

**Review Article**

Hazardous Waste Management and Challenges in Nigeria

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Abstract: Nigeria is a heavily polluted country. The problems and challenges of hazardous waste management in Nigeria is enormous. There are enough laws and policies on hazardous waste in Nigeria. There are institutions charged with implementation, execution and enforcing legislations and regulations of hazardous waste in Nigeria. These institutions are not adequately empowered to implement and execute policies, or enforce environmental laws. The simple execution of policies on ground and the enforcement of existing laws in the country can improve the environmental situation in Nigeria if environmental institutions are strengthened financially and politically.

Keywords: Hazardous Waste, Waste Management, Oil Spillage, Gas flaring, Ogoniland, Nigeria

1. Introduction

According to Central Intelligence Agency [1], Nigeria covers a total area of about 927,768 km² with an estimated population of 181,562,056 people in 2016 and an estimated growth rate of 2.54% in 2013. Nigeria is most populous country in Africa. The population is characterized by a strong rural to urban migration. As at 2010, half of the country's population already live in urban areas with estimated annual urbanisation rate of 3.5% from the year 2010–2015 [1]. The majority of the urban population lives in large, sprawling cities in the south like Lagos, Ibadan, Warri, Benin City and Port Harcourt. Cities of over 5 million people like Kano, Kaduna and Sokoto also exist in the north. Population densities, even in rural areas, especially in the southeast part of the country, are often above 200 persons/km² [2]. The practical absence of effective regulatory policies, monitoring system and agency on hazardous waste management and other environmental issues after independence, made the country susceptible recipient of exported trans boundary hazardous waste dump by waste merchants from industrialized nations. The first recorded incidence was in 1988 when about 4,000 tonnes of toxic waste from Italy was dumped in Koko port in Nigeria. Prior to 1988, the government of Nigeria had no meaningful environmental policy [3]. The government then, in response made the harmful waste (Special Criminal Provision etc.) Decree 42 of

1988. By this Decree, the Federal government enacted the Federal Environmental Protection Agency (FEPA) Act which brought about the creation of the FEPA [4]. However, prior to an amended by FEPA (Amendment) Decree No. 59 of 1992, 59 industries were established without any Environmental Impact Assessment (EIA) report. FEPA had to make it compulsory for all existing industries to carry out comprehensive environmental audit of plants to the Agency [5-6]. The concern by the government to protect the environment gave rise to the creation of the Federal Ministry of Environment (FMEnv) in 1999 from FEPA, to ensure effective coordination of all environmental matters [7]. The ministry oversees agencies including National Oil Spill Detection and Response Agency (NOSDRA) created in 2006 [8] and National Environmental Standards Regulatory and Enforcement Agency (NESREA) created in 2007 with mandates that covers hazardous waste [9]. As a Federation, environmental regulations in the country concerns the thirty-six (36) states and the federal capital territory. States are mainly responsible for their own environmental issues under various environmental and planning laws. The apex executive body in Nigeria is the FMEnv with the NESREA as the main enforcement body [9].

2. Hazardous Waste Generation and Characterization

The 1991 FEPA Guidelines defines hazardous waste as by-products of society that can pose a substantial hazard to human health or the environment when improperly managed, possesses at least one of the four (4) characteristics: ignitability, corrosivity, reactivity, or toxicity, or appears on FEPA lists [10]. According to FEPA Act hazardous waste can be determined by: ignitability; corrosivity; reactivity; halogenated hydrocarbons concentration; polycyclic aromatic hydrocarbon (PAH) concentration; polychlorinated Dibenzo p - dioxins and dibenzofurans concentrations; and polychlorinated Biphenyls (PCB's) concentration [10]. Below are the major sources of hazardous waste in Nigeria.

