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Re-thinking Waste Management Regime for Effective Environmental Protection in Nigeria.

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ABSTRACT

One cannot approach the heart of any Nigerian city without titanic heaps of putrefying, malodorous and nauseating waste in sight. Waste management has become a thorn in the flesh of most African cities. Population explosion, urbanization, rural – urban migration, industrialization, etc, has placed puzzles on waste management in metropolitan cities of the 21st Century Nigeria. The Nigerian government lacks policy direction on waste management. Even where policy exists, enforcement is often the Achilles heel. Now that environment issues have dominated national and international discourses, this paper intends to re-examine waste management measures that ensure effective environmental protection in the 21st Century Nigeria. Doctrinal methodology was used to source relevant data from primary and secondarNy authorities. It was found *inter alia* that waste management has posed a lot of problems; that adequate waste management measures are lacking in Nigeria. Governments similarly have failed to make waste management a priority irrespective of the lethal threats it poses to the health of the citizens and serenity of the environment. We recommended among other things, adoption of modern methods of waste management in Nigeria; prioritisation and privatisation of waste management and recycling of waste to achieve 'waste to wealth' policy in Nigeria.

Keywords: Environment, Environmental Protection, Waste, and Waste Management

INTRODUCTION

In most Nigerian cities, the most visible urban environmental problem that confronts a first time visitor is wastes accumulation and derisory disposal methods. These wastes disfigure the city image, thus, not only distort the city but also pose terrific health hazards. In some cases, the volume of wastes assumes towering magnitude that they have constituted effective dams across streets, thereby rendering such streets inaccessible to traffic.

From time immemorial, African communities revered and preserved the environment. It was a taboo in most African societies to urinate or defecate on farmland, on or near the road, water course, under fruit trees, etc. Shifting cultivation was practiced to preserve the soil fertility. Wastes were disposed by way of composting which in turn provided the requisite manure for gardening and farming.These measures, though were cataleptic and half hazard, persisted until the emergence of western civilisation and industrialization when anarchy was introduced into waste management in African continent.

Although city inhabitants can claim relief by virtue of the common law rule in *Ryland v. Fletcher*, a lot of frustrations hung around plaintiffs seeking to enforce abatement of nuisance or claiming relief therefrom especially where such nuisance is considered of a public nature. Indiscriminate dumping of waste has become a common menace in cities which rendered every street deplorable. Little or no attention was however paid to their health implications by government at all levels.

The United Nations Conference on the Human Environment (UNCHE) convened in Stockholm, Sweden in June 1972, awakened the developing countries (such as Africa) to go "environmental concern" The Government at various level had no coordinated institutional mechanism for environmental protection and monitoring in Nigeria. Nigeria as a nation was never cognizant, thus had no policy on waste disposal even on the face of increasing industrialisation and explorative activities indicative of colonization. This position became persistent without

any form of regulation by way of policies, law or any plan like environmental impact assessment plan, etc. The Koko Waste Dump of 1988 wherein about three thousand, eight hundred and eighty (3,880) tons of toxic and hazardous waste was dumped at the small port town of Koko in June 1988 awakened and impelled Nigeria to initiate a policy on waste disposal. On general assessment, irrespective of the national policy on waste disposal, Nigerian cities still stink with the stench of waste dumps every season of the year. This calls for urgent measures that will effectively deal with this nagging issue hence this paper.

Conceptual Underpin

The Environment

A pedestrian would conceive 'environment' in terms of the location or place where one is at a particular time. The Cambridge International Dictionary of Englishsees 'environment' as the surroundings, the condition in which one lives or works and the way in which these conditions influence how one feels or how effectively one works. The National Environmental Standard Regulation Enforcement Agency Act defines environment simply in terms of water, air, land and all plants and human beings or animals living therein and the inter-relationships existing among these or any of them. Environment, similarly conceived, comprises the earth; including water, land and air; all layers of the atmosphere, matter of organic and inorganic nature, living organism and the increasing natural system that incorporate foregoing components. The Black's Law Dictionary however proffers the following definition of the environment:

> The totality of physical, economic, cultural, aesthetic, and social circumstances and factors which surround and affect the desirability and value of property and which also affect the quality of people's lives.The surrounding conditions, influences or forces which influence or modify.

