

Research Article

Current Status of Municipal Solid Waste Management Practise in FCT Abuja

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Abstract: Municipal solid waste management constitutes one of the most crucial health and environmental problem facing African cities. Most cities spend 20-50% of their annual budget on solid waste management and only 20-80% of the waste is collected. This study examines the current status of municipal solid waste management within Federal Capital Territory Abuja (FCT Abuja) and aims to identify the current challenges and areas requiring improvement. The data collection is in stages, using an integrative approach via semi structured interview and field observations. The qualitative data was analyzed descriptively, while the quantitative data was analyzed using basic statistics. Bases on the finding it is concluded that municipal solid waste management is a serious issue due to its human health and environmental sustainability implications, that has yet to be properly address within the FCT Abuja.

Keywords: Environment, FCT Abuja, management, solid waste

INTRODUCTION

Municipal Solid Waste Management (MSWM) is a globally challenging issue especially in developing countries, due to its adverse environmental effects (Zamorano *et al.*, 2009; Jalil, 2010; Adekunle *et al.*, 2011). Mankind naturally depends on the environment to sustain their lives but solid waste is one of the three major environmental problems (other major environmental issue include flooding and desertification) in Nigeria, many other developing and even the developed countries are threatened by this. It plays a significant role in the ability of nature to sustain life within its capacity. Most cities spend 20-50% of their annual budget on solid waste management and only 20-80% of the waste is collected (Achankeng, 2003). The standards of waste management is still poor and outdated in many developing countries, with poor documentation of waste generation rates and its composition, inefficient storage and collection systems, disposal of municipal wastes with toxic and hazardous waste, indiscriminate disposal or dumping of wastes and inefficient utilization of disposal site space. Improper solid waste management has contributed greatly to river pollution, also contributes to climate change. Rapid development, population increase and changes in consumption pattern have directly (and indirectly) resulted in the generation of enormous amount of waste, ranging from biodegradable to synthetic waste.

The rapid population increase due to urbanization in Abuja metropolitan areas have caused difficulties for the state and local environmental protection agencies in providing an effective and efficient municipal solid waste management (Olanrewaju and Ilemobade, 2009). Urbanization affects land use and when not controlled causes the emergence of illegal structure and neighborhoods which is characteristic of some areas within the metropolis. This has ultimately affected the city plan, thereby affecting services such as; waste collection, which has eventually lead to illegal dumping. These illegal dumps with time have become mountain like open dumps in the middle of residential areas, with odours and rodent. These open dumps cause health risks and reduces the aesthetic value of the surrounding environments as well as contaminate natural resource. The rapid growing waste generation rates and high cost of waste disposal, depletion of landfill space and the problem of obtaining new disposal sites resulting in open dumping are unresolved issues. It has become necessity due to the above mentioned to have an overview and examine the current state and challenges with this regard. Abuja Environmental Protection Board (AEPB, 2012) have the sole responsibility of solid waste management in the Federal Capital Territory (Abuja-Citiserve, 2004). Only few state capitals have been able to put in place fairly sustainable urban waste management programs. It is therefore a common site to find mountains of waste scattered all over our cities for days or even weeks with no apparent effort displayed at getting rid of them

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within certain districts, even with the attendant risk of air and ground-water pollution.

According to Tchobanoglous *et al.* (1993a) the term municipal solid waste normally is assumed to include all of the waste generated in a community with the exception of industrial process waste and agricultural waste; sources as residential, commercial, institutional, construction and demolition, municipal services excluding treatment facilities, treatment plant sites; municipal incinerators. In Nigeria municipal waste density generally ranges from 280-370 kg/m³, Waste generation rate is 25 million tons annually and daily rate of 0.44-0.66 kg/capital/day (Ogwueleka, 2009). Waste generation and composition is greatly influenced by population, income, economic growth, season, climate and social behavior. In Nigeria waste stream generally consist of putrescibles, plastics, paper, textile, metal, glass. In FCT Abuja waste composition is heterogeneous and is mixed; non-degradable materials and degradable components. The waste is not segregated at the source or at any point during handling and comprises of hazardous and non-hazardous waste. The hazardous components usually consist of house hold cleaning agent and left over chemical from renovations.

