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Management and Disposal of Some Domestic Solid Wastes in Fct, Abuja-Nigeria

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ABSTRACT

This study was carried out to determine the management and disposal of some domestic solid wastes in FCT, Abuja. Survey of household and Questionnaire were used as data collection tools for the study.Four towns were selected from each Area Council through a multi-stage technique to ensure engagement of urban and slum districts.Ten households were selected from each of the town sampled. Each household earmarked for sampling was given labelled polythene bags for daily collection of the wastes. The wastes were subsequently collected every evening to the designated sites and labelled polythene bags from the various households were weighed and weights noted.Then the wastes were sorted out into various categoriesand weighed again. The results from the study area showed that the main components of domestic solid waste were food residues, vegetables and perishables, glass, paper and cardboards, plastics and ceramics, polythenes, used cans, and textile materials. The waste had heterogeneous composition comprising of 85% degradable and 15% non-degradable materials co-dumped without separation. The implication of these is that if not properlymanaged, such wastes may decay rapidly leading to high multiplication and subsequent contamination with bacteria and other microbes from the rotten food and vegetables. Since some of these wastes are often removed by the less privileged for either direct consumption or sold to make money or for recycling back to the immediate communities, which may lead to the spreading of microbial infections that may be of serious public health concern. In FCT wastes are either collected by Abuja EnvironmentalProtection Board(AEPB), its contractors, or burnt by the households. Household waste burning is widely practiced especially in dry season as a form of reducing combustibles in wastes.However, the health and environmental implication of waste burning is that it contributes to bio-accumulation of toxins and formation of acid rain.The Chi-Square test is used as a statistical analysis.The study recommended for an Integrated Solid Waste Management hierarchy; source reduction, reuse, recycle, waste combustion and landfills, should be strictly adopted and followed.

Key words; **Management, Disposal, Domestic, Wastes**

INTRODUCTION

According to the United State Environmental Protection Agency (USEPA,2014)waste can be defined as any discarded, rejected, abandoned, unwanted or surplus matter, whether or not intended for sale or for recycling, reprocessing, recovery or purification by a separate operation from that which produced the matter. Waste could also be defined as anything declared by an environmental protection policy to be waste whether of value or not (Epa, 2017) .waste in general terms according to USAID, 2010, is an unwanted as it is obviously undesirable. It is nevertheless an inevitable and inherent product of social, economic and cultural life.These definitions suggests that what constitute waste must occur in such a volume, concentration or manner as to cause a significant alteration in the environment. Thus, apart from waste being an unwanted substance that is discarded, the amount of it and the impact it makes on the environment also became consideration in defining wastes.According to Gana and Dauda, (2014) waste could be classified into three (03) categories.

1. Solid wastes - these are unwanted substances discarded by the human society. These include urban wastes, industrial wastes, agricultural wastes, biomedical wastes and radioactive wastes.
2. Liquid wastes - these are waste generated from washing, flushing or manufacturing processes of industries.
3. Gaseous wastes - these are waste that are released in the form of gases from automobiles, factories or burning of fossil fuels, like petroleum, and get mixed in the atmosphere.And according to Benjamin *etal.,*2014. Wastes could also be classified into different types depending on their sources:

1.Household wastes/municipal or domestic wastes.
2.Industrial wastes or hazardous wastes and
3. Biomedical or hospital wastes.

Waste in whatever form or classification: solid, liquid, or toxic, has become a major consequence of modernization and economic development, notably, the solid form of waste is fast becoming a menace in both developed and developing nations (Oluwole, 2014).Environmental and developmental issues have become integral parts of policy agenda in development planning at National and international levels. The united nation (UN) conference of the Human environmental held in Johannesburg, south African in 2002 and the UN conference in environmental and development (UNCED) of 2012 popularly called Rio 2012 (Earth summit) that took place in Rio de Janeiro in Brazil, and the recent earth day of Monsanto, (USA) in 2016 reflect the political attention that has being accorded to the environment and its linkages to sustainable development. Every participating country at the summit reaffirmed her commitment to the waste recovery and conversion of wastes to other useful purposes, and disposal of waste in environmentally sound and sustainable manner (UNCED, 2016).

In the African continent, attention has been focused on environmental issues and the struggle to forestall, further destruction of the environment .It was in recognition of these that the

organization of African unity (OAU) in 2002 set aside 3rd of march of every year as African environmental day (Sanparks,2015).

Many countries of the world including Nigeria were recognizing the importance of environmental planning and management, and have joined many international organizations. Nigeria is now an active member of INFORTERRA, the global environmental information network with focal points in 68 countries. Information concerning change in the local and international environment are disseminated through this forum.