One glaring thing from the above definitions is that the environment is a matrix of the entirety of all that make up the earth. This does not in any way isolate man from other factors that make up the earth. It rather considers the totality of all the things that make up the habitable earth and effects they bear *inter se*. Thus, the effect of man's activities on the species that share the earth with him namely; animals, the forest, the ecosystem and indeed:

(a) The threat of increasing, population vis-a-vis decreasing natural resources
(b) Human impact on animal population and natural landscape,
(c) Deforestation and threat to endangered species
(d) Consequent increase in the use of hydrocarbon fuel
(e) Threat of food insufficiency and good housing and
(f) Varied aspects of resources depletion.

Howbeit conceived, the environment comprises both our immediate and remote surroundings and includes but not limited to the physical, social, economic, terrestrial, aquatic, arboreal environment, the subject matter of which environmental law regulates.

Nigerian National Policy on Environment

Nigeria only initiated National Policy on the Environment in 1989 following the Koko hazardous waste dump incident. Prior to Buhari/Idiagbon military regime of 1983-85 which implemented the War against Indiscipline (WAI) policy, Nigerians had no regards to the issue of environmental protection. This nonchalant attitude to environment consequently multiplied environmental problems and posed hardships for officers administering existing minimal rules and regulations aimed more at securing some degree of nature conservation in the country. The Department of Forestry and Land Resources, in a memo submitted to the International Workshop on Goals and Guidelines of the National Environmental Policy for Nigeria 1988,

lamented the hardships of implementing any legal regime thus:

> ...It is easier to constitute forest reserves by decree but the result would be lack of cooperation from the people, especially the Local Communities and Peasant Farmers...

Government, of necessity, needs to inject live into legal regime that stimulates environmental consciousness in the citizenry. The Nigerian situation in this era was entirety contradictory to what obtained in most western states where extensive environmental movements in the 1960 prompted governments into implementing apposite legislations and or policies targeted at protecting the environments. The United Nations Environmental Programme (UNEP) in 1988 organised an International workshop in concert with the Federal Ministry of Works and Housing (Environmental Planning and Protection Division) on the Goals and Guidelines of the National Environmental Policy for Nigeria. This marked a turning point in the readjustment of the nation's relationship with her environment based on the principle of sustainable development.

The blueprints expedited by the workshop were directed towards achieving the needs of the Nigerian Environment in such germane areas as land use and soil conservation, water resource management, forestry, wildlife and protected natural areas, sanitation and waste management, toxic and hazardous substances, occupational health and safety, energy production and use, mining and exploitation of mineral resources, agricultural chemicals, guidelines for public participation, legal and institutional arrangements for environmental protection ideas and principles enunciated by major international efforts and reports as "Our Common Future" by the World Commission on Environment and Development (Brundtland Report), The United Nations "Environmental Perspective to the Year 2000 and Beyond" and the "Cairo Programme of Action for African Cooperation in the field of Environment" similarly influenced a great deal of the proposed goals and guidelines. The workshop brought to bear proposed goals and guidelines which provided new and vital foundation for the advancement of policies, legal and institutional regime for the protection and improvement of the environment which was adopted by the Federal Government of Nigeria and publicised in November, 1989.

Gen. Ibrahim Babangida, the then Military Head of State, in the foundation laying ceremony of the Federal Environmental Protection Agency, was convinced that these events signified:

> ... the consummation of our desire not only to protect our environment as a clean and healthy place for all of us to live in, but more importantly, to preserve it as a worthy legacy to bequeath to our unborn generations.

