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Studies on Solid Waste Disposal and Management Methods in Makurdi and its Environs North Central Nigeria

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Studies on Solid Waste Disposal and Management Methods in Makurdi and its Environs North Central Nigeria

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ABSTRACT

Studies were carried out on the waste disposal and management methods in Makurdi metropolis and its environs in North Central Nigeria. Face to face structured interviews, visitations, observations and review of secondary data were applied in the study. The entire capital city and its environs were divided into seven units for ease of accessibility and data gathering. The result revealed that people living within Makurdi Metropolis (North Bank, Wurukum, Highlevel, Wadata, and Modern Market) possessed waste containers for collection of waste generated in their homes/shops but the methods of disposal were questionable. The waste was either littered on streets, gutters, undeveloped plots, or dumped into rivers and streams by people living close to streams and River Benue who use them as dumpsites. There is also the practice of dumping the waste at the government agency collection points without any form of sorting. Whereas people living around Makurdi Environs (Apir and Airforce Base Area) mostly adopted pit burning technique where waste is swept into and burned. The knowledge of people living within Makurdi and its environs of integrated solid waste management (sorting of waste, reducing, reusing and recycling) is very low. The services rendered by waste managers; BENSESA and some accredited Private Waste Managers were unsatisfactory as a result of poor service coverage and improper management methods adopted. The waste handlers only engage in relocation of wastes. This, they attributed to inadequate machinery and staff. Practically there is no engineered landfill available for solid waste management in Makurdi and its environs. The implications of these findings to environmental health are enormous and is strongly advocated that necessary organs/public institutions responsible should make deliberate and consistent efforts to address these anomalies.

Keywords: Solid waste, Management, BENSESA, Private Waste Managers, Landfill, Dumpsites.

INTRODUCTION

Solid waste means unwanted materials or substances that are left or discarded after use, also included are by-products of process lines or materials that may be required by law to be disposed of (Okecha, 2000). Solid waste management is explained as that discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics and other environmental considerations and that is also responsive to public attitude (Tchobanoglous *et al.*, 1993).

Solid waste can be classified in a number of ways, on the basis of source, environmental risks, utility and physical property. On the basis of source which is commonly used, solid wastes are classified as: municipal solid wastes, industrial solid wastes, agricultural solid wastes, mining and mineral wastes, construction and demolition wastes, healthcare wastes, radioactive (Nuclear) wastes, human and animal wastes (Omofonmwan & Esegibe, 2009). The generation of solid waste from household, industries, markets, abattoir and shops result in improving the standard of living of the inhabitants.

Isu (2005) noted that 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. Improper management of waste have resulted in public health issues in other countries. Bubonic plague in Europe during 14th century was due to mountain garbage in the cities which resulted to 30% increase in the population of rats. Indiscriminate solid waste disposal is actually a menace and embarrassment to the nation where heaps of refuse litter most parts of the city (Isu, 2005). Considerable percentage of urban waste in developing countries is deposited either on the roads, or road sides, unapproved dump sites, in water ways, drainage system, or in open sites which adversely affect environmental friendliness. In fact, solid waste poses various threats to public health and adversely affects flora and fauna as well as the environment especially when it is not appropriately collected and disposed (Gerald, 1995). However, whenever approved solid waste dump site is used there is no guarantee

that wastes are appropriately disposed because of continuous expansion of the site. Thus, the adjacent areas including high ways, farmlands, forest plantation, etc. are encroached upon which has a toll on biodiversity conservation (Hardy and Seatterwaite, 1992).

The main Objective of this study is to look at Solid Waste disposal and Management Methods adopted by residents of Makurdi metropolis and Environs North central Nigeria.

MATERIALS AND METHODS

Study Area

Makurdi the capital of Benue State is located along River Benue with coordinates as 7°43'50"N and 8°32'10"E with an estimated population of over 500,000 as at 2007 (NPC 2006) and still growing. Average annual temperature 31°C with SW wind at 10km/hr and relative humidity of 66% annually.

Sampling Sites

Benue State Environmental Sanitation Authority (BENSESA), some registered/accredited private waste handlers, others areas include: North Bank, Wurukum, High-level, Wadata, Modern Market, Apir and Air force Base area all in Makurdi and Environs.

