An Assessment of Household Solid Waste Disposal Practices in Sabon Gari, Zaria

A. M. Stanley[1], S. S. Andrew[2], A. A. Dania[1] and I. F. Sani[3]
[1]Department of Building, A.B.U., Zaria,
[2]Department of Agric Economic and Rural Sociology, A.B.U., Zaria,
[3]Department of Mechanical Engineering, A.B.U., Zaria,

Abstract

Activities of man on the environment have influenced the ecosystem deterioration. Generation and disposal of wastes, combustion of fossil fuel and bush burning are some of the activities linked to ecosystem degradation. The study assessed household waste disposal practice and its challenges in Sabon Gari, Zaria. This was carried out through administration of questionnaire, checklist, physical inspection and photographing of dump sites and interview with agencies responsible for municipal solid waste management. 150 questionnaires were randomly administered to households in the study area out of which 76% response rate was received. The results show that 97.37% of households generate an average of 2kg composite wastes daily, of which 32.43% are food residues with high frequency (54.95%) of generation. 87.39% of the wastes are degradable, while 38.74% are reuseable. 80.18% of the wastes are kept in bins for disposal, while 46.85% are burned. The results also show that 37.84% of the households felt that the government is responsible for the provision of necessary machineries for waste evacuation. However, wastes are rarely evacuated by the agencies responsible. This could be linked with inadequate equipment and funds challenging the agencies. The study concluded that most households generate substantial quantities of wastes which are not properly disposed; these threaten human health and the environment. It is therefore recommended that public enlightenment on health impacts associated with improper disposal of wastes should be intensified.

KEYWORDS: Environmental Pollution, Health, Sabon Gari, Solid Waste, Sustainability

Introduction

Waste as the name implies is any unwanted material, substance or object resulting from industrial, institutional, hospital and household activities which could be in the form of rubber, plastic, metal, paste, oil, organic matter and other similar commodities. It is solid or liquid, renewable or non-renewable, degradable or non-degradable (ThERRA, 2006). In whatever form, waste is nuisance when left unchecked and poses serious challenge to both the community and the government. Rapid urbanization, high population density and quest for improvement in standard of living are factors responsible for the generation of large quantities of wastes in most Nigerian cities. These wastes (Municipal Solid Wastes) as observed by Ojo (2008), are generated mostly in urban centres. An average of 0.14m3 of household wastes is generated per week in Anambra State, while about 19,000 metric tons is generated in Osun urban centres per month. Also, in 2007 about 377, 126 tons of solid wastes were generated in Kano municipal (Afolabi and Adamu, 2008). The question is, where do all these wastes go to?

Roadsides, ditches, drainages, water bodies, empty plots of land, farms, wetlands, uncompleted buildings, etc. are sites observed for dumping of household wastes in most Nigerian cities. This unsanitary and indiscriminate indulgence of the public has been attributed to the ineffectiveness of waste management of the environment by the Government (Ojo, 2008). In Osibanjo (2008) and Bogoro and Babanyara (2011), it was also linked to lack of infrastructure for solid waste management, which includes roads, facility for waste collection, disposal and treatment, etc. Improper management of waste results in the accumulation of heaps disposed off as landfill. This depicts negative impression of the environment which threatens human health. It promotes breeding of flies, mosquitoes, rodents, etc. and causes ground and surface water pollution, air pollution, road obstruction, flood, as well as, attracts animals which may cause zoonotic infections (Sridhar, 2008). It also results in loss of biodiversity, affects tourism attraction and the environmental aesthetics (Ojo, 2008).

Solid Waste Management (SWM) may be defined as "a process associated with the control, generation, storage, collection, transfer and transportation, processing and disposal of solid wastes in a manner that is in accord with the best principles of public health, economic, conservation, aesthetics, and other environmental considerations; and, that also is responsive to public attitudes"

(MNES, 2001). The impacts of man's activities on the environment need to be checked. Waste must not be generated faster than the earth's bearing capacity, but in a sustainable way. To achieve this, sustainable municipal waste management programme alongside with energy generation from biodegradable wastes need to be enforced. This is in line with sustainability which is defined as "an economic, social and ecological concept, intended as a means of configuring civilization and human activity. Thus, the society and its members are able to meet their needs and express their greatest potential in the present, while preserving biodiversity and natural ecosystem..." (Wikipedia, 2003). To practice this, it is necessary to improvise methods of wastes segregation and characterization at the source, for recycling (TheRRA, 2006).