The policy was crucial given that Nigeria lacked a patent focus for accurate management of her environmental problems. The WAI policy was catalytic to the formulation of the Environmental Sanitation Edicts in almost all the states of the federation, though the basic ingredients needed to sustain a national commitment to environmental protection and improvement was entirely lacking. The blueprint having infused environmental consciousness in successive governments, the National Policy Guidelines that Nigeria strives to pursue, even in the present time became clearer; that is, achieving sustainable development in Nigeria particularly geared towards:

- Securing for all Nigerians a quality environment adequate for the health and wellbeing of her citizens;
- Conserving and using the environment and natural resources for the benefits of the present and future generations;
- Restraining, maintaining and enhancing the ecosystems and ecological processes essential for the functioning of the biosphere to safeguard biological diversity and the principles of optimum

sustainable yield in the use of living natural resources and ecosystem;

- Raising public awareness and promoting essential linkages between environment and development and to encourage individual and community participation in environmental improvement efforts;
- Cooperating in good faith with other countries, international organizations/agencies to achieve optimal use of trans-boundary natural resources and effective prevention or abatement of trans-boundary environmental pollution.

Waste Generation and Management in Nigeria

Waste is a term employed to conceptualise any useless by-products of industrial process; material or manufactured articles so damaged as to render it useless or unsalable. Conceived broadly, waste covers both solid wastes (refuse, or garbage) and sewage (waste water). Both Federal Environmental Protection Agency and the extant National Environmental Standard and Regulations Enforcement Acts proffered no definition of Waste.

The Lagos State Environmental Sanitation Law however, sees waste as any substance that constitutes scrap materials or effluents or other unwanted surplus substances arising from the application of any process. The Enugu State Environmental Protection Agency Law as amendeddefines waste as an unwanted or unused product in whatever state whether solid, liquid or gaseous from any source whatsoever, discharged into the environment and having a present or future harmful or noxious effect. The United Kingdom Environmental Protection Act, and the Control of Pollution Act, 1974, defines waste as:

(a) Any substance which constitutes a scrap material or other unwanted surplus substance arising from the application of any process; and

(b) Any substance or article which requires to be disposed of as being broken, worn-out, contaminated or otherwise spoiled.

The World Health Organization (WHO) defines waste to mean "Something which the owner no longer wants at a given time and place and which has no current or perceived market value."These definitions conceptualise waste and give a clue of different types of waste. The basic legal framework relating to the duty to manage waste as well as the licensing obligations was thus formed. The WHO's definition however appears ambiguous and capable of double meanings. For instance, a person having no further use of an item may throw it away. But at the same time another person may have a need for it and retrieves it. In most developing countries today, there are second-hand items of clothing, vehicles, etc, which have been discarded by former owners but were retrieved by those having need for them. One wonders whether these items could be defined as wastes.

In*R. v. Rotherham Metropolitan Borough Conrail ex Parte Pankin;* Safely Kleen UK Ltd. "SK" secured twoplanning permissions relating to distribution, waste extraction and re-cycling centre dating 18th May and 29th December 1988 respectively. “SK” later signed contracts in January and February 1989 with builders, etc, and work commenced. The applicant residing 560 metres away claimed he had no knowledge of the planning permissions until March 1989 when he filed proceedings maintaining that each of the permissions was invalid for failure to sufficiently advertise them. With particular reference to the second permission, he contended that is was invalid because the relevant application was not processed in accordance with the Town and County Planning (Assessment of Environmental Effects) Regulations 1988. Schiedumann J held that the term “Waste” should be assigned its ordinary meaning and that based on the particular facts of this case, treatment and recycling of solvents amounted to the treatment of waste. The learned judge aligned himself with the defendant’s argument that “the solvents can rightly conceived

both as trade waste and raw material. This decision however did not categorically proffer the meaning of waste.

In *Kent County Councils v. Queen-Borough Rolling Mill Co. Ltd;* the material from where this cause of action emanated came from a disused site which was being cleared by a demolition company. The Defendant Company contended that the material did not amount to waste since it was put to useful purpose and could not therefore be designated as unwanted. Pill J held that the fact that the material was put to useful purpose could not weigh much on deciding whether or not the material was a waste. The significant factor was the nature of the material at the material time it was disposed. In other words, if the material was useless at the time it was discarded, it means it is useless and it so remains useless until it is considered a raw material for recycling.

Earlier in *Long v. Brook*;the court had held that the meaning of "waste" should be relative to the perspective of the person discarding the material. The court was similarly of the opinion that the definition of waste contained in the original Framework Directive on Waste was concerned with the potential health and pollution hazard that the materials could bring and, although recycling was to be encouraged, material could be waste notwithstanding itspotential for future use.

