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SOLID WASTE MANAGEMENT: A CASE OF ABAJI CITY, ABUJA, NIGERIA

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ABSTRACT

Municipal solid waste (MSW) management infrastructure is critical for City liveability. Cities without efficient MSW management infrastructure will be bedevilled with untidy environment. Cities at the periphery metropolitan areas face neglect on solid waste management. Abaji City in the Federal Capital Territory Abuja has been in the media for awhile as one of those cities facing neglect on solid waste management. Also, researchers focus more on the metropolitan areas creating research gap on the cities at edge. It is against this background, this study examined the state of municipal solid waste management in Abaji City, Nigeria. The objectives are to find out domestic waste management in the households, and to uncover general waste management in the study area. The methodology adopted in this study includes questionnaire survey and document analysis of media archives. The primary data used for this study came from questionnaires administered on randomly selected residents in the two zones of the study area. Out of 200 questionnaires distributed, 105 questionnaires were completely answered and returned thus form the basis of analysis for the survey. The secondary data utilized came from observations and media document analysis. Descriptive statistics and interpretative discourse approach were used to deduce conclusions. The study findings revealed a poor state of MSW management infrastructure with numbers of issues causing failure in the system, which includes lack of funds, lack of private sector participation and residents' insensitivity to waste management in their environment. The study recommends among others adequate funding for MSW management, stakeholders' participatory approach and selection of best suited waste treatment practise that is based on research.

Keywords: Municipal Solid Waste, Waste Infrastructure, Waste Management

INTRODUCTION

Abaji City in the Federal Capital Territory Abuja has been in the media for two years as one of those cities facing neglect on solid waste management. Waste is unavoidable as human activities exist daily. Waste generation could be domestic, commercial or industrial in nature; its composition could be hazardous and non-hazardous. However, waste disposal has become a global problem due to ineffectiveness in the management of various wastes generated worldwide. As a result, solid waste constitutes a major environmental problem in the cities around the globe. Solid waste generation depends on the socio-economic characteristics of the city dwellers (Luis *et al.*, 2005) which invariably depend on the status of the country as developed or developing. However, estimates have shown that about 1.3 billion tonnes of solid waste are generated yearly in the cities worldwide. This is expected to increase to 2.2 billion tonnes by the year 2025 (World Bank, 2012; UNEP, 2013). Untreated Solid waste impacted negatively on the urban environment and the impact on the global scale is fast growing such as the greenhouse gases (GHG). Apart from GHG, cities in different countries suffer air pollution, water pollution, flooding and these impacts on human health (World Bank, 2012). In the aforementioned, Nigeria cities are no exception as reports showed the federal government of Nigeria spend 10 billion Naira annually to combat environmental problems of which water contamination

from uncollected indiscriminate waste disposal puts the lives of 40 million Nigerians at risk (UN-Habitat, 2010). The disposal and management of solid waste in our cities appeared the most intractable environmental problems in Nigeria. Dumping of solid waste in an open space is common in the developing countries like Nigeria; the consequence is not only on the contamination of water bodies, but also pose some hazard risks such as flooding, outbreak of diseases and in some countries has lead to landslides due to long time dumping without evacuation/ treatment. This study, therefore investigates the management of solid waste in Abaji City of Abaji Area Council, Federal Capital Territory, Nigeria. This study is guided by the following research objectives;

1. To find out domestic waste management in the households of the study area.
2. To find out the issues and challenges militating against proper waste management in the study area.
3. To suggest appropriate solid waste management practices suitable for the study area.

LITERATURE REVIEW

Solid waste is defined as discarded non-liquid materials from households, industrial and commercial establishments, institutions, and streets, which do not have value any more in the eyes of the holders (UWEP, 1996). Waste components vary based on place of generation and the season in which the waste is generated. Solid waste according to the source could be domestic, commercial and institutional waste, and based on the type it could be hazardous or non-hazardous (PEARL, 2015). Established literatures regarded solid waste from households as municipal solid waste (MSW). For example, the EU's Landfill Directive defines municipal solid waste as, "waste from households, as well as other waste which, because of its nature or composition, is similar to waste from households" (OECD, 2013). Furthermore, according to World bank (2012), the intergovernmental panel on climate change (IPCC) sees MSW to include; food waste, garden (yard) and park waste, paper and cardboard, wood, textiles, nappies (disposable diapers), rubber and leather, plastic, metal, glass and others (e.g. Ash, dirt, dust, soil, electronic waste). However, extant literatures have shown that waste is inevitable and complete prevention of waste seems impossible. Hence, responsible waste management practices must be searched. Globally, most noticeable practical ways of managing waste can be seen in Figure 1.