Background of study: Tanskanen (2000) developed and applied a computer model to study the Integrated Municipal Solid Waste Management in Helsinki Metropolitan Area (Finland). The model was developed for analyzing on-site collection systems of waste materials separated at the source. The study aimed at finding and analyzing separation strategies, fulfilling the recovery rate targets adopted for Municipal Solid Waste in Finland. Ni-Bin and Davila (2008) offered a unique Municipal Solid Waste investigation with regard to both physical and chemical characteristics illuminating the necessary management policies with greater regional relevancy. Zotos *et al.* (2009) developed a systematic approach for Municipal Solid Waste Management at both the household and non-household level. It aimed at providing a framework in the Municipal Solid Waste Management field for municipalities in Greece, as well as other countries facing similar problems. Turan *et al.* (2009) presented a brief history of the legislative trends in turkey for Municipal Solid Waste Management; the study presented the Municipal Solid Waste responsibilities and management structure, together with the present situation of generation, composition, recycling and treatment. Bovea *et al.* (2010) compared from an environmental point of view different alternatives for the management of Municipal Solid Waste generation in a town within Spain. Tunesi (2010) analyzed local Waste Management strategic and management planning documents. In the study three different emerging energy recovery strategies were identified, with each energy

recovery strategy resulting in different solutions in terms of technology selection.

Ahiamadu (2007) carried out a comparative analysis on various Waste Management options, with emphasis on the health and environmental impacts of Municipal Solid Waste and the challenges confronting Municipal Solid Waste Management in Nigeria. Olanrewaju and Ilemobade (2009) researched on Ondo state Integrated Waste Recycling and Treatment Project in Nigeria, looking into the issue in terms of Municipal Solid Waste Management before and after the introduction of this system. They documented the success of the project in turning waste to wealth. Babayemi and Dauda (2009) evaluated the Solid Waste generation, categories and disposal option in developing countries. They used Nigeria as a case study; their study results indicated large generation at high rates without corresponding efficient technology to manage the waste. Onwughara *et al.* (2010a) studied the issues of road side disposal habit of Municipal Solid Waste in Nigeria. The study emphasized on various Waste Management options; Integrated Waste Management, environmental impacts under health, social effects and the legislation of extended producer responsibility were suggested. Several studies over the years have been carried out towards addressing these issues, different methods have been applied toward resolving different aspect of Solid Waste and Waste Management issues as a whole. This study looks into Municipal Solid Waste Management in the Federal Capital territory of Nigeria; FCT Abuja using Integrated Solid Waste Management System (ISWMS) as an assessment tool. This ensures that all system components which comprise of a Solid Waste Management are incorporated into the investigation. This study was conducted using one case study; FCT Abuja.

LITERATURE REVIEW

Municipal solid waste management in Nigeria: Waste generation is an integral part of human activity influenced by social dynamics and economic development. Although nature has the capacity to dilute, disperse, degrade, absorb and reduce the impact of unwanted residues in the environment. Ecological imbalances have occurred where the natural assimilative capacity has been exceeded (Tchobanoglous *et al.*, 1993b). Improper waste handling and management pose great threats to the environment and public health. In Nigeria, The commonly practised waste management option in Nigeria, basically involves the collection of mixed waste materials and subsequent dumping at designated dumpsites. It is not a practice to separate waste materials at source or any point during its management (Adekunle *et al.*, 2011). In Nigeria waste stream

Table 1: Waste generation in some urban cities in Nigeria

City	Population	Agency	Tonnage/month	Density (kg/m ³)	Kg/capita/day
Lagos	8,029,200	Lagos state management authority	255,556	294	0.63
Kano	3,348,700	Kano state environmental protection agency	156,676	290	0.56
Ibadan	307,840	Oyo state environmental protection commission	135,391	330	0.51
Kaduna	1,458,900	Kaduna state environmental protection agency	114,443	320	0.58
Port Harcourt	1,053,900	Rivers state environmental protection agency	117,825	300	0.60
Makurdi	249,00	Urban development board	24,242	340	0.48
Onitsha	509,500	Anambra state environmental protection agency	84,137	310	0.53
Nsukka	100,700	Enugu state environmental protection agency	12,000	370	0.44
Abuja	159,900	Abuja state environmental protection agency	14,785	280	0.66

All sites engineering Ltd. (Ogwueleka, 2009)

generally consist of putrescibles, plastics, paper, textile, metal, glass. It is generally reported that enormous quantities of Solid Waste are generated daily in the major cities of Nigeria as shown in Table 1 are high. But exact figures are difficult to determine due to the fact that proper records of collection and disposal are not kept by the authorities responsible. Waste generation and composition is greatly influenced by population, income, economic growth, season, climate and social behavior.

