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Assessment Of Solid Waste Management Practices in Abuja Municipal Area Council (Amac)

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ABSTRACT

This study assesses the solid waste management practices and the role of agencies responsible for its management in Abuja Municipal Area Council (AMAC). A total of 400 structured questionnaires distributed randomly were used to obtain information from household heads and Informal waste collectors operating AMAC. Oral interviews with the staff of Abuja Environmental Protection Board (AEPB) were also undertaken. Simple descriptive statistics analysis was used in the presentation of the data obtained. It is evident from the study that socio-economic characteristics such as educational levels, monthly income, family size and etc. of the households in the study area greatly influence the quantity of waste generation. The study revealed that 69% and 31% of the waste generated in AMAC are biodegradable and Non-biodegradable respectively with kitchen waste alone constituting 46%. The average waste generated is 0.65Kg/capital/day. The findings also showed that waste collection within the study are done mostly ones in a week (46%) sometimes the waste spent more than a week (17%) without being attended to which pose serious health issue. It is observed from our findings that the informal waste collectors are only interested in the recyclable material, this is not far-fetch from the fact that after sorting is done on the waste collected, 10% are thrown into drainages, 24% to open space, 55% left at the separation point. Only 11% got to public collection points. The outcome of the interview on staff of AEPB revealed that the agency is only responsible for the collection, transportation and disposal of the waste to the government approved sites leaving out waste treatment. The poor performance of this agency is closely linked to inadequate machineries/equipment, trained personnel, poor funding and negative attitude of the households towards solid waste management. The study finally recommends community participation, payment for waste disposal, increase public-private partnership, adequate resourcing of waste management agency, monitoring and supervision, use of integrated solid waste management model and the application of appropriate technologies among others.

Introduction

Solid wastes are undesirable or useless items or materials in solid state generated from human activities in residential, industrial and commercial areas (Glocal University, 2014, Orhorhoro and Oghoghorie, 2019). These waste are categorized into three: based on origin (domestic, industrial, construction, commercial, and institutional), contents (organic materials, glasses, metals, plastics, papers, etc), and hazard potentials (toxic, non-toxic, flammable, radioactive, infectious, etc) (Oyebola and Babatunde, 2008; Sharma *et al*., 2014). These different categories of solid waste often posed problem of environmental degradation. Poor waste management is capable of contaminating the world's oceans, clogging drainages which eventually cause floods, transmitting diseases (such as *Escherichea coli, staphilococus aureus and samonela sp.*), increasing respiratory problems through burning of refuse, harming animals that consume them (waste) unknowingly and affecting economic development in both agriculture and tourism sectors also promoting undesirable residential morbidity (Achi *et al*., 2000; Guisti, 2009; Sameh, 2016).

According to the World Bank (2018), annually, the globe generates around 2.01 billion tons of municipal solid waste, with at least 33% not managed in an environmentally sound manner. The world waste projection shows that rapid urbanization, population growth, and economic development will push the global waste to increase by 70% to a staggering 3.40 billion tonnes of waste generated annually by 2050 (World Bank, 2018). Worldwide, waste

