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## Table of Content

1. Assessing the Role of the Judiciary in the Fight against Corruption in Nigeria *Arome M. Okwori* 01
2. Arrest and Investigation of Judicial Officer by Law Enforcement Agencies: Is There a Breach of the Principle of Separation Powers? *Bobai Paul Ali* 31
3. Insurgency, Religion, and the Burden of National Security in Nigeria: The Crusade or the Law, as Scepter of Authority? *M.O.Adeleke, L.A.Raimi, O.B.Adegbite* 47
4. The UNFCC Mechanisms for Emission Reduction: Implementation Constraints in Nigeria *Oluwadamilola A. Adejumo, Adedoyin Akinsulore & Oreoluwa O. Oduniyi* 71
5. Bigamy and Dearth of Prosecution in Nigeria *M.A. Lateef & N. K. Adegbite* 91
6. An Appraisal Of Mechanisms for Municipal Solid Waste Disposal and Management in Nigeria *Fagbemi, S. Akinlolu* 119
7. Administration of Public-Private Partnerships in Nigeria: Lessons from India *Augustine Edobor Arimoro* 145
8. Rethinking the Socio-Legal paradigm of the Protection of Women's Rights in Nigeria *Keseme Philip Odudu & Ebitari Joshua Allison* 171

9. Appraising the Mode of Initiation of Criminal Investigation by the Police in Nigeria *Emmanuel Folayan Ijalana, Mike Mbama Okiro, Livinus I. Okere & Adeyeye Adewole* 199
10. Children and Crime: An Overview of Juvenile Justice in Nigeria  
*Okike Ajanwachuku & Prudence Adula Okparavero* 223
11. Appraisal of Nigeria's Pension Reform Act 2014  
*A. A. Oluwabiyi & B. Posu* 242
12. An Appraisal of the Concept of Judicial Activism in Nigeria  
*Onu Kingsley Osinachi* 261
13. Environmental Integrity and the Challenge of Crude Oil Theft in Nigeria  
*Oluwadamilola A. Adejumo & Ayoola A. Abuloye* 281
14. Collective Bargaining and Collective Agreements as Instruments of Regulating the Employment Relationship in Nigeria  
*Oluwayemisi A. Adewole* 301
15. Tax Amnesty in Nigeria: An Examination of the Voluntary Assets and Income Declaration Scheme (VAIDS)  
*Newman U. Richards* 323
16. A Legal Juxtaposition of Traditional and Online Copyright Infringements in Nigeria  
*Christian S. Godsfriend* 343

# AN APPRAISAL OF MECHANISMS FOR MUNICIPAL SOLID WASTE DISPOSAL AND MANAGEMENT IN NIGERIA

Fagbemi S. Akinlolu\*

## *Abstract\**

*The Nigerian environment is faced with plethora of challenges of varying degrees which have continued to degrade the environment with concomitant health impact to Nigerians. For instance, the problem of improper waste disposal in Nigerian environment cut across all types of waste as well as strata of Nigerian society. It is common sight in Nigeria today to see heaps of festering waste dumps in our urban cities and commercial centres, residential apartments, the drains, the highways, corners of major or and minor streets and undeveloped plots of land. This paper seeks to appraise the mechanisms for municipal solid waste disposal and management in Nigeria. The pertinent issues which the paper will interrogate include the patterns and categories of municipal solid waste in Nigeria, the environmental and health impact of waste and the mechanism for waste disposal and management in Nigeria. The paper relies on a desktop study approach; hence information were obtained from previous publication relevant to the current study, particularly from peer reviewed publications. The paper reveals indiscriminate disposal of municipal solid wastes and attendant blockage of drainage channels and flooding of the environment during and after rainfall. The impacts of this include physical nuisance of the environment and hazards to humans' health. The paper concludes with suggestions, amongst others, that government should make concerted efforts to improve the extant waste disposal and management mechanism by strengthening solid waste management infrastructural in Nigeria.*

**Keywords:** Mechanisms, Municipal, Solid, Waste, Disposal and Management.

## **1.0 Introduction**

The issue of waste disposal and management has continued to attract attention in the last few decades. For instance, as humans' population<sup>1</sup> and consumption

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increase, so do wastes. Scientific discoveries and technological advancement, apart from rise in population, have led to increase in the production of wastes<sup>2</sup>. Dangers posed by unmanaged wastes are the devastating ecological and human disasters, which they occasion, some of these wastes are hazardous and very detrimental to human, animal and plant life. Urban residents, most especially, suffer to a great extent from severe environmental and health challenges associated with insufficient access to clean drinking water, inadequate sewage facilities and solid waste disposal. The problem of solid and domestic wastes disposal in urban centres in developing countries is a major concern to government and this problem is a major concern in Nigeria where municipal waste generation is always on the increase due to increase in population, urbanisation and socio-economic factors.<sup>3</sup> According to Mshelia,<sup>4</sup> Nigerian urban centers have become veritable centres of rural-urban influx and this interface gives some explanation of the high rate of waste generation.<sup>5</sup> Wastes are generated so fast, dumped carelessly and the technology and the capacity, particularly by environmental sanitation bodies and agencies to evacuate these wastes are so limited. He further stated that the vigorous pursuits of economic

1. For instance, the Nigerian population was estimated to in the region of about 184, 635, 279 million people as at December 2015. See United Nations, Department of Economic and Social Affairs, Population Division (2015). *World Population Prospects: The 2015 Revision, Key Findings and Advance Tables*. Working Paper No. ESA/P/WP.241.
2. Bell and Bell, *Environmental Law: The Law and Policy Relating to the Protection of Environment*, 4<sup>th</sup> ed. (London: Black Stone Press Ltd.) cited by L Atsegbua, V Akpotaire & F Dimowo. *Environmental Law in Nigeria: Theory and Practice*. (Lagos: Ababa Press Ltd., 2004) 101.
3. FK Omole & MK Alakinde 'Managing the Unwanted Materials: The Agony of Solid Waste Management in Ibadan, Nigeria' (2013) 1(4) *International Journal of Education and Research*, 1-17: 13; AW Butu, BR Ageda & AA Bichi, 'Environmental Impacts of Roadside Disposal of Municipal Solid Wastes in Karu, Nasarawa State, Nigeria' (September 2013) 1(1), *International Journal of Environment and Pollution Research*, 1-19: 2.
4. AD Mshelia, 'Solid Waste Management: An Urban Environmental Sanitation Problem in Nigeria' (June 2015) 4(3), *Sky Journal of Soil Science and Environmental Management*, 034-039: 01.
5. For instance, urbanization has constituted a great environmental challenge to human existence in all countries of the world. The situation in urban centers of developing economies is more serious and has become unbearable because the access to basic necessities, such as portable water and functional health facilities, is very poor. See MA Adetunji, TI Atomode & IO Isah, 'Assessment of Solid Waste Management in Lokoja, Nigeria' (2015) 7 (1) *Jordan Journal of Earth and Environmental Sciences* 103-108: 103

development without due consideration to its negative effects has contributed to environmental problems.<sup>6</sup> Also in the word of Adegoke,<sup>7</sup> 'virtually all aspects of man's productive (economic) activity involves the generation of waste'. For example, industrial wastes are created when materials and fuels are extracted and processed in industrial process. In normal life, the use of goods and services also generate waste, and when domestic consumer products get worn out or become out modeled, they are simply discarded. Hence, domestic waste is generated. This process has led to escalation of our solid waste especially from industrial processes (cartons, boxes, crates, building materials, wood chips etc).<sup>8</sup>