In Nigeria waste density generally range from 280-370 kg/m³, Waste generation rate is 25 million tons annually and at a daily rate of 0.44-0.66 Kg/capita/day (Ogwueleka, 2009). Per capital rate of MSW production in Lagos, Nigeria is reported to range from about 0.21 kg/day/person (Bamgbose *et al.*, 2000; World Bank, 2004) to about 0.35 kg/day/person (CSL, 2002; Aboyade, 2004). This is equivalent to about 49 million kg waste per day (17.9 million metric tons/year) in Nigeria. With a population of about 140 million as of 2006 population and currently 167 million at a growth rate of 3.2% as of 2012 (CIA, 2012; NPC, 2012). Refuse is stored in 1.5 m³ containers in the residential areas while 1.6 m³ containers and built-up dumps are used in the commercial, industrial and some residential areas. Vehicles for waste collection include; open tippers, side loaders, lift able container trucks and rear-loading compactors (Agunwamba *et al.*, 1998). The curb system of collection is used in single detached residential areas and apartments; 1.5 m³ bins. The set-out/set-back system is practised in some residential areas in places like Onitsha (Agunwamba *et al.*, 1998). In apartments, institutions and commercial areas communal bins; movable and stationary containers are used.

In a study by Onwughara *et al.* (2010b) about the disposal habit, environmental impact of MSW in Nigeria. An overview was given about the various management practicing and necessary rules to achieve sound management. Umuahia, a town in the Southeast of Nigeria; the capital of Abia State was the selected case study. With a population of about 1.2 million people who produced 250 metric tons of waste in 2005 and 350 metric tons of waste in 2007 daily. In their

study 80% of the MSW was generated from market trader, the MSW consists generally of mixed waste containing hazardous and non-hazardous component. Which are neither separated, treated nor recycled before disposal by the municipality. While waste collection projects had been planned and conducted successfully in some parts of Nigeria both by the private and public sector, there is rarely any concrete plan for proper disposal of waste in Nigeria (CPE, 2010).

Municipal solid waste management in FCT Abuja:

In Abuja Municipal area waste composition is heterogeneous and mixed; non-degradable materials and degradable components. The waste is not segregated at the source and comprises of hazardous and non-hazardous waste. The hazardous components usually consist of house hold cleaning agent and left over chemical from renovations. In Abuja waste bulk mainly consist of plastics, paper, glass, metal and other recyclable components. The degradable portions of the waste consist of food waste and yard waste.

MSW generation: Waste generation in FCT Abuja is quite high due to the economic status and population density of the Federal Capital. Households generate high quantities of mostly organic waste from food waste and yard waste. High quantities of plastic waste is generated from food containers; beverages and packaging. Studies have shown a high correlation between income level and waste generation quantities. But with the high dependency of many countries on modern technology and packaged food products this has caused suburbs and rural areas to have high waste generation rates. Table 1 shows the waste tonnage for FCT Abuja and other urban cities within Nigeria.

MSW composition: The waste composition in FCT Abuja is quite the same like any other developing country. Organic and plastic waste make up the highest composition in term of quantity in the waste stream as Shown in Table 2. The Table 2 also shows the waste compositions based on the districts located in the central area of FCT Abuja; the Federal Capital City (FCC).

Table 2: Household waste composition for different districts in Abuja

Waste type and %	District names					
	Garki	Wuse	Maitama	Asokoro	Gwarimpa	Apo
Paper	13	12	13	13.6	6.9	10.1
Metal	5.6	3.3	5.30	6.7	5.4	4.9
Glass	5.5	4.4	5.32	4.1	4.1	-
Plastic	16.2	17.3	20	15.1	21.3	18.7
Food remnants	52	54.3	54.80	53	61.2	65.3
Textile	2.2	4.7	0.10	3.1	-	-
Rubber	3.4	1.5	0.19	0.7	-	0.9
Others	1.8	2.4	0.60	2.8	1.1	-
Person/household	8	8	6	6	13	6

Others includes wood, sanitary pads and diapers; Federal Ministry of Environment Report (2004)

Table 3: Waste collection method for Nigeria

Residential area	Collection method
Well planned, high income and low density areas	House to house
Medium density residential layouts	Kerb side
High density low income districts	Communal depots

MSW storage: Abuja Environmental Protection Board has specific waste storage containers which can be bought from their office. The waste storage containers vary in type and sizes, they are bought based on the size desired and kind of usage. The commercial areas, housing complexes and offices have different sizes and specific types designated for their usage. The waste storage container range from; 10L, 50L, 100L, 240L and more. The smaller sizes come in hard plastic while the larger storage containers are made of metal. The location of the storage container is based on building layout and type of housing unit.