generated per person daily averages 0.74 kilograms. The composition of municipal solid waste (MSW) is influenced by the level of income, season of the year, population, culture and lifestyle of people living in the community (Aderoju and Guerner 2012). Based on income level, there is a positive correlation between waste generation and income level. Daily per capita waste generation in high-income countries is projected to increase by 19 percent by 2050. To put it straight, in the European Union countries, over 250 x 10^6tonnes of MSW are produced each year with an annual growth of 3% (Al-Salam, *et al*., 2009) compared to low and middle-income countries where it is expected to increase by approximately 40% or more (World Bank, 2018). The total quantity of waste generated in low-income countries is expected to increase by more than three times by 2050. The World Bank (2018) also stated that by 2050, the total amount of waste produced in low-income nations is predicted to have increased by more than thrice. The East Asia and Pacific region produces the greatest waste, accounting for 23% of global waste, while the Middle East and North Africa region produces the least, accounting for 6%. At the global scale, the involvement of the informal sector in waste management cannot be overemphasized. Large numbers of scavengers (waste pickers) work in poor conditions in most developing countries, although there is potential for a range of jobs and small enterprises at all stages of MSWM. The informal sector worldwide has an estimated 24 million waste pickers, mostly in developing countries but also in richer countries (ILO, 2013; World Bank Group, 2020). Although the informal waste pickers recover a greater proportion of recyclables than the formal sector in most developing countries, they work under poor conditions, and do not get a fair value for recyclables. Improved MSWM and use of waste as a resource for generating other products holds great potential for jobs and small enterprises while preserving the livelihood and improving the welfare of informal waste pickers (World Bank Group, 2020). Continentally, in sub-Saharan Africa, the World Bank (2012) Urban Development Series publication stated that waste generation is approximately 62 million tonnes a year with each person generating an average of 0.65 kg/day. By 2025, the report projected that urban waste generation in this region will be 161.27 million tonnes annually. Going by this report and Nigeria's population, the country generates 43.2 million tonnes of waste annually and by 2025 with a population of 233.5 million (according to populationpyramid.net figure); Nigeria will be generating an estimated 72.46 million tonnes of waste annually at a projected rate of 0.85 kg of waste/day. This means that Nigeria annual waste generation will almost equal her crude oil production. In Abuja today, solid waste management is a serious problem due to the influx of rural dwellers, and the amount of solid waste usually generated outstrips the ability and capacity of Abuja Environmental Protection Board (AEPB). The collection of solid waste is the most difficult and expensive aspect ofsolid waste management due to the unplanned nature of most cities in Nigeria today (Emankhu and Yamusa, 2018). Ineffectivecollection systems often lead to waste accumulation, creating nuisance and odour problems,environmental pollution, fire hazards and generally threatening the physical well-being of thepopulace (Emankhu and Yamusa, 2018).To cope with these challenges, AEPB the agency saddled with the responsibility of waste management in the city has hired and still liaising with private contractors for waste collection, transportation, disposal and treatment to complement the effort of the Agency in waste management. Also to gear up the waste collection processes, there is the presence of informal private operators like Baban Bola collecting reusable materials from homes and in dumpsite (Agunwamba,2003). Yet, more and more heaps of this waste accumulates in various corners of the city of Abuja. It is against this background that this study seeks to assess solid waste management practices in Abuja Municipal Area Council (AMAC).

Materials and Methods

Study Area: Abuja Municipal Area Council (AMAC) is an area council found in the Federal Capital Territory of Nigeria. The council area is located between latitude $8^0$40ˈN and $9^0$20'N of the equator and longitude $6^0$40ˈ E and $7^0$40ˈ E of the Greenwich meridian. It is bounded by Gwagwalada Area Council in the northwest; to the north by Bwari Area Council; to the east by Nasarawa State; and to the south by Kuje Area Council respectively. It is regarded as the largest and most and urbanized of all the six (6) area councils in the FCT. The area council has a land mass of about 1,500 sq km (38.8%) of the total area of the FCT (Balogun, 2001). The area council is made up of five districts (Maitama, Garki, Wuse II, Wuse zone 5 & 6, and Gwarinpa) with 12 political wards namely; Central Business District, Wuse, warinpa, Garki, Gui, Jiwa, Gwagwa, Karshi, Orozo, Karu, and Nyanya (Touriistlink, 2013).