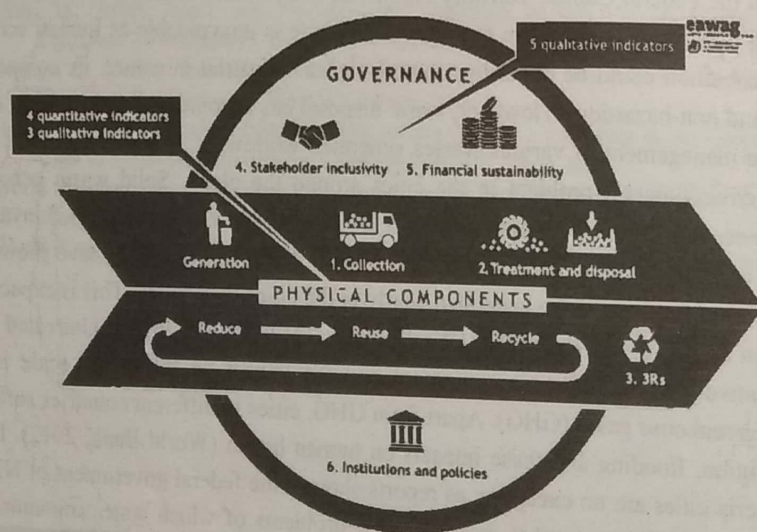


Figure 1: Solid Waste Management Framework (Source: Rodic, 2016)

From the Figure 1, the value chain of solid waste management falls within the ambit of two important components which is physical (generation, collection, treatment and disposal) and governance (stakeholders, policies and financial sustainability). In view of the above, the expositions of the components are revealed as follows:

Generation: waste generation varies as a function of affluence, however, regional and country variations can be significant. For instance, sub-Saharan Africa is reported generating about 62 million tonnes of wastes annually compared to 270 million tonnes of wastes generated on annual basis in the East Asian and the Pacific Region where China as a country contributed about 189 million tonnes yearly (World Bank, 2012). Undoubtedly, the sources and types of waste generated is essential in the evaluation of composition and generation rates of MSW in a community and are related to residential (domestic) e.g. food waste, textiles, leather, ashes, yard waste; commercial / industrial premises e.g. paper, cardboard, wood etc. (Yuan, 2000).

Collection: waste collection services come in different forms depending on the locality and level of technical knowhow. These services could be delivered by the formal sector (Public or Private sector operators), or by informal sector (e.g. by the community, community based organizations (CBOs), non-governmental organizations (NGOs) or micro- and small enterprises) (UNEP, 2015). However, adoption of any forms of waste collection services depends on the legislations of the municipality, regional and country at large. The effectiveness and efficiency of such waste collection services will depend on the waste management arrangement, facilities available and level of area coverage. Evidence from literature suggests this has been an intractable task in the African region such that MSW collection rate stood at 46% compared to 65% and 98% collection rates in the South Asian and OCED region respectively (World Bank, 2012; UNEP, 2015). In consideration of MSW collection, World Bank (2012) categorised collection methods as:

(a). **House-to-House:** waste is collected from house to house refuse bins by waste collectors which takes different forms in different country. For example; in India, waste collectors go from house to house e.g. with tricycle therefore making it possible for most inner city especially not motorable to have their waste collected (PEARL, 2015). Typical of house to house waste collection in Nigeria is trucks collecting wastes move from house to house regularly and deposit waste collected to designated disposal site.

(b). **Community Bins:** In this case households in the community/neighbourhood placed their refuse in the designated community bins. Thereafter, the waste is transported by the municipality, or its' designate as schedule.

