



Management of Hazardous Waste in Nigeria, A Propose Strategy for Regulators, Operators and Businesses

Abba Suleiman^{1*}, Yusuf Abdullahi Rigasa², Nasir Kabir³

¹Civil engineer/Environmental Scientist, National Oil Spill Detection and Response Agency, NOSDRA

²Department of Environmental Management, Nassarawa State University, Keffi

³ Department of Civil Engineering, Abubakar Tafawa Balewa university, Bauchi

*Corresponding Author: Email; besotted002@yahoo.com; Mobile: + 234 8036013614

Abstract Industrialization involves the consumption of resources and generation of wastes. Many of the materials used or produced in chemical processes possess hazardous properties. As such they require proper management throughout their life cycle to minimize adverse effects on public health and safety or to the environment generally. A healthy environment is that which nurture humanity through the provision of ecosystem services. Ecosystem services from the aquatic environment can be impaired where water bodies are polluted by man-made chemicals, liquid and solid hazardous wastes. Nigeria suffers from the lack of a green vision required for sound management of hazardous wastes. As a result, critical environmental assets are increasingly damaged with little hope of remediation. The way forward is to design a disposal site that will adequately accommodate hazardous and non-hazardous wastes in an environmentally sound manner. A throwaway society as found in Nigeria is more concern with consumption of resources disregarding the potential impacts of hazardous wastes on man and environment. The absence of a national vision on wastes coupled with lack of separation at source ensures that municipal wastes in Nigeria are always hazardous requiring adequate disposal. The proposed disposal facility is equally appropriate for municipal wastes. As a signatory to SDGs, Nigeria is required by its commitments to managed 40% of municipal and hazardous wastes in an environmentally sound manner. The design when implanted will assist compliance and safeguard communities and critical environmental assets.

Keywords Pollution, Resilience, Environmental rights, Environmental Governance

1. Introduction

Nigeria is the most populous country in Africa with great potentials for human, social and economic development. The country is divided into six geopolitical zones, each with a unique environmental assets and human diversity. Currently, the country is challenged by rapid population growth, rising levels of poverty and deprivation, diseases, and unsustainable exploitation. Poverty and deprivation are the major causes of environmental health challenges in Nigeria. These challenges include unsafe drinking water, poor sanitation and hygiene, urban pollution, vector borne diseases and soil degradation. Contamination of the environment can also occur through industrial processes (e.g. PCBs and heavy metals) or accidental industrial by- products (e.g. polychlorinated dibenzo-p-dioxins and furans. Handling and incineration of hazardous wastes may all potentially contribute to dioxin and furan contamination. In nature, no chemical is hazardous as they are design for survival and livelihood of man and associated biodiversity and ecosystem services. The desire of mankind for unsustainable lifestyles, profit and quality of life beyond the carrying capacities of existing ecosystems has led the emergence of hazardous chemicals and throwaway communities in Nigeria and beyond. Economic activities are crucial to national development and healthy lifestyles. However, lifestyle choices and development



plans must be sustainable. Sustainability is development at no (null) environmental costs. Waste management is a huge challenge to government regulators, industrial operators and small and medium scale enterprises. This article reviewed best practices in hazardous wastes disposal and recommend a way forward for Nigeria.

2. Where We Are

Nigeria is committed to the implementation of its commitments to environmentally sound management of hazardous waste and in accordance to Basel Convention among others. These commitments include the development of comprehensive risk management policies aimed at pollution prevention and risk elimination; establishment of environmental and health surveillance programs; capacity, knowledge and information sharing among key sectors and stakeholders; strengthening of local, state and national strategies for prevention, detection and control of illegal traffic in hazardous waste; substitution of toxic chemical with less harmful alternatives; promotion of more environmental friendly practices by industries; and sustained public awareness campaigns and education on sound management of hazardous waste [1]. The goal of sound management of hazardous materials is to eliminate health and environmental risks to man and environmental assets. Recent amendment to the convention prohibits the export of hazardous waste for disposal from developed to developing countries; from 1997 the prohibition is also applied to hazardous waste exported to developing countries for Recycling.