As observed by (Oluwole, 2014) in countries around the world, one major environmental problem that confronts municipal authorities is solid waste management. The study posited that cities, governments and dwellers are confronted by problem of solid waste generation. It also maintained that, in third world cities, between one-third and one-half of the solid waste generated remains uncontrolled. In high -income countries, the issue associated with solid waste usually centered on the difficulties and high cost of disposing the large quantity of solid wastes generated from different sources. And of most striking concern are the management problems of domestic wastes.

The management of domestic waste is one of the huge challenges of the urban areas of all sizes. From big cities to small, it is always in the top the most challenging problems for city managers. The disposal of domestic solid waste generated is particularly problematic in cities of developing countries. In this regard Nigeria is not exempted as evidences show that the problems associated with poor domestic waste disposal are daily realities in most Nigeria cities.In Nigeria, there is no doubt that a new environmental consciousness is evolving. The public is beginning to talk about the environment even as numerous single issues, environmental groups are emerging. At some point, major public events including natural disasters, flood and erosion as well as threats of cholera, and typhoid have increased people's interest. Membership in existing environmental groups is increasing even as new programmes and opportunities are appearing. These, however, are hardly enough to combat the problem that if not given urgent attention will negatively affect the security of our beloved and great nation (Evelyn, 2012). Still in our memory is the 1996 saga of typhoid, cholera, meningitis etc. which even affected the country's diplomatic relationship with other nations. All these were as a result of poor sanitary conditions.Omole and Alakinde(2013) showed that waste management present problems in a mega city like Lagos, Kano and other major Nigeria cities which are linked with economic development, population growth and the inability of municipal councils to manage the resulting rise in industrial and domestic wastes. Haphazard industrial planning, increased urbanization, poverty and lack of competence of the municipal government are seen as the major reasons for high levels of waste pollutions in major Nigerian cities. Some of the solutions have been disastrous to the environment, resulting in untreated waste being dumped in places where it can pollute waterways and ground water (Strdha and Hammed, 2014).

It is very important to understand the wastes, their nature, problems associated with them, and how to dispose them off hygienically. In Nigeria today, there are no sewers or underground

drainage system and as a result all liquid waste find their way into water courses. There are no urinals or toilet facilities in many public area .Schools are devoid of functional toilet. Solid wastes are found everywhere and anywhere.Improper disposal of wastes can cause a lot of problem to man, animals, plants and the society at large. Waste disposed on land or in water can become toxic and infectious materials that are dangerous to human health. These materials can cause skin and blood infection, eye and respiratory infection as well as different diseases that result from the vector borne disease (Oluwale2014). Therefore, house wastes and other streams of wastes have to be removed from our environment in order to avoid rubbish and pollution that can pose risks to public health.

LITERATURE REVIEW.

According to Adewale (2011) municipal solid waste is defined as non-air and sewage emissions created within and disposed of by a municipality, including household garbage, commercial refuse, construction and demolition debris, dead animals and abandoned vehicles. Butu and Mshelia (2014) was of the view that Municipal Solid Waste(MSW) are regarded as discarded materials arising from operational activities taken place in different land use such as residential, commercial and industrial. Domestic or residential wastes are those that are collected from dwelling places on a regular basis, such waste include organic matter resulting from preparation and consumption of food, rags, nylon and ashes are the remains after various cooking and heating processes. The commercial wastes are those that arise from shops, Supermarkets, market and others; they include paper carton, polythene bags and nylons. The industrial wastes are those waste materials that arise from industries; these could be solid, liquid, sludge or gas. According to Omole and Alakinde,(2013), industrial waste include metals, scraps, chips and grits from machine, shops, sawdust, paper pieces and glass. USEPA 2017, also classified solid waste into three categories, namely; garbage, ashes and rubbish. The garbage includes organic matter resulting from preparation and consumption of food. Ashes include remains from cooking and heating process and the rubbish may either take the form of combustible such as paper, wood, leaves and weeds or non-combustible such as glass, plastic, polythene and metal materials. Stridher and Hammed 2014, classified solid waste into two categories by its characteristics .These are organic solid waste and inorganic solid waste. Organic solid wastes are those that are generally biodegradable and decompose in the process of which emits offensive and irritating smell when left unattended. These are putrescible wastes eg garbage. Inorganic solid wastes are those that do not decompose at any rate. This category of waste matter may be combustible depending on the type and the nature of the material they constitute. According to Tutor Vista 2017, wastes are classified either by where it is generated or by its composition (whether biodegradable or not).Biodegradable solid wastes are those that can be broken down (decomposed) into their constituent elements by bacteria and other micro organisms. Food wastes, manures and waste from producing crops are the main biodegradable wastes. Non-biodegradable (sometime called inorganic) solid wastes are

those that do not decompose by microbial action. These wastes include plastic containers, scrap metals, food and drink cans and plastic bags. Materials in solid wastes can also be classified as combustible or non-combustible, depending on whether they will burn or not. The majority of substances composing municipal solid waste include paper, vegetable matter, plastics, metals, textiles, rubber and glass (USEPA, 2014).