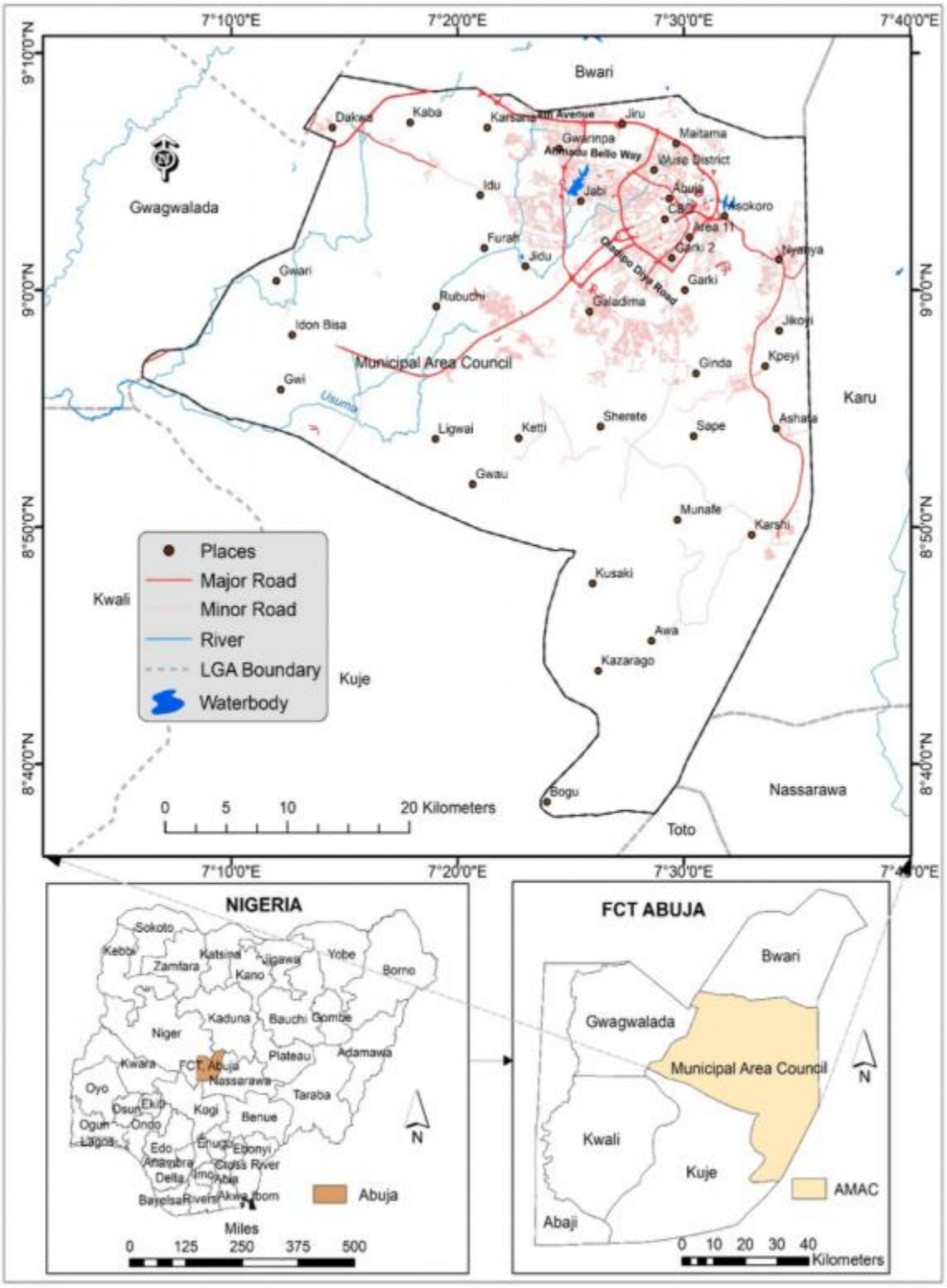

Figure 1: Study Area: Map of AMAC

Source: Fieldwork, 2023.

Methods:

The research design adopted for this research is purely descriptive in nature. Both primary and secondary data source are employed. The primary sources are direct sources where the researcher collected unprocessed or raw data from. These include management and staff of Abuja Environmental Protection Board (AEPB), private waste collectors and household heads of Abuja Municipal Area Council (AMAC). Secondary source on the other hand include existing literature (published and unpublished) found pertinent to solid waste management practices. The sample techniques adopt purposive non-probability sampling to select districts while random sampling was used to select household heads. The criteria used for selecting districts were to allow for complete coverage of the peripheral and city center residential areas and the rate of waste generation. Gwarinpa, Garki, and Wuse II districts are sampled based on purposive non-probability sampling method. The purposive sampling method was adopted in order get the work done in good time. The major instrument used for this study is Questionnaire administration. Questionnaires were administered to household heads in each of the districts through simple random sampling. Abuja Environmental Protection Board staffs and informal solid waste collectors were also served different questionnaires based on the information required from them.

The questionnaires were structured to get information on solid wastes usually generated in AMAC, the agencies saddled with responsibility of managing solid waste, the roles of the agencies towards managing solid waste in AMAC, the strategies and processes of managing solid waste, the challenges of solid waste management practices, and solutions that would help improve solid waste management practices in AMAC. A total of 436 questionnaires were administered; 400 to Household heads, 22 copies to the private waste collectors while 14 copies were served the management and staff of AEPB.