A recent study by Batagarawa (2011) on sustainability appraisal of waste management in Nigeria used Kaduna metropolis as a case study, found out that there is ineffective strategy of waste management. Nwude et al (2011) evaluated solid waste management in Kaduna metropolis and also found out that the agencies in charge of solid waste management are inefficient. In Benedine et al. (2011), the impact of spatial distribution of soild waste dumps on infrastructure in Samaru, Zaria, using Geographic Information Systems (GIS) was assessed and found out that solid waste affects public infrastructures such as roads, drains, etc. In this study, the practices of solid waste generation and disposal by households and the agencies responsible for its management in Sabon Gari Local Government Area (LGA) were assessed.

Study Method

The study assessed municipal solid waste disposal in Sabon Gari, Zaria. Sabon Gari being the largest settlement in Sabon Gari local government area is characterized by lots of commercial activities. With a population of 291,358 (FGN, 2009), it has lots of public and private institutions, large market, industries, etc. which could be the reasons for the high population and the commercial activities. The study was carried out through administration of questionnaire, checklist, physical inspection and photographing of dump sites, as well as interview with staff of Kaduna Environmental Protection Agency (KEPA) and Kaduna State Urban Planning and Development Authority (KASUPDA) Sabon Gari LGA. One hundred and Fifty (150) questionnaires were randomly administered to some selected households in the study area, where heaps of municipal solid wastes were found. 76% of the total questionnaire was returned while 24% constituted invalid and was not

returned. The sample size of 150 households for the study area was considered adequate, going by Israel (1992) and IWSD (2003). The questionnaires received were analysed using simple statistical tools such as mean, percentages and frequency. Results obtained were presented in the form of charts, tables and plates.

Results and Discussion

Fig. 1 shows the constituents of waste generated by the households. It was observed that majority (35.14%) of the waste generated were papers, food items (32.43%), old clothes and fabrics (19.82%). The least was plastics with frequency of 8.11%. It is therefore evident that most wastes generated in the study area are biodegradable (Table 1). This agrees with the findings of Wolf (2004) that most wastes generated in growing cities of developing countries are biodegradable waste (paper, food, fabric etc). Table 1 further shows that 61.26% of the households waste generated are non reuseable. Plate 1shows the waste disposed of in the vicinity.