Solid waste management is a global issue that is a growing source of concern in developed and developing countries due to increase urbanization; changes in consumer pattern and industrialization, which all directly influence solid waste generation (Kadafa *etal,* 2013) .Butu and Mshelia (2014) are of view that the nature and composition of solid waste is a product of climatic and business activities in urban centres. He argues that most of the agricultural produce such as maize, cassava, vegetables, millet are brought unprocessed during the rainy and harvesting seasons from the nearby farms. The composition of refuse generated in an area determines the type of disposal method suitable for a particular form of waste and the effectiveness of a collection system depends on the cooperation of households and individuals in various sectors of the city in providing containers for storing refuse in accordance with the regulation and regularly placing the materials for collection (Ramatta *etal.,*2014). Kayode, 2011) links socio-cultural factors to land use pattern such as housing density and eating habits. He further stated that solid waste accumulation is a product of chaotic land use pattern, the number of household living and that the eating habit in a house greatly determines the composition of refuse generated. Gana and Dauda (2014) are of the view that municipal waste management problems in Nigeria cut across concern for human health, air and water, and land pollution among others. Butu and Mshelia, 2014) argues that continuous indiscriminate disposal of municipal solid waste is accelerating and is linked to poverty, poor governance, urbanization, population growth, poor standards of living and low level of environmental awareness.

According to Adewale 2011, there are several factors that set Municipal Solid Waste Management in developing countries apart from management in industrialised countries. First, the types of materials that compose the majority of waste are different. In developing countries, there is a much higher proportion of organics, and considerably less plastics and large amount of organic materials makes waste more dense, with greater moisture and smaller particle size. The second difference is that technologies used in industrialized countries are often inappropriate for developing countries. Even garbage trucks are less effective because of much heavier, wetter, and more corrosive quality of their burden. Other technologies such as incinerators, are often far too expensive to be applied in poor nations. Thirdly, developing countries cities are characterised by unplanned, haphazardly constructed, sprawling slums with narrow roads that are inaccessible to collection vehicles. Finally, there is often a much smaller stock of environmental and social capital in developing countries. People are unaware or uncaring of cradle-to-grave solid waste management needs, being more concerned with more immediate problems such as disease and hunger.

According to Ojo 2014, 87% of Nigerians use unsanitary methods of solid waste disposal which constitute nuisance, ugly sight, produce unpleasant odour, and create a breeding ground for pests and diseases.The most common methods of municipal solid waste management are land filling, incineration, composting and anaerobic digestion. Incineration, composting and anaerobic digestion are volume reducing technologies, ultimately, reduces from those methods must be land-filled (Awosuji 2010).Land filling is the only true "disposal' method of managing MSW. It is also the most economical, especially in developing countries where it typically involves pitching refuse in a depression or closed mining site (Adewale 2011). Although it has its own problem to both man and his environment.Landfills produce land fill gases and leachate which can harm human and natural systems(Gupta *et al., 2015*).The effects of these problems can only be minimised through effective management. According to Kadafa *et al. (*2013) municipal waste composition in developing countries is always heterogeneous and mixed (degradable and non-degradable components). The waste is not segregated at the source and comprises of hazardous components and non-hazardous. Non-degradables must be sorted out before incineration.Segregation from the source makes disposal easier, effective and more safe. Benefit of incineration include reduction of volume of waste and production of energy in the form of electricity and heat (Hammed *et al.*2014). However, construction and start-up costs of incineration facilities can be prohibitively expensive for developing nations.

Composting and anaerobic digestion use natural microbial organisms to decompose the organic fraction of MSW (Adewale 2011). The non-organic fraction must be land-filled or incinerated. These methods reduce the volume of waste that must be land-filled and end products can potentially be used as agricultural fertilizers, or processed into fuels for motor vehicles (CalRecycle Draft, 2019). However, like incineration, project implementation can be too expensive for poor communities.

METHODOLOGY.

THE STUDY AREA- This study was carried out in the Federal Capital Territory (FCT) Abuja of Nigeria. The Federal capital Territory Abuja is the new capital of Nigeria. The former capital was Lagos. The new capital was established in 1976, due to over population, congestion, waste management and other environmental problems. The FCT , Abuja consist of six area councils: AMAC, Bwari , Gwagwalada, Kuje , Kwali and Abaji as shown in Fig, 1. The territory is located just north of the Confluence of Niger river and Benue River. It is bordered by the states of Niger to the west and North, Kaduna to the north east, Nasarawa to the east and South, and Kogi to the South West.

FCT lies between latitude 8^0. 25 and 9. 20 north of the equator and longitude 6. 45 and 7.39 east of Greenwich meridian. Abuja is geographically located in the centre of the country. The Federal Capital Territory has a landmass of approximately 7,315 km^2,with the population size of 1406239(NPC,2006), and it is situated within the Savannah region with moderate climatic conditions.