Analysis of the data collected was done using descriptive statistical tools in Statistical Package for Social Sciences (SPSS). The descriptive statistical tools in SPSS were used to classify and summarize the data, through percentages, frequencies, tables and graphs in a manageable size to give good impression and easy understanding of the results.

Result and Discussions

Socio-demographic description of the respondents.

The first index to consider here is the gender distribution of respondents, the result of the study presented on table 1 revealed that 39.5% of the respondents are male, while 60.5% are female. Women were found to engage more in the study because they spend more time home and are responsible for greater waste storage and disposal.

Table 1: Socio-demographic characteristics of the (Household Heads) Respondents

Variable	Measurement	Count	Percent (%)	Cumulative Percent (%)
Sex	Male	158	39.5	39.5
	Female	242	60.5	100.0
Age	15 - 25 Years	52	13	13
	26 - 35 Years	100	25	38
	36 - 45 Years	132	33	71
	46 - 55 Years	96	24	95
	56 Years and above	20	5	100.0
Marital Status	Single	146	36.5	36.5
	Married	236	59	95.5
	Divorced	6	1.5	97
	Widowed	12	3	100
Family size	>3 Family Members	98	24.5	24.5
	3 - 5 Family Members	183	45.75	70.25
	6 - 9 Family Members	115	28.75	99
	9 Members and above	4	1	100.0
Level of Education	Primary School Education	16	4	4
	Senior Sec. School Education	108	27	31
	Tertiary	276	69	100.0

Occupation	Students	89	22.2	22.2
	Traders	126	31.5	53.7
	Farmers	7	1.8	55.5
	Civil servants	158	39.5	95
	Others	20	5.0	100
Monthly Income	Less than 30,000	11	2.8	2.8
	30,000-50,000	42	10.5	13.3
	51,000-70,000	82	20.5	33.8
	71,000-100,000	123	30.8	64.6
	100,000 and above	142	35.4	100

Source: Fieldwork, 2023.

Most of our respondents were found between the age ranges of 26-55 years, which represents 83% of the entire population of the study. This result is not far fetch from the fact that majority of the respondents in the study area are at their youthful stage of numerous desire, thus, unrestricted of solid waste generated in AMAC. On the other hand, respondents above 56 years are just 20 representing 5% of the study population which are also people of low waste generation. Sterner and Bartelings (1999) found that the elderly produce less amount of solid waste, which may be attributed to the rather modest way of life usually led by the aged. Marital status is an important factor that influences and determines the family size of the respondents, because the more the number of married respondents, the more the number of the persons in the family, hence more solid waste generated. It is revealed that 59.0% of the respondents are married while 36.5% are single.

Family size is an important component in determining the amount of household solid waste. The result of the study showed that majority of the sampled population 74.6% (298) have 3-9 people in their respective household, hence more waste generated. The educational status amongst inhabitants can notably influence the prosperity of awareness of programs aimed at evolving solid waste management practices. The more a family gets educated and aware of the adverse effects of improper solid waste management, the more it recognizes the importance of effective management of solid waste (Kayode&Omole, 2011). The result of the study regarding the educational status of respondents revealed that 69% of the respondents attended tertiary schools, while those that have primary and secondary as the highest level of educational attainment constitute 4% and 27% of the sample size. The type of occupation of respondents determine the level of income, hence rate and types of solid waste generated. With respect to the occupations of the respondents in the study area, the result of the study showed that majority of the respondents sampled are civil servants (39.5%), 31.5% are traders, while the rest of the respondents are either students or engaged in farming and other artisan works.The income of respondent is one major influencing factors believed to play a direct role in deciding waste generation rates and composition (Zhu, Asnani, and Zurbrugg, 2007). The result of the study revealed that majority (66.2%) of the respondents earn more than N70, 000 monthly in the study area, consequently generate more waste. The study is in agreement with the study carried out by Medina (1997) which indicated that solid waste generation is directly linked to the income of households, and the higher-income members consume more and generate more waste which could also be more of recyclable items. The increase in the income level leads to a clear difference in the amount and composition of solid waste generated among households' i.e changes in the pattern of households' consumption (Ogwueleka, 2003).