On waste, Nigeria currently has no waste management policy. Whilst waste management is a constitutional responsibility of local governments, states have taken over the function due challenges of funding, infrastructure and institutional framework and the implications of waste on public health and the environment. In most states in Nigeria waste management has been reduced to sub-standards cleaning exercise with little or no attempt to recover cost, resources or encourage community participation and resilience. The aim of managing waste sustainable is to nullify government subsidies and convert all waste streams to resources (Zero waste). Current strategies and institutional framework are far away from these targets.

The negative impacts of wastes on humans and the environment in terms of pollution of land, water, and air, are becoming more acute than ever before. Nigeria has over the years put in place various administrative, legal and institutional frameworks to address the challenges in waste management, using the integrated approach and focusing on the 3R concept (Reduce, Recycle, Re-use), including recovery and final disposal. Various programs and activities on waste management have been put in place, including the construction of sanitary landfills; composting; establishment of recycling plants; establishment of National Registration Scheme for the import and export of Used Electrical/ Electronic Equipment; and Public Awareness/ Sensitization Campaigns on Sustainable Waste Management. Nigeria has also intensified efforts, through many collaborative programs, to address the problems of marine pollution and wastes from both land and sea sources.

It is evident that Nigeria has laws and regulations that indicate recognition of the need for sustainable and sound management of hazardous wastes. What is required is a National Hazardous Waste Management plan. Current disposal routes include burning (incineration), chemical treatment, fixation, burial and disposal into existing public waste infrastructure (waste dumps). Recovery processes are rarely employed. The communities living and working with hazardous substances especially in poor rural areas are at greatest risk from health and environmental impacts. Hazardous wastes and chemicals are frequently used in an unsafe manner and without understanding of associated risks. The risks these communities take is exacerbated by the circumstances of their relative poverty, lack of effective regulation systems, illiteracy and limited availability of appropriate information and training. The reuse of empty containers of hazardous wastes for water storage are common in household, mosques and public space.

On Global scale, Nigeria among others is committed to sustainability (Rio Earth Summit of 1992) and delivery of SDGs to its citizens. The expected outcomes would be realizable if hazardous wastes are not managed in an environmentally sound manner.

3. Hazardous Wastes

Hazardous materials are substances that are dangerous or potentially harmful to our health or the environment. Hazardous wastes can be liquid, solid, gaseous, or sludges. They can be discarded commercial products, like



cleaning fluids or pesticides, or the by-products of manufacturing processes. Hazardous wastes are materials that are known or tested to exhibit one or more of the following four hazardous traits:

- a. Ignitability (i.e., flammable);
- b. Reactivity;
- c. Corrosivity;
- d. Toxicity.

Toxic wastes are materials that can cause death, injury or birth defects to living organisms. They spread quite easily and can contaminate lakes, rivers and atmosphere. The term is often used interchangeably with “hazardous waste”, or discarded material that can pose a long-term risk to health or environment. Generally, Hazardous wastes are poisonous by-products of manufacturing, processes. They may be gaseous emissions, liquid, solid, or sludge and contain chemicals, heavy metals, radiation, dangerous pathogens, or other toxins.

The Harmful Waste Act (Cap 165 LFN 1990) was the first comprehensive legislation against dumping and trafficking in harmful wastes on any land or in territorial waters or contiguous zone or exclusive economic zone of Nigeria or its inland waterways. The Federal Environmental Protection Agency (FEPA) Act (Cap 131 LFN 1990) gave rise to the establishment of the first comprehensive institutional framework for prevention and control of pollution in Nigeria. FEPA became the core of Federal Ministry of Environment (FMEnv) in 1999. National Environmental Standards and Regulations Enforcement Agency (NESREA), a parastatal under FMEnv, has inherited the statutory duties of the defunct FEPA. National definition of waste used for the purpose of trans-boundary movements of waste exists in Nigeria. FEPA Harmful Wastes act (LFN CAP 131) defined as substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of the laws of the Federal Republic of Nigeria. The National Guidelines and Standards for Environmental Pollution Control in Nigeria define “Hazardous Wastes” as a by-product of society that can pose a substantial or potential hazard to human health or the environment when it is improperly disposed. The definition was based on hazardous characteristics e.g. (ignitability, corrosivity, reactivity or toxicity). Currently, there are no wastes defined as, or considered to be hazardous wastes by national legislation in accordance with Art. 1, para 1 (b) of the Basel Convention. The National framework is also silent on hazardous materials, technologies and operations other than waste acquired from overseas which are covered under the convention.

