An Appraisal of Solid Waste Disposal Practices in Samaru Community, Zaria - Nigeria

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*Abstract:-*Solid waste disposal has been a problem to Man because of the level of daily generation in different levels and where they are been dumped have been a serious effect to the built environment. This study appraise solid waste disposal in Samaru community using a Checklist as the instrument of data collection. Five (5) clusters having residential, commercial and institutional occupancy types were used for data collection within the study area. While the solid waste quantity was measured using a Digital scale in kilogram per house per day (kg/house/day). The results deduced shows that, major occupants in the community to made up of 83.1% residential, 14.3% commercial and 2.6% institutional. In addition, the solid waste been generated is majorly rubbish (45.4%) and garbage (44.0%,) usually from the kitchen with 53.7%, which comprises of 39.7% of the food items mostly using plastic containers (35.0%) and polythene bags (38.6%) for storage. The average solid waste generated in the community is 1.30, 2.10 and 1.53 kg/house/day in residential, commercial and institutional building respectively, with a recycling and reuse getting more awareness as there is up to 20.6% of the respondent perceiving its value. It is thus evident that, the present method and way of solid waste disposal at Samaru community Zaria is inadequate. Thus, a well-known waste collection points in the streets are suggest with a sustainable designed frequency.

Key words: Solid waste generation, disposal methods, Households and Public health

I. BACKGROUND OF STUDY

In view of the ever-increasing population of townships, it is inevitable to have massive generation of solid wastes in the residential communities. Agdag (2009) noted that many individuals still regard environmental degradation within urban solid waste generation as an inevitable price of development. Traditionally, Nigerians had been practicing waste recycling for long at the local level unknowingly using old materials/items such as newspapers, leather, vegetable wastes for animal feeding, cartoons and planks of dismembered wooden cupboards or bed-frames (Ogwuelake, 2004). Waste generation therefore have a tendency to increase with an increase in population and economy growth that together add up to problems of waste disposal system and its management posed not only on the environment but also on the public health. While some environmental problem are associated with the effect of waste pollution, built-up landfills and obstructed drainage systems exposes severe health problems to the population and especially children in developing countries (Adebola et, al, 2013).

Solid waste poses various threats to public health and adverse affects on the environment especially when it is not properly, adequately and efficiently collected and disposed (Geoffrey, 2005). Non-maintenance of dumpsites, poorly maintained urban streets roads and irregularities in the designation of landfill site are common challenges. These are as results of solid dumpsite are on the increase at various parts of the communities, the unhealthy disposal and the lack of secure landfill and use of several solid waste disposal methods in streets (Adenyi, 1986).

Changes in technology and incomes bring about changes in the consumption habit of the citizenry and therefore the composition of waste materials. Thus a lot of non-biodegradable waste are being generated and are not easily absorbed or diluted naturally, and such waste accumulation are daily increasing in heaps along major areas. The foul-smelling odour and liquid effluence emanating from such heaps especially during the rainy season constitute environmental hazards and degrade the aesthetic values of the built environment (Ayuba, 2005).

According to Kironde (1999), there is lack of human resources at both the national and local level with technical expertise necessary for solid waste management, planning and operation. Likewise, the social status of solid waste management personnel is generally low. As a result of the negative perception of the society regarding the work that involves the handling of solid waste, such societal perception leads to low regards for the work, low self-esteem for the workers especially the garbage men and in turn produces low working ethics and poor quality.

There exist an imbalance between the production of solid waste and efficient disposal, as clear priority has often being given to issues of industrial and commercial development without paying attention to solid waste disposal facilities (Bako, 2014). This has resulted to waste been piled up along street side and at times totally blocking the drive ways and in turn puts the health of the populace at a great danger. As they as well encourage breeding of mosquitoes and communicable diseases (WHO-UNICEF, 2005).

Oseni (2012) reported that in early pre-industrial time, waste generation was not issues as population were small; waste was dispose of in the ground where it would turn to compost to improve soil fertility. Nowadays, due to population growth

and urbanization, the disposal of waste has proven to be a major public health issue and a vital factor affecting the quality of the built environment. Agunwamba (2003) established that environmental sanitation involved the control of all conditions that contribute to contamination and what permit the spread of disease or infection and one of the role of solid waste disposal systems.