Sample Size

A total of 384 persons were sampled (using sample size calculator by Research System Survey software) and Waste Management groups (BENSESA and Private Waste handlers). These included management personnel of BENSESA and accredited private waste handlers

Materials

Face to face interviews, questionnaire, review of secondary data and personal visitation and observations by researchers were used. Modified after Blanche *et al.* (2006).

Methodology

Structured interviews, personal observation and review of secondary data were used to address the objectives of the study. The interview was conducted for Households, Business centres, private waste handlers and management staff of Benue State Environmental Sanitation Agency (BENSESA).

Data Collection

Primary data was collected through field investigation, face-to-face interviews, and review of secondary data.

RESULTS AND DISCUSSION

Table 1: Respondents by category and gender

Sex of Respondents	Type of Respondents			
	Waste Managers	Residents	Traders	Total
Male	22 (95.65)	175 (53.85)	21 (35.59)	218
Female	1 (4.35)	150 (46.15)	38 (64.41)	189
Total	23 (100)	325 (100)	59 (100)	407

Table 2: Use of Waste containers at Homes/Shops

Location	Possession of Waste Containers					
	Yes	Percent	No	Percent	Total (%)	
North Bank:						
Residents	34	85	4	15.00	40	100
Traders	18	90	2	10.00	20	100
Wurukum:						
Residents	37	92.50	3	7.50	40	100
Traders	18	90.00	2	10.00	20	100
Highlevel:						
Residents	38	95.00	2	5.00	40	100
Traders	20	100	-	-	20	100
Wadata:						
Residents	31	77.50	9	22.5	40	100
Traders	16	80.00	4	20.00	20	100
Modern Market:						
Residents	38	95.00	2	5.00	40	100
Traders	20	100	-	-	20	100
Apir:						
Residents	14	50.00	14	50.00	28	100
Traders	9	64.29	5	35.71	14	100
Bas						
Residents	20	71.43	8	28.57	28	100
Traders	11	78.57	3	21.43	14	100

Table 3: Waste Sorting

Location	Whether waste is sorted				Total
	Yes	Percent	No	Percent	
North Bank					
Residents	2	5.00	38	95.00	40
Traders	1	5.00	19	95.00	20
Wurukum					
Residents	7	17.50	33	82.50	40
Traders	3	15.00	17	85.00	20
Highlevel					
Residents	1	2.50	39	97.50	40
Traders	1	5.00	19	95.00	20
Wadata					
Residents	8	20.00	32	80.00	40
Traders	-	-	20	100	20
Modern Market					
Residents	5	12.50	35	87.50	40
Traders	-	-	20	(100)	20
Apir					
Residents	9	32.14	19	67.86	28
Traders	4	28.57	10	71.43	14
Base					
Residents	7	25.00	21	75.00	28
Traders	2	14.29	12	85.71	14

Table 4: Responses to whether it is possible to reduce on amount of waste generated

Location	Possible to reduce on amount of waste generated				Total
	Yes	Percent	No	Percent	
North Bank					
Residents	7	17.50	33	82.50	40
Traders	4	20.00	16	80.00	20
Wurukum					
Residents	5	12.50	35	87.50	40
Traders	2	10.00	18	90.00	20
Highlevel					
Residents	10	25.00	30	75.00	40
Traders	2	10.00	18	90.00	20
Wadata					
Residents	4	10.00	36	90.00	40
Traders	1	5.00	19	95.00	20
Modern Market					
Residents	9	22.50	31	77.50	40
Traders	5	25.00	15	75.00	20
Apir					
Residents	1	3.57	27	96.43	28
Traders	1	5.00	13	95.00	14
Base					
Residents	3	10.71	25	89.29	28
Traders	2	14.29	12	85.71	14