(c). **Curb-side Pick-up:** Homeowners are responsible for placing the containers to be emptied at the curb (road side) on collection day and for returning the empty containers back to their houses (Tadesse, 2004).

(d). **Self Delivered:** waste generators delivered their wastes to disposal sites or transfer stations or hire third-party operators.

(e). **Contracted or Delegated Service:** Especially of commercial or industrial premises hire firms (or municipality with municipal facilities) who collect wastes on schedules based on agreed charges with the customers. Municipalities often license private operators and may designate collection areas to encourage collection efficiencies.

Treatment and Disposal: waste treatment and the final disposal of it are crucial in the waste management life-cycle. The two major dimensions to waste(s) treatment are; waste characteristics (economic value) and technology availability (Wilson *et al.*, 2015). Thus, Waste is considered as resource(s) inherent with some economic values which need to be processed, transformed and managed. The processing by way of sorting based on waste characteristics will bring more desire of the 3'Rs (that is, reduce, reuse and recycle). The advocates of the 3'Rs which is considered as waste management hierarchy (Peng *et al.*, 1997; Wolsink, 2010) suggests that waste should be reduced from

source where it cannot be totally avoided, next action is to reuse the used items or materials where it is practicable such as construction waste and for waste that cannot be reused, effort should be directed to sort out for recycling purpose (Nagapan et al., 2013). This will reduce the waste that goes for final disposal. However, the success of the waste management hierarchy will depend on the full participation of all relevant stakeholders (stakeholder inclusivity). The stakeholders must be included in the planning, policy formulation and implementation processes. This is core for the institutions and policies effectiveness (Topic and Biedermann, 2015). Also, very important component of the waste management life-cycle is the financial sustainability (Rodic, 2016). Topic and Biedermann (2015) opined that without direct economic benefits, investment and subsidies, the waste management system rarely sustainable.

METHODOLOGY

This study draws on primary and secondary data. The primary data were collected through survey questionnaire which was part of a larger study on housing quality in the study area by the author. It is basically to assess the residents' methods of managing their waste and waste disposal. On the other hand, the secondary data were obtained through observations (photographs) and discourse analysis of national newspapers in the country that published on waste management issues especially related to the study area. In obtaining quantitative data, the questionnaires were administered in the major parts of Abaji City, which was divided into zone of traditional and non-traditional residence. However, it covers Abaji central area, Senior and Junior quarters, Pipeline area and Abbattior area. In total 200 questionnaires were administered and only 105 (53%) questionnaires were returned fully answered. Thus, data were analyzed with the Statistical Package for Social Sciences (SPSS software version 22.0) and results were presented in tables, descriptive statements and inferences were drawn.

RESULTS AND DISCUSSIONS

Respondents' Socio-economic attributes

Table 1: Education level and Occupation of the respondents (% in Parenthesis)

Education Level	Occupation				Total
	Self employed	Government employee	Private sector employee	Unemployed	
Primary education	6 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	6 (5.71)
Secondary education	9 (30.0)	6 (10.53)	3 (37.50)	1 (10.0)	19 (18.10)
Tertiary education	5 (16.67)	51 (89.47)	5 (62.50)	4 (40.0)	65 (61.90)
No Education	10 (33.33)	0 (0.0)	0 (0.0)	5 (50.0)	15 (14.29)
Total	30 (28.57)	57 (54.29)	8 (7.6)	10 (9.5)	105 (100)

Table 1 shows that 28.57%, 54.29%, 7.6% and 9.5% of the respondents are self-employed, government employee, private employee and unemployed respectively. Observations showed that those respondents with primary school education are self-employed and those with no education about 33% of them are self-employed while the rest are unemployed. As for those with secondary education, substantial numbers of them works with private sector 37.50%, 10.53% were government employees and 30% of them are self-employed. On the other hand, respondents with tertiary education constitute

89.47% of the government employees, 62.50% of the private sector employees, 16.67% are self-employed and substantially constitute 40% of the unemployed. Overall, it is revealed that 61.90% of the respondents had tertiary education, 18.10% had secondary education and 5.71% had primary education while 14.29% had no formal education.