In today's society, learning the correct method of handling the waste generated has become essential. Solid waste has become the most visible environmental problem in our community. Solid waste generation in our community is a continuous process and can accumulate to a larger volume, and calls for a well-planned approach or system in tackling the problem to avoid situation in which people will have to compete for space. A community that is free of waste apart from ensuring the convenient of activities therein also give good comfort and free from health challenges.

In addition, a solid waste management practice is limited with very low priority in developing countries, like Nigeria except perhaps in capital and large cities. Most municipalities lack the effective collection techniques as a result, not all of the waste generated is collected. The increasing dumpsites, abandoned waste, and deposit in the streets and open places in residential areas further evidence this. Thus, becomes a breeding ground for diseases carrying organisms leading to diseases such as cholera and malaria.

Concept of Solid Waste Generation, Collection and Disposal

Solid waste refers to the garbage arising from animal and human activities discarded as unwanted and useless. It is usually from industrial, residential, and commercial activities in a given area handled in variety of ways. Similarly, it is any solid material or items discarded after use by occupants of any building type (Graiser, 2007). The effort to root out this monster in our environment is as a front burner problem (Martin, 2012). as efficient solid waste disposal system is actively in place in developed societies. Thus, developing societies were limited due to several challenges.

Solid waste is subdivided into two; Garbage and Rubbish. Garbage (edible or non-edible) is the solid or semi-solid waste incidental to preparing, cooking and serving food, and cleaning of food service items. Rubbish (combustible or non-combustible) consists of wastes, which originate in food service facilities, barracks, wards, quarters, and offices. It includes items such as wastepaper, plastics, wood, metal, glass, ashes, and broken or damaged crockery (Tcholoanglas, 2002).

It is of paramount important to know that, classification of solid wastes into types is necessary for its proper disposal. In a nutshell, an administration of activities that provides safe collection, transporting, processing, recycling or disposal of any unwanted waste product is known to be a Solid Waste Disposal system where the process of final treatment, utilization, processing, transferring or depositing of solid waste occurs (Ogwuelake, 2004).

The aforementioned provides an information to the authorities in-charge to know the kind of solid waste generated from a community or streets, for proper disposal system to be used. Furthermore, Bako (2014) generally maintained that solid waste are classified into two categories as municipal solid wastes and industrial solid waste for the purpose of assigning responsibilities.

According to Agunwamba (2003), solid waste collection" includes the initial storage of waste within the household, shop or business premises the loading, unloading and transfer of waste, and all stages of transporting the waste until it reaches its final disposal site. Waste collection also includes the curbside collection of recyclable materials that are technically not waste. The collection methods were further classified to house to house (waste collectors visit each individual to collect garbage), community bins (fixed points in a neighbourhood or locality), Curb side pick-up and self-delivered to disposal site or transfer station.

However, Adebola (2013) outlined the following types of storage containers; metal barrels/buckets, plastic bins, Disposable leather bags and other items commonly used for storage include cardboard boxes, kerosene cans and container made out of truck tires. In most of the third world countries (Ali, 1999), solid wastes are disposed around cities and towns along the roads, which gave rise to several problems like pollution due to smoke, water pollution due leachate, blockage of drains and sewers due to plastics and health hazards to workers and rag pickers and humans living nearby areas.

Due to these reason safe disposal of solid waste is important for safeguarding the public health, environment and wildlife as well. Furthermore, Sado (2015) reported dustbin, metal barrel and bags as the common storage container in academic area with 22.2%, 33.3% and 33.3% respectively with the other types having 11.2%. In nutshell, polythene bags containers are popular where 50% of the refuse constitute garbage. However, an efficient waste management system is the one that provides ecologically sound disposal option for waste that cannot be reduced, recycled, composted, combusted or processed further.

Composting is a diverse process that includes a variety approaches depending on the type of organic material being composted and desired properties of the final product. Composting of organic materials can significantly reduce waste stream volume; it reduced the space in landfills. When compost is mix with soil to promote a proper balance between air and water in the resulting mixture, helps to reduce the soil erosion and serves as a slow release fertilizer (Tcholoanglas, 2002).