Crude Oil Spillage: Petroleum and its derivatives are highly inflammable and toxic to the ecosystem. The petroleum and petrochemical industry are the primary base of Nigeria's economy and are the major sources of environmental hazard materials in the country. From 1976 to 1996, there was a total of 4,835 spills in Nigeria resulting in a cumulative spill volume of 2,382,373.7 barrels of crude oil. Of this amount only about 15.91% was recovered, on the average, implying that about 84.09% of the cumulative spill was lost to the environment [11-12]. In 1980, Texaco Finima-5 oil blowout in the Niger Delta was curtailed after 30 days of burning and emission of poisonous gases into the air. About 200,000 barrels of oil was lost. Four villages including marine life in the town of Finima and Sangama River were polluted, leaving 350 hectares of mangroves dead [13]. Another major spillage at Abudu oil pipeline was witnessed in 1982. The oil flowed into the nearby villages leaving untold destruction behind. The crops withered, the soil dried up and marine life died [13]. From 1976 – 1991, 2,796 spills of about 2.1 million barrels of oil spill was reported in Ogoniland also in the Niger Delta. This accounts for about 40% of total oil spills of the Royal Dutch/Shell company [14].

Gas Flaring: It is on record that Nigeria is the highest gas flarer in the world [15-16]. It has been estimated that the total emission of carbon dioxide (CO₂) from gas flaring in Nigeria amounts to about 35 million tonnes per year. The average rate of gas flaring in Nigeria over the period 1970 - 1979 stood at 97%, while for the period 1980 – 1989, this stood at about 72%, falling marginally to an average of 72% during the period 1990 – 2000 [17-18]. The emission of CO₂ into the atmosphere contributes to global warming and the flaring of natural gas in the Niger delta of the country has led to an increase in the climatic temperature of gas producing communities and a destruction of the biotic life in such areas. Dwelling houses around such sites are bathed in acid rains, which also leave farmlands wasted and unproductive [19].

Electronic Waste: Waste electrical and electronic equipment (WEEE) generated in Nigeria sums up to 1.1 million tonnes for 2010, which is around 7 kg per capita [20]. This includes at least 100,000 tonnes of WEEE that entered the country illegally in 2010. According to Osibanjo and Nnorom [21], a very significant proportion of ICT users in

Nigeria rely on second-hand equipment from developed countries, primarily from Europe and North America. According to M. Amachree [22], these figures have reduced drastically as a result of the steps taken to monitor the importation of used EEE into Nigeria and there are presently, no specific figures. WEEE contains hazardous materials such as lead, mercury, beryllium, cadmium, and brominated flame-retardants that pose both human and environmental health threat [2].

Mining Activities: Crude mining activates expose farm lands and rivers to toxic chemicals such as lead, sulphur, arsenic, mercury and cyanide which are threat to humans and the environment [23]. Mining process in the northern part of Nigeria result in large amounts of toxic waste. Large amounts of mine tailings are simply sent into rivers. Most of local communities in Zamfara state use mercury amalgamation method in extracting gold, a process particularly degrading and creates a morass of hazardous waste [24]. The state suffers environmental exposure to lead from the processing of lead-rich ore mined by artisans for gold extraction [23]. Exposure to natural radiations emitted by some radioactive minerals is a major source of health hazards. It has been established that monazite, pyrochlore and xenotime, which are obtained as by-products of tin mining in the Jos Plateau, are radioactive. Mysterious deaths have been attributed to a high level of radiations released by monazite-rich sand used for building the houses the deceased lived in in these area [25].

Household Hazardous Waste: Most household wastes include among others: household cleaners, materials for home maintenance, garden products, and automotive products, the used contents or leftovers of these products, are either poisonous, toxic, flammable, caustic, corrosive, reactive, explosive or radioactive, or a combination of these characteristics [26]. Study by Rosas and Gutiérrez [27] shows that the quantity of hazardous wastes varies from 0.01-1% of the total solid municipal wastes, depending on the characteristics and customs of each locality. Sangodoyin and Ipadeola, in their study in south western Nigeria reported that wastes with hazardous components generated by high, medium and low income earner groups are of 5.6%, 4.4%, 4.2% respectively [28].