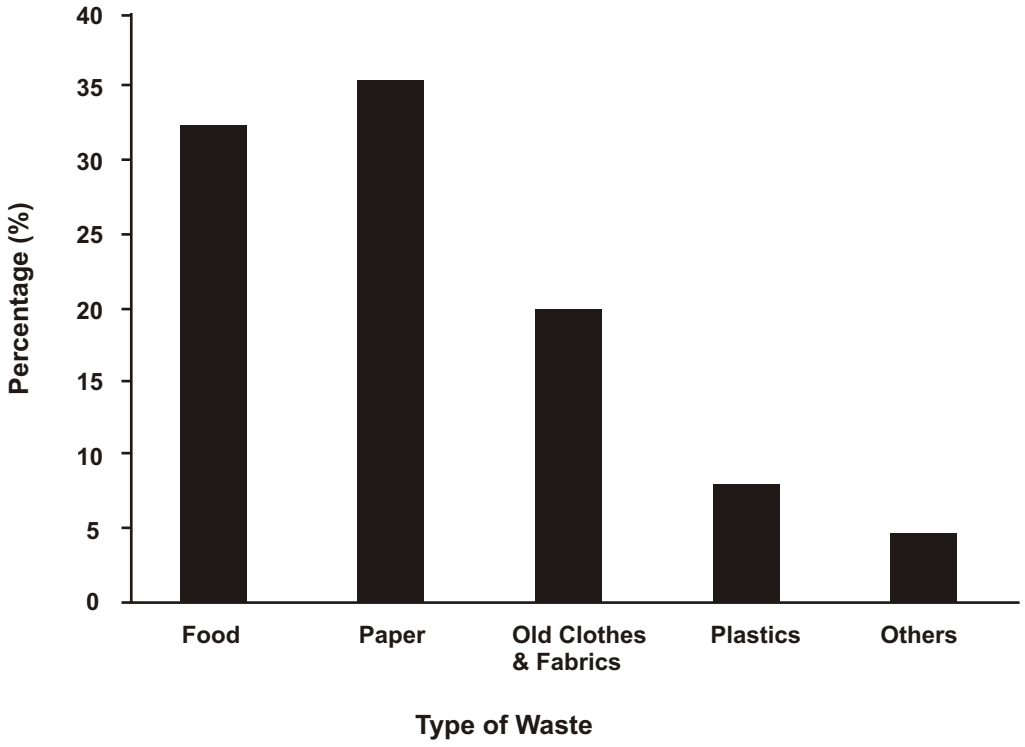

Figure 1. Average Composition of Household Waste Generation

Table 1: Degradability and Reuseability of the Household Waste

S/N	Variable		Frequency (No)	Percentage (%)
1.	Degradable	a). Yes	97	87.39
		b). No	14	12.61
		Total	111	100
2.	Reuse-able	a). Yes	43	38.74
		b). No	68	61.26
		Total	111	100

Plate 1: Biodegradable Waste mixed with Polythene around the Households

The study also observed that an average quantity of 2kg composite waste is collected for disposal by 50.45% of the households as shown in Table 2.

Table 2: Daily Average Quantity of Household Waste Generation

S/N	Quantity (kg)	Frequency (No)	Percentage (%)
1.	2	56	50.45
2.	4	35	31.53
3.	6	20	18.02
	Total	111	100

Table 3 shows that 97.30% households temporarily store the wastes generated within households, while 2.70% do not store wastes. 57 households with the highest frequency of 51.35% segregate the stored waste before reuse or disposal. It was however observed that only 30 households with frequency of 52.63% reuse the segregated wastes, while 47.37% dispose the wastes after segregation. It was also observed that majority (63.16%) of the households dispose less than 2kg of the waste after segregation. It can therefore be inferred that most household in the study area generate wastes daily and are stored and segregated before disposal.

Table 3: Waste Handling Characteristics

S/N	Variable		Frequency (No)	Percentage (%)
1.	Storage	a). Yes	108	97.30
		b). No	3	2.70
		Total	111	100
2.	Segregation	a). Yes	57	51.35
		b). No	54	48.65
		Total	111	100
3.	Reuse after segregation	a). Yes	30	52.63
		b). No	27	47.37
		Total	57	100
4.	Quantity disposed after segregation (kg)	a). < 2	36	63.16
		b). 2 – 5	12	21.05
		c). > 5	9	15.79
		Total	57	100

The methods adopted by the households for the storage and disposal of waste are shown in Table 4. It was observed that 89 households with the highest frequency of 80.18% store waste in dustbins, while 9 households with the least frequency of 8.11% discard their wastes in open dumps. Majority (46.85%) of the households burn the waste, while some (29.73%) pay for the disposal and the least frequency of 23.42% dispose in the open dump. It is therefore evident that the methods adopted for waste disposal in the area affects the environment either directly or indirectly due to open burning which contributes to air pollution as observed by Wolf (2004).

Table 4: Method of Waste Storage and Disposal

S/N	Variable		Frequency (No)	Percentage (%)
1.	Method of Storage	a). Dustbin	89	80.18
		b). Bag	11	9.91
		c). Discard	9	8.11
		d). Others	2	1.80
		Total	111	100
2.	Method of Disposal	a). Burning	52	46.85
		b). Open bin	26	23.42
		c). Pay for	33	29.73
		d). Others	0	0
		Total	111	100

The cost of waste disposal incurred by the households who pay for such services was assessed. It cost between N100 N500 for majority (78.79%) of the households to dispose of their wastes monthly, while few (6.06%) spend above N1000 as shown in Table 5. The frequency of waste disposal for majority (44.14%) of the households was weekly, while 39.64% disposed daily and the least with frequency of 16.22% dispose monthly.