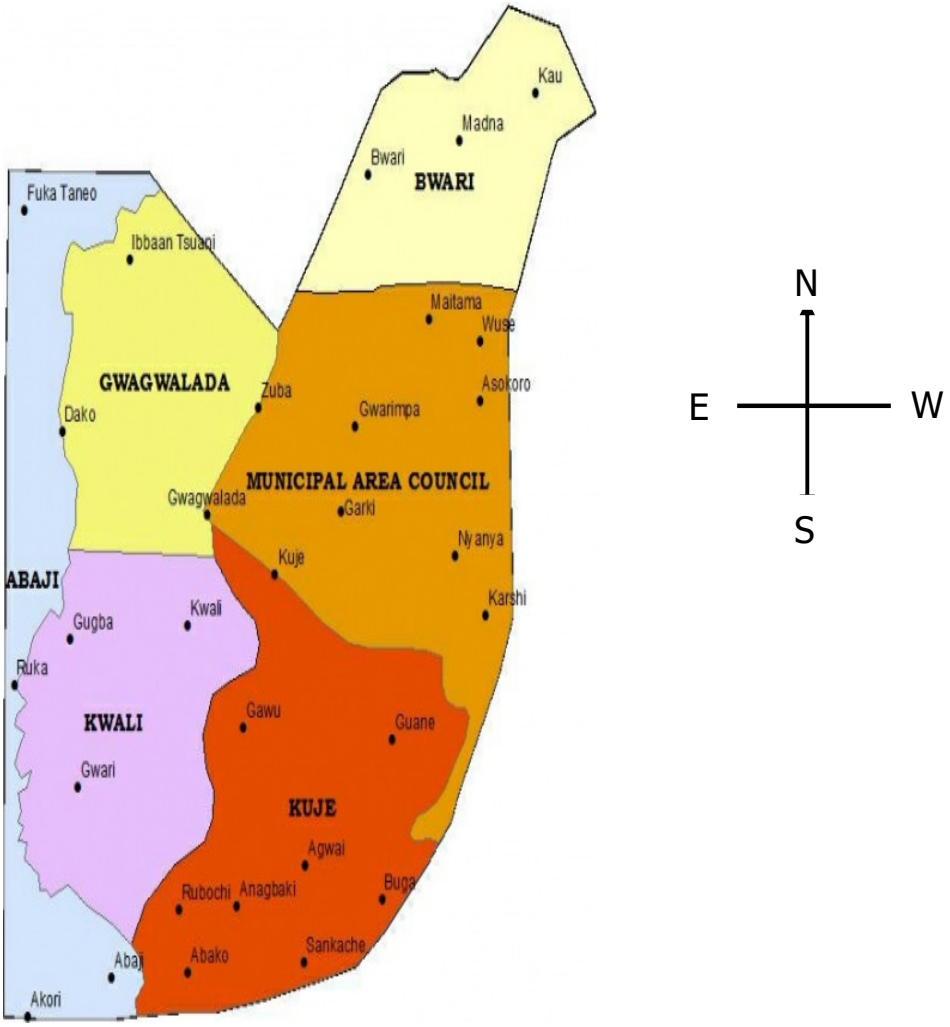

Fig 1: Map of Federal Capital Territory, Abuja.
Source: NPC, (2008).

Sampling method

Preliminary information was sought through the use of Questionnaire, interview and field observation. These gave an idea of how wastes are generated by households, nature of waste disposal, frequency of waste collection by AEPA, etc.

Sample size determination

With the population size of FCT;1406239(NPC,2006), and taking into consideration previous studies on problems of domestic waste management in FCT. It was decided to take 0.5 as the maximum variability, as it was found that 50% of the households in Abuja have good solid waste management or disposal methods.Using the formula;

$$\{n= \frac{z^2pq}{n^2}\}$$

Where n=Sample size
p= proportion of houses with good solid waste disposal method =0.5
q= proportion of houses without good solid waste disposal method =0.5
z= value of standard normal deviation at 95% confidence interval level=2
d= degree of precision= 0.05

Therefore, $n= \left\{ \frac{(2)^2 \times 0.5 \times 0.5}{(0.05)^2} \right\}$

$$= \left\{ \frac{4 \times 0.25}{0.0025} \right\}$$

$$= \frac{1}{0.0025}$$

=400
The sample size (n) was 400 which was used for the study.

Sampling method

There are different methods of data collection for research depending on the type of research. According to Lawal *et al.* (2014) the most widely accepted view among the environmental is to expresses the estimates relating to the total solid wastes generated daily in kg/day per household. Hence the survey of household was used in this research since it gives the appropriate level of pollution of the entire community.

Sample collection

Four towns/villages were selected from each of the six Area councils and the town selected divided into high and low density areas. Other criteria that were used in this classification includes level of income and nature of employment of the occupants, type and structure of buildings and classes of civil servants in accordance with the study carried out by Benjamin *et al.(*2014). Ten (10) households were randomly selected from each of the twenty four (24) selected towns.