Table 1: Inventory of Hazardous Wastes in Nigeria

S/No	Source	Waste Type	Composition	Hazardous characteristics	Waste Management Options
1	Oil and Gas	Sludges/Liquids	Hydrocarbons,	Flammable, Toxic	Incineration/ landfill Waste dump, Recycling
2	Auto Mechanics	Liquids	Lubricating oils	Flammable, Ecotoxic	Reuse, Reduce, Recycle, incineration
3	Leather Works	Sludges/Liquids	Chromium, Sulfides, etc.	Toxic	Pyrolysis, incineration
4	Power and Energy	Oils from capacitors, transformers, etc.	Polychlorinated PCBs	Toxic, Ecotoxic	Incineration, landfill waste dump
5	Agriculture	Obsolete herbicides/ Pesticides	Organophosphorus Pesticides DDT, Aldrin, Dieldrin, Chlordane,	Toxic/Ecotoxic	Incineration, Reformulation
6	Healthcare waste	Chemicals, tissues, shapes, absorbent	Tissues/Cultures	Infectious	Incineration, Autoclaving, encapsulation, inertization, land disposal



7	Cleaning Service	Sludges/Liquids	Perchloroethylene (PERC)	Toxic	Containerization, landfill waste dump
8	Metal Finishing	Sludges/Liquids	Sulfuric and/or Hydrochloric acids Cyanides Cadmium, Copper Chromium, etc.	Corrosive Toxic Toxic	Landfill waste dump, Incineration
9	Timber Treatment	Sludges/Liquids	Copper, Chromium, Arsenic, Boron, PCP's	Toxic, Ecotoxic	Incineration, landfill waste dump
10	Paint Manufacture	Sludges/Liquids	Organic solvents	Flammable, Toxic	Recycle, Incineration

In summary, the Federal Ministry of Environment in partnership with its parastatals has produced legal tools and guidelines for sustainable management of local environmental assets. These tools include:

- a. FEPA Harmful Wastes Provision, act of parliament 42, 1988;
- b. National Guidelines and Standards for Environmental Pollution Control in Nigeria 1990;
- c. National Effluent Limitations Regulations S.1.8 1991;
- d. National Pollution Abatement in Industries and Facilities Generating Wastes Regulations S. 1.9 1991;
- e. National Environmental Protection Management of Solid and Hazardous Wastes Regulations S.1. 15 1991;
- f. FEPA (Amendment) act of parliament No. 59 of 1992;
- g. National Guidelines and Standards on Waste Disposal through Underground Injection – 1999;
- h. National Guidelines and Standards on Industrial Effluents, Gaseous Emissions and Hazardous Waste Management in Nigeria 19;
- i. Guidelines on Hazardous Chemicals Management;

Though the enforcement of these laws is slow, the effort of NESREA in developing and enforcing local environmental standards is commendable and in progress.

4. Institutions Involved in Management of Hazardous Wastes

The responsibility of ensuring that hazardous waste is managed in environmentally sound manner and do not present undesirable effects to human health and environment rest with various ministries and governmental agencies through laws, regulations and guidelines. The major institutions involved are;

- a. Federal Ministry of Environment;
- b. Federal Ministry of Health;
- c. Federal Ministry of Water Resources;
- d. Federal Ministry of Investment;
- e. Federal Ministry of Labor and Productivity;
- f. Federal Ministry of Agriculture;
- g. Basel Convention Coordinating Center for Training and Technology Transfer for the African Region; Federal Ministry of Environment, University of Ibadan Linkage Centre, University of Ibadan
- h. State ministries of Environment (SMEnv);
- i. National Agency for Food and Drug Administration and Control (NAFDAC);
- j. National Environmental Standards and Regulations Enforcement Agency (NESREA);
- k. Standards Organization of Nigeria (SON);
- l. Local Government Areas
- m. Vulnerable Communities

