

# Assessment of Municipal Waste Disposal Methods: A Case Study of Ibadan, Nigeria.

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## Abstract

In order to prevent health hazards that can occur as a result of inappropriate waste disposal, this study was carried out to identify the various municipal waste disposal methods practiced, and present the methods that are mostly adopted in the South Sahara region. It also analyzed the effects of these methods practiced on individuals and environment, and proffered solutions to the problems facing the populace as a result of these inappropriate methods of waste disposal. The third largest city of Africa located in Nigeria, called Ibadan was used as a case study. Questionnaires of population size 5000 were administered to households in all Local Government Areas of Ibadan. 4500 questionnaires were completely filled and returned. The rating results derived from the survey revealed that the most practiced municipal waste disposal method is open burning.

**Keywords:** Environmental Assessment, Health, Waste Disposal, Open Burning.

## INTRODUCTION

Municipal Waste disposal methods have been of great concern both globally and locally. Apart from constituting a threat to the environment, it also poses serious health hazard to the populace. World Health Organization (WHO) estimates that more than 20% of the world population lack proper sanitation and more than 40% of all populations lack appropriate waste disposable methods (Oastridge and Trent, 1999). However, the hazards posed by such disposal are not only in terms of odour and presence of disease causing micro-organisms, but can also arise from the radiation emanating from such methods.

It is generally believed that in Nigeria, individuals, government and environmental agencies pay little or no attention to environmental impacts of waste management and disposal though it is a statutory responsibility of the parties concerned. Federal Environmental Protection Agency (FEPA), Ministry of Environment, Environmental Protection Agency and even local authorities are responsible for planning a defined line of action for disposal and management of waste generated on daily basis in the society but it is quite unfortunate that they have failed in this regard.

Ibadan being used as a case study is the capital of Oyo State which in the South Western geopolitical zone of Nigeria. It is the largest city of African origin south of the Sahara. This description becomes quite understandable when it is realized that the city, apart from having a pre-colonial origin with a large area belonging to the old unplanned section, is located in the midst of a rich agricultural land, stretching far outside its immediate environs or regions. This has made the metropolis a market place for cocoa and other local agricultural produce. Chemical, Electronics, Plastic and tobacco Industries, as well as various forms of small businesses flourish in the Metropolis. The attendant effect of all these is the rapid generation of domestic, agricultural and industrial waste.

The city of Ibadan is also noted for its chaotic street patterns with layouts that are hardly passable especially by heavy vehicles needed to remove the waste. The roadsides are now waste dump sites and in some cases, such waste dumps have taken over several roads and damaged others as a result of accelerated rate of weathering of the bituminous surface. The city could be classified as a degraded environment with wraps of table water, leaves, disposables and other related refuse littering all nooks and crannies of the city.

Initially, the residents of Ibadan managed their wastes their own way thereby exposing them to health danger and making them vulnerable to all kinds of diseases. In order to ameliorate these, and make life comfortable to people, Ibadan Waste Management Authority was established in 1997 and it covered all the LGAs in Ibadan. This authority regulates the waste activities in the town but for more effectiveness and efficiency of waste management in the town, wastes disposal was contracted out to private companies and it cut across all the eleven LGAs in Ibadan. Furthermore, these private companies provide waste disposal collectors like skip bins, drums, mobile waste van and disposable nylon to people to dispose their wastes. Despite all these decent ways of waste disposal methods, some people still prefer to use inappropriate methods of waste disposal such as throwing waste in the stream or gutter, burning waste, throwing waste in an open land etc. This is one of

the reasons why problems of solid waste management and its disposal have reached a critical stage in major towns and cities of Nigeria especially in city of Ibadan in Oyo state.

## **MATERIALS AND METHOD**

Administration of questionnaire, interview and personal observations were employed in the course of this study. The research was designed to survey households on methods of solid waste disposal and how these wastes generated in houses were managed. The data required for the study were collected from primary sources i.e. the information was gotten from residents of Ibadan, and the areas were selected randomly within each local government area. Five thousand questionnaires were equally administered in all the local government areas, four thousand and five hundred were completely filled and returned. Each of the household questionnaires comprises of nineteen (19) questions. The questions were related to the socio- economic characteristics of respondents, gender, marital status, educational status, age, monthly income, occupation and housing type of the respondent. Several methods are used to analyze research data such as percentage frequency, correlation, cross – tabulations, tables and charts through SPSS tools.

## **RESULT AND DISCUSSION**

According to the results of four thousand and five hundred questionnaires analyzed in this study, several methods were observed to be used by residents of Ibadan region in disposing their solid wastes and these methods are briefly described below:

### **1. Skip bins**

Skip bin is one of the commonly used solid waste collectors. It is usually placed along the roadside or in the market square and is operated at free cost to users. It is also placed on the streets but this involves payment of token by the users to the contractors. A staff from the private company in charge of the collector is always there to collect the money. Skip bin is also placed at hospitals and secretariat offices; this is managed by the management of the hospital or secretariat respectively. Skip bins are disposed depending on when it is full but most time, twice in a month into a waste van which will convey the wastes to dumpsites approved by the government.



Plate 1, One of the municipal disposal containers used in Ibadan - A Skip bin

### **2. Drums**

Drum is another solid waste collector made available for people by private companies and is normally placed in front of the building. This involves monthly payment which depends on the area and the private company in charge of that area. It is often disposed every week mostly on Mondays.



Plate 2, Drum – One of the household waste disposal containers

### 3. Disposable nylon / sac

Use of disposal nylon / sac for waste disposal is the cheapest among the proper means of waste disposal in Ibadan. It is operated at free cost. The sac/ nylons when filled with wastes are placed along the roadside and are being disposed every week mostly on Mondays or Tuesdays. It is people that reside near the roadside that benefit mostly from this disposal method. Despite the fact that it is operated at no cost, some people still prefer to ignore this means and practiced the indecent methods of disposal.