Nevertheless, Jibril (2012) postulate reduce, reuse and recycle with its critical success factors continue to regenerate acceptance in solid waste management practice with enomous potentials such as cost reduction, efficiency and improved performance. Futhermore, a campaign for Sustainable Materials Management (SMM) is been recognised for sustainable solid waste management. It is the use and reuse of materials across their entire life cycle, which conserves resources, reduces waste and minimizes the environmental impacts of materials.

Proper Solid Waste Disposal and Environmental Health

Hazardous wastes that are not properly disposed of can leak and contaminate soil and water, which can lead to issues with both the environment and human health. Burning the wrong types of waste can release gases into the atmosphere. When waste is properly discarded, special liners are use to prevent toxic chemicals from leaking out and precautions are taken so that any methane related to burning trash is safely contained.

When waste is properly disposed, it helps to prevent additional pollution, which can improve public health. Proper management of solid waste usually has the goal of disease prevention, sustenance of healthy environment (Ikemike, 2015) polluted air increases the risk of respiratory illness, and waste that is properly disposed of has a lesser chance of getting into the water supply and causing illness. Contrary to these, it is conducive for the spread of diseases. The more important diseases in this category are dysentery (amoebic and bacillary), typhoid fever, cholera, plague, endemic typhus, and infectious hepatitis (Fewtrell, 2005).

The effects of improper waste disposal however include effects to our climate, air pollution, soil contamination and human health impacts; all these from the pest and Insects such as flies, mosquitoes and rats that carry bacteria comes from dirty sources (WHO-UNICEF, 2005). It also postulated that, effective solid waste management can enhance the living standard of communities and enhance economic growth (Edward *et al* 2017), thus, government should employ, train and empower unemployed youths to reduce the rate of unemployment in Nigeria. While for a sustainable development in Nigeria, it requires efficient management of solid waste, hence a degraded environment cannot sustain a continued growth (Chukwuemeka, 2012).

Measurement of Solid Waste Volume

Investigation on amount of municipal wastes means a series of data collection simultaneously, including quantities of solid waste generated, separated for recycling, and collected for further processing or disposal. The principal reason for measuring these is to obtain data that can be use to develop and implement effective solid waste management program. Different methods and units are use to quantify solid waste quantities (Adebola *et al* 2013).

According to Adebola, et.al (2013) it is necessary to estimate the quantities of solid waste been generated within a community. Estimates are usually base on the amount of waste generated per person per day (kg/person/d). Thus, 0.7-1.8 kg per capita per day of waste is been generated in urban area of developed countries while in the case of developing countries it is 0.4-0.9 kg per capita per day and it depends on the population, income per capita and general economic growth (WB, 1992).

Never the less, the World Bank's Solid Waste Management Brief of September 20, 2018 shows, the rising rate of waste generation of 2.01 billion tonnes amounting to a footprint of 0.74 kilograms per person per day in 2016. While, with rapid population growth and urbanization, annual waste generation is to increase by 70% levels to 3.40 billion tonnes in 2050.

Within Nigerian metropolis, Ogwueleka (2009), reported waste density ranged of 280 to 370 kg/m3 with the waste generation rates ranged of 0.44 to 0.66 kg/capita/day with common constraints such as insufficient financial resources, absence of bylaws and standards, lack of institutional arrangement, insufficient information on quantity and composition of waste, inappropriate technology and inflexible work schedules. On contrary to this, Stanley *et al* (2012), findings shows 2kg/household/day as average waste generated in typical community of Nigeria. Thus, most of these wastes were not properly disposed rather than end up in drains, ditches and empty spaces. Kwetey *et al*. (2014), observed the unwillingness of household to pay for improved waste management service due to lack of legislations on illicit burning, open dumping of waste and lack of waste collection containers to receive refuse. Thus, Adequate and proper integration of the informal sector waste management into the solid waste management policies can promotes dialogue and lead to sustainable management practices and poverty alleviation (Martin O. A., 2012).

II. METHODOLOGY

To achieve the set objectives of this study research design utilized for the study was field survey using checklist for data collection through convenience sampling procedure. It aimed at assessing and proffering measures put in place to ensure effective solid waste disposal in Samaru community of Sabon Gari local government of Kaduna state. According to Health Department of the local government Secretariat, the population of household in the study area is three thousand five hundred (3500). This comprises commercial, institutional and residential houses in Samaru community. The study area, divided into five clusters; Aminu Tinau road, Habibu Street, Market road, Sarkin Pawa and Danraka Estate with each receiving a proportionate number of houses for the administration of an instrument.