Waste management practices among Households in AMAC

The composition of waste generated in AMAC is presented on table 2. It was gathered from the table that 69% of the waste generated are biodegradable while that of non-biodegradable are just 39%. Table 3 also showed that the quantity of waste generated is mostly between 3.1 and 7.0 kg/capital/day representing 72.5%. Figure 1 revealed that most of the households store their waste in open/closed nylon/paper bags in the corner of their homes before taking it down to the general collection points for final disposal to the government approved point.

Table 2: Composition of waste generated by households in AMAC

Category	Waste	Frequency	Percentage (%)	Cumulative percentage (%)
Biodegradable	Kitchen waste (leftover food, vegetables&fruits)	184	46.00	46.00
	Papers	46	11.50	57.50
	Woods	28	7.00	64.50
	Textiles	12	3.00	67.50
	Others	6	1.50	69.00

Non - biodegradables	Plastics	68	17.00	86.00
	Glass	11	2.75	88.75
	Metals	21	5.25	94.00
	Others (Battery, car parts, used oil etc.)	24	6.00	100.00

Source: Fieldwork, 2023.

Table 3: Quantity of waste generated by household in AMAC

Waste (Kg/Capital/day)	Frequency	Percentage (%)	Cumulative percentage (%)
Less than 0.30	46	11.50	11.50
0.31 – 0.50	123	30.75	42.25
0.51 – 0.70	167	41.75	84.00
0.71 – 0.90	37	9.25	93.25
0.91 – 1.00	21	5.25	98.50
Above 1.00	6	1.50	100.00

Source: Fieldwork, 2023.

Availability and proximity to waste collection point is another bottleneck in waste management in AMAC. While 36.75% of the respondents agreed to having a collection point at the neighborhood or close to the roadsides, 16.50% and 14.75% reported non availability and availability at about 500m away respectively from their residence. It was also gathered that agencies responsible for the evacuation of waste to the final points visit once or at most twice a week (Fig 2).

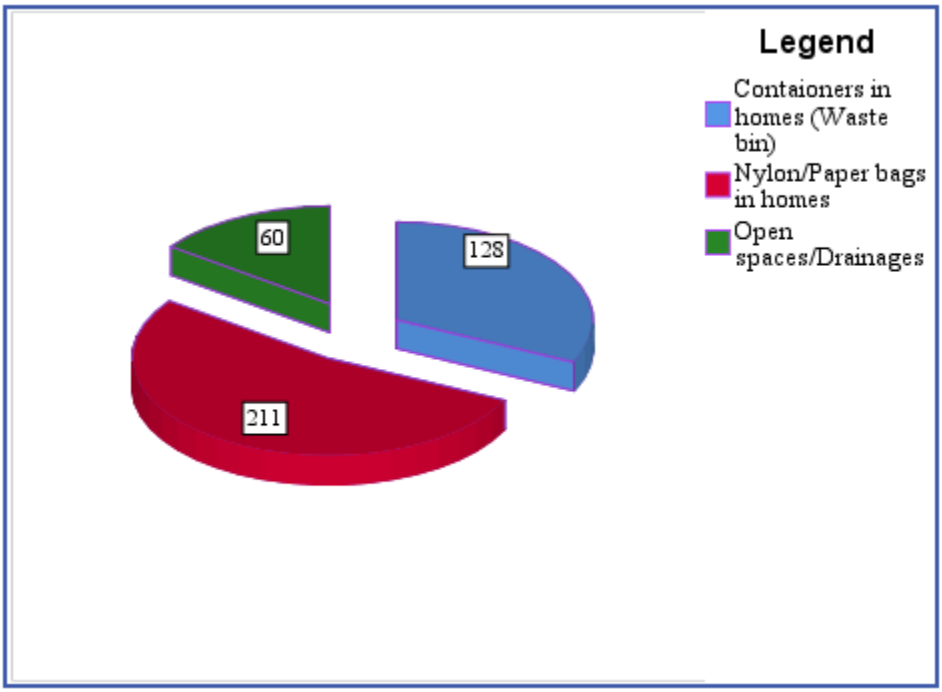

Figure 2: Waste Storage Methods Employed by Households
Source: Fieldwork, 2023.

Table 4: Availability and proximity of waste collection points in the study area.