Similarly, the Divisional Court held in *Cheshire County Council v. Armstrong Transport(Wigan) Ltd*that the contractual obligation to return the crushed building site rubble to its original site to assist rebuilding works meant that the rubble was not a waste as the original holder had not wished to dispose of it. The Divisional Court similarly held that the value of the material or the views of the defendants were irrelevant when considering whether or not the material constituted a waste. It further held that it was not even apposite to examine the aims and purposes of the holder of the waste when conceiving waste under the Environmental Protection Act 1990.

From the foregoing therefore, waste, whether “unwanted" or of "value" may be summarily defined as follows:

- The identity of discarded material as waste must derive from the point of view of the person discarding the material;
- Once any material is discarded as waste, it becomes and remains a waste until it is positively re-processed as valuable; it is therefore not enough that a sorting out process has taken place; and
- The residue of material from industrial processes which are still treated as valuable or wanted by the producer cannot be regarded as waste.

The World is experiencing a high rate of urbanisation. It was projected that by the year AD 2025, over 60% of the World willbe urbanised. The increasing rate of urbanisation is alarming and so are its attendant problems. One of such problems is waste generation and management. Waste generation was as old as man. Waste was generated from the time man made his first fire, washed his cloths in the river and threw his trash on the earth. The increase in human population came with increased human activities. As these activities continue, waste generation also continued to build up. The industrial development has produced new kinds of waste including non-decaying and indissoluble wastes.

Wastes are inevitable consequences of human activities and are either by-products of initial production processes or arose from objects or materials disposed after use. Wastes are everywhere in all parts of the world. It is therefore synonymous with the environment.

Waste Typology

The following typologies of wastes are identifiable:

Solid Wastes: these include waste such as the household empty bottles or slag-heap from the coal mine, or the packaging material from the supermarket store. Industries, in production process, generate solid wastes such as broken glasses, plastics, rubbers, iron scraps, etc, and disposed off.

Liquid Wastes: these are effluent discharges by industries and some of them are toxic and acidic and as such harmful to the receiving water bodies or any environment where they are discharged. For instance, such effluents are made up of oxides of nitrogen, carbon, sulphur and dangerous acids such as cyanides, etc. Liquid waste may also include sewage effluent.

Gaseous Wastes: in this category are included sulphur dioxide from the coal generated power station, or the chlorofluorocarbon (C.F.C's) from the aerosol or refrigerator, or methane from the herds of domestic cattle grazing in the fields, etc.

Similarly, wastes discharged into the environment could either be:

i. Harmful Waste: waste is conceived as harmful where it is injurious, poisonous, toxic or contains noxious substance. Instances of harmful waste includes nuclear waste emitting any radioactive substance, especially where the waste is in such quantity, whether with any other consignment of the same or of dissimilar substance, as to subject any person to the risk of death, fatal injury or incurable impairment of physical and mental health. The fact that the harmful waste is placed in a container does not in itself mean that it shall be taken to exclude any risk which might be likely to arise from such harmful waste.This has been criticised for being too long and ambiguous and capable of generating interpretational problems in the courts. Simply defined, "harmful waste" means noxious, harmful, pernicious refuse which is rejected, superfluous, useless and is capable of causing harm, physical or mental impairment or even death. It encapsulates waste of all descriptions both from industrial and domestic sources comprising solid, liquid and or gaseous substances.

ii. Hazardous Wastes: the National Environmental Standard and Regulations Enforcement Agency (NESREA) Act defines hazardous waste as:

> Any substance designated as such by the Minister by order published in the Gazette Hazardous substances designated by the minister may include the discharge in such quantities of any hazardous substance into the air or upon the land and the waters of Nigeria or at the joining shorelines is prohibited, except where such law in force in Nigeria.

NESREA Act therefore invested on the Minister the powers to designate any substance as hazardous. The court can however interfere where the minister exercises his power arbitrarily. In *Ashbridge Investment Ltd. v. Minister of Housing and Local Government,*Lord Denning MR stated as follows:

> Under this section, it seems to me that the court can interfere with the Minister of environment's decision if he has acted on no evidence; or if he has come to decision to which on the expert evidence he could not reasonably come that the "substance" so designated as hazardous is in fact not "hazardous substance" or if he has given a wrong interpretation to the words of the statute; or if he has taken into consideration matters which h ought not to have taken into account, or vice versa, or has otherwise gone wrong in law. It is identical with the position when the court has power to interfere with the decision of a lower tribunal which has erred in point of law.