Again, our new consumption pattern as a result of modernisation has changed the composition and quantity of solid waste we generate. This is evident in the kind of municipal solid wastes we generate. They are generally very diverse and usually made up of complex mixtures of biodegradable and non-biodegradable matters. Non-biodegradable fractions of the municipal solid wastes are the major problems in solid waste management, because plastic, polythene and e-waste materials constitute physical nuisance to the environment.<sup>9</sup> In addition most of these non-biodegradable materials contain high levels of chemical elements which some have been implicated in the etiology of many ailments peculiar to humans.<sup>10</sup> The composition and quantity varies from place to place as solid waste generated relates to the economic and social status of a person. For example, very affluent class of people generates certain types of heavily packed solid waste (tin/can, plastic, bottles etc), while the less affluent class generates different types of solid waste (mainly organic or biodegradable materials). This is because their standard of living and income level differs from the affluent class as they

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6. AD Msheila (n 4).

7. OS Adegoke, 'Waste Management within the Context of Sustainable Development' in the Environmental and Sustainable Development in Nigeria'. (1990): Proceedings of workshop held at NICON-NOGA Hilton Hotel Abuja FCT 25th – 26th April, 1989.

8. AD Mshelia (n 4).

9. AW Butu, BR Ageda & AA Bichi (n 3) 16.

10. *Ibid.*

thrive most on vegetal matters. In most major cities in Nigeria, wastes are indiscriminately disposed. Refuse disposal and storm water drainage are inefficient and there are inadequate defined channels for storm water drainage. Furthermore, the method of recycling which is a very potent method of waste management has little or no significance in Nigeria. For instance, it has been said that the best method of sustaining the environment is such that returns backs wastes in a recyclable way so that the wastes becomes useful and helps the biotic relationship to maintain an aesthetic and healthy equilibrium that characterizes an ideal environment.<sup>12</sup>

The focus of this paper is to appraise the mechanisms for municipal solid waste disposal and management in Nigeria. The paper therefore relies on a desktop study approach; information were obtained from previous publication relevant to the current study, particularly from peer reviewed publications, which examined the environmental and health implications of solid waste disposal to people living in close proximity of wastes dumpsites.<sup>13</sup> This, in addition to legal framework for waste disposal and management in Nigeria, is done to enrich various issues discussed in the paper. The paper is arranged in seven sections. Following this introduction, section two clarifies few concepts to aid understanding of the subject-matter. In section three, the paper identifies various patterns and classifications of wastes. Section four analyses methods of wastes disposal and management in Nigeria. Section five the paper highlights legal frameworks for municipal solid waste disposal and management in Nigeria, while section six discusses environmental and health impacts of waste. Section seven concludes the paper with recommendations.<sup>13</sup>

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12. ES Chukwuman, R Tabor, N Ephraim, OA Obinna & NE Ikechukwu Onwurah 'Biotechnological Tools for Environmental Sustainability: Prospects and Challenges for Environments in Nigeria' (2012) <<http://www.hindawi.com/journals/btr/2012/450802>> accessed on 26<sup>th</sup> September, 2017 at 6.00pm.



## 2.0 Conceptual Clarification

In view of the nature of this paper, there are few concepts that requires clarification and or explanation for proper understanding of the paper. These concepts are waste, waste collection, transportation and disposal.<sup>14</sup> Waste is a refuse or superfluous material which remains after a manufacturer or chemical process has taken place. It is anything that is not or no longer useful and is to be thrown away, or disposed of. Waste may be any solid or semi-solid materials which have been discharged by its primary owner or original user, and may or may not be found useful by any other person but constitute nuisance to peoples' health and the environmental when left untreated.<sup>15</sup> Wastes according to the Basel Convention are substances or objects which are disposed or are intended to be disposed or are required to be disposed of by the provisions of national laws.<sup>16</sup>

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13. E Amasuomo & J Baird 'Solid Waste Management Trends in Nigeria' (2016) 6(4) *Journal of Management and Sustainability* 35-44; TC Nzeadibe & RN Anyadike, Social Participation in City Governance and Urban Livelihoods: Constraints to the Informal Recycling Economy in Aba, Nigeria (2012) 3 (4) *City Culture & Society* 313-325; JU Ogbazi, 'Alternative Planning Approaches and the Sustainable Cities Programme in Nigeria. (2013) 40 (3) *Habitat International*, 109-118; SI Efe, 'Waste Disposal Problems and Management in Ughelli, Nigeria' (2013) 4 *Journal of Environmental Protection*, 4-11; EC Ogar, EE Ogar, VNNgoka & A Moses, 'Attitude towards Waste Management and Disposal Methods and the Health Status of Cross River State, Nigeria, (December 2016) 1 (1) *SCIREA Journal of Agriculture* 231-247; NC Anyanwu & JO Adefile 'Nature and Management of Solid Waste in Karu Nasarawa State, Nigeria' (2014) 4(11) *American International Journal of Contemporary Research* 149-159; IM Adekunle, AA Adebola, KA Aderonke, OA Pius & AA Toyin, 'Recycling of Organic Wastes through Composting for Land Applications: A Nigerian Experience (2011) 29(6) *Waste Management Resources*, 582-93 and EE Nkwocha, EC Pat-Mbano & MU Dike, 'Evaluating the Efficiency of Solid Waste Collection Services in Owerri Municipality, Nigeria (2011) 2(1) *International Journal of Science and Nature*, 89-95.
  14. LAtsegbua, V Akpotaire & F Dimowo (n 2) 101.
  15. In section 75 (2) of the United Kingdom Environmental Protection Act 1990 and section 32 of Lagos Environmental Sanitation Edict 1985, 'waste' as 'any substance which constitutes a scrap material, an effluent or other unwanted surplus substance arising from the application of any process. See MalColm, R, *A Guidebook to Environmental Law* (London: Sweet and Maxwell, 1992) 19; Article 1 (a) of the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*. Adopted in Basel, Switzerland on 22 March 1989 and United Nation's Report, 'Urbanisation patterns and rural population growth at the country Level.' *United Nations Population Division. World Population Prospect. The 2011 Revision*; PA Oluwande 'An Overview of Urban Solid Waste Management in Nigeria' A Paper presented at the Workshop on Waste Disposal Environmental Pollution and Community Health, Industrial unit and Technology, University of Ibadan between 13<sup>th</sup> – 16<sup>th</sup> June, 2002; see the case of *Kent County Council v Queenborough Rolling Mill Co. Ltd* (1990) 89 LGR 306. In that case, waste was defined as discarded materials by the owner; M Chandrasekar, 'Policy and Prospects on Municipal Solid Wastes'. Workshop on Municipal Solid Waste in India, Delhi: IIT. 21-27.