Variables	Frequency	Percentage (%)	Cumulative Percentage (%)
Not available	66	16.50	16.50
Available at neighborhood and roadsides	147	36.75	53.25
Available at 500m away	59	14.75	68
Collected by private operators	128	32	100

Source: Fieldwork, 2023.

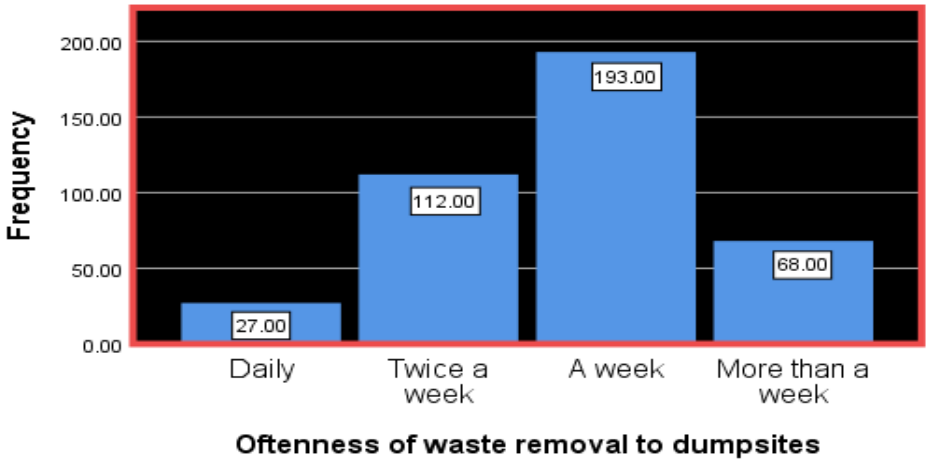

Figure 3: Frequency of Waste Collections to the Dumpsites by AEPB and Private Collectors
Source: Fieldwork, 2023.

INFORMAL WASTE COLLECTORS

As it were, solid waste generated in the households have to be disposed properly out of the residential environment to avoid the spread of diseases, environmental contamination, eye sore and etc. In this regards, both private and government bodies are involved in the collection and proper disposal of these waste but at different scales. The private bodies perform these roles to generate income. They also generate income through sorting of recyclable items such as plastic bottles, iron materials, in waste.

Demographic characteristics of the informal waste collectors

Twenty-two informal waste collectors are present for this interview. The result of the interview revealed the gender composition to be male all through (100%) in the AMAC. 72.7% of their ages ranges between 15 and 36 years. It was also observed that majority (59.1%) of the informal waste collection in AMAC attained secondary education, while 40.9% had primary education.

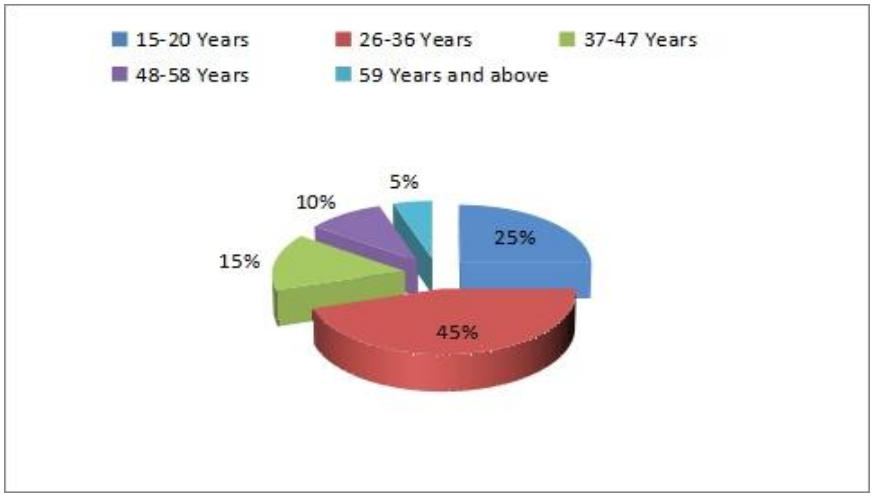

Figure 4: Age Distribution of Informal Waste Collector in AMAC
Source: Fieldwork, 2023.

Table 5: Educational level of the informal waste collectors

Educational level	Number of respondents	Percent (%)
Primary	9	40.9
Secondary	13	59.1
Tertiary	0	0
Total	**22**	**100.0**

Source: Fieldwork, 2023.