This is to say that the minister must be convinced that a substance is hazardous before designating such substance as hazardous. It is also required of the Minister to publish his decision in the gazette. Therefore, if the Minister designates and gazettes any harmless substance as hazardous, the courts may interfere upon application and set it aside because the Minister may have based his decision on facts which ought not to be taken into account. Thus, in *Secretary of State for Education and Science v. Tameside Metropolitan Borough Council,* Lord Wilberforce stated that:

> If a judgement requires, before it can be made, the existence of some facts, then,

> although the evaluation of those facts is for the Minister of Environment alone, the court must inquire whether those facts exist, and have been taken into account, whether the judgement has been made upon a proper self-direction as to those facts, whether the judgement has not been made upon other facts which ought not have been take into account.

iii. Poisonous Waste

The Criminal Code Act defines poisonous waste as a noxious, offensive or polluting waste, which causes damage to land, property, water, air, forest and wildlife and the totality of the environment. The Act, accordingly, criminalises any act of vitiating the atmosphere in any place so as to render it noxious to the health of persons; and fouling of water, spring, stream, well tank, reservoir, or place so as to render it less fit for the purpose for which it is ordinarily used.

The English Control of Pollution Act defines poisonous waste to include noxious or polluting waste which has been deposited on land and amounts to an "environmental hazard". It is situation where:

> the waste has been deposited in such a manner or in such a quantity (whether that quantity by itself or cumulatively with other deposits of the same or different substances) as to subject persons or animals to a material risk of death, injury or impairment of health or as a material risk of death, injury or impairment of health or as to threaten the pollution (whether on the surface or underground) of any water supply.

The fact that the waste is put in containers is not for itself to be taken to exclude any risk which might be anticipated to arise if the waste were not in containers.

The degree of risk of the hazards mentioned is to be assessed with particular regard:

(i) To the measures, if any, taken by the person depositing the wastes, or by the owner or occupier of the land, or others for minimising the risk; and

(ii) To the likelihood of the waste, or of any container in which it is deposited, being tampered with by children or others.

It should be noted that the foregoing definitions of poisonous waste under the English Control of Pollution Act 1974, substantially corresponds with the definition and position of the Nigeria Harmful Waste (Special Provisions, etc,) Act.

Sources of Waste

There are many sources of wastes. The sources are particularly more pronounced in developing countries due probably to low literacy level. In developed or industrialised nations, great efforts are made to reduce waste, supported by high degree of literacy and orderliness. However, the main sources of wastes are attributable to human population explosion. It is postulated that with more people, there will be more sewage and more solid wastes. These problems, as usual, are more escalated in developing countries. In order to determine their sources, waste could be classified into domestic wastes, commercial waste, agricultural waste and industrial wastes.

(i) Domestic Wastes: Household and school activities generate food waste, fuel residue scraps, various forms of wrapping leaves, papers, rage, empty cans and containers, plastic and a variety of unserviceable household appliances. These household wastes are often dumped indiscriminately in most Nigerian cities.

(ii) Commercial Wastes: These wastes are generated from markets, trade or business, sports and sports related activities. These include garbage, discarded materials ofdifferent sorts, wrapping papers, empty containers, etc.

(iii) Agricultural Wastes: Agricultural Waste originates from farming and other agricultural activities such as garden wastes, poultry wastes and so on.

(iv) Industrial Wastes: Industrial wastes are generated from the by-

products of industrial or factory processes. The form of industrial waste depends on type of mechanical process invoked.

Industrial waste may be classified into biodegradable and non-biodegradable. Theformer consists of those types of wastes from agro-based or food based industries that can decompose over time as a result bacterial action. The latter refers to industrial wastes which are not broken down by biological processes but persist very long in the form in which they are discarded. These include glass, oil, metals, plastics and many classes of mining and mineral derived waste. These industrial wastes could either be toxic, hazardous and radioactive in nature. They are toxic, when, by its by nature, they pose a direct threat to human and animal health such as the waste dumped in Koko in Delta State of Nigeria in 1982.