Waste therefore, may be generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, and other human activities.

In ideal situation, waste are collected from the source of generation and taken to disposal sites, but in Nigeria, waste are dumped off by host generators before they are collected and disposed of by sanitation agencies. The waste storage and collection receptacles used at generation site are old bucket, basket, cartons, plastic bag/containers tin/can in most cases. The inability of solid waste evacuation team to keep pace with the rate of waste generated, results to perpetual existence of piles of solid waste in Nigeria.<sup>17</sup> Wastes are usually transported by untrained individuals (wards of residents or hired labour) to refuse dumps using manual labour. Push – push or wheel barrow waste-laden heaps are moved from compound to disposal sites, as well as the use of human potter age. Very few use motorized vehicles (pick up vans, boot of cars, motor cycles, bicycles etc). Distance of public bins in most cases is very far from residents and this compound the problem of waste transportation. As a result of this, residents far away from the bins resort to dumping of waste indiscriminately.<sup>18</sup>

The disposals of large quantities of solid waste, which accumulate in our urban areas, are as a by-product of modernisation. Owing to this fact is our quest for development and sophistication, which the price ultimately paid for such yearnings are waste that litters our surroundings. It has been and is still a common practice in the country to dispose of refuse by the most expedient method

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16. See Article 1 (a) of the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*. Adopted in Basel, Switzerland on 22 March 1989.

17. O Chidi & AC Okoye, 'Solid Waste Management in Akwa metropolis and Public Awareness: - Sensitizing the Populace through the use of Social Cartoons' (2014) 1(2) *Journal of Environmental and Human* 15-24.

18. AJ Oloruntade, PA Adeoye & F Alao, 'Municipal Solid Waste Collection and Management Strategies in Akure, South-Western Nigeria', (2013) 11(1) *Caspian Journal of Environmental Sciences*. 1-10.

available.<sup>19</sup> The most common method is open space dumping of refuse.

### 3.0 Patterns and Classifications of Solid Waste

Waste could be classified by its inherent properties and in terms of utility and sources. Waste is generally classified as solid, liquid or gas. Basically, waste could either be biodegradable or non-biodegradable wastes.<sup>20</sup>

According to Beukering *et al*,<sup>21</sup> many items can be considered as waste and this include household rubbish, sewage sludge, wastes from manufacturing activities, packaging items, discarded cars, old televisions, garden waste, old paint containers etc. All these sum-up into what often refers to as municipal waste, commonly known as trash or garbage, a combination of all of a city's solid and semisolid waste. It includes mainly household or domestic waste, but it can also contain commercial and industrial waste with the exception of industrial hazardous waste (waste from industrial practices that causes a threat to human or environmental health). Industrial hazardous waste is excluded from municipal waste because it is typically dealt with separately based on environmental regulations.<sup>22</sup> In summary, solid wastes are generally classified into domestic/household waste,<sup>23</sup> agricultural wastes,<sup>24</sup> commercial wastes,<sup>25</sup> municipal services wastes,<sup>26</sup> institutional wastes,<sup>27</sup> construction/demolition

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19. VO Oyaigbevwewen, 'A Conceptual Framework for an Environmental Management Policy in Nigeria', In Sada P. O. and Odemerho, F. O (eds) *Environmental Issues and Management in Nigerian Development*. (Ibadan: Evans Brothers Ltd., 1988) 59 – 67; A Kagu, 'Refuse Generation and Disposal in Maiduguri, Borno State'. In Daura, M. M. (ed). *Issues in Environmental Monitoring in Nigeria. Nigerian Geographical Association (NGA) 1997*) 40 and A Timmi-Aku, 'Toying with Waste Management' (2000) *Crystal Magazine*, 23.
  20. BJ Ajibuah, 'Pattern and Disposal Methods of Municipal Waste Generation in KadunaMetropolis of Kaduna State, Nigeria' (*December 2013*) *1(12) International Journal of Education and Research*, 1-14: 6; M Ali, 'Primary Collection of Solid Waste Management in Faisalabad, Pakistan'. (1996) Draft Final Report. Water, Engineering and Development Centre (WEDC). Institute of Development Engineering. Loughborough University: Loughborough. (Chapter 2).
  21. P Beukering, M Sehker, R Gerlagh & V Kumar, 'Analysing Urban Solid Waste in Developing Countries: A Perspective on Bangalore'. (1999) *Collaborative Research in the Economics of Environment and Development (CREED) and Environmental Economics Programme (IIED)*. (Chapter 4).
  22. BJ Ajibuah (n 20) 5.

wastes<sup>28</sup> and hazardous waste.<sup>29</sup>

#### 4.0 Mechanisms for Waste Disposal and Management

Waste management is the collection, transport, processing or disposal, managing and monitoring of waste materials. Waste disposal and management is an important factor for the maintenance of a healthy environment. Solid waste management is the process of putting together those items of environmental nature where man exist.<sup>30</sup> It is widely accepted that the management of solid waste is a global problem.<sup>31</sup> However, in Nigeria, the culture of the people in the geographical entity called Nigeria varies from one nationality to the other and their way of life has contributed tremendously to affect their environment. For

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23. This include residential or household refuse generated from single or multifamily dwellings which give rise to food waste, paper, cardboard, plastics, yard waste, wood, glass, metals, ashes.
  24. These are wastes and residues resulting from diverse agricultural activities such as ploughing, harrowing, ridging, bush clearing, planting and harvesting of raw field, tree and vine crops, animal slaughter and operation.
  25. Commercial waste is gotten from stores, offices, hotels, market and warehouses. These include packaging materials, cartons, paper, typewriter, ribbons. The waste from restaurants etc is similar in nature to household refuses but usually contains higher portion of paper and polythene.
  26. This is waste from street cleaning, landscaping, parks, beaches, other recreational areas which include litter, waste from road side vendors, animal droppings, unauthorized disposal of house and commercial waste and tree trimming.
  27. These are wastes usually generated from hospitals, schools, dispensary, pharmacy, barracks which may largely be household types, but hospitals (medical wastes/clinical wastes) dispose more dangerous materials such as cotton wools, bandages, syringes, waste from operating theatres and discharged drugs and cans.
  28. Example is excavated materials from construction sites.
  29. According to Environment Protection Agency (EPA), hazardous wastes are wastes or combination of wastes that pose substantial threat to human health or living organisms because such wastes are non-degradable in nature, they can be biologically magnified, they can be lethal and they may otherwise cause or tend to cause detrimental cumulative effects. See generally I Abdullahi, MA Ajibike, AP Manuwueje & OI Ndububam, 'Environmental Impact of Indiscriminate Waste Disposal: A Case study of Nigerian Air force Base Kaduna' (October 2014) 1 Issue-1, *International Journal of Engineering and Applied Sciences (IJEAS)* 25-33: 28; EA Akpan, 'Primary Health Care in Environmental Protection' In Olanran, N.S, Akpan, E. A, Ikpemein E.E & Udofia, G. A (eds) *Environmental and Health* (Lagos: Macmillan Nigerian Publisher, 2013) 67; WO Adebayo, 'Environmental Consequences of Wastes Generation and Disposal Technique along Roadside, Drains and Stream Channels in a Tropical Urban Center' (1995) 1(1) *Environmental Issues* 1-4; JO Aribisala, T Omotoso & P Folorunso, 'Waste Management Systems' (June 2004), *Proceedings of National Civil Engineering Conference, held in Port-Harcourt between 17-20*; S Igbaonugo, 'Lagos: A City Where Filth Stifles Splendour', (2004) An article contributed to the Daily Independent Lagos. 29-30 and AD Mshelia (n 4) 36
  30. S Uchegbu, *Environmental Management and Protection*. (Enugu: Spotlight, 1996) 41
  31. E Amasuo & J Baird (n 13) 35

