disconnected the pipes serving many of the Comfort Stations. With electricity, it is the same story. Organisation for cleaning of the facility did not present much problem but this was inhibited by factors such as lack of water and light.

*Operational.* A Comfort Station was normally located in any land donated by the owner family. Many times, the facility could not be centrally located to the extended family and therefore it becomes more accessible to some members than others. The problem of lack of access was more pronounced at night especially for children users who were afraid to go out at night. Family members had to resort to the use of “chamber pots” at night to be later hand-carried and evacuated at the Comfort Station by day time. Similarly, children who are culturally assigned refuse disposal duties and who must cross a highway in order to reach the refuse depot always deposited the refuse on the other side of the street opposite the site of the depot. This experience from the use of the elevated refuse depot is an example of what to expect when people are made to fit into technology instead of technology being designed with the characteristics of the users in view.

(b) *The Nigerian Guineaworm Eradication Project (NIGEP)*

The global realization in the early 1980s that guinea worm disease (Dracunculiasis) could be eradicated (Hopkins 1983) happened not only in the wake of the eradication of smallpox, but more



Figure 1: A Comfort Station Facility in Ibadan, 1985



Figure 2: An Elevated Refuse Depot, Ibadan, 1985

importantly, in the context of the International Drinking Water Supply and Sanitation Decade (IDWSSD) (Belcher 1985; Edungbola *et al*, 1985). Guinea worm, it was observed, was 'the only disease exclusively transmitted by drinking water (and therefore) can be eradicated simply by providing safe water sources' (Bourne 1986). Resolutions by the World Health Assembly in 1981 and 1986 clearly tied the elimination of guinea worm disease to improved water supply (WHO, 1986; Hopkins, 1987). Officials of the Water Decade's Steering Committee believed that the eradication of guinea worm would not only be a by-product of the Decade, but might also have been the single most important legacy of their efforts (Bourne, 1986; 1988). The connection with the DWSSD meant that efforts to eliminate guinea worm, community by community, and country by country, would take place in a broader development perspective, that is, in the same vein as the philosophy of primary health care as espoused by the international health community (WHO and UNICEF 1978).

Emphasis was placed on the idea that not only was guinea worm a 'neglected' disease (Hopkins 1983) but that it also symbolized the neglect suffered by remote, poor rural dwellers from national development programme such as water supply, education and health care (Watts 1987; Yacoob *et al*, 1989). From the foregoing, it can be seen that the decision to eradicate guinea worm disease was inextricably linked with an intention to provide poor, endemic



communities with clean, safe and reliable water supplies.

The broader development nature of these activities was appreciated by the villagers themselves. Not only did they recognise the importance of eliminating the disease, but they also stressed the value of the programme in providing regular water, decreasing the physical burden of water collection, increasing the time available, especially for women, to engage in economic development and fostering a sense of self-accomplishment within the community itself (Foly and Caudill, 1986).

After the Nigerian Guinea Worm Eradication Programme (NIGEP) was launched in 1987, media advocacy was undertaken to ensure that policy-makers did not forget their promise. The international media also picked up on the fact that "Clean water is key to eradication of guinea worm" which was the subtitle to an article in the *Washington Post* (Thompson, 1987; Rotival, 1988). Subsequently, in Nigeria the National Plan of Action (Federal Ministry of Health, 1989) for elimination of guinea worm set forth that "The main interventions which will be used are health education (to encourage use of safe water, non-pollution of water supplies, and use of filters), and provision of safe drinking water on a priority basis to affected villages which have mobilized themselves to take control measure" using a PHC approach. Although eradication efforts were initially stimulated by the idea that control of the disease through the provision of safe water would result in wider development benefits, programmes later evolved into an epidemiological approach.

This consisted of targeted, short-term interventions such as use of the insecticide Abate to kill the intermediate host in ponds (species of crustaceans known as Cyclops) or the use of cloth filters to remove the Cyclops. These interventions were reminiscent of the change in focus of PHC to Selective PHC (Walsh and Warren, 1979), wherein a limited number of supposedly cost-effective measures could be used to reduce child mortality and morbidity, and thus replace a more comprehensive package of health interventions, which included of course, clean water supply. Concerns about cost included the multiplier effects of improved water supply programmes (Briscoe and Cunningham, 1987).

Unlike the developmental approach of improved water supply, the simple, supposedly cost-effective intervention of cloth filters would not reduce the overall burden of disease in the community. Being guinea worm-specific, filters would not remove such organisms as *Giardia lamblia*, *Entamoeba histolytica*, hookworm, *Ascaris* sp., *Trichuris trichiura*, and *Strongyloides* sp. Those are also found in water sources containing Cyclops infected with guinea worm larvae (Ilegbodu *et al*, 1987).