Table 5: Responses on where the waste is taken for disposal

Location	Where the waste is taken for disposal			
	Collection Centre (%)	Pit for Burning (%)	Landfill/Dumpsite (%)	Others (%)
NorthBank				
Residents	5 (12.5)	8 (20.0)	22 (55.0)	5 (12.5)
Traders	4 (20.0)	5 (25.0)	9 (45.0)	2 (10.0)
Wurukum				
Residents	11 (27.5)	9 (22.5)	18 (45.0)	2 (5.0)
Traders	3 (15.0)	5 (25.0)	11 (55.0)	1 (5.0)
Highlevel				
Residents	10 (25.0)	5 (12.5)	24 (60)	1 (2.5)
Traders	5 (25)	2 (10.0)	12 (60.0)	1 (5.0)
Wadata				
Residents	5 (12.5)	7 (17.5)	24 (60.0)	4 (10.0)
Traders	2 (10.0)	5 (25.0)	11 (55.0)	2 ((10.0)
M/Market				
Residents	8 (20.0)	11 (27.5)	23 (57.5)	1 (5.0)
Traders	4 (20.0)	5 (25.0)	9 (45.0)	2 (10.0)
Apir				
Residents	-	18 (64.29)	7 (25.00)	3 (10.71)
Traders	-	10 (71.43)	3 (21.43)	1 (7.14)
Base				
Residents	-	11 (39.29)	15 (53.57)	2 (7.14)
Traders	-	11 (78.57)	2 (14.29)	1 (7.14)

Table 6: Materials that need to be sorted for Recycling

Location	Hard Plastics (%)	Polythene (%)	Glass (%)	Papers (%)	Metals (%)
NorthBank					
Residents	8 (20.00)	7 (17.5)	4 (10.00)	3 (7.50)	18 (45.00)
Traders	4 (20.00)	6 (30.00)	1 (5.00)	2 (10.00)	7 (35.00)
Wurukum					
Residents	7 (17.5)	11 (27.5)	4 (10.00)	2 (5.00)	16 (40.00)
Traders	5 (25.00)	4 (20.00)	2 (10.00)	1 (5.00)	8 (40.00)
Highlevel					
Residents	7 (17.50)	6 (15.00)	3 (7.50)	4 (10.00)	19 (47.50)
Traders	4 (20.00)	2 (10.00)	1 (5.00)	3 (15.00)	10 (50.00)
Wadata					
Residents	6 (15.00)	7 (17.50)	4 (10.00)	3 (7.50)	20 (50.00)
Traders	3 (15.00)	4 (20.00)	2 (10.00)	1 (5.00)	10 (50.00)
M/Market					
Residents	7 (17.50)	9 (22.50)	1 (2.50)	4 (10.00)	19 (47.5)
Traders	6 (30.00)	4 (20.00)	-	1 (5.00)	9 (45.00)
Apir					
Residents	5 (17.86)	3 (10.71)	1 (3.57)	3 (10.71)	16 (57.14)
Traders	2 (14.29)	4 (28.57)	1 (7.14)	2 (14.29)	5 (35.71)
Base					
Residents	4 (14.29)	5 (17.86)	2 (14.29)	2 (14.29)	15 (53.57)
Traders	1 (7.14)	4 (28.57)	-	3 (21.43)	6 (42.86)

Table 7: How the waste is collected and transported

Waster Manager	Tractors/Trucks (%)	Individual drop Off (%)	Transfer Station (%)
BENSESA	19 (95.00)	1 (5.00)	-
Private Waste Managers	3 (100.00)	-	-

Table 8: The situation in terms of number of waste collection Vehicles, containers, bins

Waster Manager	Adequate (%)	Inadequate (%)
BENSESA	1 (5.00)	19 (95.00)
Private Waste Managers	-	3 (100.00)

Table 9: How Frequent is the collection

Waster Manager	Daily	Once a Week	Twice a week
BENSESA	15 (75.00)	2 (10.00)	3 (15.00)
Private Waste Managers	-	-	3 (100.00)

Table 10: The Major practices of Solid Waste Management currently in practice

Waster Manager	Dumping	Composting	Reduction	Reuse	Burning	Burying
BENSESA	12 (60.00)	-	-	-	5 (25.00)	3 (15.00)
Private Waste Managers	3 (100.00)	-	-	-	-	-