instance, in a recent study conducted by Adetunji *et al*<sup>32</sup> in Lokoja, it was revealed that 64.6% of the residents in Lokoja burn their refuse in their neighborhood. While 20.8% of residents indicated that they dispose their waste at the accredited road intersections where the public waste disposal vehicles come to collect the waste deposited. Similarly, an approximately 16.8% of the sampled population in Lokoja Metropolis who live close to the trenches of streams and erosion channels dispose their waste in to water bodies for onward transmission to bigger water bodies like Meme River and River Niger. This practice makes it difficult for the people to make use of the water from these two rivers for domestic purposes without proper treatment.

Furthermore, in a densely populated cities in Nigeria as well as small villages, the habit of dumping solid wastes which are mainly domestic, medical and industrial in strategic and commercial centers or near houses is a common environmental phenomenon. In spite of diverse cultural approaches to waste management, the management of waste is very important and needs to be tackled with all seriousness. The contemporary difficulties facing urban centres in Nigeria can be attributed to government's incapability in financing solid waste management at various levels. The management of waste constitutes one of the most immediate and serious environmental problems facing most towns in Nigeria. Waste management, according to Adeyemi,<sup>34</sup> is one of the most intractable problems facing city administrators and environmental agencies. Solid waste management is by far one of the greatest challenges facing environmental bodies in the country.<sup>35</sup>

It should be noted that waste management practices differ between the developed

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32. MA Adetunji, TI Atomode & IO Isah (n 5) 106. Another study conducted by EC Ogar, EJE Ogar, VN Ngoka & A Moses shown that in Calabar South Local Government Area of Cross River State, wastes are being dump indiscriminately by the roadside, any available, open drain, litters in open space, papers and polythene bags etc are indiscriminately dumped in any available open space. Waste in the market and residential points and autoscraps are dumped anywhere, anyhow and these apparently affects the aesthetic value of the environment, creating environmental disaster. Waste disposal of open dump or burning causes air and water pollution which underground water supply are also polluted. see EC Ogar, EJE Ogar, VN Ngoka & A Moses (n 13).

33. D Rinberg, *Municipal Waste Management* (USA: Noyes Data Corporation, 1975). USA.

34. AS Adeyemi, JF Olorunfemi & TO Adewoye, 'Waste Scavenging in Third World cities: A Case Study in Ilorin, Nigeria'. (2001) 21(2) *Environmentalist*, 93-96.

and developing nations, for urban and rural areas, and for residential and industrial producers. It has been observed that waste management practices are not uniform among countries (developed and developing), and sectors (residential, commercial or industrial). Some waste management practices include: waste hierarchy, the 3Rs of waste management, Reduce, Reuse and Recycle, here waste management strategies are classified according to their desirability in terms of waste minimization.<sup>36</sup> Management for non-hazardous waste residential and institutional waste in metropolitan areas is usually the responsibility of local government authorities or the state. It should be noted that there are several methods of waste disposal and management. However, the most common ones are dumping,<sup>37</sup> sanitary landfill,<sup>38</sup> incineration,<sup>39</sup> recycling<sup>40</sup> and composting.<sup>41</sup>

35. T Ogwueleka, 'Municipal Solid Waste Characteristics and Management in Nigeria. (2009) 6(3) *Iranian Journal of Environmental Health Science & Engineering*, 173-180.
36. See L Giusti, 'A Review of Waste Management Practices and Their Impact on Human Health', (2009) 29(8) *Waste Management*, 2227-2239.
37. NC Anyanwu and JO Adefila (n ) 55 study in Karu revealed that people are of the habit of dumping their refuse within a close range to their residence or where they carry out their daily activities due to distance apart and it accounts for huge heaps of accumulated refuse found along the road-sides, streets, and gutters. This further explains why people tend to disregard the use of designated official dump-sites and create alternative points.
38. Sanitary land fill involves burying the waste, and this remains a common practice in most countries. Landfills were often established in abandoned or unused quarries, mining voids or burrow pits. A properly designed and well-managed landfill can be a hygienic and relatively inexpensive method of disposing of waste materials. Many landfills also have landfill gas extraction systems installed to extract the landfill gas. A typical example of a landfill is the one located in Ojota in Lagos State.
39. Incineration is a process where combustible wastes are burned at a high temperature to consume all combustible material. Incineration of waste materials converts the waste into ash, flue gas and heat. In some cases, the heat generated by incineration can be used to generate electric power. This process reduces the volumes of solid waste to 20 to 30 percent of the original volume. Incineration is common in countries such as Japan where land is scarcer, as these facilities generally do not require as much area as landfills. Waste-to-energy (WtE) or energy-from-waste (EFW) is part of the features of incineration. A typical incineration in Lagos State is the center in Simpson and the waste to energy center in Ikorodu. There a lot of other waste management methods but are rarely in use in Nigeria and they include Energy recovery, Resource Recovery and Avoidance and reduction methods of waste management. See EPA 842/09: *This guideline provides definitions for a range of terms commonly used within the waste industry*; N Gouveia & RR do Prado, 'Health Risks in Areas Close to Urban Solid Waste Landfill Sites', (2009) 44(5) *Revista de Saúde Pública* 1-8.
40. Recycling involves the reprocessing of discarded material into new and useful product. It purposes is to reduce the amount of waste that must be disposed in landfill or incinerator. These methods involve refurbishing of materials that would otherwise be considered as waste for reuse. The most consumer recycled item include, aluminum, beverage cans, glass, bottles, paper boards etc. Recycling is very popular among developed countries, which have long realized that waste is not necessarily a wasteful - it can be turned into money. See MW Murad & C Siwar, 'Waste Management and Recycling Practices of the Urban Poor: A Case Study in Kuala Lumpur city Malaysia' (2007) 25(1) *Waste Manage Res.* 3-13; PT Nguyen, 'Assessment of Plastics Waste Generation and Its Potential Recycling of Household Waste in Can Tho City, Vietnam' (2011) 175(1-4) *Environmental Monitoring and Assessment*, 23-35; See SN Momodu, KO Dimuna & JE Dimuna, 'Mitigating the Impact of Solid Wastes in Urban Centres in Nigeria' (2011) 34(2) *J Hum Ecol*, 125-133; 131-132 and PC Prabu, 'Impact of Heavy Metal Contamination of Akaki River on Soil and Metal Toxicity on Cultivated Vegetable Crops' (2009) 8(9) *Journal of Environmental, Agricultural and Food Chemistry* 818 -827.