MSW collection: There are twelve private companies contracted for waste collection, with variations in number of weekly collections in different districts and neighborhoods as of 2004. Collections in some neighborhoods are periodically consistent, while in others it is not. Influencing factors such as insufficient collection vehicles, insufficient number of staff, unplanned neighborhoods and high costs. House to house waste collection is carried out with home owners being responsible for placing their waste bins in front of their houses. The collectors take the waste bin from the front of each house, roll it to the collection vehicle usually parked in front of the house, empty the waste bin and then place it back to the frontage of the house. Based on the policy guideline for Solid Waste Management the below waste collection methods should be used; Table 3. For communal bin an adequate number is required based on the policy within 200-250 m walking distance to residence.

Since waste segregation at source is nonexistent in Nigeria, the vehicles are not compartmentalized. For commercial, housing estate, housing complexes and office areas the size of the bins and the collection mode differs. The large metal bins are placed behind the office buildings, housing complexes and estates,

commercial complex. The waste is collected weekly or as arranged with the Abuja Environmental Protection Board. The waste collected is also mixed with no segregation at the source. The collection is also inconsistent here. Waste collection has been a challenge for several years with increasing generation rates, development, changes in road networks, illegal structures, traffic conditions, insufficient collection vehicles, traffic density, vehicle conditions, hauling distant, collection time, collection route, all prove a challenge in Abuja. The collection vehicles vary in Abuja from manual to mechanized, but the problem is maintenance with most of the vehicles grounded. Table 4 shows the waste collection, transportation and disposal vehicles operation within the FCC. Half the AEPB vehicles have compactor, but only 30% of these vehicles are operational, while the private contractors in contrast only 15% of their vehicles have compactor (Imam *et al.*, 2008).

At this stage of my research I have confirmed FCT Abuja has one transfer Centre but it remains unclear whether it is operational yet and since waste segregation isn't practiced yet to confirm if at the landfill or at any point waste sorting is carried out. It would seem the waste is directly buried at the land fill after collection in the past but in the course of the research confirmation on past and present practice will be documented from reliable sources.

MSW disposal: Majority of the waste composition consist of materials that can be recycled, but the AEPB doesn't recycle. Recycling is usually carried out by the informal sector and scavengers. Paper, aluminum cans and glass are sort and some recycle collectors go house to house to purchase recyclables from home owners. In terms of disposal there is presently no sanitary landfill in Abuja. The F.C.T has four waste dumpsites Mpape, Gosa, Ajata and Kubuwa. Mpape dumpsite was open in 1989 and closes in 2005, spanning 16 ha with waste depth of 15-30 m. Ajata dumpsite was open in 1999 and Kubuwa dumpsite was opened in 2004 but the Kubuwa dumpsite was forced to close due to odour and random fire outbreaks. The dumpsites are characterized by indiscriminate dumping on ground surface without

Table 4: Summary of waste collection, transportation and disposal vehicles operating in Abuja

Type	Owned by AEPB			Owned by private sector		
	Existing units	Operational number	Operational %	Existing units	Operational number	Operational %
Lorries	4	4	100	12	10	83
Trippers	8	2	25	48	32	67
Roll-on roll-off skip vehicles	2	2	100	1	1	100
Tractors	3	2	67	1	1	100
Automated compactor trucks	17	5	29	9	8	89
Side loader trucks	2	2	100	-	-	-
Total	36	17	47	71	52	73

Federal Ministry of Environment Report (2004)

compaction efforts. Wastes in the dumpsites are continuously set on fire in order to reduce the volume of the wastes. Waste is dumped at Mpape dumpsite but due to complaints of odor, air pollution from residents residing in close proximity to the dumpsite was closed in 2005. There is no landfill regulation or standard that provides a basis for compliance and monitoring.