Table 5: Cost and Frequency of Household waste disposal

S/N	Variable		Frequency (No)	Percentage (%)
1.	Cost of monthly disposal (₦)	a). 100 – 500	26	78.79
		b). 600 – 1,000	5	15.15
		c). > 1,000	2	6.06
		Total	33	100
2.	Frequency of disposal	a). Daily	44	39.64
		b). Weekly	49	44.14
		c). Monthly	18	16.22
		Total	111	100

Plate 2: Household Waste Disposed in the Open

Fig. 2 shows that 61.26% of the respondents perceived that wastes have high potential for farm manure, while 18.02% has potential for recycling. Also 9.91% has potential as feed for livestock and 10.81% are of no economic value. These ascertained the results in Fig. 1, Table 1 and the findings of Abel (2007) that 61.6% household wastes generated in Ogbomoso are degradable and could be of economic value.

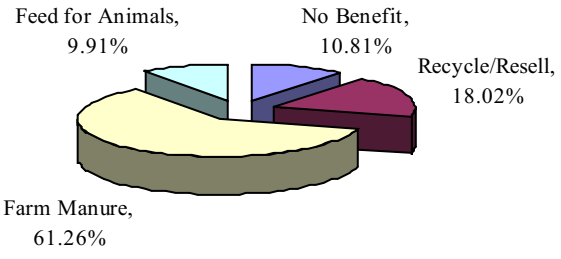

Figure 2. Respondents' Perception of the Economic Values on Waste

The strategies for household wastes control were assessed as shown in Fig. 3. Majority (37.84%) of the households affirmed that it is the government's responsibility to provide adequate machinery to evacuate municipal waste. However, 19.82% argued that recycling/resell of the reuseable items will reduce the problem of evacuation of Municipal waste. The result agreed with the findings of Ojo (2008) that the government is to some extent responsible for the provision, control and evacuation of municipal solid waste.