## **5.0 Legal Frameworks for Municipal Solid Waste Disposal and Management in Nigeria**

As evident above, the conventional waste management approach based on collection and disposal has failed to provide efficient and effective results. Although, it is a responsibility of local governments to manage waste disposal. However, the federal government has issued laws and policies that are related to waste management. In view of this, the extant laws with respect to solid waste disposal and management in Nigeria are.

### **5.1. Federal Laws related to Household Waste Disposal**

The basis of environmental policy in Nigeria is contained in the 1999 Constitution of the Federal Republic of Nigeria.<sup>42</sup> Accordingly to Section 20 of the Constitution empowers the government to protect and improve the environment and safeguard the water, air and land, forest and wildlife of Nigeria. To tackle various challenges confronting the environment on account of indiscriminate waste disposal and other environmental problems, the federal government of Nigeria has promulgated various laws and regulations to safeguard the Nigerian environment. The Federal Ministry of Environment (FME) administers and enforces environmental laws in Nigeria. It took over this function in 1999 from the Federal Environmental Protection Agency (FEPA),<sup>43</sup> which was created under the Federal Environmental Protection Agency Act of 1988 (FEPA Act). Current established legislations relating to waste management

41. Composting is a biochemical process in which organic materials such as lawn clipping, kitchen and domestic waste and other household organic waste decompose to a rich solid like material. It is a process of rapid, partial decomposition of moist solid organic waste by aerobic organism. This technique is popularly used in rural areas by farmers. Composting is aerobic and produces primarily carbon dioxide, and methane which can escape into the atmosphere and can be hazardous, this also contributes to global warming and also produce obnoxious odor. See A Salam, 'Environmental and Health Impact of Solid Waste Disposal at Mangwaneni Dumpsite in Manzini: Swaziland' (2010) 12(7) *Journal of Sustainable Development in Africa* and AK Bihon, Urban Inequities Survey. In: Paper on Housing for the Poor in Addis Ababa' (2008) *Addis Ababa Administration Housing Agency, Addis Ababa* 10–12.

42. O Makinde & T Adeyoke, 'Nigeria: Environment Law In Nigeria', (2011) <[http://www.mondaq.com/article.asp?article\\_id=53804&signup=true](http://www.mondaq.com/article.asp?article_id=53804&signup=true)> accessed on 24 October, 2017.

43. For instance, in 1988, the Military Government promulgated Decree No. 58. The Decree established Federal Environmental Protection Agency and charged it with the responsibility of maintaining decent environment in-Nigerian cities and towns. Section 4 of the Decree charged the Agency with the responsibility for the protection and development of the environment amongst other functions of the Agency. See SN Momodu, KO Dimuna & JE Dimuna (n 40) 126

are:

- i. The National Environmental Standards and Regulations Enforcement Agency Act, 2007<sup>44</sup>
- ii. The Environmental Impact Assessment Act, 1992<sup>45</sup> and
- iii. Harmful Waste (Special Criminal Provision Etc.) Act 1988.<sup>46</sup>

Relevant regulations are:

- i. The National Environmental Regulations, 2009; and
- ii. The National Environmental Protection Regulations.

The National Environmental Standards Regulation Enforcement (Establishment) Agency Act<sup>47</sup> like its predecessor- Federal Environmental Protection Act establishes an Agency<sup>48</sup> and charged it with the responsibility for the protection and development of the environment, biodiversity conservation and sustainable development of Nigeria's natural resources in general and environmental technology, including coordination and liaison with relevant stakeholders within and outside Nigeria on matters of enforcement of environmental standards, regulations, rules, laws, policies and guidelines.<sup>49</sup>

The new Act further charged the Agency to enforce compliance with regulations on the importation of, exportation, production, distribution, storage, sale, use, handling and disposal of hazardous chemical and waste other than in the oil and gas sector.<sup>50</sup> It is observed that despite of the failure of the new Act to include solid and municipal waste management in the function of National Environmental Standards Regulation Enforcement (Establishment) Agency, the Agency is given power to submit for the Minister, proposals for the evolution and review of

44. The Act repealed the Federal Environmental Protection Act of 1988

45. Now Cap E12, Laws of the Federation of Nigeria 2004

46. Harmful Waste (Special Criminal Provision Etc.) Act Cap. HI Laws of the Federation of Nigeria, 2004

47. NESREAA

48. *Ibid* s 1

49. NESREA s 2

50. *Ibid* s 7 (q)



existing guidelines, regulations and standards on the environment other than in the oil and gas sector including: waste management and environmental sanitation<sup>51</sup> and other forms of pollution and sanitation. In order to give effect to these provisions, section 25 (1) of the NESREA empowers the Agency to make regulations for the purpose of protecting public health and promotion of sound environmental sanitation with a sanction that any person who violates the provision of the regulation made pursuant to section 25 (1) shall be guilty of an offence and punished under the penalties imposed in the regulations made pursuant thereto.<sup>52</sup>

The Harmful Waste Act of 1988 prohibits and declares unlawful all activities relating to the purchase, sale, import, transport, deposit, or storage of harmful wastes.<sup>53</sup> Under the Harmful Waste Act, "harmful waste" is defined as "any injurious, poisonous, toxic or waste-emitting radioactive substance if the waste is in such quantity, whether with any other consignment of the same or of different substance, as to subject any person to the risk of death, fatal injury or incurable impairment of physical and mental health; and the fact that the harmful waste is placed in a container shall not by itself be taken to exclude any risk which might be expected to arise from the harmful waste."<sup>54</sup> Pursuant to the provision of section 25 of NESREA, the National Environmental Regulations was made in 2009 and provides the legal framework for the adoption of sustainable and environment friendly practices in environmental sanitation and waste management to minimize pollution.<sup>55</sup> The Act provides authority to ensure compliance with local and international laws on environmental sanitation and pollution prevention and control through monitory and regulatory measures. The law also make regulations namely: the National Effluent Limitation Regulations,

51. *Ibid* s 8 (k) (xvii) (xxiv)

52. *Ibid* s 25 (2)

53. OH Uchendu, 'Household Waste Disposal Laws in the Federal Republic of Nigeria' (2016) *Georgia State University* 30; NA Robinson, LH Lye & E Bursleson, *Comparative Environmental Law and Regulation* (2011), 40:170.

54. *Ibid*

55. Laws & Regulations, NESREA, <<http://www.nesrea.gov.ng/nesrea/regulations/index.html>> accessed on 27 October, 2017.

National Environmental Protection (Pollution Abatement in Industries and Facilities Producing Waste) Regulation on the environmental protection in the country.