Nine years after NIGEP was launched, these results show a striking lack of commitment to the eradication of guinea worm through the provision of safe water, despite WHO's (1996: 39) continued emphasis that "This parasitic disease is transmitted by drinking polluted water in regions where water is a rare commodity" (emphasis added), The need for water is not lost on villagers who 'reasoned correctly that filters were not useful if there was no water to pour through

Table 3: Status of Nigeria Guinea Worm Eradication Programme (NIGEP) strategy indicators

Indicator	Status/Year % Endemic Villages Where Implemented		
	1994 *	1995*	2002
Provision of filters	64%	94%	100%
Case containment	12%	90%	100%
Reporting monthly	72%	73%	95%
Provision of safe water supply	46%	48%	52%

Source: \*Brieger, *et al* (1997)

them' (Brieger *et al*, 1989-90). In fact it is estimated that only 43% of Nigeria's population had access to safe water in 1995 (WHO 1996).

### **Present Public Health Measures**

The Federal Military government started a laudable programme by which individuals would clean their houses and the immediate environment every month. Federal Ministry of Environment has endorsed it through the Environmental Sanitation Policy which is being put in place this year. State Governments are making special allocation of funds to boost environmental health services. On oil pollution, the Federal Government signed an agreement with a foreign American firm for the control of pollution in oil-producing riverine areas of the country. Also, there is a nation-wide programme of cleaning urban high-ways. Importantly, the Federal and State Governments have embarked on a programme of public information and awareness, the training of more staff and the introduction of legislation. This is a good beginning but the magnitude of the environmental hazards faced by Nigerians, as described, more than justifies a need to intensify environmental education, training and public awareness.

### **The Future outlook**

The environmental health problems no doubt require better solutions than those that are being offered, at present. For example, what is being cleaned-up in the city is being covered up in unauthorized places or dumped along the inter-city high-ways. What is required is a plan for a permanent solution. Our roads and drains become littered again a few days after a "clean up" operation campaign. The problem is not lack of education but inadequate back-up of facilities which will enable the public to transform their education into desirable actions. The refuse dump must be accessible to users, dust bins must be emptied regularly from homes. People cannot use toilets which do not exist. The level of hygiene that can be maintained by a family of eight who share a room in the inner city with no access road and drainage is limited. Adequate funds should be provided for the provision of essential public

facilities in sufficient numbers. The Federal, State and Local Governments should increase their budgetary allocation to environment and health.

Right now, considerable efforts are being made in the health sector, new hospitals are being built, doctors are being trained in large numbers and their strike actions are being effectively curtailed while drugs are being imported in large quantities. But these efforts, albeit well-intentioned, are unlikely to yield the desired results in terms of a visible impact on the health of the people until there is adequate number of trained personnel to monitor the quality of the environment.

The incessant failures that have attended well-intended government efforts suggest a need to find the right type of technology for wastes disposal instead of imported technology. When elevated refuse depots were being constructed in Ibadan to ease the evacuation of refuse into the refuse trucks, the designers did not take into consideration the socio-cultural, economic and behavioural implications. Children who are normally saddled with the responsibility of taking refuse to the depots refused to climb the steps. The new technology failed.

Research is needed to come up with technologies for waste disposal which will take into consideration the characteristics of the users as well as operational necessities. Research is a basic necessity for the development of a viable training programme.

There are two options for environmental policy formulators. The two have implications for the role that environmental education, training and public awareness have to play in the implementation of environmental policy. The two options are based on the premise that the nation must not import an environmental policy just because it has been successfully implemented elsewhere. The planners must strive to formulate one which can be implemented within the limits of the social, economic, technological and scientific resources of the nation. This is to say that anything in the name of development that is bound to create an environmental hazard which is beyond the available expertise of national scientists should be rejected, even if the money to import such

expertise from outside is available. The benefits of such ventures are better postponed until the national expertise to handle the resultant environmental hazards is developed. This underscores the need for environmental policymakers to start with building human capacity in environmental sciences that are relevant to our national needs. The second option is that even when a nation relies heavily on a particular industry for its revenue, and the products of this industry are consumed outside the country, the health cost of the attendant environmental hazards created by such an industry should be met from the revenue being generated. If those who enjoy the fruits do not face the created hazards, they are unlikely to be seriously committed to the amelioration of the hazards because in their opinion, they have paid for the products.

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