Determination of Waste Composition

Each household earmarked for sampling was given two labelled polythene bags (one for the collection of wastes and the second one serve as spare for the collection in the following day) for daily collection of the wastes. And the wastes subsequently collected every evening to the designated site.

Sorting of the wastes

Each labelled polythene bag from each household was separately weighed and weight noted. Thereafter, the contents of each bag emptied on cement slab before being separated into various types viz:- Food and Food crops, Vegetable and perishables, Glass materials, paper and cardboards, Plastic and ceramics, Polythene materials, Used cans and Textile materials.The weight of each of the waste type was taken for each bag for the various households and expressed in kg.

Statistical Analysis

All results were analysed by the use of Chi-Square($p< 0.05$).

RESULTS AND DISCUSSION

Composition of Domestic Solid Waste in FCT

The composition of domestic solid waste generated in the FCT was determined and result presented in Tab 1. From the result, remnants of food and food crops constituted 380kg amounting to 47.07%, vegetable and other perishables accounted for 256kg(31.71%), paper and cardboard constituted 30kg(3.71%) and textile materials accounted for 26kg (3.22%). Others are polythene materials, which is 40kg constituted the major materials that littered the environment but because of its weightlessness accounted for 5%, glass materials is 29.2kg constituting 3.61%, plastic and ceramics is 24kg amounting to 2.97% and the used cans is 22kg that accounted for 2.72%..Categorizing the eight (8) types of wastes generated within six (6) Area Council of FCT; biodegradable and non-biodegradable. The weight of these two types of waste is shown on Tab 2. The biodegradable wastes constituted 690kg accounting for 85% with the non-biodegradable components amounting to 117.2kg(15%).Thebulk of the non-degradable waste is potentially recyclable materials while the degradable are materials that can be composted. The findings in previous studies by Adewale (2011) showed thatthe developing nations such as Indonesia, Colombo and Sri Lanka, residential wastes are 78%, 81% and 89% respectively. Kadafa(2017), also confirmed that over 70% 0f domestic solid waste in Nigeria cities arebiodegradables.This degradable wastes may decay rapidly leading to high multiplication and subsequent contamination with bacteria and other microbes from the rotten food and vegetables if not effectively managed. Some of these wastes are often removed by the less privileged for either direct consumption or sold to make money or for recycling back to the immediate communities, which may lead to the spreading of microbial infections that may be of serious public health concern. The infections may include among others cholera, typhoid fever, and shigellosis (UNDP 2014).

The biodegradable is large enough to be composted rather than disposedoff. Composting can be used to handle biodegradable wastes such as food, animal industry wastes, green waste, wood,paper and cardboard wastes, and agricultural residues to produce a range of organic soil

amendment products that can replace manufactured fertilizer, reduce the need for pesticides, improve soil structure, reduce soil erosion and reduces the need for irrigation.

Tab 1: Composition of Domestic Solid Waste

Domestic solid wastes	Weight (kg)	Percentage(%)
Food and food crops	380	47.07
Vegetable and perishables	256	31.71
Glass materials	29.2	3.61
Paper and cardboards	30	3.71
Plastic and ceramics	24	2.97
Polythene materials	40	4.95
Used cans	22	2.72
Textile materials	26	3.22
Total	807.2	100%

Tab 2: Weight of Biodegradable and non-biodegradable wastes generated in six area council of FCT.

S/No	Types of Waste	Weight (kg)	%
1.	Biodegradable	690	85%
2.	Non-biodegradable	117.2	15%
	Total	807.2	100%

Impact of pollution from Domestic SolidWastes Generation in FCT

The impact of pollution from domestic waste materials in FCT is presented in Tab 3. The result showed that Gwagwalada Area Council generated the highest amount of remnant of food with a total of 79kg. This was closely followed by Kuje with 76kg. Bwari, Abaji and Kwali generated 66kg, 64kg and 63kg respectively. AMAC generated the least of 32kg. The impact of pollution from Vegetable and other Perishable materials showed that AMAC generated the highest amount of wastes (82kg). Gwagwalada generated 46kg, closely followed by Kuje(41kg.) Kwali, Abaji and Bwari generated 34kg, 28kg, and 25kg respectively. Pollution from Plastic and Ceramic nature showed that Abaji generated 12kg, followed by Kwali (4kg). Kuje produced 3kg, while Bwari and Gwagwalada generated 2kg each. Pollution arising from Polythene showed that Kuje and Abaji generated 8kg each, closely followed by Kwali and Gwagwalada (7kg) each. While Bwari and AMAC generated 6kg and 4kg respectively. Similarly, the result of Pollution from Used Cans revealed that Abaji and Kwaligenerated 12kg, and 4kg respectively, Bwari, KujeGwagwalada and AMAC generated between 1kg and 2kg. However, analysis of results showed significance differences in all of the above

wastes.Pollution from Paper and Cardboard showed similar pattern of waste generation with Abaji producing highest wastes(12kg) followed by Kwali (6kg), AMAC generated 4kg, Bwari and Kuje generated 3kg each, and Gwagwalada generating 2kg. The impact of pollution from glass showed that Abaji generated 11kg, followed by Kwali(7kg), Kuje and Bwari generated 4kg each,Gwagwalada and AMAC generated 2kg and 1.2kg respectively. Textile waste is also one of the wastes that polluted the environment from households. It was found that Abaji generated 10kg, Kwali generated 8kg while AMAC generated 3kg with Bwari and Kuje generating 2kg each.