Although, the management of nonhazardous wastes in the country is essentially a matter for state and local governments in Nigeria. However, the federal government has published three policy guidelines on waste management and sanitation. For instance, the Federal government's *National Policy Guidelines on Solid Waste Management* aims to "improve and safeguard public health and welfare through efficient sanitary Solid Waste Management methods that will be economical, sustainable and guarantee sound environmental health.<sup>56</sup> Also the *National Policy Guidelines on Sanitary Inspection of Premises* seeks to promote a clean and healthy environment for the populace. Finally, the *National Environmental Sanitation Policy* seeks to "stimulate, promote and strengthen all government regulations concerned with housing and urban development, sanitation related endemic diseases and illnesses and environmental education."<sup>57</sup>

Attached to the Environmental Impact Assessment Act of 1992 is a schedule of activities and industries for which environmental impact assessments are mandatory, including assessments for the "Waste Treatment and Disposal" industry.<sup>58</sup> Any person who fails to comply with the provisions of the EIA Act commits an offence and is liable on conviction to a fine or to imprisonment for up to five years. Fines are also imposed on guilty firms or corporations. The Harmful Wastes Act provides that any person found guilty of purchase, sale, import, transport, deposit, or storage of harmful waste shall on conviction be sentenced to imprisonment for life.<sup>59</sup>

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56. Federal Ministry of Environment, *Environmental Policies* 9, (Jan. 30, 2014) <http://environment.gov.ng/index.php/downloads/3-environmental-policies> accessed on 23 October, 2017.

57. *Ibid.*

58. O Makinde & T Adeyoke (n 42)

Pursuant to the aforementioned provisions of NESREA Act, each state and local government in Nigeria may set up its own environmental protection body for the protection and improvement of the environment within the community. Hence, all the States in Nigeria including the Federal Capital Territory of Abuja have Environmental Sanitation Laws dealing with environmental protection and safety. Under the State laws, enforcement is placed in the hands of several bodies which include; Environmental Sanitation Task Force, Waste Management Boards, State Environmental Protection Agencies, Environmental Sanitation Courts, Special Courts are also established to try any person who violates the laws.<sup>60</sup> Few of these laws are discussed briefly below.

## **5.2 State Laws related to Household Waste Disposal**

In Lagos State, the environmental sanitation and protection law was enacted to prevent street obstruction, improper disposal of wastes, refusal to cover refuse bins and failure to clean sidewalks.<sup>61</sup> This law makes it an offence to cause or permit a discharge of raw untreated human waste into any public drain or water course or onto any land or water.<sup>62</sup> Precisely, the Lagos State Environmental Protection Agency Law was enacted in 1996 to establish the Lagos State Environmental Protection Agency (LASEPA).<sup>63</sup> LASEPA's functions include monitoring and controlling the disposal of waste in Lagos State and advising the State Government on all environmental management policies.<sup>64</sup> Under the LASEPA Law, LASEPA is required to carry out public educational programs to inform the public on methods of environmental sanitation and management. The Environmental Pollution Control Law, also enacted in 1996, provides for control

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59. In case of an organization, a term of imprisonment would likely be served upon the person in the organization who is most culpable.

60. H Ijaiya & OT Joseph, 'Rethinking Environmental Law Enforcement in Nigeria' (2004) 5 *Beijing Law Review*, 306-321

61. Environmental Law Research Institute Synopsis of Laws and Regulations on the Environment in Nigeria "Environmental law and policies in Nigeria" <<http://www.elri-ng.org/newsandrelease2.html>> accessed on 28 September 2017.

62. The Environmental Pollution Control of Lagos State, s 12

63. Lagos State Environmental Protection Agency Law (1996) <[http://www.lasepa.gov.ng/pdf/LASEPA\\_LAW.pdf](http://www.lasepa.gov.ng/pdf/LASEPA_LAW.pdf)> accessed on 22 October, 2017

64. O Makinde & T Adeyoke (n 42)

of pollution and protection of the environment from abuse due to poor waste management. The Pollution Control Law also requires the Ministry of Environment and Physical Planning to educate the general public on the types of disposal methods acceptable by the State Government for domestic and industrial wastes.<sup>65</sup> The Lagos State Environmental Sanitation Law, passed in 2000, requires citizens to clean their property on the last Saturday of the month.<sup>66</sup> For three hours, typically from 7am-10am, human and vehicular movements are restricted except for those related to sanitation activities such as waste removal or sweeping debris from the entrance to one's dwelling place. Violators of the restriction order are arrested by agents of the Environmental Sanitation task force and summarily tried in a special court named the "Special-Offences Court," which was established to try such offenders.<sup>67</sup> In 2015, Lagos enacted the Lagos Waste Management Authority Law, which established the Lagos State Waste Management Authority. This authority has the power to fine violators of the Lagos Waste Management Authority Law.<sup>68</sup>

In Abia State, the most recent state law addressing household waste management is the Abia State Basic Environmental Law of 2004. According to the Abia State Basic Environmental Law, the responsibility to ensure basic environmental practice lies with the Ministry of Environmental and Solid Mineral Resources, the Abia State Environmental Protection Agency, and the local government authorities.<sup>69</sup> The law addresses several environmental law issues. In part, the law states that dumping of refuse into streets or drains or open spaces is prohibited.<sup>70</sup> The law also states that landlords and tenants are liable for refuse around their houses.<sup>71</sup> The law states that owners or occupiers of tenements must provide and

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65. *Ibid*

66. D Benson & B Madukwe, *Lagos Environmental Sanitation Law: What the constitution says*, *Vanguard Nigeria*, <<http://www.vanguardngr.com/2015/03/lagos-environmental-sanitation-law-what-the-constitution-says/>> accessed on 21 October, 2017

67. *Ibid*

68. ET Iruuga, *Solid Waste Management in Nigeria*, D-WASTE.COM (Nov. 15, 2012), <<http://www.d-waste.com/new-infographics/item/124-solid-waste-management-in-nigeria.html?start=1>> accessed on 25 October, 2017

69. Abia State Basic Environmental Law (2004), s 7.

maintain waste bins for refuse of any description that can only be brought out of the tenement for garbage disposal.<sup>72</sup> Importantly, the law states in Clause 38 that the Abia State Environmental Protection Agency must designate and develop refuse disposal sites for final disposal of waste all over the State.<sup>73</sup> Any person or organization who fails to comply with the clauses outlined in the Law or who obstructs any agent of the Abia State Environmental Protection Agency from doing his or her job can be subject to fines ranging from ₦250.00 (\$0.79 USD) or ₦500.00 (\$1.59 USD) a day to one-time fines of ₦2,000.00 (\$6.34 USD) to ₦10,000.00 (\$31.72 USD). Interestingly, the Abia State Basic Environmental Law has a section on “Environmental Health.” Clause 48(a) and (c) in this section defines a nuisance in part as “any premises in such a condition to be injurious to health,” and as “any ... other thing in such a state or condition as to be injurious to health,” including refuse pits, gutters, and ditches.<sup>74</sup> As will be discussed further, these clauses specifically apply to the process of household waste disposal because trash heaps and illegal dumps qualify as “nuisance” and are in violation of these law.

In Kwara State, the State Government in order to create awareness of environmental and health impact of waste disposal created Kwara Waste and Environmental Protection Agency (KWEPA) under the Kwara State Ministry of Environment and Tourism and the Kwara State Environmental Protection Agency through the Kwara State Environmental Protection Agency Law 1992.<sup>75</sup> The Agency created under the Law was charge with the responsibility to carry out research and development activity for environmental protection and to educate

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70. No person shall dump/deposit on any street, open space, gutter, drain or drainage system or tenement whether occupied or not any can, loose refuse or waste of any description except at such places as authorised by the Ministry (Ministry of Lands) – The Abia State Basic Environmental Law (2004), s 15.

