

Nigerian environment and health security: Current issues and projections to Year 2050

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Abstract

Background: In line with the NUC request to the University of Ibadan to develop a 'Blueprint for Health Security in Nigeria by 2050', this document was prepared to highlight steps and discuss actions required toward achieving this goal.

Method: The situation of environmental problems in Nigeria such as: erosion and land subsidence, flooding (coastal, river and urban), drought and desertification, oil pollution from spills, and well blow-outs, biodiversity loss, industrial and municipal pollution from wastes, climate change, toxic and hazardous wastes, including E-waste, were addressed in the blueprint. **Results / Comments:** Although Nigeria is unlikely to be attacked with nuclear explosives, plans of nuclear power development, makes it desirable for nuclear security and emergency preparedness response measures to be put in place. A holistic forecasting of major environmental health factors is suggested; keeping in view the year 2050 is a little over 3 decades away. In addition, SWOT analysis of Environmental Management was carried out while processes of monitoring and evaluation, as main tools for achieving health security in Nigeria by 2050 were identified and reported.

Conclusion: Achieving health care for all by 2050 though a gigantic task, Nigeria has adequate Environmental Health and Scientific manpower and resources to address the issues. This document should educate the general public on Environmental Health and its different components which include; Climate Change, Water, Sanitation and Hygiene (WASH), Environmental Chemical Pollution, Food safety and Hygiene, Waste Management and Air Quality among others.

Keywords: *Climate change, Exposure assessment and environmental toxicology, Environmental management, Environmental pollution, Erosion and flooding, Health security,*

Abstrait

Contexte : Conformément à la demande de la Commission Nationale des Universités à l' Université d'Ibadan pour développer un 'Plan directeur pour la Sécurité Sanitaire au Nigeria d'ici 2050', ce document était prêt à mettre en évidence les étapes et discuter des actions nécessaires en vue d'atteindre cet objectif.

Méthode : La situation des problèmes environnementaux au Nigeria tels que: l' érosion et l' affaissement du sol, les inondations (côtère, rivière et urbaine), la sécheresse et la désertification, pollution par les déversements d'hydrocarbures, et éruptions des puits d'hydrocarbures, la perte de la biodiversité , la pollution industrielle et municipale des déchets , le changement climatique, les déchets toxiques et dangereux, y compris les déchets électroniques, ont été abordés dans le plan directeur.

Résultats / Commentaires : Bien que le Nigéria soit peu susceptible d'être attaqué avec des explosifs nucléaires, les plans de développement de l'énergie nucléaire rendent souhaitable la mise en place de mesures de sécurité nucléaire et de préparation aux situations d'urgence. Une prévision holistique des principaux facteurs de santé environnementale est suggérée ; gardant à l'esprit que l'année 2050 est un peu plus au-delà de 3 décennies. En outre, l'analyse SWOT de la gestion de l'environnement a été réalisée au cours des processus de suivi et d'évaluation comme principaux outils permettant de réaliser les objectifs de sécurité sanitaire au Nigeria d'ici 2050 ont été identifiée et rapportée.

Conclusion : Assurer les soins de santé pour tous d'ici à 2050, bien qu'il s'agisse d'une tâche gigantesque, le Nigéria dispose du personnel de santé environnementale et des ressources scientifiques nécessaires pour faire face aux problèmes. Ce document devrait informer le grand public sur la santé environnementale et ses différentes composantes, notamment : Changement climatique, eau, assainissement et hygiène (WASH), pollution chimique de l'environnement, sécurité alimentaire et hygiène, gestion des déchets et qualité de l'air, entre autres.