The lower values for paper, glass, plastic and can wastes may be due to daily activities of human scavengers which might have led to removal of these categories of wastes for recycling in the larger community in exchange for money. This assertion is confirmed by the non significant difference in generation of paper/ cardboard, glass/ceramics and textiles in different areas.Polythene and cellophane were found in all of the study areas. This may be due to their common use in these areas. Polythene bags and other polythene materials are used in the package of almost all commercial and domestic products such as magi, biscuits, sweets, onions, vegetables, grains, etc. This explains the level of polythene usage as the commonest material that littered the environment todayin the areas covered by the study. The 4.95% accounted for by the polythene materials in current study calls for the modification of the method of estimating solid waste generation in kg/day per household as advocated by Mc Lara. The advocacy is not feasible with regard to polythene materials which were weightless but more in quantity and formed the commonest and widely pollutants in FCT and other part of Nigeria (Ogwueleka, 2013).Waste generation rate is high in such places like markets, commercial centers (shopping malls), motor parks and other public places. Inorganic materials such as glass,polythene materials, metal cans from processed foods,egg shells, vegetable/fruit materials etc are mostly generated in high income areas especially in the city center (AMAC). While organic matters like pilled backs of foods and unprocessed food materials, ashes resulting from the preparation of food, plastics, rags etc are mostly found in low income areas.

Tab 3: Impact of pollution from domestic solid waste generation in FCT

Area Councils	Food & Food Crops	Veg & Perishable	Glass Materials	Paper & Cardboard	Plastic & Ceramics	Polythene Materials	UsedCans	Textile
Abaji	64	28	11	12	12	8	12	10
AMAC	32	82	1.2	4	1	4	1	3
Bwari	66	25	4	3	2	6	2	2
G/lada	79	46	2	2	2	7	1	1
Kuje	76	41	4	3	3	8	2	2
Kwali	63	34	7	6	4	7	4	8
Total (Kg)	380	256	29.2	30	24	40	22	26
Total $\bar{X}$	63.33	42.66	4.86	5	4	6.66	3.66	4.33

Methods of Handling Wastes.

The methods of handling wastes generated in the study area is influenced by environmental and awareness of the respondents. These attributes appear to enhance proper and adequate solid waste disposal and handling practices. Fig. 2 showed that 45%-50% of respondents handle their wastes by the use of waste bins. Others (20%) move their wastes to distant dumpsites. And (10%) dump their wastes around the house and 4% buried them around the house.The disposal methods seem to be guided by prevailing practices in each of the area council, with all the respondents in AMAC(67%) and Gwagwalada(53%) being more disposed to proper methodsie collection by AEPB as shown in Fig.3. On contrary, few respondents who believe in either burning refuse or left to decay into manure or burying these refuse around their houses, reside outside the headquarters of the area councils.Municipal Solid Waste collection and disposal is regarded as social service. In many cases, no fee is paid bymost waste generators and waste management agencies rely on government budgetary allocations which is grossly inadequate.

Tab 4. showed that only 46% of the respondents pay for refuse collection services and most of them are in business areas of local government headquarters and residents of AMAC central city.However, majority (68%) of respondents said they are willing to pay if the exercise will be effective as showed in Tab 5. In this study wastes generated in the six (6) area councils are either collected by Abuja Environmental Protection Board, its agents(contractors), or are burnt by the households. Household waste burning is widely practiced in Nigeria especially in dry season as a form of reducing combustibles in wastes.However, the most important health and environmental implication of waste burning is from air emissions, which include particulates, carbon monoxides,nitrogen oxides, acid gases (chlorides and sulphides), volatile organics and mercury. These compounds contribute to bio-accumulation of toxins, acid rain and global warming (Adewale, 2011). Inhalation of particulate matter poses danger to the lung and blood tissues**.** Tab 6. showed that all houses surveyed in AMAC, and other parts of Area council headquarters have refuse binsfor storage of solid waste in conformity with best practices and as defined by proper and adequate solid waste management. Over 76% of the refuse bins have cover as shown in Tab 7. In contrast, a study in Lagos in 2001 showed that residents preferred to store generated waste in small uncovered plastic buckets(Afon,2007).