71. Landlords/occupiers of tenements and market leaders shall be held responsible for anything dumped around the areas they occupy for which, they are unable to show evidence of appropriate report to the Ministry – The Abia State Basic Environmental Law (2004), s 18.

72. Abia State Basic Environmental Law (2004), s 17

73. *Ibid* s 14

74. *Ibid* s 20. See OH Uchendu (n) 35

the general public on the types of disposal methods acceptable by the State Government for domestic and industrial wastes among others.<sup>76</sup> For the purpose of achieving its set goals, the law created a governing council whose function is to formulate policies and programmes aimed at enhancing the position and improvement of the protection of the environment in the state, formulate and enhance policies, rules and regulations on solid waste collection and disposal, coordinate the activities of all the agencies in the state connected with environmental matters; conduct public enlightenment campaigns and disseminate vital information on environmental matters, render advisory services and support to all Local Government in the state in areas of solid waste management matters; take measures to guarantee consistent effectiveness of environmental structures throughout the state for solid waste collection and disposal; formulate master plans for solid wastes management for development of environmental standard; mobilize the inhabitants of all areas in the state for the effective observance of environmental rules and guidelines for the promotion of a healthy and safe environment; monitor and control disposal of solid waste generated by both Government and private facilities in the state and implement applicable laws and standards on activities related to the environment among others.<sup>77</sup>

At the Local Government level, the law established the Local Government Committee on environmental protection for the purpose of maintaining good environment quality in their domain. For the effective control and management of solid wastes in the state, the law authorised the Agency, local government council or private collector to assist in the disposal of refuse waste within the state. The law also provided that vehicle or container used in transporting or

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75. Cap K16 Laws of Kwara State, 1992.

76. HO Ijaiya, 'The Legal Framework for Solid Waste Disposal and Management in Kwara State, Nigeria' (2013) 4 *Journal of Environmental Protection*, 2013, 4, 1240-1244: 1240.

77 *Ibid*

convening refuse or waste within the state should be covered in such a way that the content thereof does not litter the street.

The law provided that all owner or occupier of a tenement should have receptacle which shall be kept within the tenement to be used for depositing refuse of any description and only to be brought out of the tenement for the disposal of refuse and that every owner or occupier of a tenement shall maintain in a good condition the receptacle and replace them when it is worn out.

Furthermore, the law also makes it an offence for any person to throw or deposit on any street, open space, gutter, drain or drainage system or tenement whether occupied or not obnoxious, toxic or poisonous waste except at such places authorized by the Agency. In addition, the law prohibits the burning of the contents of any dustbin or receptacle of the Agency.

The law also provided that any person who contravenes any of the offences mentioned above commits nuisance and would be tried by either a Magistrate Special Environmental Court or Area Court within the jurisdiction and upon conviction shall be liable to a maximum fine of N5000.00 (five thousand naira) or imprisonment for six months.<sup>78</sup>

The Environmental Sanitation Law of 2004 was enacted to ensure sanitary conditions in residential and public places in Kwara State. In order to promote clean environment in the state, the law provided that every owner, occupier or tenant of a tenement should clean and keep the streets, side-walks at the front, back or either sides of such tenement and the drains, gutters or channels by such streets, free of all filth, rubbish and refuse; not to litter, sweep out or throw ashes, refuse, paper, nylon and rubbish into any street, public place or vacant plot; not to use dustbins which may be leaking or permitting litter to escape out which may injure people handling them and to ensure the cleanliness of their premises,

78. *Ibid*

particularly the background and the courtyard. The law also makes it mandatory for producers, sellers and consumers of pure water, ice cream and related products to ensure that the nylon of the product are properly disposed of after consumption. The law prohibits indiscriminate dumping of wastes along the highways, roads, channels, gorges, vacant lands except at designated refuse disposal sites as approved by the Kwara State Environmental Protection Agency. The law provided that any person who contravenes or fail to comply with the provision of the law shall be guilty of an offence and shall upon conviction be liable to the fines ranging between N500.00 (Five hundred naira) and N10000.00 (Ten thousand naira).

### 6.0 Environmental and Health Impact of Waste.

Waste has hazardous effect on the environment including every living thing. It does not only pollute the land but also affect living beings.<sup>79</sup> Nigerian cities and towns face serious environmental problems arising from poor household waste management.<sup>80</sup> The generation and accumulation of solid waste are beginning to produce social, economic and environmental problems in significant proportions. These problems are particularly acute in regions with high population growth, which result in the generation of high amount of waste with no land to dispose them.<sup>81</sup> For instance, a World Health Organization (WHO) Report as far back as 2006 has identified waste as one of the biggest challenges to the health of the people residing in Lagos. The report revealed that Lagos was beset with the difficulties of clearing over 10,000 tons of solid waste generated daily.<sup>82</sup> According to the report, the growth in the population of Lagos from 5.7 million in 1991 to about 9 million in 2005 has made it difficult for the State Government to find a solution to Lagos waste problems.

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79. BJ. Ajibuah (n 20) 7

80. OH Uchendu (n 53) 23; UM Nwosu, RA Eke, & KA Uwakwe, 'Scaling up the practice of sanitary refuse disposal in Aba, South Eastern Nigeria' (2014) 9 (2) *Journal of Medical Investigations and Practice* 70-73

81. I Abdullahi & others (n 29) 28



Premised on the foregoing, generation of waste in Nigeria has been of great concern to the government, posing multiple problems that prove to be beyond the scope of local and city councils.<sup>83</sup> Part of the problem, according to Anyanwu *et al.*,<sup>84</sup> is that major streets are continually polluted by garbage from varying sources. This waste is generated at a rate that is beyond the ability of the city authorities to handle, resulting in poor waste management that portends serious environmental crises in most Nigerian towns and cities. For instance, Emily,<sup>85</sup> posits that when waste is not collected, unsanitary conditions develop and pose environmental and human health risks. The prevalence of parasites, tetanus, malaria, hookworm, cholera, diarrhea and diseases like degue fever, yellow fever, and bubonic plague.<sup>86</sup> Insanitary disposal of solid waste promotes fecal-oral transmission of diseases through fecal contamination of the hands, food and water. Solid waste dumps provide breeding grounds for mosquitoes, rats and other vermin, generating amongst others; Lassa fever and the snakes are also known to be poisonous reptiles.<sup>87</sup> Similarly, house flies that enter kitchens after landing on waste dumps can transfer bacteria by landing on food, increasing the incidence of diarrhea.<sup>88</sup>

Direct dumping of untreated waste in rivers engendered the accumulation of toxic substances in the food chain, through the plants and animals that feed on it directly or indirectly, the degradation of the aesthetic value of the river and death of aquatic organisms are of immense value to the economy of the Metropolis.<sup>89</sup> Batteries, old medicines, used motor oil and other dangerous waste such as dirty