Roles of Private Waste Collectors in Waste Management in AMAC

The municipal solid wastes in the study area are collected from households, hotels, and market areas mostly by the informal waste collectors. But the rates at which they collect the solid waste vary with aforementioned sources. The result of the study indicated that (45.5%) of the waste collected are from households compared to those from hotels (22.7%) and market (31.8%). The collection and transportation of such waste from households to public waste collection point are mostly done by young boys as discussed above for token of N100 - N200. These young informal waste collectors move round with wheel barrows, carts, and cartons collecting wastes from various households and business arenas.

Table 6: Point of Waste Collection

Variable	Number of respondents	Percent (%)
Household	10	45.5
Hotel	5	22.7
Market	7	31.8
Total	**22**	**100.0**

Source: Fieldwork, 2023.

The informal waste collectors usually take the collected solid wastes to their waste separation point where they sort the needed solid wastes and thrown the unwanted ones sometimes in drainage channels, public waste collection point or open spaces depending on whichever one that is close. However, the result of the study (Fig 4) revealed that majority (55%) of the informal waste collectors usually take the collected solid waste from households, hotels, and market areas to their waste separation point (also called Baban Bola place) where sorting of waste takes place. 24% of the informal waste collectors take the collected waste to open space where they sort the wastes and left the unwanted ones out. 11% and 10% of them take to public waste collection point and drainages respectively. With this result, solid wastes are not well managed.

It is worthy of note that all the informal waste collectors on AMAC are involved in waste sorting. The result of the study showed that most (82%) of the informal waste collectors take the sorted or separated wastes to Baban Bola, while18% of them take the sorted wastes directly to recycling companies.

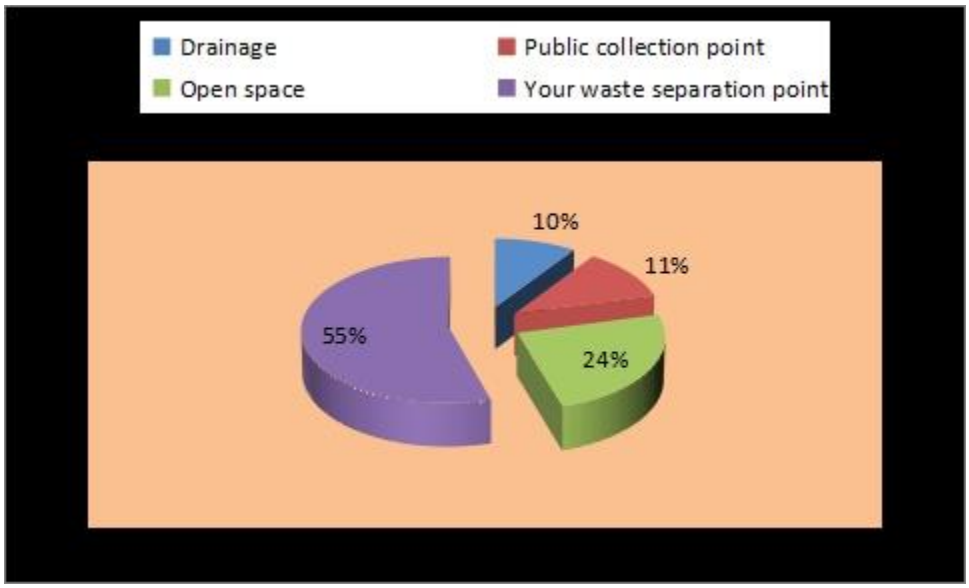

Fig 5: Final Destination of Waste Collected by Informal Waste Collectors
Source: Fieldwork, 2023.

Table 7: Final Destination of the Sorted Waste

Variable	Number of respondents	Percent (%)
Baban Bola	18	82
Waste recycling companies	4	18
Others	0	0
Total	**400**	**100.0**

Source: Field survey, 2023.

AGENCY SADDLES WITH THE RESPONSIBILITY OF SOLID WASTE MANAGEMENT IN AMAC

This section presents the results of the interview undertaken with the Abuja Environmental Protection Board (AEPB) staffs. Five AEPB staffs were interviewed

to have an in-depth discussion and understanding on the roles of the agency in solid waste management in AMAC.