Mots - clés : *Changement climatique, évaluation de l'exposition et toxicologie environnementale, gestion de l'environnement, pollution de l'environnement, érosion et inondations, sécurité sanitaire,*

Introduction

Environmental Health deals with all the physical, chemical, and biological factors external to an individual and all the related factors. Environmental health plays an important role in impacting ecosystems and human health [1]. Environmental health in Nigeria has evolved from traditional practices through organized systems covering pre-colonial, colonial and post-colonial periods. Understanding of environment related diseases has moved away from centuries old supernatural beliefs to evidence based causative agents which are physical, chemical or biological in nature [2]. Environmental health has several components. These are shown in Figure 1.

rate was 5.2 per cent. Agriculture contributed to 26% and livestock 6% of GDP in 2003. Industry contributed to 30.5% of GDP, mostly from oil. For the period 1990 to 2003 household consumption grew at an annual rate of 3.7%. In 2001 it was estimated that approximately 51% of household consumption was spent on food, 31% on fuel, 2% on health care, and 8% on education. By 2000 about 60% of the population had income below the poverty line. Of the 57.21 million of labour in 2005, an estimated 70% were in agriculture, 10% in industry, and 20% in services. The unemployment rate in 2005 was estimated at 2.9%. The total number of housing units in 1992 was 25,661,000.

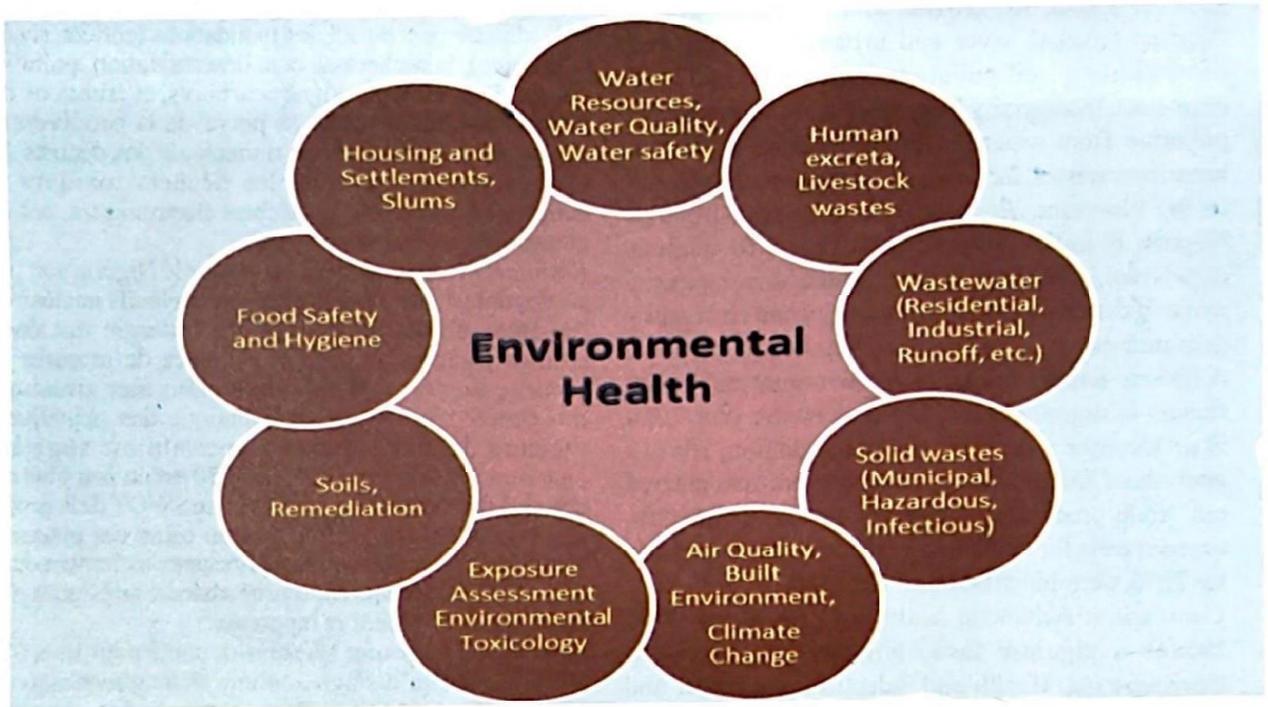


Fig. 1. Components of Environmental Health [3]