Medical Waste: Health-care activities in Nigeria generate significant amounts of hazardous wastes, such as chemotherapeutic agents, radio nucleoside, mercury, anaesthetics gas, corrosive and expired pharmaceuticals. Used needles, blood stained cotton and expired drugs are categorised as hazardous medical wastes because they can be poisonous or toxic [29]. In a study of 5 big health faculties in Abuja, the average waste generation rate per bed/day was found to be 2.78 kg of solid waste, 26.5% of the total waste was hazardous in nature [30]. In a study carried out in the most populated state in Nigeria (Lagos), the medical wastes generated range from 0.116 - 0.561 kg/bed/day, while the total waste is about 215.56 kg/day. Thus, the average generation rate is approximately 0.181 kg/bed/day [29].

3. Hazardous Waste Management Laws, Regulations and Conventions

National Legislation, Regulations and Guidelines: The incidence of Koko waste dump, led to the promulgation of the harmful waste Special Criminal Provision etc. Decree 42 of 1988, which, made it a criminal act punishable by life imprisonment, to carry, deposit, transport, import, sell, buy or negotiate in trade of harmful waste in Nigeria territory. This was the initial step towards effective management of hazardous waste in the country [3]. There are existing legislations, regulations and guidelines for the reduction and/or elimination of hazards waste generation in Nigeria. They include: Harmful Waste Act (Decree 42 of 1988) retained as Cap HI LFN 2004; Environmental Impact Assessment Act retained as Cap EI2 LFN 2004; Environmental Guidelines and Standards for the Petroleum Industry in Nigeria 2002; Petroleum Drilling and production Regulation 1967; National Environmental Protection (pollution abatement in industries and factories generating waste) Regulations S. I. 9 of 1991; National Environmental Protection; Management of Hazardous Wastes S. I. 15; Guidelines on Hazardous Chemicals Management; Guidelines on Pesticides Management; National Implementation Strategy for Chemicals Hazard Communication; National Environmental (Mining and Processing of Coal, Ores and Industrial Minerals) Regulations, S. I. No. 31 of 2009; National Environmental (Electrical/Electronic Sector) Regulations, S. I. No. 23 of 2011. Guide for Importers of UEEE.

Economic Policy and Instruments: The country's policy includes some good economic instruments as recorded in the document, *A Review of the National Policy On the Environment* [31]. The economic instruments includes: The Polluter Pays Principle (PPP), which prescribes that the polluter should bear the cost of preventing, and remediating pollution; The User Pays Principle (UPP), in which the cost of a resource to a user must include all the environmental costs associated with its extraction, transformation and use (including the costs of alternative or future uses forgone); The Pollution Prevention Pays Principle (PPPP), which encourages industries to invest positively to prevent pollution; promoting tax reliefs and subsidies that encourage investment in pollution abatement; employing appropriate insurance and other risk management schemes to fund remediation and restoration of polluted or degraded areas; imposing penalty taxes, fines, and charges for noncompliance with environmental standards and regulations; promoting the use of market-based extraction charges; and appropriate taxes on the extraction of resources to discourage their destructive exploitation and inefficient use [31].

International Conventions: International Conventions includes Bamako Convention on the Ban of the Import into Africa and the Control of Trans boundary Movement and Management of Hazardous Wastes within Africa; Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and their Disposal, including its Ban

Amendment. Basel Convention signatories are required to obtain written consent of the competent authority before the movement occurs [32]. Decree No. 42 of 1988 on harmful waste was harmonized with the Basel Convention [32]; Rotterdam Convention on the Prior Informed Consent Procedure (PIC) for Certain Chemicals and Pesticides in International Trade; Stockholm Convention on Persistent Organic Pollutants (POPs Convention) and Vienna Convention on the protection of the Ozone Layer and the Montreal Protocol on substances that Deplete the Ozone layer.