Table 2: Occupation and Monthly income level of the respondents (% in Parenthesis)

Occupation	Monthly income level					Total
	Less than N50,000.00	N51,000.00 - N100,000.00	N101,000.00 - N150,000.00	N151,000.00 - N200,000.00	N201,000.00 and above	
Self employed	12 (29.27)	8 (25.81)	5 (29.41)	3 (33.33)	2 (28.57)	30 (28.57)
Government employee	17 (41.46)	20 (64.52)	9 (52.94)	6 (66.67)	5 (71.43)	57 (54.29)
Private sector employee	2 (4.88)	3 (9.68)	3 (17.65)	0 (0.0)	0 (0.0)	8 (7.62)
Unemployed	10 (24.39)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	10 (9.52)
Total	41 (39.05)	31 (29.52)	17 (16.19)	9 (8.57)	7 (6.67)	105 (100)

Table 2 shows that 39.05% earned less than N50, 000.00 monthly, 29.52% earned between N51,000.00 -N100,000.00 while 16.19% earned between N101,000.00 - N150,000.00 and the remaining respondents constitute about 15% earned N151,000.00 and above on a monthly basis. Noticeably, private sector employees earned less than N151, 000.00 and above in the whole, while government employees constitutes highest paid in the whole.

Table 3: Housing area and Household Monthly income of the respondents (% in Parenthesis)

area	Housing	Household Monthly income				Total	
		Less than N50,000.00	N51,000.00 to N100,000.00	N101,000.00 to N150,000.00	N151,000.00 to N200,000.00		N201,000.00 and above
Non-traditional residence		11 (26.83)	22 (70.97)	15 (88.24)	9 (100.0)	7 (100.0)	64 (60.95)
Traditional residence		30 (73.17)	9 (29.03)	2 (11.76)	0 (0.0)	0 (0.0)	41 (39.05)
Total		41 (39.05)	31 (29.52)	17 (16.19)	9 (8.57)	7 (6.67)	105 (100)

Table 3 revealed the dichotomy of the study areas which shows that the highly paid respondents reside in non-traditional area (see income above N150, 000.00). While the respondents from the core area (Traditional residence area), constitutes majority 73.17% earning less than N50, 000.00 monthly. This implies that the core area (Traditional residence area) represent the low-income area, while non-traditional residence area represent high-income area.

Table 4 : Housing area and Waste storage in the house of the respondents (% in Parenthesis)

Housing area	Waste storage in the house				Total
	Metal Dustbin	Basket	Plastic Bucket	Nylon	
Non-traditional residence	18 (46.15)	4 (44.44)	12 (37.5)	22 (88)	56 (53.33)
Traditional residence	21 (53.85)	5 (55.56)	20 (62.5)	3 (12)	49 (46.67)
Total	39 (37.14)	9 (8.57)	32 (30.48)	25 (23.81)	105 (100)

Table 4 shows the methods of waste storage in the respondents' respective houses before final disposal. In both zones, metal dustbin and plastic bucket are highly used, this constitutes 37.14% and 30.48% respectively. Observation during the survey shows that the metal dustbins are actually condemned metal buckets and this goes for plastic buckets. For example, see Figure 2 for a plastic bucket waste storage in one of the compounds visited in the traditional residence zone. On the other hand, there is high use of nylon in the non-traditional residence area. This could mean that generation of waste in this area is less compared to the core area, although this was not measured as it is not within the scope of the study.

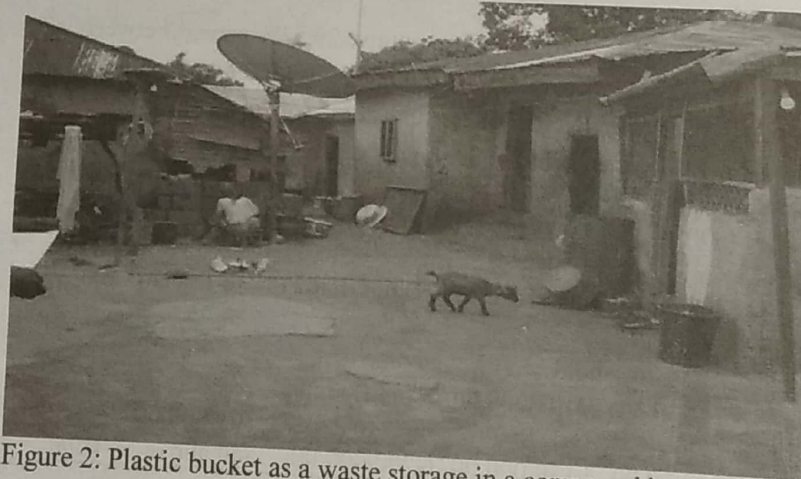


Figure 2: Plastic bucket as a waste storage in a compound house at Abaji

Table 5: Housing area and Waste disposal (% in Parenthesis)

