Characteristics and Management for Solid Waste: Implications for Health

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ABSTRACT

Solid wastes are heterogeneous accumulation of domestic, agricultural, industrial and mineral materials. It can as well be called "refuse". The composition of solid wastes in probably the most significant characteristics operating its disposal or recovery of material from waste, and can vary conscionable from one community to another. For instance, wastes generated in developing communities contains a large percentage of organic materials, usually three times higher than that of industrialized countries. Generally composition of waste are of two types: physical and chemical compositions sources of solid waste are classified as residential industrial, commercial, institutional, construction and demolition of municipal services processes and agricultural wastes. Solid waste management involves the collection, transportation, storage, pre-treatment and disposal of the waste reissue, as well as after-care of the disposal sites as part of the management activities. The main reason for solid waste management in to reduce the volume of waste generated and to make hazardous waste non-toxic by threating before the final disposal in natural system (earth, metro, or air). Government private agencies and individuals should be involved in waste characteristic at the source. This approval will go a long way in helping the recovery of reusable materials from domestic waste in all areas.

KEYWORD: Solid Wastes Management, Industrial and Mineral Materials

Introduction

The problem of solid waste is a universal one as waste exists in every society Waste management problems only appear more serious in developing societies because of poor management system. The quantity and type of waste generate depends upon the function which a city performs, its economic status and the level of technological development.

Initially, solid waste management efforts were directed merely to the removal of waste from the urban centres and the subsequent destruction of such waste. Later, attention shifted to waste utilization, waste reduction, re-use and re-cycling, and management to reduce pollution emanating from waste disposal. The advanced nations have developed avery rigorous waste management frame work which ensures efficient waste collection, storage, transportation and disposal to minimizing the impacts of disposal on the environment. In addition, there is emphasis on waste sorting, re-cycling and re-use including other practices which help to save waste management costs. This however, is not the case in many developing countries. In Calcuta, India, for example, Chattopadhyaya, Duttad and Ray, (2011) have reported a complete absence of segregation of waste at source, limited house-to-house collection and the use of very old vehicles in waste collections. In Pakistan, A1-khatib, Arafat, Basheer, Shawahneh, Salahat, Eid

and Ali. (2007) found out that although municipal solid waste collection service was available for 98% of the residents, no proper treatment or landfill procedure was adopted for the collected waste in most of the area. Instead, waste burning in open dumpsites was the most common practice due to the inefficient collection of waste disposal fees from residents. Municipalities often suspended the collection service due to reduction in its labour force. In Nigeria, a major feature of the urban environment, particularly from the beginning of the oil exploration in the 1970's was the rapid takeover of cities by all kinds of solid waste (FEPA, 1991). Most state capitals and other large cities are littered with solid waste despite the presence of state and local government-owned waste management agencies including private waste collectors. According to the Federal Environmental Protection Agency (FEPA, 1991), about 20 kg of domestic waste generated per capita per year in Nigeria. Nigerian Environmental Study and Action Team (1991) reported that Nigeria generated over 60% of her waste as leaves and food remnants in the 1960's.With the growth of industries in recent years, polythene and paper of various types have replaced leaves a wrapping and packing material.

Ogwueleka (2009) observed that solid waste management in Nigeria is characterized by inefficient collection methods, insufficient coverage of the collection system and improper disposal while Babayemi and Dauda (2009) decried the complete lack of efficient and modern technology for the management of waste. To make disposal effective, Ogboi and Okosun (2004) suggested the use of informal labour waste collectors who collect metals, bottles, glassware are plastic materials from refuse dumps for re-cycling and re-use. As population increases and was composition become more non-biodegradable with high recycling and re-use values, the role informal waste collectors becomes more necessary in the urban solid waste management scenario. Nwachukwu (2009) has recommended t privatization of solid waste management systems and adequate funding of agencies responsible for refuse, collection and disposal in the Nigerian cities such as Onitsha.