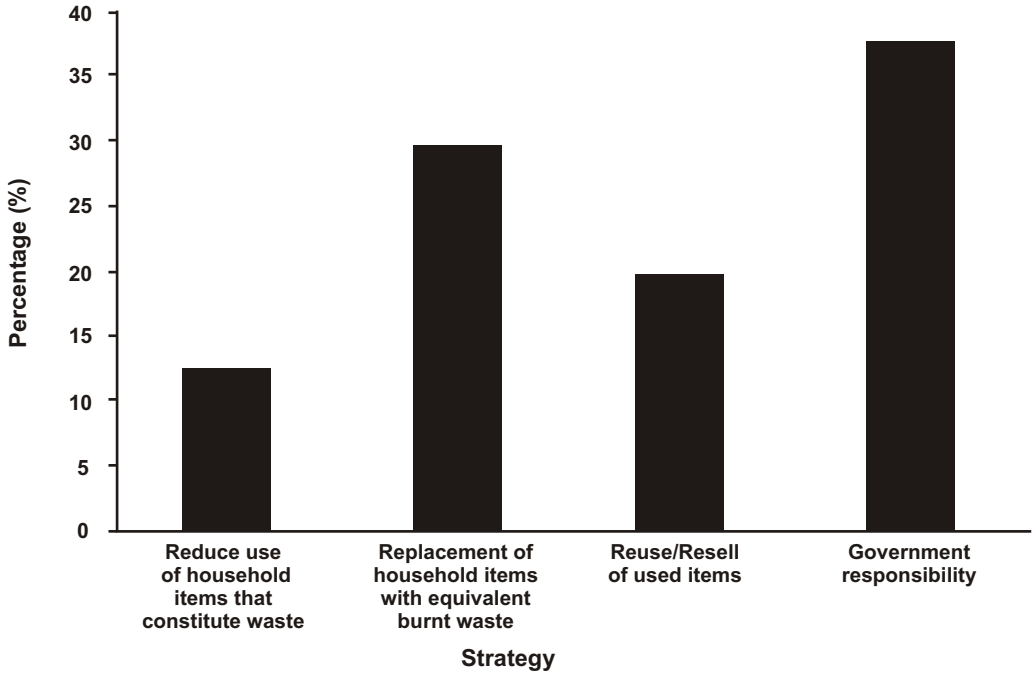

Figure 3. Respondents' Perception on Strategies for Households Waste Control

KEPA and KASUPDA in conjunction with the local government councils are responsible for handling waste in Kaduna State (Batagarawa, 2011). These agencies among several other functions are to locate, construct and maintain solid waste dump sites and sanction defaulters (FEPA, 1991). The study sought after the function and compliance from interview with 5 representatives of the agencies in Sabon Gari LGA as shown in Table 6. It could be observed from the table that the agencies are responsible for locating, constructing and maintaining of public dump sites in the LGA. However, only 40% of the major dump sites were constructed and designated by KEPA. The table also shows that there are problems with prompt disposal of waste from the public dump sites, as also observed

in Table 8. The problems are associated with inadequate equipment for the collection, transportation and disposal of waste. Table 7 shows the conditions of equipment available in the LGA for waste disposal. This equipment included 1 tipper truck and 1 pay loader which are both in off-the road states, a situation which impairs disposal of municipal solid waste in the study area.

Table 6: Role of the government agencies in municipal solid waste disposal

S/N	Variable		Yes (%)	No (%)
1.	Role of agencies in municipal solid waste disposal	a). Locate solid waste dump sites	20	80
		b). Construct and maintain public dump sites	80	20
		c). Station a labourer to tidy the dump site	20	80
		d). Sanction defaulters	80	20
2.	Practices by agencies in disposal of solid waste	a). Provide designated dump sites	40	60
		b). Adherence of households to designated dump centres	20	80
		c). Sufficient fund for solid waste disposal	40	60
		d). Adequate equipment for solid waste collection	0	100
		e). Haul waste long distance for disposal	40	60
		f). Adequate equipment for solid waste disposal	0	100
		g). Adequate equipment for transportation of solid waste	0	100
		i). Adequate skilled manpower for equipment operation	20	80
		j). Adequate staff remuneration	20	80

Table 7: Equipment owned by agencies for solid waste collection and disposal

S/N	Equipment	No. required	No. available	Condition on road	No off the road
1.	Bulldozer	4	-	-	-
2.	Tipper truck	6	1	-	1
3.	Dino truck	3	-	-	-
4.	Tractor	3	-	-	-
5.	Pay loader	4	1	-	1
6.	Tanker	2	-	-	-
7.	Refuse container	100	-	-	-
8.	Shovel	100	-	-	-
9.	Brooms	50	20	-	-
10.	Hoes	100	-	-	-

Table 8 shows that wastes are rarely collected from the dump sites by the agencies resulting from inadequate equipment, funds and transport. This is affirmed in Tables 6, 7, Nwuse et al (2011) and Bogoro and Babanyara (2011) that inadequate fund, skilled staff, equipment and remuneration grossly affect the disposal of municipal solid waste.

Table 8: Frequency of waste collection by the agencies

S/N	Frequency	Frequency (No)	Percentage (%)
1.	Frequently	0	0
2.	Occasionally	2	40
3.	Rarely	3	60
	Total	5	100

Conclusion

The study shows that most of the households generate substantial quantity of wastes (Table 2) which are not properly disposed of. Some households are aware of the negative impacts of the wastes and try to reduce its accumulation by burning which in turn affects the quality of air within the immediate environment. Majority of the household wastes end up in drains, ditches, empty plots of land, ongoing construction, etc., as portrayed by Plates 1 and 2. This affects human health and negates the environment. It is therefore recommended that there should be further community-bsed public enlightenment on the health impact of improper disposal of waste in the environment. Government should employ all necessary machinery to encourage and make household waste disposal in such communities a communal routine; in addition to sensitizing households to provide bins for waste collection which should be evacuated regularly by paid agent for proper disposal to safe places.

References

Abel (2007), In: Ojo, O. (2008): State of the Environment in Nigeria. Proceedings of the First National Environment Summit "Greening the Environment for Sustainable Economic Development. Federal Ministry of Environment, Housing and Urban Development. Transcorp Hilton, Abuja.