Housing area	Waste disposal				Total
	Designated govt refuse disposal	Nearby bush/open space	Burning	Private firms	
Non-traditional residence	28 (56.0)	20 (45.45)	8 (72.73)	0 (0.0)	56 (53.33)
Traditional residence	22 (44.0)	24 (54.55)	3 (27.27)	0 (0.0)	49 (46.67)
Total	50 (47.62)	44 (41.90)	11 (10.48)	0 (0.0)	105 (100)

Table 5 shows how the respondents finally disposed off their wastes. It shows that 47.62% dumped their refuse in the government designated refuse depot. Such depot was found in the neighbourhood of traditional residence during reconnaissance survey conducted in the area (see Figure 3). On the other hand, dumping of waste in the nearby bush/open space is high given a 41.90% cut across the two zones. An open space dumping site in the neighbourhood of non-traditional residence was sighted as depicts in Figure 4. Also, about 10.48% in both zones indulge in burning of their waste. Surprisingly, there is no presence of private firm(s) in the management of waste in the whole city.



Figure 3: Government refuse depot Angwa Abaji



Figure 4: Open space dump at senior quarters liman Abaji

DISCOURSE ANALYSIS OF REFUSE DISPOSAL IN THE FCT

The discourse analysis is a qualitative data assessment of talks or texts through which people accounts for their social world. In this context, interviews conducted and recorded or documented such as Newspapers or government documents in the area of subject matter and the study area became imperative. Therefore, opinions of stakeholders were observed in the National newspapers in the country to triangulate data results from quantitative method. The poor state of solid waste management services in Abaji City and its environs as being noted by some notable national newspapers in the country. Such newspapers are analyzed and findings were reported.

For example, Daily Trust Newspaper of November 17, 2015 had reported waste management debacle in Abaji and Kuje Area Councils of Federal Capital Territory (FCT). As Abaji is the focus of this paper, the excerpt from the news revealed as thus;

"... The newspaper correspondent reported that refuse had littered most parts of Abaji City and the refuse heaps became scavengers work station..."

The above aptly described the situation in Abaji City. This corroborates the result of the survey which shows about 41.90% of the residents dumped their waste in the open/unauthorized site thereby littering the whole city.

In the same paper (Daily Trust Newspaper of November 17, 2015), it was reported that;

"...Residents that spoke to the reporter lamented the blockage of water drainages, and as a result, flooding became a season disaster in the city..."

The blockage of drainages in Abaji City was reported in the study carried out by Sule (2013) and recommended that wastes in the drainages should be evacuated to prevent future flooding during raining season.

Figure 5 is an example of street taken over by refuse in Abaji. This shows the level of environmental sanitation in the City. The situation has caused flooding in some part of the City.



Figure 5: A refuse dump near First Bank office in Abaji (Source: Daily Trust newspaper, 2015)

Daily Trust Newspaper of November 17, 2015 also reports;

"... an official of the environmental unit of Abaji area council affirm their mobilization of street sweepers for the evacuation of refuse in the designated places. However the official advocate for collective efforts for sanitation in the City..."

From the statement above, it implies that the council itself lacks capacity in the waste management if council only mobilize sweepers every three weeks. This confirms why the city is littered with refuse, such operation from the council cannot be said to be effective hence the stinking situation of the environment.

Furthermore, the council official said *"...the council was still waiting to get some funds from the FCDA in order to commence the evacuation of the refuse..."*

The above shows that the council faced difficulty in financing waste management in its area of jurisdiction. In addition excerpt from the council official statement revealed the dilemma of waste management in the council where waste generators are not charge for any fees.