To have the exact proportion for the sample, a sample size table was used to arrived at a total of three hundred and fifty (350) sample size is obtained from sample frame within the

confidence level of 95% and a margin error of 5.0%. Data analysis was with statistical package for the social science (SPSS) to carry out simple descriptive statistical analysis such as mean, percentage and frequency. Results obtained were therefore present in the Tables.

III. RESULT AND DISCUSSION

Data from the survey established that majority of the buildings in the community are residential houses across all the clusters as shown in Table 1. It deduce that, only 2.6% are institutional with Danraka estate having almost the 50% while commercial are fairly represented with same Danraka estate constituting 50% of the occupancy type.

Table 1: Type of Occupancy in the Community

S/N	Clusters	Residential	Commercial	Institutional
1	Market road	82	9	2
2	Aminu tunau	50	4	3
3	Abibu steet	76	7	0
4	Sarkin pawa	61	3	1
5	Danraka estate	21	27	4
	Total Percent (%)	291 83.1	50 14.3	9 2.6

Results shows that, from all the clusters 45.4% of the houses has rubbish type of waste with 44.0% of garbage and 10.6% of ash. Thus, the survey established that majority of solid waste generated in the community constitute rubbish and garbage.

Table 2: The Sources of Waste Generation

S/N	Sources	Frequency(No)	Percent (%)
1.	Kitchen	188	53.7
2.	Dinning	55	15.7
3.	Sitting/bedroom	59	16.9
4.	Toilet	9	2.6
5.	Others	39	11.1
	Total	350	100.0

Different sources that generate waste are were assessed and result is presented in Table 2. It shows that 53.7% of solid waste is from the kitchen as such more attention is required there to provide sustainable means of collection, storage and disposal. However, major compositions of the waste in house are usually from different forms depending on the types and occupancy of the building. Thus, Table 3 present the different types of composition as assessed.

Table 3: Major Composition of Solid Waste been Generated

S/N	Composition	Frequency(No)	Percent (%)
1.	Paper	111	31.7
2.	Plastic	21	6.0
3.	Food item	139	39.7
4.	Cloth/fabric	11	3.1
5.	Polythene	67	19.1
6.	Scrap metal	1	0.3
	Total	350	100.0

Table 3 has 39.7% of the solid waste comprises of food items and closely followed with 31.7% of paper related waste. It is therefore in line with Stanley et al (2012), where cloth/fabric and plastic has percentage frequency as 19.82% and 8.1% respectively. This called for assessing the types of dustbin use for the collection of waste in the community and result has 34.9% of plastic container and 30.9% of basket based on the nature of the composition for adequate storage and evacuation. However, other assessment has 38.6% of the houses using polythene bags and 19.7% uses wheelbarrow for storage and evacuation and details are as presented in Table 4.

Table 4: Type of Tool Used for Storage of Solid Waste

S/N	Type of tools	Frequency (No)	Percent (%)
1.	Paladin	54	15.4
2.	Metal barrel	91	26.0
3.	Polythene bags	135	38.6
4.	Wheelbarrow	69	19.7
	Total	350	100.0

In addition, 42.6% use off site collection service, 38.6% use backyard collection, 9.7% use alley and 9.1% use cud side. Thus, off side and backyard alley methods are common in the community. Furthermore, 65.7% of the population agreed that on the two methods of collections is effective, though more improvement that is effective should be encourage to the community through house-to-house campaign.

Table 5: Solid Waste Handling Characteristics

S/N	Handling characteristic	Frequency(No)	Percent (%)
1.	Segregation & storage	77	22.0
2.	Segregation & reused	95	27.1
3.	Disposal	178	50.9
	Total	350	100.0

However, other handling characteristic of solid waste disposal that enhances more sustainable disposal with an economic gain was assess and presented in Table 5. It has segregation & reuse (27.1%) and segregation & storage (22.0%) perceived as a more appropriate handling process.