Afolabi, A. O. and Adamu, D. J. (2008). Pollution and Waste Management: Challenges Towards Achieving the MDG 7 by 2015. Proceeding of the First National Environment Summit "Greening the Environment for Sustainable Economic Development. Federal Ministry of Environment, Housing and Urban Development. Transcorp Hilton, Abuja. 20th 21st April. Pp 200 209.

Bagatarawa, R. L. (2011): Sustainability Appraisal of Waste Management in Nigeria: Development and Evaluation of An Index Based

Tool. Ph.D. Dissertation, Department of Civil Engineering, University of Portsmouth.

Benedine, A., Robert, T. A. and Abbas, I. I. (2011). The Impact of Spatial Distribution of Soild Waste Dumps On Infrastructure in Samaru, Zaria, Kaduna State, Nigeria, Using Geographic Information Systems (GIS). Research Journal of Information Technology 3(3): 113-117, 2011

Bogoro, A. G. And Babanyara, Y. Y. (2011). Evacuation of Solid Waste in Residential Areas of Bauchi Metropolis, Nigeria. Journal of Environmental Sciences and Resource Management. Vol. 3. Available at www.cenresinpub.org.

Federal Environmental Protection Agency (FEPA) (1991). Guidelines and Standards for Environmental Pollution Control in Nigeria. Federal Republic of Nigeria.

Federal Republic of Nigeria (FRN) (2009): Federal Republic of Nigeria Official Gazette. Legal Notice on Publication of 2006 Census Final Results. The Federal Government Printer, Abuja Nigeria. 2nd February.

Israel (1992). Determining Sample Size. In: Eboh, E.C. (2009): Social and Economic Research: Principles and Methods. African Institute for Applied Economics. Enugu. P. 94.

IWSD, (2003). *Research Proposal Development Manual: In:* MacDonald, M. (2006): Pointe Monnier Power Station Phase 2 and 3 Development - Environmental Impact Assessment. Central Electricity Board, Glasgow G2 8JB, United Kingdom.

MNES, (2001). *Annual Report 2000-2001.* Ministry of Non-Conventional Energy Sources, (MNES), Government of India, New Delhi. [Online] Available @ http://public.wsu.edu/~susdev/WCED87.html (Assessed 20th November, 2010).

Nwude, M. O, Igboro S. B, Umar Ibrahim and Okuofu, C.A (2011). Evaluation of Solid Waste Management in Kaduna Metropolis, Nigeria [Online]. Available from http:www.abu.edu.ng/publications/2011-02-03-153941_3066.doc (Assessed 20th November, 2012)

Ojo, O. (2008). State of the Environment in Nigeria. Proceedings of the First National Environment Summit "Greening the

Environment for Sustainable Economic Development. Federal Ministry of Environment, Housing and Urban Development. Transcorp Hilton, Abuja. 20th 21st April. Pp 60 61.

Osibanjo, O. (2008). Pollution and Waste: Issue and Management Strategies. Proceedings of the First National Environment Summit "Greening the Environment for Sustainable Economic Development." Federal Ministry of Environment, Housing and Urban Development. Transcorp Hilton, Abuja. 20th 21st April.

Sridhar, M. K. C. (2008). Environmental Health and Sanitation. Proceedings of the First National Environment Summit "Greening the Environment for Sustainable Economic Development. Federal Ministry of Environment, Housing and Urban Development. Transcorp Hilton, Abuja. 20th 21st April. Pg. 264.

Thermal Energy for Renewables (ThERRA) (2006). Proposal for the Definition and Calculation Principle for Renewable Heat. [Online] Available from http//www.therra.info/pdf/Definitions&Methods/ProposalDefinitionRESHeat9.pdf (accessed 21st June, 2009). Pp 120 149.

Wolf, S. (2004). Municipal Solid Waste Management in Developing Countries: Nigeria, A Case Study. NTRES 314.

Wikipedia, (2003). Sustainability. In Mbamali, I. (2005). Stone Quarrying in Nigeria. An Overview of Necessary Initiatives Towards a Sustainable Built Environment. Conference Series. Department of Building, A.B.U., Zaria. September.