Nigeria at a glance

Nigeria has a total land area of 983,213 km² occupied by a population of 195,875,237 with more than 250 ethnic Groups as of 2018. The country has 6 Ecological Zones with varying climate. Roughly 13,517,000 hectares of land (14.8%) is under forest. Oil sector contributed to 89.2% of exports as of 2003. Natural gas reserves were estimated at 176 trillion cu ft (as of 1 January 2005). Politically, the country is divided into 36 States, One FCT and 774 Local Government Areas. In 2002 the country had an estimated 193,200 km of roads, including 1,194 km of expressways. In 2005 Nigeria's GDP was estimated at \$132.1 billion and the annual growth

As of 2004, there were an estimated 27 physicians, 66 nurses, 2 dentists, 8 pharmacists, 9 medical laboratory scientists and 52 midwives per 100,000 people. Lack of proper facilities and inadequate salaries promoted more private health facilities. There was also increased brain drain for several years. Total healthcare expenditure stood at 2.8% [4].

Situation of Environmental Problems in Nigeria and the Health Impacts

A report from Nigerian Environmental Statistics Unit listed the critical environmental problems in Nigeria [5]: sheet erosion, gully erosion, coastal and marine

erosion and land subsidence, flooding (coastal, river and urban), drought and desertification, oil pollution from spills, and well blow-outs, biodiversity loss, urban decay and squatter settlements, industrial and municipal pollution from wastes, concrete jungles/cities and climatic change. Additional to this, air pollution is on increase due to inappropriate cooking fuels, automobiles, motorcycles, unplanned industrial parks, auto mechanic workshops, small and medium scale industries scattered in unauthorized locations, and market and trading activities.

When the current environmental problems are prioritized, Water Sanitation and Hygiene (WASH) based diseases take priority among the communicable diseases. A World Bank report (Punch, August 28, 2017), revealed that Nigeria provided clean water to fewer than 10 per cent of its city dwellers in 2015, down from 29 per cent 25 years earlier i.e. 1990. Water Aid lamented that as of 2018, in Nigeria 59 million people do not have clean water (coverage 67% by 2015), and 123 million do not have a decent toilet (Coverage 33% by 2015) and 59,500 children under the age 5 die every year. Girl education is hampered due to lack of menstrual hygiene facilities in schools. The SDG Goal 6 therefore demands "Ensure Access to Water and Sanitation for all" (Water Aid, <https://www.wateraid.org/uk/where-we-work/nigeria>, Accessed May 23, 2018). Adequate WASH facilities cost US\$3 per capita as of 2010. Water supply and sanitation are not provided efficiently in Nigeria. It was reported that State Water Agencies are massively overstaffed – in 2000, there were about 70 staff per 1,000 customers in State Water Agencies [6].

Nigeria has been fortunate over the years in eradicating small pox, plague, Guinea worm and to a great extent Polio. Nigeria is also plagued with threat of Emerging infections such as Ebola, SARS, Lassa fever and others lurking in the environment and showing up in epidemic proportions. Historically, HIV and the associated secondary infections and Ebola have reawakened the importance of environment in disease transmission and appropriate mitigation measures by addressing sanitation and hygiene at individual and community level. Diarrhea, typhoid, malaria are still threats in many Nigerian communities and effective preventive measures are required. Serious among these are also water-, soil-, air-, and food- borne infections affecting children, and other vulnerable groups particularly in the high and medium density communities.

Waste management is a serious threat and to date no city has found a viable solution. Faeco-oral, zoonotic

infections and vector-borne infections are associated with wastes beside being a nuisance and poor aesthetics. Some years ago in Sokoto a yellow fever epidemic was attributed to uncleared waste dumps in the city. Dengue, Chikungunya and encephalitis are new entries of mosquito-borne infections. Toxic and hazardous wastes including E-waste are mixed with residential municipal waste which is linked with human behavior and attitude. The recent lead poisoning episode in Zamfara State [7] is an eye opener due to mining activities which are environmental in nature. Fortunately, Nigeria does not produce much nuclear waste as most of the usage is in small quantities in nuclear medicine, oil exploration and some diagnostic and research laboratories.