In 1985, the Federal Government of Nigeria introduced the Environmental Sanitation (clean-up campaign). All Nigerian residents were mandated to conduct mandatory environmental clean-up every last Saturday of the month, which was a good effort by the government was, but lacked proper implemented. After each exercise waste gathered by residents is not collected by the responsible authorities. This eventually washes into the storm drains and gutters during rainfall.

Lack of institutional arrangement is a major problem in the Solid Waste Management System in FCT Abuja, lack of expertise and manpower to run Solid Waste Management programme in Nigeria. Majority of environmental agency workers have little or no functional background or training in engineering and management. So the operations result in ineffective and inefficient Solid Waste Management. There is no reliable measurement of generated waste and non-appreciation of the magnitude of the waste management is a problem.

METHODOLOGY

Study area: The Federal Capital Territory; FCT Abuja is the current capital of Nigeria the previous capital was Lagos. The Federal Capital was established in 1976, due to so many problems such as over population, congestion, space limitations, waste management and other related environmental issues. The FCT Abuja was a pre-planned city consisting of six area councils; AMAC, Bwari, Gwagwalada, Kuje, Kwali and Abaji as shown in Fig. 1. The area councils can further be subdivided into districts. FCT Abuja has a land area of 7,753.9 km/sq., with a population of 1,406,239 (NPC, 2012). A master plan for Abuja was designed to avoid



Fig. 1: Map of FCT Abuja showing area councils

the problems that visible made the former capital inappropriate to be the nation’s Federal Capital associated with unplanned growth as is evident in other cities within Nigeria. The Federal Government establishments relocated to Abuja in the 1990s and today rapid expansion has exceeded the anticipated master plan (Imam *et al.*, 2008), with the waste management plan being lost as the city growth and development deviated from the master plan.

Data collection: In this study FCT Abuja is selected as representative of the current Solid Waste Management in Nigeria. The selection is based on the existing situation with different waste management problems, size and challenges (Eriksson *et al.*, 2005; Kumar and Goel, 2009), being a Federal Capital of the country that should be a model of excellence for other cities to emulate. The research design is a case study which will involve an assessment of the municipal solid waste management system for FCT Abuja. The data collection is in stages, using an integrative approach. The data consists of quantitative and qualitative data; the quantitative data consists of secondary data collected from the Abuja Environmental Protection Board (AEPB), such as waste characteristic and quantities

Table 5: Municipal waste characterization for the federal capital city

Composition of municipal waste	Quantity (tons)	(%)
Paper	16112.944000	25.30
Textile	1930.309900	3.03
Plastics	5357.687800	3.40
Water sachets	9257.822800	14.50
Glass	2250.388300	3.00
Metals	2642.803500	3.14
E-waste	1786.329865	2.80
Organic materials; food and garden waste	28420.761600	42.60
Other organic materials	1948.060000	2.15
Total	63707.107465	100

AEPB (2012)



Fig. 2: Open dump within a residential area in Bwari area council

(Kumar *et al.*, 2009). The qualitative data will consist of primary data generated by carry out interviews and field observations toward obtaining a holistic and in-depth assessment. The interviews are semi structured and carried out using purposive sampling method. The information needed about the institutional management is only available via staff within the solid waste department. This data will give a more in-depth and descriptive view in relation to the institutional framework. The qualitative data was analyzed descriptively, while the quantitative data was analyzed statistically.

RESULTS AND DISCUSSION

FCT Abuja has five area council; Abaji, Kwali, Kuje, Bwari, Gwagwalada and one municipal area

council; AMAC. Each area council is responsible for waste management within their individual jurisdiction. Each area council has an environment and sanitation/ public health unit in which waste management and public cleansing is one of the major responsibilities. AMAC which acts as the headquarters of the other five area councils is located in the centre of Abuja city. The Federal Capital City (FCC) in terms of waste management and public cleansing is carried out by the Abuja Environmental Protection Board (AEPB) which is a parastatal under the Federal Capital Territory, but areas of jurisdiction and responsibilities of AMAC and AEPB within the FCC need to be clearly marked due to conflict in terms of duties to be carried out. The area councils lack the manpower or expertise to manage waste in the area councils so it is a usual site to find open dumps within residential area as shown in Fig. 2. Open dumps are a usual site with the FCT Abuja, within the FCC there are a couple of them and when one moves away from the city centre they are more frequently sited. The waste management authorities blame the attitude and educational level of the populace for this, but when individual within the areas these open dumps are found where interview they blame the authorities for infrequent collection and some areas entirely do not receive waste management services. In Abuja waste bulk mainly consist of plastics, paper, glass, metal and other recyclable components; as shown in Table 5.