5. Multilateral Environmental Agreements

Nigeria is a signatory to the four major international conventions pertaining to hazardous waste management namely, the Basel Convention; the Montreal Convention; the Rotterdam Convention and the Stockholm Convention. The focus of this study is the Basel convention. Nigeria is also a signatory of the Bamako Convention, a regional effort for environmentally sound management of hazardous waste. The Basel Convention was principally devoted to setting up a framework for controlling the “transboundary” movements



of hazardous wastes, that is, the movement of hazardous wastes across international frontiers. It also developed the criteria for environmentally sound management. The Convention entered into force on 5 May 1992. In the past Decade (2000-2010), the Convention built a framework for complete implementation and enforcement of treaty commitments with emphasis on minimization of hazardous waste generation. The focus of the convention amongst others includes;

- a. Active promotion and use of cleaner technologies and production methods;
- b. Further reduction of the movement of hazardous and other wastes;
- c. The prevention and monitoring of illegal traffic;
- d. Improvement of institutional and technical capabilities - through technology when appropriate - especially for developing countries and countries with economies in transition (EITs);
- e. Further development of regional and sub-regional centers for training and technology transfer.

As of March 2009, there were a total of 172 parties and signatories to the convention. Out of these, 46 are African States, Nigeria inclusive. Nigeria currently hosts the Basel Convention Coordinating Regional Centre for the African Region at Ibadan.

6. Status of Commitments to Basel Convention among Others

Nigeria is a signatory to Basel convention which was signed March 1991 and currently host the regional center located at Ibadan, Oyo state capital. The country is a proactive member and currently run projects under the convention one of which is this study. The focal point is the Department of Pollution control, Federal ministry of Environment. The domestication of the convention in Nigeria is slow due the diversity and scope, which is beyond the immediate absorption and implementation capacity of local institutions. Though the convention is on Control of Transboundary Movements of Hazardous materials and their Disposal, local response tends to be reactive than proactive. The gap is gradually being narrowed through the activities of the regional center, the Federal Ministry of Environment and local stakeholders. This demonstrates the willingness of Nigeria to fully implement its commitments in the convention.

7. The Way Forward

Effective environmentally sound management of wastes requires active participation of all key stakeholders at local, national, regional and global levels. This will require a nationally documented road map [2]. A strategic approach and a National Hazardous Waste Management Plan are critical for desired outcomes

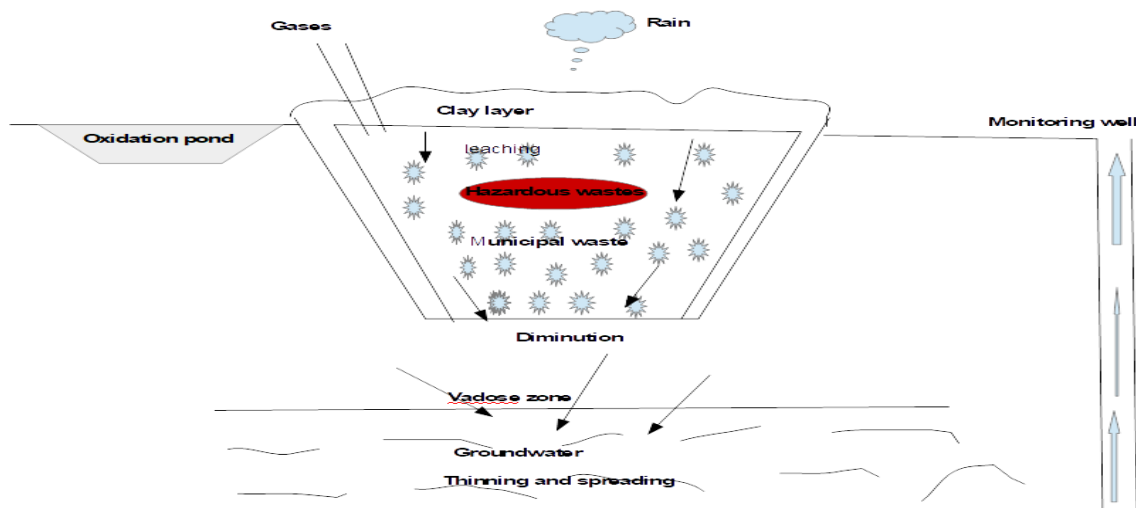


Figure 1: Propose Landfill Disposal Site

8. Propose Waste Disposal Site

The proposed final disposal site is designed to contain both hazardous and non-hazardous (predominantly municipal waste) waste in a ratio of 1:4 respectively; the facility is to be covered with a layer of clay at the top to minimize percolation. Oxidation ponds and monitoring wells are to be appropriately sited for collation of