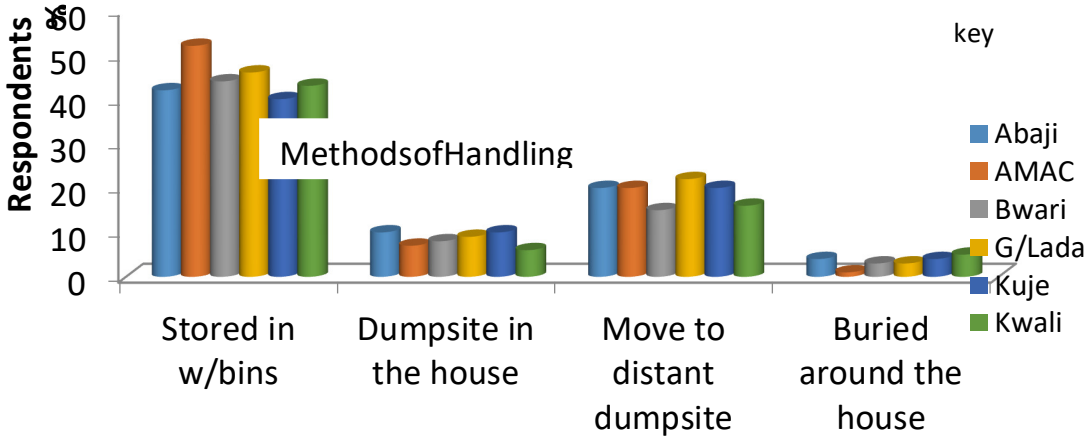

Fig 2: Methods of Handling Wastes.

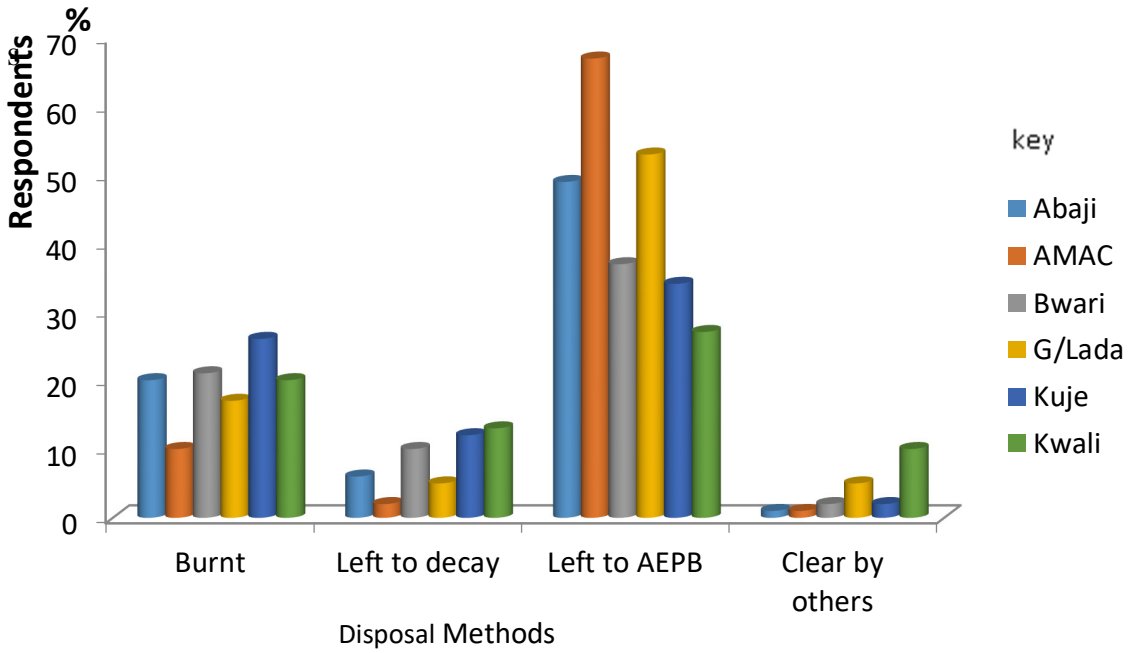

Fig 3. Disposal Methods.