The Abuja Environmental Protection Board (AEPB) was established by edict No. 3 of 1997 to take over and replace the defunct task force on Environmental Sanitation. It is currently located at 776 Independence Ave, Central Business District 90003, Federal Capital Territory (FCT) Abuja. AEPB holds the responsibility of solid waste management in the FCT. It regulates and monitors activities which sometimes necessitate the enactment of legislations. The agency is saddles with the following functions:

- Imposing recycling responsibilities on industries and companies
- promotion of environmental issues within the FCT
- provision of land for waste management infrastructure
- supervision and enactment of bye-laws; and
- assisting in capacity building

The agency collaborates with other bodies to manage waste within the FCT.

Roles played in solid waste management processes and strategies by AEPB

The result of the interview found out that the roles the agency (AEPB**)** plays in solid waste management processes include collection of solid waste generated in AMAC, transportation of the waste collected and disposal of waste to official waste dumpsites in an environmental friendly manner. The outcome of the interview also revealed that the agency is not saddles with the responsibility of sorting and treatment and recycling of solid waste generated, but imposes recycling responsibilities on waste recycling industries and companies. The agency among other roles played regulates and monitors activities of the companies saddled with waste treatments.

Challenges of the Agency (AEPB)

Despite effort to address waste disposal issues, heaps of these wastes are still been visible across the town rendering the city filthy. Poor funding of the agency through low budgetary allocation from government is one of the main reasons for irregular collection and disposal of waste in AMAC. This inadequacy has rendered the agency incapacitated in handling the increasing solid waste. The existing equipment for solid waste management were grossly inadequate when compared to the population growth of the city. Negative attitude of households in the disposal of their respective waste to the designated collection points is worrisome. Most of them, rather than paying the informal waste collectors to handle their waste opt to dump waste in open spaces, unoccupied plots, and even drainages, generating a cascade of environmental issues.

Inadequate manpower and trained staff to run solid waste management program in AMAC is another bottleneck. Majority of the AEPB staff have little or no functional background or training in environmental management issues, hence results to ineffective and inefficient solid waste management. Unsuitable and inappropriate sitting, design, operation and maintenance of collection points and disposal sites is a problem that cannot be overlooked as the final disposal method commonly used which is open dumping without proper treatment and landfill procedures is outdated. All of the preceding highlights underscore the poor performance of the agency responsible for solid waste management in AMAC.

CONCLUSION/RECOMMENDATIONS

Waste they say is an important part of human which when well manage is of great benefit both to man and its environment. The study waste management in AMAC which at aimed at assessing the effectiveness of solid waste management practices in Abuja Municipal Area Council (AMAC) revealed that waste generation is higher than its collection as a result of population growth which consequently leads to waste accumulation overtime, thereby, degrading the environment. Waste collection is constrained by lack of equipment, trained and skilled manpower, coupled with poor funding of agencies involved in solid waste management. The informal sectors i.e private waste collectors which are meant to assist the agency (AEPB) are found out from the study to be mostly interested in sorting for recyclable waste, hence dump the useless ones anywhere mostly in drainages thereby causing unnecessary environmental issue. Payment for waste management services is not popular as residents display varying attitude towards the issue. Findings has also shown that the waste stream from the study area has huge material resources that can be recovered. Therefore, there should be active community participation and involvement of community based organizations in solid waste management in AMAC.

It is recommended that the government should encourage participation through involving the residents and Community Based Organizations (CBOs) in decision making on solid waste management process. Non-Governmental Organizations should be more involved in the planning and execution of solid waste management in AMAC. All the households should be made to pay for disposing their waste, this would help the private waste collectors and the government agencies overcome their financial predicaments.

Public-private partnership should be encouraged as government alone cannot provide the necessary funds and manpower to tackle solid waste management in the area. There is also a need for sensitization programs to educate

the populace aboutthe dangers associated with poor refuse collection and disposal on the environment and healthof the Public in general. They also need to be enlightened about various sustainable optionsavailable for waste management.

Integrated Solid Waste Management Model should be adopted to ensure efficient and effective solid waste management in the area. Residents should be encouraged to separate the waste generated into their various components before final disposal. Waste can also be disaggregated into plastic, metals, cans, bottles and food waste for proper management.

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