Co Solid waste

Solid waste can also be defined as non-gaseous, non-liquid waste resulting from the daily activities of community's residential, commercial, agricultural and industrial activities. (USEPA (1990) defined solid waste as garbage, rubbish and other discharged materials resulting from various domestic, industrial, commercial, mining, agricultural operations and from various other human activities. However, solid wastes is defined as the heterogeneous accumulation of domestic, agricultural, industrial, and mineral materials. Solid wastes could be defined as non-liquid and non-gaseous products of human activities, regarded as useless. These include construction materials, scrap metals spent oil, grits, dirt, garbage, vegetable matter from bush cleaning, soil excavations domestic waste, among others. The term 'solid waste' and 'refuse' have been used interchangeably by many people in various circumstances. Quiby (1975) as cited by Olayiwola (2000) considered solid wastes and refuse as synonymous as they could be used ii interchangeably. But Straub (1975) and Mantell (1 975) also cited by Olayiwola (2000) gave a distinction between solid wastes and refuse. The former refers refuse as a part of solid waste, while the later refers to solid wastes as part of refuse. In this work, the opinion of Straub (1975) n refuse as part of solid waste will be used. It could take the forms of refuse, garbage and sludge (Leton and Omotosho, 2004).

Attempts to expand the scope of knowledge on solid waste generation beyond a particular locality is very necessary. Ogbonna*el al.,* (2002) have observed that little or no attention is given

to some sub-urban settlements for provision of waste collection and disposal services. Okopedi, a traditional city in Okobo Local Government Area of AkwaIbom State, now to be found on the lane of increasing population due to the strategic sitting of the Ibom International Airport cityand improving economy in the state, is yet to be fully explored for adequate information and data on solid waste collection and disposal.

Composition of Solid Waste

Solid wastes are heterogeneous in nature and its composition varies with place and time. The heterogeneous nature consists of a number of different materials derived. From various types of activities the compositions also vary throughout the world. Even in the same country it changes from place to place, depending on a number of factors such as social, customs, standard of living, geographical location and climate, among others. It is site-specific and depends on the natural resources and source, which provide the base for given urban centre. The composition of solid waste is probably the most significant characteristics affecting its disposal or recovery of materials from waste; and can vary considerably from one community to another. Waste generated in developing countries contains a large percentage of organic materials, usually three times higher than that of industrialized countries. The waste is also more dense and humid, due to the prevalent consumption of fresh fruits and vegetables as well as unpackaged food. In Nigeria, the major constituents o solid wastes are paper, metal, glass, ceramics, plastic, textiles, dirt, polythene wrappers, wood, bone, ash, stone, dust and putrescibles organic matters (Nwankwo, 1994).

Today, information have it that over the years there is a marked increase in volume and change in composition of solid waste in these urban centers. This change ranges frompredominantly vegetable matters and food remnants to a hi h percentage of non-putrescribes such as cans, plastic bottles, glass, metals textile, paper and polythene as a result of consumers good packaging all over the country (Nwankwo, 1994). This changes have been adduced to rapid urbanization and the attendant drastic shift from rural habits, norms and values of the people or urban civilization. These materials leave large void spaces and lowmoisture content which explain, to some degree their low density values. The average proportion of the constituents reaching a disposal site for a particular urban area changes in long term, as well, as a significant seasonal variation within a year. For this reason analysis of the composition of solid waste in different urban area is expressed in terms of a limited number of constituents. The compositions of waste are basically of two types: physical and chemical compositions.

Physical Composition of Solid Waste

These include the components (comprising of scraps, plastic, discarded tires, food remnants, lead and iron materials, among others) density and sizes of the wastes. The knowledge of' the density and size of waste is essential for the design of all element of the solid waste management system.

Chemical Composition of Solid Waste

This refers to the chemical components of solid waste. It is essential in determining the efficacy of any treatment process. Chemical composition includes: (i) chemical (ii) biochemical and (iii) toxic.

(i) Chemical: chemical composition includes life Nitrogen, phosphorous and potassium (N-P-K), total carbon content and calorific value of the waste.

(ii) Biochemical composition: this includes carbohydrate, proteins, natural fibre and biodegradable factor.

(iii) Toxic: toxicity characteristic include heavy mental pesticides insecticides, toxicity test leachates, content among others.

Classification and Sources of Waste

Classification of solid waste is the tools that allowed getting together important information to the study and applicability of suitable and efficient management models. Solid wastes are classified according to their source and from the origin of generation, with a view of obtaining workable efficient method of storage, collection, treatment and disposal.

There are eight major classifications of solid waste source: these are residential industrial, commercial, institutional, construction and demolition of municipal service processes and. agricultural wastes (WHO, 1984) Because of these factors, several researchers have attempted to provides different classification of municipal solid waste, MS\I, from their sources. Ejah (2002), classified solid waste into broad classes:

1. Ordinary household garbage, certain industrial and agricultural garbage such as straw.
2. Faces.

For classification based on the origin of generation, the author classified solid waste into:

(i) Garbage which consists of waste from cooking and serving food, market waste from handling storage and sale of produce which are all generated from household, restaurants, institutions, stores and markets.