The degradable portions of the waste consist of food waste and yard waste. The Fig. 3 shows the waste composition for FCT Abuja. Municipal solid waste and hospital waste are collected separately but are dumped/ buried together. The waste composition in Fig. 3 consists of mixed waste inclusive of hospital waste.

Abuja Environmental Protection Board (AEPB): AEPB consist of about 8 department, public relations, accounts and finance, environmental health, administrations and supplies, enforcement and monitoring, environmental monitoring, planning, research and statistics, environmental conservation,

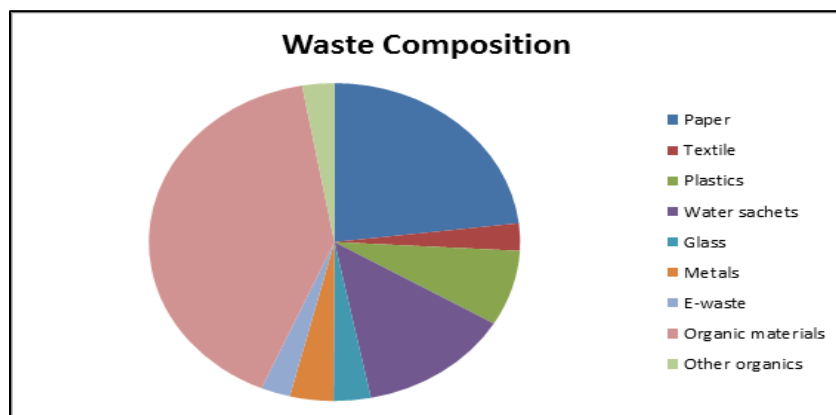


Fig. 3: Municipal waste composition for the federal capital city AEPB (2012)

waste management and sanitation department; inclusive consisting of units such as solid waste, clinical waste and liquid waste. The solid waste, clinical waste and liquid waste management are the responsibility for the waste management and sanitation department. AEPB has contracted waste collection and transfer to 20 contractors which carry out door-door collection for the residential areas, collection point evacuation for commercial area and institutions within the FCC. The FCC has three landfill, of which only two are currently operational under the management of AEPB; Mpape landfill, Gosa landfill and Ajata landfill. Currently only Gosa and Ajata landfills are currently operational.

Mpape landfill: The Mpape landfill has a depth of approximately 15-20 m and covers about 16 ha of land. This dumpsite was operational from 1989-2005 by the AEPB. It was a former quarry and after the closure of the quarry it was used as a dumpsite; open dump. Initially in Mpape dumpsite AEPB tried to operate a controlled dumpsite; using intermediate laterite cover (construction waste) and machinery. The landfill has been closed due to exhaustion of space, fire outbreaks and complains from the surrounding residents who live in close proximity to the landfill. There is currently a continuous seepage of leachate from the buried waste that flow to the surface especially during the raining season, which produces more leachate due to infiltration. As shown in Fig. 2, the residential housing in close proximity to the landfill with leachate continuously flows down the slope. During the dry season there are continuous burning fires from the buried waste causing heavy air pollution within the area.

The Mpape landfill was not an engineered landfill and in 2005 it was closed using intermediate soil cover, grasses where planted to reduce runoff and infiltration. There are explosions from the trapped methane gas specifically during the dry season, leachate seeping from the closed landfill on to the surface and methane emission to the surface from the closed landfill, as shown in Fig. 4, 5, 6 and 7. The landfill is up slope with residential housing 200 m down slope and one of the major issues of concern is the contamination of the ground water within the residential areas near to the landfill. Since boreholes are the major domestic water source within that specific area and generally within the FCT Abuja. The boreholes have not been tested to confirm contamination. The leachate has been sent to a laboratory in Germany by AEPB to test which major contaminants are in the leachate. Copper and mercury have been found to be of high concentration in the leachate. All these issued from the improper operated and closed landfill pose environment hazard, human health hazard and even physical hazard from the methane gas that has a high potential to travel laterally with residential houses in close proximity as shown in Fig. 4.