Table 6: Solid Waste Quantity Generated in the community (kg/house/day)

S/N	Clusters	Residential	Commercial	Institution
1	Market road	1.08	4.04	2.50
2	Aminu tunau road	1.26	2.40	2.33
3	Abibu street	1.39	1.44	0.00
4	Sarkin pawa street	1.38	1.73	0.75
5	Danraka estate	1.44	1.27	2.08
	Average	**1.30**	**2.10**	**1.53**

Table 4.11 shows that, the quantity of waste generated 2.10kg/house/day in commercial buildings is higher than the remaining and generally below 2.6kg/day as obtained by Sado (2015) being the average weight in academic area. This has to do with high concentrations of restaurants that generate more waste from food items and more seen in the Market road. However, within a decade there is about 100% increase in the waste generation rates when compared with Ogwueleka (2009), range of 0.44 to 0.66 kg/capita/day in Nigeria. While Table 4.12 describe the frequencies of periods in which disposal are been carried out.

Table 4.12 How often solid waste is disposed			
S/N Periods	Frequency (No)	Percent (%)	Valid Percent
1. Daily	195	55.7	55.7
2. Weekly	150	42.9	42.9
3. Monthly	3	0.9	0.9
Total	350	100.0	100.0

Generally, 55.7% of the houses disposed daily and 42.9% disposed weekly and differs with Sado (2015) that is up to 77.7% daily though in academic aria. While, 52.3% of the waste is degradable which is less than 87.39% as obtained by Stanley *et.al* (2012) with also 75.7% of the population are of the opinion that waste been generated are non-reusable contrary to Staley *et.al* (2012) that has only 38.74%.

Table 7: Other Methods of Waste Disposal

S/N	Methods	Frequency (No)	Percent (%)
1.	Burning immediately	118	33.7
2.	Incineration	6	1.7
3.	Open space/bin	111	31.7
4.	Pay for	115	32.9
	Total	**350**	**100.0**

Other methods of disposal as in Table 7 were assessing and traditional methods are common such as air space burning and open space dust sites due to economic standard and development. Results is in agreement with Mudiare, (2015) where about 72% of the household practice open burning and dumping as domestic solid waste management strategy. However, very few houses uses incineration methods with about 32.9% uses pay for methods for onward disposal to off site. In addition, the results in terms of percentages of frequencies does no differ from what Sado (2015) obtained in open space dumps and burning as 33.3% and 22.2% respectively

Table 8: The Economic Perception on the Value of Waste

S/N	Perceptions	Frequency (No)	Percent (%)
1.	Feed for animal	71	20.3
2.	Farm manual	45	12.9
3.	Recycle/reuse	72	20.6
4.	No benefit	162	46.3
	Total	**350**	**100.0**

Economic value of the waste is also perceived and about 46.3% has no idea as presented in Table 8, and it may as result of like of awareness. While, recycling and reuse is getting more awareness as there is up to 20.6% of the respondent perceived value. While is comparatively good compare to its benefit in animal feed and farm manual, though depends on the types of waste which in this case study 53.7% is from the kitchen and it also constitute up to 83.1% of residential occupancy type. Thus, this 46.3% of non-benefit is a confirmation of what Kwetey et al (2014) postulated that, household socio-economic characteristics; education and income have no significant influence in willingness to pay for improved waste service.

IV. CONCLUSION

A study on an appraisal of solid waste disposal was carryout and the findings shows the major occupants in the community to made up of 83.1% residential, 14.3% commercial and 2.6% institutional. In addition, the solid waste been generated in the community is majorly rubbish (45.4%) and garbage (44.0 %,). The generated solid waste is usually from the kitchen with 53.7%, which comprises of 39.7% of the food items mostly using plastic container(35.0%) and polythene bags (38.6%) for storage. The average solid waste generated daily in the community is 490kg and uses off site method of disposal with 52.3% degradable and 75.7% of non-reusable. Thus, recycling and reuse is getting more awareness as there is up to 20.6% of the respondent perceiving its value.

It is therefore evident that, the present method and way of solid waste disposal at Samaru community Zaria is inadequate. There is a need to adopt an improved technique towards effective solid waste disposal systems to achieve sustainable environment for enormous benefit. Waste collection point is recommended and be known to everyone in the streets with a sustainable designed frequency. Orientation

and other advocacy on solid waste management in the built environment are also encourage for pollution free environment.

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