The rural scenario is no better as the farming and fishing populations suffer from preventable diseases due to poor sanitation and hygiene practices and farm inputs such as excessive and inappropriate use of pesticides and other biocides, besides occupational injuries and poisoning. Neglected tropical diseases (NTDs) are also emerging at an alarming rate. In addition, the vector borne infections are closely associated with the environment. Newer infections due to increasing resistance of the organisms to chemicals, antibiotics and drugs is another emerging threat which require priority actions as they are challenging the existing preventive and therapeutic measures. The present situation calls for proper planning and judicious actions through intelligent decisions in the over three decades to make total health achievable in Nigeria. The following forecasting is suggested, keeping in view the year 2050 is a little over 3 decades away.

Forecasts to 2050 and Management Plans

The year 2050 is just 32 years ahead. This period may be conveniently divided into 3 phases- 2019 – 2030 (12 years), 2031-2040 (10 years) and 2041-2050 (10 years) and some of the priority areas to be addressed are listed (Appendix; Tables 1 & 2)

Sources of Funding

The sources of funding may include the following:

- International organisations: WHO, UNICEF, UNEP, UNIDP, DFID etc.
- Government Agencies
- Others (philanthropist)

Monitoring and Evaluation

Monitoring of environmental health programme or intervention project is "an ongoing, continuous

Table 1. Forecasts for priority Environmental Management and Actions to prevent disease for improved health

	2019-2030	2031-2040	2041-2050
	Short Term	Medium Term	Long Term
Environmental Component			
Water	Items: 1, 2, 3, 4, 5, 6 and 8.	Items: 7 and 8.	Items: 7 and 8.
<ol style="list-style-type: none"> 1. Resources development (Storage, Rain harvesting, recycled water, preventing leakages in distribution) 2. Supply development 3. Improved water treatment and accessibility 4. Improved Quality 5. Water Safety Plans 6. Behavioral change among water users 7. Water Resources data Bank 8. Man power training and capacity building 			
Wastewater	Items: 1, 2, 3, 4, 5, 6 and 7	Items: 2, 5, 6 and 7	Items: 2, 5, 6 and 7
<ol style="list-style-type: none"> 1. Improved drainage system using underground drainage 2. Phasing out of septic tank system in urban areas including mega-cities 3. Introduction of Primary and Secondary wastewater treatment systems in phases 4. Segregation of municipal and industrial wastewaters with technically sound treatment systems 5. Manpower training for maintenance of treatment facilities 6. Data Bank 7. Capacity building 			
Fecal / Livestock Waste Management	Items: 1, 2, 3 and 4	Items: 4, 5, 6 and 7	Items: 4, 5, 6 and 7
<ol style="list-style-type: none"> 1. Abolition of Open Defecation 2. Provision of Improved toilets 3. Capacity building for toilet construction and maintenance 4. Development of fecal sludge based waste to energy technologies (biogas) 5. Byproduct utilization for food security and environmental hygiene 6. Sanitation and hygiene improvement among targeted groups through education, provision and use of locally made sanitary devices. 7. Data Bank and Record Keeping/maintenance 			
Solid Wastes	Items: 2, 3, 4, 5, 6, 7 and 8	Items: 1, 2, 3, 4, 5, 6, 7 and 8	Items: 2, 3, 4, 5, 6, 7 and 8
<ol style="list-style-type: none"> 1. Segregation of wastes into municipal, hazardous, and infectious types; E-waste may be specially addressed 2. Special waste: nuclear waste 3. Waste assessment, quantification and data bank 4. Establishment of community based waste storage facility/kiosks for resource recovery 5. Establishment of 'Waste to Wealth' and 'Waste to Energy' technologies among the 			

communities is good resource conservation strategy.