(ii) Rubbish which consists mainly of combustible materials as papers, wood tree branches, yard trimming among others. Some which may be non-combustibles, examples, metals tin, cans, and glass, among others, all from source as garbage.

(iii) Street refuse/dead animals, e g. Sweepings, dirt, dead rat, dogs, chicken all from street/sidewalks.

(iv) Ashes from wood used for cooking and burning of rubbish, or on-site incineration.

(v) Motor scrapes which are contributed mainly by motor workshops and vehicle owner who can no longer afford to maintain their vehicles.

(vi) Industrial wastes, which consist of food processing waste, garri processing plant, meat processing waste, chemical waste, among others.

(vii) Other wastes include those from demolition of houses and other structures and construction of new complexes.

Solid waste are also classified as domestic and estate wastes, a domestic waste includes: Garbage, Rubbish, Ash, House sweeping, and other bulky waste, while estate includes industrial wastes, hospital wastes, Mu wastes, and Agricultural wastes.

Solid Waste Management

Waste management issues are the concern of everybody. It is one area of importance where the problem• of pollution may arise from time to time if not properly handled.. Consequently, to avoid environmental pollution and degradation by waste, waste management should become a matter of necessity. The main aim of solid waste management is to reduce the volume of waste generated and to make hazardous waste non-toxic by treating before the final disposal into natural system (earth, water and air). Solid waste management according is a planned system of effectively controlling the production, storage, collection, transportation, processing of the waste in a sanitary and aesthetically acceptable and economic manner. In the opinion of Nkwanko (1994), solid waste management involves the collection transportation storage pretreatment and disposal of the waste residue, as well as after-can of the disposal sites as part of the management activities.

Nwankwo (1994) explained pre-treatment activities of solid waste as aiming at volume reduction which could take the form of reduction in size of the combustible solid waste, recycling or compaction of the waste particles. pre-treatment as on-site processing is used to recover useable materials to reduce volume or to alter the physical form of the solid waste. Disposal of waste is an activity which covers manual sorting, compaction, incineration and land filling of the residue. This grouped the basic elements involved with solid waste management from the point generation to the final disposal point as:

1 Waste generation
2. On-site handling, storage and pre-processing,
3 Collection
4. Transfer and transportation,
5. Processing and recovery, and
6. Disposal.

Solid waste management in Nigerian urban centres is poor and has been identified as a major environmental and public health problem. From the American perspective, the sheer magnitude of solid waste management in Nigeria is hard to comprehend. Waste management is at the lowest ebb in most towns and communities. In areas where waste management seems to be in practice. either most parts of the city centres do not benefit from the public waste disposal services and therefore have to bury or burn their waste or dispose it haphazardly. Or the number of public waste bins provided cannot commensurate the volume of waste, as a result, the amount of trash that accumulates in a matter of hours are more than what waste collectors could haul in a day, such that a fair percentage of these trash never make it as far as the informal dumps.

Types of Solid Waste Management

Among the most common methods of solid waste management are, crude dumping; opendumping, incineration, landfill and composting, while reclamation, recycling and reused methods are the current method of waste management practiced in most developed and some developing countries of the world.

Crude dumping method: crude dumping is a primitive method of waste disposal. It is a system of dumping refuse unguardedly at various points. This practice is evident in Nigerian rural and urban co Even when some refuse closets have been erected at collection points, the refuse dumped into such dumps may not be removed over a long period.

Open Dump Method: this is one the oldest methods of waste disposal methods that has been long abandoned in urban centres of most developing countries, but are still practiced in Nigerian urban centres. This practice embraced all stream of solid wastes being disposed. Open dumps are area where wastes are disposed without proper control, including the environment. It is a long established method for waste disposal that demands minimum efforts and expenses. It. involve the disposal of all streams of waste, organic and inorganic materials together in an, open space or depression (Nwankwo, 1994). Though very popular, open dumps are unsanitary and destroy the aesthetic appeal of the environment. They harbor flies fleas mosquitoes, rats andother either dissolved or leach harmful chemical that is carried away from the dump sites to contaminate soil, ground water and surface water through runoff, among others.