Industrial wastes can be categorised into five, manufacturing, servicing, food processing, agro-allied and chemical/allied; it has been found that the total average daily volume of industrial solid waste in every capital city in Nigeria stood at 107. 7 kg. The manufacturing industries lead in the generation with 39.7*%;* followed by agro-allied with 21.5%, and food processing 18.8% respectively. As such, a huge chunk of non-degradable and non combustible, degradable and combustible, toxic and acidic and hazardous substances are introduced into the environment.

When living standards rise, people consume more and waste more. But what people throw away depends upon where they live. According to Uchegbu, in industrialised countries, packaging contributes about 30 percent of the weight and 50 percent of the volume of household waste generations. Food and yard scraps account for most of the remainder. Paper contributes by far the largest share of packaging, followed by glass, metal and plastic. He stated that every Nigerian discards almost 17 kilograms of paper each year and that a large part of urban household waste in Enugu State is vegetable and putrescible materials, including human faeces.

Methods of Waste Management

Waste management is a planned system of effectively controlling the production, storage, collection, transportation, processing and utilisation or disposal of wastes. There are many methods of waste management. The type of waste generated determines the method of its management.During the pre-colonial period, the households refuse / wastewere, as a matter of routine, dumped in nearby farmlands to serve as manure for the next planting season. In some cases, refuse gathered were burnt in open grounds. However, these methods are no longer adequate in view of increased population and development. Again, increased population and current developments have given rise to increased and intensive waste/refuse production resulting in an ineffective waste disposal system generally.

The various methods of waste management and disposal could be categorised to include the use of waste bins, incineration, landfill, recycling, use of pits and composting, transshipment, hog feeding and pyrolysis. We will therefore discuss these methods hereunder.

Use of Waste Bins: The use of waste bins usually involves the use of various types of receptacles for the purpose of collecting or holding refuse until they are disposed of by being curried to the appropriate dumping site. Many people have such binsin kitchens as well as in bedrooms, inside their houses as well as outside. In some cases, bye-laws are made specifying the type of containers to be used even in commercial vehicles. Also, paper containers, which collapse under pressure or when saturated, serve as instruments for refuse collection for many homes and offices. The use of large metal bins in front of the premises depends on whether relevant government or non-governmental agents collect refuse from private premises and offices.

However, it must be emphasised that effective management ofthe household refuse demands its proper sorting or separation into three categories namely:

- Food waste and leaves;
- Rags and the like; and

- Tins, glasses and plastics.

Each type should have its own distinct receptacle so as to reduce the problem of handling and disposal. This practice would help to inculcate the culture of environmental cleanliness in our youths as well as makes refuse disposal cheaper, easier and quicker.

Incineration: Incineration is a very useful tool of waste management no matter the type of the waste products. The incineration is a process of reducing waste products to ashes. The design of an incinerator depends on the waste products to be handled. Huge industrial incinerators burn varied kinds of refuse such as paints, oil, sewage, sludge and city garbage.Modern incinerators are made to consume oil sorts of waste products and their resulting gas, eliminating air pollution. Advanced countries have combined waste incineration with the recovery of energy to produce heat. This is a form of recycling. Therefore, if certain types of industrial wastes are properly sorted out into their various components, such as plastics, metals, glasses and papers and recycled, they may serve as a local and cheap source of raw materials for our industries.

On the other hand, small incinerators burn waste products in homes and offices. Controlled open air burning and residential incinerators are not basically different from each other in terms of resulting air pollution. Nonetheless, the burning of large quantities of waste compacts solid wastes and reduces the cost of refuse transportation to designated dumping or recycling areas. However, the stage of refuse generation in Ebonyi state and other States now require an improved incineration method for municipal garbage. Considering the dangers of open air burning, the acquisition of modern incinerators may eventually be better for health purposes.