leachate and ground water surveillance respectively. Cells of required sizes are constructed depending on the locational attributes. The cells are filled with hazardous wastes and are adequately protected with a layer of clay to prevent mixing with the municipal wastes. A venting system is put in place for collection of gases which are produced during decomposition. This process results in the volume reduction and achieves stabilization of the waste. The rate of this process depends mainly on the waste type and the conditions of the environment. Wet and warm environment will hasten the decomposition process by promoting bacterial growth. Diminution zone is a barrier that is located around the disposal site. It functions as a protection for the facility against leachate as well as a safeguard for groundwater. It does not have permeable lining; the leachate seeps out into permeable ground where it is treated by biological action of the soil minimizing the potential for pollution. The vadose zone is the portion of the subsurface above the water table, it is often regarded as a filter that removes undesirable substances before reaching the aquifer. All these components will be acting together to safeguard wastes and protect ground water.

9. Strategic Approach to International Hazardous Waste Management

According to UNEP [3], in developing and implementing the Strategic Approach and the Global Plan of Action, Governments and other stakeholders should be guided by:

- a. Principles and approaches in the following:
 - i. Stockholm Declaration on the Human Environment particularly, principle 22;
 - ii. Rio Declaration on Environment and Development and Agenda 21, particularly chapters 6, 8, 19 and 20;
 - iii. United Nations Millennium Declaration;
 - iv. Bahia Declaration on Chemical Safety.
- b. The following agreements, where applicable to them:
 - i. Montreal Protocol on Substances that Deplete the Ozone Layer;
 - ii. Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal;
 - iii. Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade;
 - iv. Stockholm Convention on Persistent Organic Pollutants;
 - v. ILO Convention No. 170 concerning safety in the use of chemicals at work.

The Strategic Approach has a scope that includes:

- a. Environmental, economic, social, health and labor aspects of chemical safety;
- b. Agricultural and industrial chemicals, with a view to promoting sustainable development and covering chemicals at all stages of their life cycle, including in products
- c. The involvement of all relevant sectors and stakeholders, including at the local, national, regional and global levels, is key to achieving the objectives of the Strategic Approach, as is a transparent and open implementation process and public participation in decision-making, featuring in particular, a strengthened role for women.
- d. The main stakeholders in the Strategic Approach are understood to be Governments, regional economic integration organizations, intergovernmental organizations, non-governmental organizations and individuals involved in the management of hazardous waste from all relevant sectors, including, but not limited to, agriculture, environment, health, industry, relevant economic activity, development cooperation, labor and science. Individual stakeholders include consumers, disposers, employers, farmers, producers, regulators, researchers, suppliers, transporters and workers.

Of equal importance on the way forward is to activate and institutionalize Global Plan of Action of the Strategic Approach to Hazardous Waste Management. Other actions include:

- a. Facilitate the implementation of existing agreements and work areas;
- b. Target issues not currently addressed in existing agreements and work areas;
- c. Chemicals or chemical uses that pose an unreasonable and unmanageable risk to human health and the environment based on a science-based risk assessment is no longer produced or used for such uses;



- d. The risks from unintended releases of chemicals that pose risks to human health and the environment assessment are minimized;
- e. Promote the generation of adequate science-based knowledge on health and environmental risks of chemicals and make it available to all stakeholder;
- f. Integrating chemicals issues into the broader development agenda;
- g. Promoting ratification and implementation of relevant existing international conventions on health, safety, occupational health and safety and environment;
- h. Promoting efforts to prevent illegal traffic inhazardous waste;
- i. Promoting greater coordination among regional and national centers and other stakeholders to address the whole spectrum of issues regardinghazardous waste;
- j. Promoting alternatives to reduce and phase out highly toxic pesticides;
- k. Promoting capacity-building, education and training and information exchange on sound management of hazardous waste for all stakeholders;
- l. Promoting voluntary industry initiatives and product stewardship in all relevant industries;
- m. Promoting the phase-out of lead in gasoline;
- n. Promoting the remediation of contaminated areas.