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82. World Health Organization Report, International view point. (2006) 44K, (5) *Journal of Environmental Health*,

83. NC Anyanwu & JO Adefila (n 13) 67

84. *Ibid*

85. W Emily, *Municipal solid waste Management in Developing Countries: Nigeria, a case study*, (New York; USA: 2004).4

86. World Health Organization, '*Solid Waste Disposal*' <[http://www.who.int/water\\_sanitation\\_health/hygiene/emergencies/fs3\\_12.pdf](http://www.who.int/water_sanitation_health/hygiene/emergencies/fs3_12.pdf)> accessed on 23 September 2017

87. AB Oyediran, *War on Filth* (Ibadan: Oluben Printers, 2004) 11

88. I Modebe, U Onyconoro, N Ezeama, C Ogbuagu & Ngozi Agam, '*Public Health Implication Of Household Solid Waste Management In Awka South East Nigeria*' (2009) 1 (1) *The Internet Journal Of Public Health* 20

kerosene and fuel can be dangerous to human health if dumped on the ground and leached into groundwater, or if dumped in rivers or streams and ingested by persons swimming, playing, or collecting drinking water.<sup>90</sup> Water leaching through the landfill can carry such toxins into the groundwater or nearby bodies of water, and from there into drinking water and the food chain.<sup>91</sup> Also the biodegradable wastes serve as good breeding grounds for cockroaches, houseflies and also create stagnant water which serves as breeding ground for mosquitoes. These spread various diseases like cholera and typhoid fever. It therefore impacts negatively on the health of the residents.<sup>92</sup>

Effective waste management is an important component of a strategy for improving environmental health, waste that is not properly managed, especially uncollected solid wastes from households and other communal activities are serious health hazard which could manifest through the spread of infectious diseases. For instance, organic domestic waste poses a serious threat, since they ferment, creating conditions favourable to the survival and growth of microbial pathogens and also increase risk of injury particularly children and other high-risk group population living close to waste disposal sites.<sup>93</sup> Landfills are a standard method for disposing of waste in the developed world, however improperly built landfills can cause environmental health and public health problems. Densely packed organic matter produces methane as it rots, which can catch fire or cause explosions.<sup>94</sup> Release of methane into the air also harms the atmosphere because methane is a greenhouse gas that is twenty-one times stronger than carbon dioxide, a gas used as a reference point when measuring

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89. BJ Ajibuah (n 20); LO Uzoigwe, SC Maduakolam & S.U. Izuka 'Impact of waste dump on groundwater quality in humid Tropics of Nigeria' (2013) 2 (3) *International Journal of Engineering Science Invention* 56-72; N Rajkumar, T Subramani & L Elango, 'Groundwater Contamination due to Municipal Solid waste disposal. A GIS based study in Erode City. (2010) 1 (1) *International Journal of Environmental Science* 39-55.

90. World Health Organization (n 54)

91. OH Uchendu (n 50) 27. See also US EPA, 'Understanding Global Warming Potentials' <<https://www3.epa.gov/climatechange/ghgemissions/gwps.html>> accessed on 26 October 2017

92. AW Butu, BR Ageda & AA Bichi (n 3) 11

93. BJ Ajibuah (n 20)

global warming.<sup>95</sup> The decaying process of organic matter produces ammonia, which in sufficient concentrations can poison fish and amphibians and render water undrinkable. The bacteria that break down rotting waste produce acids, and these acid by-products can be concentrated enough to dissolve poisonous heavy metals such as lead and cadmium.<sup>96</sup>

Household waste can also cause a risk to public health by damaging the environment. For example, smoke from garbage incineration (e.g. bush burning) not only causes respiratory problems, but may also carry toxic metals and acids from waste materials into the atmosphere, and nitrogen and sulfur in smoke contribute to acid rain.<sup>97</sup> Modern household waste is full of dangerous chemicals. For example, many paints and batteries contain lead, and electronic goods carry hazardous substances. Dumping of waste in the gutters and drains can cause flooding by blocking water drainage, especially in the rainy season in tropical climates, contributing to the growth of mosquito populations.<sup>98</sup> The truth is that when waste is improperly disposed of, dangerous chemicals can damage the environment and, consequently, health hazard to living being. Governments have a responsibility to protect the environment and their citizens by implementing appropriate waste disposal laws and regulation few of which are highlighted below.

## **7.0 Conclusion**

Disposal of solid waste has constituted a serious environmental threat to human existence in urban centers in the developing countries of the world. But this is more pronounced in some of the urban centers in Nigeria due to population

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94. The Economist, 'Down in the dumps' Feb. 26, 2009 <<http://www.economist.com/node/13135413>> accessed on 24 October, 2017

95. *Ibid*

96. *Ibid*

97. *Ibid*

98. ET Iriuruaga, 'Solid Waste Management in Nigeria' (Nov. 15, 2012), <<http://www.d-waste.com/new-infographics/item/124-solid-waste-management-in-nigeria.html?start=1>> accessed on 27 October, 2017.

growth and urbanisation problems added to these are technological advancements and industrial activities. For instance, this study has revealed that waste disposal and management constitute serious problem in the societies and Nigerian urban cities. Nigerian cities and towns are currently facing serious environmental problem arising from poor solid waste management. Solid waste is generated at a rate beyond the capacity of the city authorities to handle in order to maintain a sustainable urban environment. This has resulted in poor solid-waste management system that portends serious environmental crisis in most Nigeria towns and cities.

Of course, the environmental and health impacts of improper solid waste disposal are enormous. However, with rational and consistent waste management practices there is an opportunity to reap a range of benefits. For instance, it can improve economic efficiency through the means of resource use, treatment and disposal and creating markets for recycled waste, which can lead to efficient practices in the production and consumption of products and material resulting in valuable materials being recovered for reuse and potential for new jobs and new business opportunities. Effective waste management practices will generate a more robust economy, a fairer and more inclusive and cleaner environment. It can also reduce or eliminate adverse impacts on the environment through reducing, reusing and recycling and minimizing resource extraction can provide improved air and water quality and help in the reduction of greenhouse emissions. Socially, proper waste management practices can reduce adverse impacts on health, which will lead to new sources of employment and potentially lifting country out of poverty and health crisis.

Based on the foregoing, the following recommendations should be considered in order to achieve effective and environmental friendly solid waste disposal and management in Nigeria: Modern means of waste management and disposal equipment should be introduced to stop indiscriminate dumping of refuse which is the current practice in Nigeria. All relevant authorities concerned with waste

disposal and management at the three tiers of government should be carried along to plan more effective waste management strategies. Government should make concerted efforts to improve the present waste disposal and management mechanisms by strengthening solid waste management infrastructures, including the amount and composition of investments and reinforcing institutional capacity for operations and maintenance of a clean environment. Consequently, adequate and responsive legal and legislative provisions should be made, strengthened and enforced for the control and management of development and environmental consequences of solid waste. The Federal Ministry of Environment and their counterparts in the states should intensify and double their efforts on the collection, storage, evacuation and disposal of solid waste in our cities. It is only when these are done that the present challenges posed by improper solid waste disposal can be prevented from reaching a crisis proportion.

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