6. Reduce landfilling of waste using waste management pyramid.
7. Encourage Public Private Partnership to effectively manage wastes with
8. Institutionalize waste pickers and scavengers to improve their health and dignity

Pollution Control	Items: 1 and 2	Items: 2, 3 and 4	Items: 3 and 4
1. Control water, soil and air pollution through technology and behavioural change			
2. Control eutrophication of streams, rivers and water bodies using pollution control technologies.			
3. Utilize aquatic weeds for recycling and use for food production.			
4. Identify point source pollutants and control them			
Soils	Items: 1 and 2	Items: 2, 3 and 4	Items: 3 and 4
1. Land treatment of Wastewaters			
2. Control of soil transmitted helminths			
3. Soil remediation, bio- and phyto-remediation for hazardous chemical removal			
4. Control of soil erosion, floods			
5. Control of soil degradation and Salinity of soils			
Air Quality	Items: 1, 2, 3, 4, 5, 6, 7 and 8	Items: 1, 2, 3, 4, 5, 6, 7 and 8	Items: 1, 2, 3, 4, 5, 6, 7 and 8
1. Indoor and Outdoor Air Quality monitoring			
2. Air pollution (including noise) control			
3. Air quality policy Development/ Regulations			
4. Air quality Data Bank			
5. Allergy/Aerosol Research and Development			
6. Emission control on highways			
7. Capacity building			
8. Community education			
Food Safety/ Hygiene	Items: 1, 2, 3, 4 and 7	Items: 5, 6 and 7	Items: 5, 6 and 7
1. Meat, Fish, hygiene			
2. Chemical control in food business/ industries			
3. HACCP Practice in food Industries, food waste management			
4. Promotion of food hygiene in small and larger eateries and food premises			
5. Fadama crops monitoring for toxic chemicals and microorganisms			
6. Wastewater reuse for Irrigation			
7. School meal programmes - monitoring and improving sanitation and hygiene			

Environmental Assessment	Items: 1, 2, 3 and 4	Items: 1, 2, 3 and 4	Items: 1, 2, 3 and 4
1. EIA			
2. EA			
3. Health and Social IA			
4. ISO certification			
Vector Control	Items: 1, 2, 3 and 4	Items: 1, 2, 3 and 4	Items: 1, 2, 3 and 4
1. Environmental			
2. Chemical			
3. Biological			
4. Engineering			
Environmental Toxicology	Items: 1 and 2	Items: 1 and 2	Items: 1 and 2
1. Technical approach; Centres for Toxicological Investigation			
2. Ecotoxicological approach			
Climate Change/Mitigation	Items: 1, 2 and 3	Items: 1, 2 and 3	Items: 1, 2 and 3
1. Carbon credit			
2. Carbon dynamics in different sectors, e.g. municipal, agricultural, industrial, life style sectors			
3. Carbon sequestration			
4. CDM opportunities			
5. Data Bank			
6. Record Keeping			
7. Community training on carbon reduction strategies, capacity building			
8. Cleaner Technologies			
9. Policies and Regulations			
10. Greening the country to reduce desertification, flood control, vector management			

Table 2. SWOT for Environmental Management

Strengths	<ul style="list-style-type: none"> • Expertise and leadership in environmental health • Resource avenue (abundant and general availability of natural water resource and wastewater; biomass resources including abundant faecal matter) • Income generation (recycling, biofertilizers) • Abundant human resources / capacity to accomplish all tasks • Availability of natural products for improving sanitation and hygiene
Weaknesses	<ul style="list-style-type: none"> • Low availability of engineering concepts • High capital expenditure • Lack of operational experience • Limited environmental awareness / non-acceptance to new concepts • Lack of funding
Opportunities	<ul style="list-style-type: none"> • Employment opportunities (e.g., waste to energy or wealth) • National / regional economic growth • Decrease use of fossil fuel ad reduced emission of pollutants • Development of new technologies / innovation (e.g engineering designs) for environmental management
Threats	<ul style="list-style-type: none"> • Low acceptance of new concepts • Lack of political will • Corrupt practices