Fig. 4: Residential housing near Mpape landfill



Fig. 5: Leachate seeping from the covered ground



Fig. 6: Leachate seeping to the top soil



Fig. 7: Methane bubbles from the seeping leachate

One of the major issues in municipal waste management in the FCT Abuja is the high volume of non-degradable fractions; polyethylene as shown in Fig. 8 even after 13 years of burial the polyethylene waste are same as the day initially buried. The cost of recycling polyethylene is higher than the cost of



Fig. 8: Polyethylene buried 13 years ago in Mpape landfill

producing new polyethylene which makes it non-profitable to consider recycling. The manufacturers have a high preference for polyethylene as such use it mostly for the packaging of their products, which are in high demand such as drinks, water and other food product. The use of glass bottles which are usually recycled and reused by the manufacturing companies is being phased out. As such currently this has been a source of great concern because of the high volume of polyethylene ending up in the landfill.

Gosa landfill: Gosa site is marked in the Abuja master plan as land laid out for a standard engineered landfill, 505 ha has been provided for a solid waste treatment plant (engineered landfill, treatment facility, composting, recycling and waste to energy plant which is intended to generate 120 megawatts from 3 plants; each generating 40 megawatts). Based on geological and hydrological studies contracted out by AEPB it was determined that the site consisted of clay-sandy soil and with the incorporation of bentonite would be an ideal location for an engineered landfill using multi-membrane. Operations started in 1980s and the initial operation consisted of: boring a pit, placing waste within and closure. In the 1980s the site was fenced, had an administrative building and access road; Fig. 9 shows the current access road into the landfill, which eventually became dilapidated due to lack of maintenance. This issue was what initiated the usage of Mpape site as a dumpsite in 1992, till after the exhaustion of Mpape site before operations were relocated back to Gosasite; Fig. 10 shows Gosa landfill. Currently Gosa landfill is closed every year during the raining season due to the inaccessibility of the access road due to lack of maintenance. This issue was what initiated the usage of Mpape site as a dumpsite in 1992, till after the exhaustion of Mpape site before operations were relocated back to Gosasite; Fig. 10 shows Gosa landfill. One of the major issues in Gosa landfill is Indiscriminate tipping by the contractors during the raining season due to inaccessibility to the main tipping point within the landfill as shown in Fig. 11 and 12. The Indiscriminate tipping increases cost for AEPB because they have to clear the waste and place it at the appropriate tipping point for the landfill to remain operational.

Currently waste segregation and recycling is not practiced in FCT Abuja by AEPB (2012). Segregation



Fig. 9: Access road into main landfill dumpsite



Fig. 10: Gosa landfill



Fig. 11: Indiscriminate tipping along landfill road



Fig. 12: AEPB clearing indiscriminate tipping along landfill road

and recycling is carried out by independent scavengers within the landfill as shown in the Fig. 13 and 14. The scavengers sort out the waste components after the contractors tip the waste. They sell the collected items in bulk to companies located in different parts of Nigeria. AEPB needs to utilize this avenue as a means



Fig. 13: Scavengers collecting recyclable items from tipped waste at Gosa landfill



Fig. 14: Collection of recyclable item by scavengers within Gosa landfill

of generating revenue toward facilitating waste management operations.

The minimum standard in terms of waste management is at least the operation of a controlled dumpsite. AEPB currently practices open dump system without any form of treatment. No form of segregation or recycling is practiced in FCT Abuja by AEPB (2012), even though from Table 5 and Fig. 3 shows that organic and paper waste is of high percentage which needs to deviate from the landfill. Another issue I came across was the jurisdiction in terms of waste management AEPB was establish to manage all issues concerning waste management and environment within the federal capital territory but under the constitution municipal solid waste management is the sole responsibility of the area councils. This creates a lot of problems for AEPB and inhibits the board from properly carrying out their function. This also leads to in coordination and open dumps within some areas. During the study the reoccurring issues which greatly where identified as inhibiting to the proper and efficient municipal waste management within FCT Abuja where; lack of proper funding, staff, expertise, Jurisdiction, equipment, land, attitude and unwillingness of the residents.

CONCLUSION

Municipal solid waste management is a serious issue; due to its human health and environmental

sustainability implications that has yet to be properly addressed within the FCT Abuja.

RECOMMENDATIONS

- Allocation of sufficient funding towards equipment purchase, staff training, maintenance of structures and equipment's
- Funding to execute a Solid Waste treatment plant
- Proper remediation of Mpape landfill
- Construction of access road into landfill

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