The prevalent participation

A large proportion of the respondents in Makurdi and Environs expressed concern on the inadequacy of the level of sensitivity of solid waste generation and disposal; this is in agreement with the findings of Mukisa (2009) in Uganda. It was also discovered that males participate more in waste handling than females except amongst traders (table 1)

Population Distribution and Materials Sorted

This study may have revealed that a direct relationship exists between population size and volume and type of waste generated in particular locations of Makurdi and Environs. Previous studies (Adewole, 2009 and Ogwueleka, 2009) suggest the same, that amount of waste generated in an area has a relationship with population and level of development (Tables 3 and 6)

Possession of Waste Containers (Table 2)

The findings revealed that a greater proportion of the respondents, possessed waste containers for solid waste collection in their homes/shops in the study location, this collaborates the findings of Mukisa (2009) in Uganda on Public Participation in Solid Waste Management. It was discovered that in Northbank, Wurukum, Highlevel, Modern and Wadata market areas, there was a private arrangement within the main market most especially with the wheelbarrow and cart pushers, who would from time to time come to the aid of the traders in disposing their wastes and in return were paid undisclosed amount of money. While at Apir and Base, most of the residents there practiced "pit-burning" of their waste. This could explain why most of them did not have waste containers because the waste is taken straight to the pit rather than first kept in a container. This accounts for dumping of refuse in water ways, drainages and road side or centres.

Sorting of Wastes (Table 3)

Across the different study sites in Makurdi and Environs, sorting of solid waste is less adopted. This again agrees with the findings of Mukisa (2009) and Agbesola (2013). The findings revealed that even those who said they sorted their waste, many of them had already declared that they did not possess waste containers. It is not clear and quite unrealistic for one to sort waste without having it in a container. The people seemed to know that it helps to sort waste but few were practicing it.

Reuse (Tables 6 and 10)

The level of item reuse is low in Makurdi and its Environs. Few people acknowledged that they have items they reuse before they think of disposal. This agrees with the findings of Agbesola (2013). The stimulus for this however was not really the consciousness to reduce the volume of waste generated. The people do not deliberately reuse items in order to reduce the solid waste volume but are rather pushed to reuse because they do not have much choice.

Reduce (Table 4)

The people still think that they cannot do anything to reduce the volume of solid waste they generate. Very few of the people interviewed could think of ways in which the waste they generate can be reduced this agrees with the findings of Agbesola (2013) in the case of Lagos Nigeria.

Recycling of Wastes (Table 6)

The knowledge base for recyclable items is also still low. There are even people who have no idea of any item that can be recycled. Some household perceived to be of low income, said metal scraps are an exception because they can be sold to itinerant scavengers at relatively fair price. In addition to selling metal items, the household revealed that the metal waste is sometimes piled up and taken to local fabricators once every few years and converted into new items such as metal pots and kettles this collaborates the findings of Agbesola (2013). Formally there is no provision for recycling of waste as asserted by Ogwueleka (2003).

Number of times Waste is taken for Disposal (Table 9)

The study shows that a vast majority of the people living within Makurdi metropolis disposed solid waste generated in their homes/shops once in a week not minding the quantity generated in a week. This is as result of unavailability of disposal sites and inadequacy in the services of the waste managers. While greater percentage of people living within Makurdi Environs disposed their wastes daily. This is as result of availability of undeveloped plots of land and pit burning method adopted by the people. Dirt is swept and dumped in open places where it is burnt off.

Waste Collection and Transportation (Table 8)

The collection and transportation of solid waste in Makurdi and Environs is said to be the function of the state and local government environmental protection agencies (Nkwocha *et al.*, 2011 and Ogwueleka, 2009). In some parts of Makurdi metropolis, stationary containers system is adopted for waste collection; the waste containers remain at strategic points of waste generation. Waste is collected and dumped at the dump sites irrespective of its composition. This is in conformity with the findings of Upendra (2008), in India. The people expressed inadequacy of containers and collection vehicles.