4. Problems and Challenges

WEEE collection in Nigeria is not organised; there are no collection centres and most times, they are dumped along with other wastes. A lot of e-waste are also stockpiled in offices and homes though states such as Lagos have started stockpiling of e-waste pending the establishment of a recycling facility. Treatment/Recycling is currently carried out by the informal sector with no knowledge of the environmental and health effects of improper e-waste management [22]. A lot of hazardous, toxic, liquid, solid and gaseous wastes are produced by Nigerian Agip oil company, a rich multinational company in oil producing communities in Ogba/Egbema/Ndoni local government areas of Rivers State. It is stated in research findings that the company employ inadequate and below standard disposal strategies [33], a common situation in Nigeria. In the 8th National Council on Environment (NEC), non-compliance of industries and organisations in the oil sector to set standards and guidelines was noted with dismay. The council noted with concern that some of the environmental problems in the country are attributed to non-compliance with the provisions of EIA Act No. 86 of 1992 [34]. There is also too little effort from the federal government to enforce compliance especially when it involves big multinationals as complained in Memo No. 10 of the 9th NEC Report by the Government of Bayelsa State. The government drew the attention of the NEC to the fact that Chevron (Nig) Ltd contravened the EIA Act by embarking on a drilling project without EIA, and the consequent environmental damage caused by gas explosion on its drilling rig, K. S. Endeavour on 16th January, 2012 [35]. Ogoniland was polluted by the Royal Dutch/Shell company with hazardous waste for 50 years. It took the intervention of the United Nations Environmental Programme (UNEP) in 2011 before Nigerian government saw the need for action [36]. But no action was taken till June 2nd, 2016 when President Buhari officially launched a clean-up programme [37]. Bassey *et al.* studied the waste disposal techniques employed in the management of solid medical wastes in five (5) selected health facility in Abuja [30]. They found that medical waste was often mixed with municipal solid waste and disposed of in residential waste landfills or improper treatment facilities (e.g. inadequately controlled incinerators). None of the hospitals surveyed practiced waste segregation. It was found that 18.3% of the hospitals incinerated waste in locally built brick incinerator, 9.1% bury their waste, 36.3%

burn their waste in open pits, while 36.3% dispose their waste into municipal dumpsites. It was observed waste management officers do not have formal training in waste management techniques and hospital administrators pay very little attention to appropriate management of medical waste. Another challenge is the low operating temperatures (~200 °C) of current medical waste incinerators, resulting in excess generation of dioxins and furans. Since the location of these facilities (at hospitals) are usually located in very close proximity of communities, the emissions from the incinerators presents a serious health risk to the same community which the hospital is meant to be serving [38]. In another study carried out in Port Harcourt, it was found that hospital wastes were not segregated into marked or colour coded containers/bins for the different waste streams neither do they keep records of waste generation and disposal [39]. In an assessment of pharmaceutical waste management in some Nigerian pharmaceutical industries it was found that more than 50% of the personnel, supposedly in charge of waste, were not trained to effectively manage waste. Those that were trained were either taught just the basics or had their training many years back and so were not aware of current trends in hazardous waste management [40]. It was found that the level of householders' awareness on the dangers of Household Hazardous Waste in Enugu metropolis is low [41].

5. Conclusion

Nigeria has good environmental policy on hazardous waste and the country is a major player in world environmental conventions yet the problems and challenges of hazardous waste management in Nigeria are enormous. This is as a result of ineffective institutions and lack of political will by the leaders of the country to enforce laws and execute policies as seen in the case of Ogoniland. The institutions charged with implementation, execution and enforcing legislations and the regulations of hazardous waste in Nigeria are not adequately empowered to do so. The simple execution of policies on ground and the enforcement of already made laws in the country can largely improve the environmental situation in Nigeria if environmental institutions are strengthened financially and politically.

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