Land Fill: The sanitation landfill in use generally includes ramps, ravinesor valleys, trenches and low areas. The system involves making a hole in the ground and filling the rubbish therein. However, this system of waste disposal is prone to problems arising from leaching, whereby liquid seeps through the landfill and takes with it some harmful chemicals from the waste and contaminating land and water below. This, at once, poisons the ground water supply system, rivers, streams, waterways and drinking water system, posing a great threat to public health. Also, the production of gases is another problem usually associated with landfill sites, for as the waste, which is buried rots down; it produces methane gases, and carbon dioxide, both of which are dangerous to human health.

Problems arising from leaching are often solved by creating a barrier suitably designed and positioned to prevent seepage. The barrier may be natural in the sense that it is formed from the rock or other material underlying the site. Thus, a layer of clayey soil could be an effective barrier for certain types of waste. In the alternative, an engineering solution involving the construction of a special wall out of an appropriate material may be provided. Although such a solution may be expensive, it is usually preferred for a site already in operation.

Recycling: The idea of recycling wastes and using them again is, no doubt attractive; hence it is currently the most pursued method of waste disposal. But in order to turn old food into fertilizer, nitrogen is required. Therefore, the production of useful material out of the waste necessarily involves a combination of the waste materials with other useful materials. Thus, to recycle old newspapers so as to produce fresh sheets of paper for assorted purposes requires a lot of energy and chemicals apart from the recycling machines. Similarly, a heating process, which uses energy, is required in order to reclaim broken and useless bottles for other purposes. Transportation is a major factor in the realisation of recycling, and can adversely affect the willingness of manufacturers to use the second grade raw materials if the cost is high.

There are various stages involved in recycling. First, the waste must be reclaimed and, then, passed through a number of processes before it emerges as a clean raw material for other purpose. It is, though, possible to recycle a waste without first subjecting it to any further processing. Milk bottles could serve a classic example for this.

For example, in developed country, we may drink the milk, wash the bottle and then place it outside the door to be collected by the milkman and "refilled for another day. But recycling involved an additional process. Broken glass bottles could be processed and used in the making of new bottles. Also food waste could be composted and made into soil.

An essential feature in recycling is that the waste must be collected and sorted out into its constituent parts. Glass, clothing, tin, paper and other items ought to be separated before the recycling and reuse could take place. When waste food, cans, glass, plastic, etc, are sorted out and dumped at specific sites, the central collection of those waste products would be made easier and cheaper. To achieve this, at the time of disposal, each product should be carried to the appropriate centre for recycling. No doubt, the process for recycling creates more jobs and provides a cleaner environment.

Use of Pits and Compositing: Pits dug in private premises were often used as refuse dumps. In traditional societies, pits measuring each about 18 inches in diameter and 30 inches deep are dug in the compound and filled with biodegradable household refuse to serve as manure for yam planting in the next planting season. This system is still a common practice in many places. However, the refuse they take are so minute that one of them may be adequate for a traditional family but grossly inadequate for a modern industrial or commercial establishment.

Composting, on the other hand, is learnt at both primary and secondary schools and is a form of waste recycling. Compost comprises a mixture of soil and partly decayed plant materials. Good materials for compost include waste food, leaves and glasses. Carefully nurtured compost would involve spreading the materials in layers and sprinkling fertilizer and lime on them. Each layer is covered with a thin soil and watered frequently during the dry season. Usually, the compost decays within three to six months. In places where the compost system is practiced, children usually imbibe it as part of their culture and, as a matter of routine, the practice is passed from one generation to the next.

Transshipment of Waste: In the late 1980s, the tightening of environmental regulations by industrialised countries led to a dramatic rise on the cost of hazardous waste disposal. Searching for cheaper methods to get rid of the waste, toxic-traders began shipping hazardous wastes to developing countries of Africa, Asia and South America and to Eastern Europe. Disposal costs in Third World Countries are cheaper because of the absence of waste regulatory controls, the ineffectiveness of the enforcement of controls or a lower standard of technology.However the environmental consciousness in the Third World has been awakened and heightened because of the people's experience to some disastrous incidents associated with waste dumping. One infamous example is the dumping of toxic and radioactive waste in Koko, Delta State, Nigeria by a private Italian Company in 1988. When it was discovered, the Nigerian government insisted that it should be removed by the Italian government. Eventually, the waste was loaded back into the ship, the Karin B, which was subsequently refused entry into a number of different countries until it returned to Italy where the Italian government was forced to find a final resting-place for the waste.