Table 3: Environmental health indicators and justification

Indicators	Justification	Possible data sources
• Percentage of residents understanding and supporting sustainable practice	High level of awareness of sustainable principles should be reached	Tertiary institutions, Non-governmental Organisations
• Percentages of schools that have adopted sustainable modules	Increase in the number of school that have adopted modules, the more students will understand and embrace sustainability	Tertiary institutions, Ministry of Education
• Percentage use of renewable (e.g. solar) and alternate energy	Renewable energy use is an indicator for sustainable living	Climate change monitoring agencies, Tertiary institutions
• Proportion with access to improved, functional and safety managed water sources	Access to improved, functional and safety managed water sources reduce incidence of water-related diseases	Federal ministry of water resources, Rural Water Supply and Sanitation Agency (RUWASSA), UNICEF-Nigeria,
• Proportion with improved, and safety managed sanitation facilities	Access to improved, functional and safety managed sanitation facility reduce incidence of sanitation-related diseases	Federal ministry of water resources, Rural Water Supply and Sanitation Agency (RUWASSA), UNICEF-Nigeria,
• Number of community, business, labour, organization and government that adopt sustainable practices and policies	Sustainability is a function of individual as well as institutional actions	Tertiary institutions, Waste Management Authorities, Non-governmental Organization
• Proportion of new automobiles (cars, motorcycle, tricycles etc.) purchased that use renewable fuel technology	This is a measure of community's awareness and practice of sustainable principles	Road maintenance agencies, Federal Road Safety Corps (FRSC), Vehicle Inspector Officers (VIO)
• Proportion of households participating in sustainable waste (liquid and solid) management option	Voluntary participation in sustainable waste management is a measure of community's commitment to sustainability	Tertiary institutions, Waste Management Authorities.

process which requires data collection at multiple points throughout the programme cycle in order to measure progress toward achieving programme objectives" [8]. On the other hand, evaluation refers to an independent assessment of either completed or ongoing activities to determine the extent to which they are achieving stated objectives and contributing to decision making [9]. Therefore monitoring and evaluation (M&E) incorporated into environmental health projects/programmes from the planning stage are important in that they assist in determining whether a programme has achieved its intended outcomes. It identifies programme weaknesses and strengths, areas of the programme that need revision, and those that meet or exceed expectations [10].

The M&E plan should consist of six major steps [11]:

- (i) Identification of programme goal and objectives;
- (ii) Description of indicators (for tracking the process and outcome of the programme);

(iii) Data collection methods (qualitative and quantitative methods)

(iv) Define M&E roles and responsibilities with regards to who will collect data for each indicator;

(v) Create analysis and reporting plan:

(vi) Plan for result dissemination.

Apart from including M & E from the planning stage, adequate fund (about 5-10% of a project budget) must be set aside. It is also imperative that the data collected should be certified to be of high quality. This can be achieved by employing stringent and systematic data quality assurance procedures. The West Virginia Office of Technology [12] described quality management process as a method (or set of procedures) by which the quality of deliverables and processes is assured and controlled during the project. The process entails carrying out a variety of

appraisal techniques and implementing a set of corrective actions to address any deficiencies and raise the quality levels within the project. This hopefully may significantly address the modern environmental health hazards and attendant health consequences that are serious public health issues engulfing Nigeria and are of increasing significance in the rest of Africa [13; 14].

In summary, accountability of the indicators/benchmark/milestone toward sustainable Nigeria in 2050 could be achieved through viable monitoring and evaluation systems. The most effective way to implement an accountability system is the establishment of a Sustainability Council or strengthening the existing one. This is a lean quasi-governmental agency whose job is to coordinate sustainability efforts and hold us all accountable to the goals, actions, and indicators as contained in the plan. Table -3 presents some of the environmental health indicators required to be monitored and evaluated for a sustainable living.

Conclusions

Environmental health problems in Nigeria are enormous and require a multi-sectorial approach. Nigeria has adequate Environmental Health and Scientific manpower and other resources to adequately address the issues. Achieving health care by 2050 is a gigantic task but is achievable. What is required are the political will and commitment, with targeted approach to achieve the desired results.

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