In the recent past, another national newspaper had reported that;

"there is lack of synergy between the authorities of Federal Capital Territory Administration (FCTA) and Councils in the territory over who is saddle with responsibility of the evacuation of refuse in the councils. Whereas some council officials have blamed the FCT Administration for non-evacuation of refuse in the area councils, the administration has insisted that it is the constitutional responsibility of the councils to clean up the environment within their respective domains". (LEADERSHIP Newspaper, September 6, 2016)

It can be deduced from the statement above that there is a problem of political jurisdiction in relation to waste management in the FCT. This might have contributed to the underperformance of the councils in the FCT to tackle waste management in their domains.

On the annual flooding;

“...the current chairman of Abaji area council (Abulrahman Ajiya) visited the flooded areas and noted that environmental sanitation in the communities is poor, because most people in the areas have contributed in no positive way to the blockage of channels that would have prevented the flood”. (LEADERSHIP Newspaper, September 6, 2016)

The above shows the insensitivity of the residents of Abaji to the health implication of untidy environment as evidence from their indiscriminate refuse dump.

CONCLUSION AND RECOMMENDATIONS

This study has shown from all the analysis above that there is improper waste disposal in the study area. Despite the dichotomy of the study area which reflects low and high-income areas, the study revealed no significant differences in their waste disposal behaviour (see Table 5). The management of the solid waste in the area is characterized with inappropriate and inefficient waste collection method as government solely responsible for the task in the cleaning up of the environment which is inconsistently done every 3 weeks. The underperformance of the municipal council in the area of waste management could not be exonerated from the political jurisdiction responsibility face-off between the FCTA and local councils. However, the FCTA agency responsible for solid waste management in the entire FCT, Abuja Environmental Protection Board (AEPB) has limited its operations to the main Abuja Metropolitan districts leaving the peri-urban cities like Abaji without regional board in the area. Notwithstanding, the feud between the FCTA and the councils, what is known all over the world is municipal councils are responsible for municipal solid waste management in their jurisdiction. However, evidence from reports analyses shows that the Abaji area council lacks financial, human resources and technical know-how to manage solid wastes in the city. Another finding of this study is the lack of private firm/sector involvement in the management of waste in the area council. Respondents' responses indicate non-existence of private firms dealing with waste collection and management in their vicinity (see Table 5). Above and beyond, the indiscriminate dumping of wastes in the city have resulted in flooding disaster in some areas of the council as documented by Daily Trust and Leadership newspapers in 2015 and 2016 respectively. In view of the above findings, the following recommendations are proffer:

There is need for concerted efforts on the part of the council to provide guidance to the residents in the area through various means to enlighten them on the need to live a healthy life by properly managing their waste and not to dump their waste in unauthorized dumping sites. Such enlightenment could be through local media like Abaji FM radio, organise seminars in the area council by the environmental department of Abaji area council and communiqué after seminars should have leaflets shared to the residents through ward councillors.

Stakeholders' inclusiveness in the planning, policy formulation and implementation processes is critical for institutions and policies effectiveness. Stakeholders who include the residents, private sectors, NGOs and the government agency must work together to have a strong sustainable solid waste management. This will foster partnership in solid waste management and bring efficiency and effectiveness in the collection, treatment and final disposal of wastes.

However, waste management goes beyond collection and transport for landfill as commonly practised in the most of the municipalities in the country. This calls for looking inward into best waste treatment methods as the world as embraced 3Rs (Reduce, reuse and recycle). In view of this, there is need for government to embrace modern way of treating waste that has economic value such as

composting of organic wastes which several reports have shown constitutes highest percentage of waste generated in the country. On composting research has been conducted on technological and technical know-how locally by (Adewumi et al., 2005). Other possible MSW treatment that has economic value is gasification for exposition see (Anyaegbunam, 2013). It is high time government collaborate with experts in the research institutions to find practical solutions which are research based.

Above all, funding is critical for successful MSW management. Without sustainable funding, MSW management rarely succeed. It is important that government appropriate adequate funding for MSW management however, mechanism for charging waste generators affordable fee must be put in place at least for sustainable running cost

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