On the other hand, the Organization of African Unity, had prior to the Basel Convention, adopted a resolution proclaiming the dumping of wastes in Africa to be a crime against Africa and its people and eventually, on the 30th day of January 1991, in Bamako, Mali, African nations adopted the Bamako Convention. The Convention banned outright the import of any form of toxic waste into Africa and similarly put in place measures aimed at controlling trans-boundary movements of such wastes generated in Africa.

Hog Feeding: Hog feeding with waste is a form of resources recovery. In America, swine is fed with edible garbage, but with legislation that garbage should be processed before it is fed to swine. In Nigeria, rural communities feed pigs with edible garbage and waste food. Hog feeding is however constrained because it cannot

be used for the disposal of the non-edibles which constitute a bulk of domestic and industrial wastes.

Pyrolysis: though not common in developing countries, this is a technique of thermal decomposition of organic materials in the absence of oxygen and is seen as an alternative to incineration. The by-products of pyrolysis are organic and inorganic solid oil and gases that can be used as fuel and are marketable. Pyrolysis has advantages over incineration because it produces more energy than it consumes.

CONCLUSION

Effective waste management mechanism is a *sine-qua-non* for sustainable environmental development. Apart from constituting a sore sight, wastes are deleterious to health and can cause epidemic in any community. It is therefore in consideration of this that we make the following recommendations:

- Government at all level should be more conscious of the need to protect the environment. Policies and programmes targeted at achieving healthy and serene environment should be designed and implemented both at the federal, state and local government levels.
- Government should consider privatising waste management to allow for private sector and well meaning individuals participate in managing waste. This to our mind will make for more effective management system and provide employment at the same time.
- Government should prioritization of waste management in Nigeria. Different levels of government should consider investing in the importation of relevant technology that will help in waste recycling. This will help the developing economies achieve "waste to wealth" policy in Nigeria.
- Public awareness is necessary to inform the Nigerian citizens of the need for serene, sane and healthy environment for information, they say, is power.
- Adoption of modern methods of waste management in Nigeria such as are discussed in this paper is necessary if we must dispense with the sight of mountainous heaps of refuse dumps in our cities.

REFERENCES

1. Cambridge International Dictionary (Cambridge: Cambridge University Press, 1995).
2. Gardner, B. A. (ed.) *Black's Law Dictionary*, 7th edn. (London: West Group Pub. Ltd, 1999)
3. Giddenes, A., "Cities in Modern World" in A. Giddenes (Ed) *Human Societies: An Introductory Reader in Sociology* (London; Polity Press, 1992).
4. Michael Purdre, "Defining Waste" in Journal of Environmental Law, Vol. 2 No. 2, Oxford University Press, 1990, p. 259.
5. Ogbodo, S. G., "Environmental Protection in Nigeria: Two Decades after the Koko Incident" in *Annual Survey of International & Comparative Law* (2009) Vol. 15, Iss. 1, Article 2
6. Okonkwo,T., *The Law of Environmental Liability* (Lagos: Afrique Environmental Department and Education, 2003)
7. Okorodudu-Fubara, M. T., *Law of Environmental Protection: Materials and Text* (Ibadan: Caltop Publications (Nig) Ltd, 1998) p. 56.
8. Omaka, C. A., *The Nigerian Conservation Law* (Lagos: Lions Unique Concepts, 2004)
9. Omaka, C. A., International *Environmental Law* (2008) Unpublished Lecture Material.
10. Omaka, C.A. *Municipal and International Environmental Law* (Lion Unique Concepts: 2012)
11. The New Encyclopedia Britannica Inc, Chicago, Vol. 12 (1998)
12. The Oxford English Dictionary, 2nd Edn. Vol. XIX, (Oxford: Clarendon Press, 1989)
13. Uchegbu,S. N., *Environmental Management and Protection*

(Enugu: Precision Printers and Publishers, 1998)

14. Uchegbu,S. N., *Issues and Strategies in Environment Planning and Management in Nigeria* (Enugu: Spotlite Publishers (Nig), 2002)