From the result of this study, it was found that not all areas enjoy effective waste collection services due to lack of adequate machinery, truck breakdowns, non-accessible roads and financial constraints from cost recovery challenges. This agrees with the findings of Agunwamba *et al.* (2003), in Onitsha where the few available trucks breakdown frequently due to overuse. Ogwueleka, (2003) reported that less than 60% of MSW (Municipal Solid Waste) generated is collected in developing countries. Solid waste generation exceeds collection capacity and this agrees with the findings of this work in Makurdi and environs.(Table8)

The situation in terms of the number of Vehicles, Containers and Bins (Table 8)

The findings of this study revealed the inadequacy of waste collection materials including vehicles, containers, buckets and bins this is in agreement with Adewole (2009). A greater percentage of BENSESA and Private Waste managers' interviewed identified the inadequacy of equipment. This could be attributed to financial challenges faced by the agency and Private waste Managers in procuring machines and equipment that will facilitate the collection and disposal of waste within this study location. This partly explains the rationale while there is poor evacuation of wastes on the streets and at collection centres where waste buckets are kept particularly by BENSESA and the poor service coverage by the Private Waste Managers. It was further noted that for effective and efficient collection system, there must be enough and well maintained equipment such as trucks tippers, pail loaders, bulldozers, road sweepers, compactors and others.

Major Practices of Solid Waste Managers (Tables 5 and 10)

The Waste Managers were given a list of Management options to choose from. These included dumping, composting, reduction, reuse, burning and burying. A larger proportion of the interviewees of BENSESA choose dumping as the management method adopted by the Agency. This is line with the researchers observation where waste irrespective of the type of waste or composition, was mixed together without any means of separation or segregation. The wastes were collected into vats/buckets which was lifted on pail loaders and transported to a dumpsite for disposal. Hundred percent of the Private waste Managers interviewed indulged in collection of the waste at the collection point to be dumped at a government agent (BESESA) collection points without sorting or they drop the waste at a small land fill. This unwholesome practices contradicts integrated solid waste management practices (waste prevention, recycling, composting, combustion and landfilling) (USEPA, 2000) and Solid Waste Chain (Davis & Masten, 2004).

The areas of priorities in terms of waste Management (Tables 5 and 10)

The interviewees were given a list of management options to which they were allowed to choose from; these included reduction, composting, separation, improved Collection and transportation, some of them identified interest in all the options, though most felt that there should be an improvement in the collection and transportation of waste. This question was aimed at incorporating the knowledge of integrated solid waste practices among the waste managers, since what is currently in practice is merely the relocation of wastes in Makurdi and environs.

CONCLUSION

This work presented studies on solid waste disposal and management methods in Makurdi and Environs. The population is without doubt increasing day in day out and the impact on the environment is also becoming enormous. The damage on the environment is already noticeable in Makurdi and Environs as a result of the careless waste disposal practices. The situation calls for an immediate arrest as the only way to reverse the effects in future.

It was discovered that while many residents possessed waste containers for collection of waste its method of disposal is questionable, Benue State Environmental Sanitation Authority, private sector participation, are responsible for the collection and disposal of all types of waste generated in Makurdi and Environs. The level and methods of solid waste disposal and management in Makurdi and Environs is not ideal.

Waste is poorly collected and dumped at the dump sites irrespective of its composition. This is as a result of the poor coverage of services of the waste managers which was attributed to inadequacy of the number of staff, vehicles, containers and bins and financial challenges by the waste Managers.

The waste management options adopted by the waste Management Agencies is not adequate hence they only engage in relocation of waste: by collecting from collection points or house hold that is residents and dumping in a dumping site. No forms of waste compositing, sorting or segregation is carried out neither is there an engineered landfill site for solid waste Management.

We therefore recommend that; There should be frequent public enlightenment on methods of solid waste collection and disposal. This can be achieved through the combined efforts of public and private organizations. The agency responsible for solid waste management (BENSESA) and Private Waste Managers should be properly provided with enough equipment, qualified personnel and funds for more effective and efficient service delivery. Solid Waste Management in Makurdi and its Environs should become the concern of everybody; Industries, the landlords, tenants, school children, traders, business people, civil servants, the privileged, the politicians etc. One single governmental agency cannot alone effectively cope with the volume of solid waste generated in Makurdi and Environs. There may public health side effect if urgent steps are not taken to stem the tide of wrong waste management practices in Makurdi.

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