Incineration methods: this method involves the reduction of combustible wastes at high temperature of between 650°C - 850°C. It is a high mutual investment and high operating/maintenance cost project. According to Ogedengbe (1990), incineration is a volume reducing process. It is a process that can effectively reduce the volume of waste that must be disposed of by 75-95% (Ogbonna*Ekweozor*, I.K, and Igwe, 2004). The fact that residues arising from incineration can again he disposed off and that it is capital and operational expensive constitutes important shortcoming. In Nigeria however, on the Lagos State Government had incinerators, but due to poor management and maintenance, it has been out of use for now. Municipal solid waste (MSW) ash from incinerators may b. a potential hazard due to the toxic clement and organic compounds that are contain in it. Another major problem of incineration lies in the burning of material containing chlorine compounds and other chemicals, such as plastics, table salt and bleach papers among others. During combustion, hazardous combustion products are introduced to the atmosphere, notably carbon (11) oxide, halogenated and polymeric hydrocarbons. The chlorine compounds combines to form dioxins and furan. Some dioxins are the most toxic gas known to man. The process of incineration also produces fly-ashes into the atmosphere.

Compositing methods: Solid wastes may be resources due to the enrichment of scarce elements over their abundance in average soils. Compositing method is a process in which organic materials are biodegraded and decomposed to useful humus-like materials (AsomaniBoateng and Murray, 1999). Compositing may be defined as the decomposition of moist, solid organic matter by use of aerobic microorganisms under controlled conditions. The end-product of this decomposition being a sanitary nuisances free, humus- like material that can be used as soil conditioner. Compositing is particularly useful especially in those areas where land for arable farming is decreasing, bush fallowing is no longer tenable and the demand for compost asan alternative to artificial fertilizer has increased in order to sustain intensive agriculture. The interest in the use of solid waste for compost can make compositing method to become an option for solid waste disposal. But what must be addressed should be the extent to which the concentration of poisonous heavy metals present in the municipal solid waste compost may adversely affect plants, soil organisms, water quality, animals and human health (Alloway, 1995).

Landfill Methods: These is another solid waste disposal method that has been receiving much publicity and acceptance in developed and developing countries, although it is on the decrease in most developed countries. In developing countries, landfill is the most publicized method of municipal solid waste management; it is pitching refuse into a depression or closed

mining site or abandoned excavated burrow pits, covering it with soil and allowing natural decomposition and setting. Although least expensive, the refuse deposited in a landfill is compacted and covered to prevent odour, flies, rodents, insects, and other nuisance usually associated with collection system. Before the landfill is constructed, the bottom of the landfill is first covered with an impermeable barrier and then covered with permeable earth materials such as gravel, which will drain the leachates via pipes to a collection and treatment system.

Since the covered refuse could produce leachates after years of it deposition, the treatment systems are designed for a long-term operation. Other methods of landfill are the ramp and the containerized types. Inspection for and control of rodents are maintained on continuous basis as well as filling of depression with non-putrefying material Landfills are sited, planned constructed and managed by a professional who thorough understands the Federal and Local regulation governing landfill design construction and operation.

Conclusion

Solid waste management in Nigeria is still far below universal recommended index. In Nigeria characterization of solid waste id having inefficient collection methods, insufficient coverage of the collection system and massive in proper dumping around unauthorized site and places. While advance countries have so far developed a standardize waste management framework which ensures efficient solid waste collection, storage, transportation and disposal to actually reduce the bad impacts of disposal of waste on the community. For proper waste disposal to reduce pollution/hazards to our community steps should be shifted to waste utilization, waste reduction, reuse and recycling and standard management, in an effort to reducing pollution arising from wrong waste disposal technique.

Recommendations

1. Reclamation, recycling and reused method of solid waste management should be encouraged in both developed and developing countries.
2. Because of perceived beneficial of waste management by urban areas, policy makers, town planners, and settlement managers to as a matter of urgency select, plan and develop more settlement that could stand as growth centre in Akwa Ibom State.
3. Government should implement classification of more rural settlement as urban development centre in all the Local Government Area in Akwa Ibom State for easy planning, development and for improvement of welfare of residents of sure location.
4. Government through it relevant agency should invest more in the management of solid waste to avoid pollution of the environment and protection of the natural environment components like the air, water and land.
5. Provision should be made for reduction of volume of solid waste from the point of generation carefully separating them according to degradable and non-degradable waste as to also reduce the volume available for disposal.
6. Standard legislation on proper solid waste disposal and management should be strictly adheres to. Enforcement of the said legislation should be properly made and defaulter should be made to face the law.
7. Proper disposable technique of solid waste management like the use of landfill, composite, incineration, open dump etc. indiscriminate solid waste disposal should be discourage to avoid the pollution of the ecosystem.

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