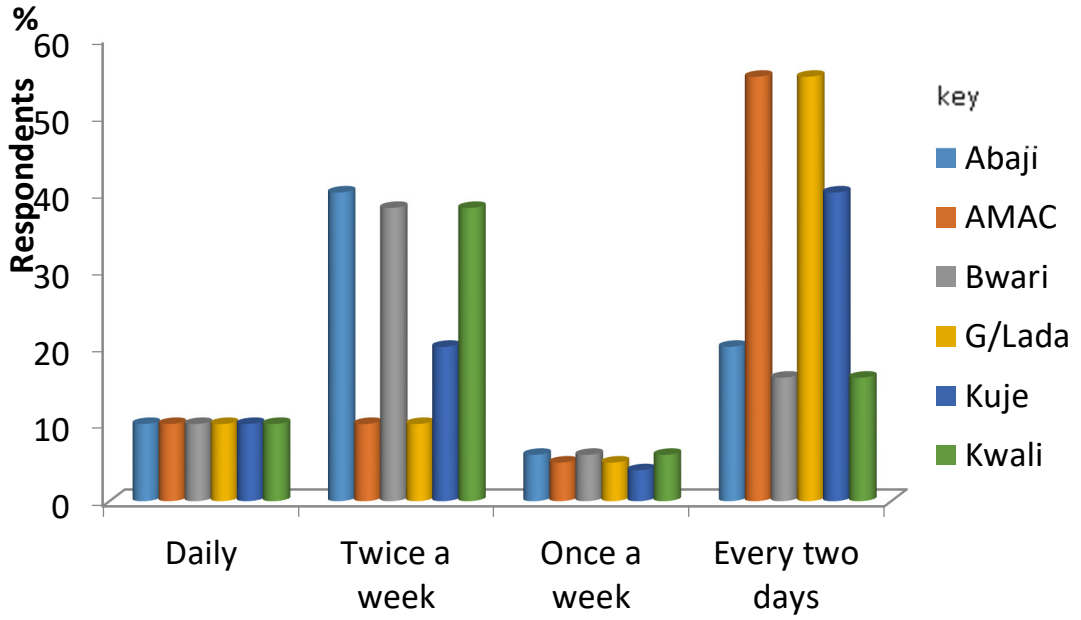

Fig 4.Frequency of refuse collection among households

Tab4: Charges Pay forWaste Collection Services

	Abaji	AMAC	Bwari	G/Lada	Kuje	Kwali	Total	%
Yes	33	51	24	49	27	23	207	46
No	43	29	46	31	47	47	243	54

Tab 5: Respondents that are willing to Payfor Waste Collection Services

	Abaji	AMAC	Bwari	G/Lada	Kuje	Kwali	Total	%
Yes	46	75	40	69	34	42	306	68
No	30	5	30	11	40	28	144	32

Tab6. Availability of Storage facilities: Refuse Bins Available

	Abaji	AMAC	Bwari	G/Lada	Kuje	Kwali	Total	%
Yes	69	76	70	74	69	70	428	95
No	7	4	-	6	5	-	22	5

Tab 7: Respondents' Refuse Bins with or without cover

	Abaji	AMAC	Bwari	G/Lada	Kuje	Kwali	Total	%
Yes	50	75	49	70	50	50	344	76
No	26	5	21	10	24	20	106	24

Frequency of Refuse Collection from Households

Generally, the frequency of refuse collection is determined by the quantity of waste generated. In areas where there are waste contractors(WC) in managing the waste such as in headquarters of area councils, it is easy to monitor and regulate frequency of emptying waste bins. In this study, most households(75%) empty their refuse storage facilities twice a week, some empty daily as shown in Fig 4, suggesting large amount of waste being generated. It is common to see overflow of refuse bins in all districts.This is because ofthe delayed in collection by AEPB, as a result of inadequate manpower, equipment, and vehicles by AEPB and waste contractors. In previous studies it was reported that poor funding is one of the main reasons for poor collection and disposal of refuse. Environmental Protection Agencies are under-staffed, with poorly trained workforce and the collection vehicles are in a state of disrepair in most cities of Nigeria(Ogwueleka,2009). There is inadequate service coverage in most urban areas and in rural areas there is no collection service at all. Refuse are dumped on many vacant plot of land and by road side. Less than 60% of municipal solid waste generated is collected in developing countries(Ogwueleka,2003).

Some of the problems contributing to solid waste accumulation include, the core or traditional areas of the cities are characterized by slum, inaccessibility of the environment which is an evidence of poortown planning in previous years. This results to placing of public containers far away from the majority of users. As a result most residents have to walk long distance before getting to dumpsite. Many have to indiscriminately dump their waste in nearby open spaces, drains, streams causing environmental problem within the community.

The proportion of residents served with proper and adequate solid waste management facilities are relatively small, and reside mostly in the AMAC and head quarter of area councils. The solid waste management practices are poor and inadequate. Because uniform patterns are not being applied in all parts of the territory, the satellite towns are particularly affected by this improper solid waste management.

Recommendations

Based on the findings of this study, there is strong need to improve solid waste management in line with international best practices in the whole of FCT. As such, the following recommendations are hereby made for the various stakeholders:

i. Sustainable ISWM hierarchy; source reduction, reuse, recycling, waste combustion, and landfill should be strictly adopted and followed.

ii. Allocation of sufficient funding towards equipment purchasing, staff training, maintenance of structures and equipments.
iii. Construction of access roads into landfills and people should be force to abide by official town planning.

iv) Enforcing laws on environmental sanitation, including ones on prohibition on indiscriminate waste disposal.

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