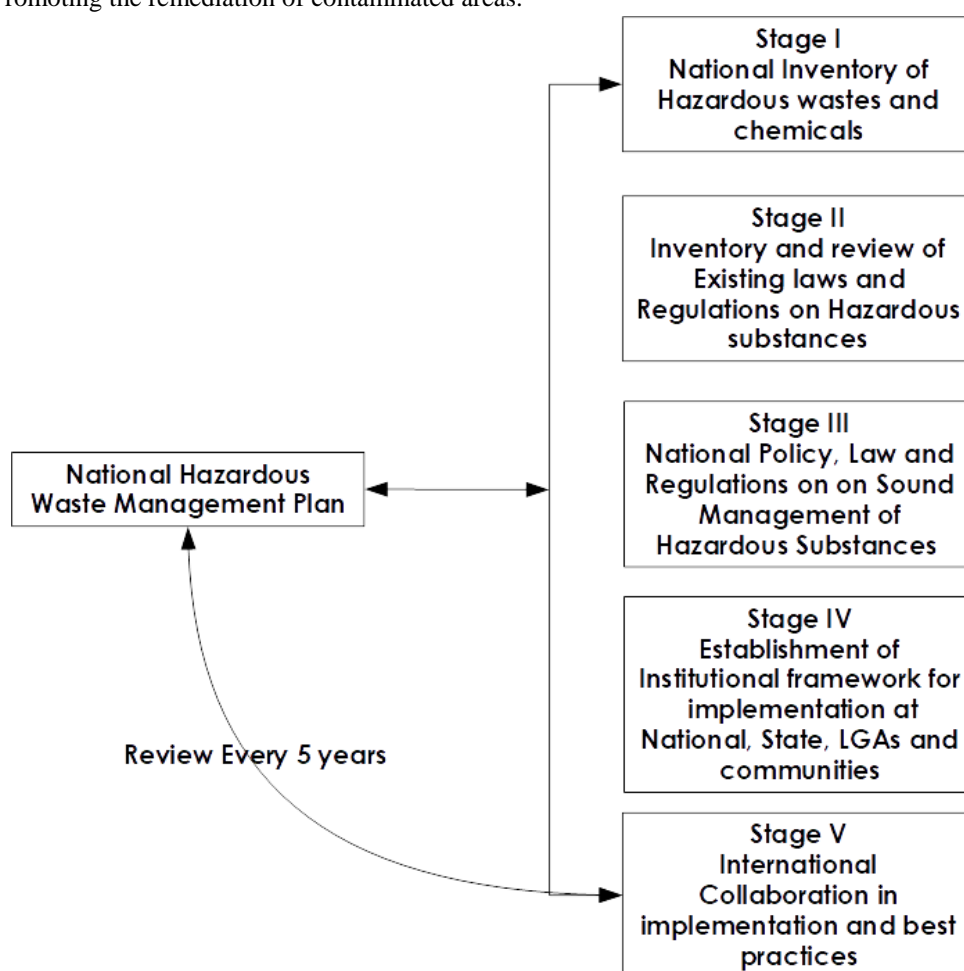


Figure2: Structure of the propose National Hazardous Waste Management Plan

Future institutional framework should involve the Pollution Control department of Federal Ministry of Environment working in synergy with similar structures at state, local government and communal levels. Community-based monitoring surveys should be employed to gather data on hazardous substances, incidents of exposure to chemicals, retail of chemicals and advertisement by the chemical companies.

At national and sub national levels, there should be less emphasis on drawing up new legislations, emphasis should be on making existing structures work. A major challenge is how to encourage compliance, so that



regulations can be enforced. Increased emphasis should be on preventing waste, on producing wastes that are less hazardous and on recycling. Equal attention is also required for long-term care of waste facilities. Environmental rights and responsibility of citizens, business and communities are critical to sustainability, safeguarding public health and resilience in sound management of hazardous substances.

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