Plate 3, Disposable nylon/sac

### 4. Dumping of waste inside gutter or stream

Dumping of waste inside the gutter or stream is also common most especially among the masses. People find it easier to drop their waste inside the nearby stream or gutters when raining with the expectation that flood will carry it away not minding the implications this may pose on individual and the environment.



Plates 4a, Dumping of waste inside gutter – an indecent method of disposing waste



Plates 4b Dumping of wastes in stream behind some households in Ibadan

### 5. Dumping Of Waste Inside Bush Or Open Plot

Dumping of waste inside bush or open plot is also common most especially among the masses. People find it easier to drop their waste inside the nearby bush or open plot not knowing the implication this may have on them.



Plate 5, Waste inside bush

## 6. Mobile waste van

Mobile waste van is another waste method used as a substitute for drums. It is mostly placed in front of buildings and it operates like drums. It is also disposed weekly

## 7. Open Air Burning

Disposing of waste items by open burning has been a way of life for many people in the region. Many grew up with the backyard burn barrel or open space for burning waste not knowing that the materials contains harmful chemicals which are released to the atmosphere when burned.

Open air burning can negatively impact our environment and our health and many respiratory diseases such as asthma, emphysema, chronic bronchitis and nervous system disorder shave been linked to it. The problem is of special concern to children, the elderly and individuals with compromise immune system.



Plate 6, The commonest solid waste disposal method – open air burning

According to the result of questionnaires analyzed in this study, several methods were observed to be used by residents of Ibadan region in disposing their wastes. These methods include dumping of refuse in stream / gutter, use of disposable nylon / sac, use of mobile waste van, dumping of refuse in a skip bin, the use of drums and open burning of refuse with the following relationships:

### i. Relationship between locations of Respondents and Waste Disposal Methods

The summary of the percentage of population that makes use of these earlier stated disposal methods is presented in Table 1 (see page 17). The highest percentage of respondents mostly disposes their wastes through burning method is 40.7% and these cuts across almost all the local government areas considered except in Ona Ara LGA. Respondents from Ido LGA and Egbeda LGA constitute a major significant proportion, followed by Ibadan South West LGA, Ibadan North LGA and Oluyole LGA. The use of drums account for 36.5% of respondents and is mostly utilized by people in urban areas of Ibadan region. Egbeda LGA has the highest percentage of those disposing through this method followed by Ibadan South West Ibadan North, Ibadan South East and Oluyole

Those utilizing skip bins followed the respondents that use drums and it accounts for 33.7% of

respondents. Respondents from Ibadan North East have the highest contributions. Ibadan South West, South East and Ibadan North also have a considerable high contribution. In addition, Oluyole, Ido and Lagelu make use of this method but at lower percentages.

The next disposal method commonly used is dumping waste inside bush or open plots and it accounts for 33.3% of the total respondents. Respondents from Ibadan North West, Egbeda, Lagelu and Ona Ara have a major contribution to this method according to this study. This is followed by Ido, South East, North East and Oluyole. Dumping of refuse in the stream or gutter is another disposal method practised majorly in Ibadan North West. Also, it is being practised in Ido, Ibadan South East and Oluyole. Lagelu and Ibadan North LGAs also utilized it but it is not commonly practiced.

According to the information above, the highest percentage of respondents mostly disposes their wastes through burning method is 40.7% and these cuts across almost all the local government areas. In comparison, local government areas categorized under sub – urban region namely, Egbeda, OnaAra, Ido, Lagelu, Oluyole dispose their solid waste according to this study majorly through burning, mobile waste van and dumping in stream or gutter except for Egbeda LGA which has higher percentage in waste disposal using drum. Conversation with the respondents revealed that there are some of the residents of these areas that wish to dispose their waste through the government approved facility but due to unavailability of these facilities, they are left with no choice than to utilize the means within their reach which is open burning. Some of the respondents dispose refuse anyhow due to unawareness or ignorance of the impacts of the improper waste disposal on their health and environment. Zurbrugg (2002) pointed out that the factors influencing solid waste management in South Sahara region are large amount of waste and composition, inaccessible road for waste collection, the people's lack of awareness and people's attitude towards waste disposal. Conversely, those that even aware of the impacts have negligence attitude towards it.

#### **ii. Relationship between Gender of Respondents and Waste disposal methods**

The Table of relationship between gender of respondent and waste disposal methods is presented in Table 2 (see page 18). Respondents that are females were in the majority of those that dump refuse inside stream/ gutter, inside bush or open plots and those that utilize burning as a disposal method. Respondents that are male counterpart predominates among the category that utilize disposable nylon /sac and mobile waste van while in the utilization of skip bin, and drums, respondents that are females prevailed over males. This could be due to the fact that females are more responsible to home keeping and tend to economized cost in terms of disposing wastes.

#### **iii. Marital Status of Respondents and its relationship with waste disposal methods**

The result of relationship between marital status and waste disposal is shown in Table 3(see page 19). The respondents that are married predominated in all the classes indicated by respondents as means of disposing their wastes. This observed trend in married respondents is not unexpected since it is accustomed that married has larger members in their household to cater for, therefore more wastes especially from kitchen wastes are generated by them and series of waste disposal methods are being utilized by them. In general, waste composition in China is dominated by a high organic and moisture content, since the concentration of the kitchen waste in urban solid waste makes up the highest proportion at approximate 60% (Yuan et al., 2006). Nevertheless, unmarried/ single people also employ the same disposal methods

#### **iv. Educational Status of Respondents and its relationship with waste disposal methods**

Educational status is a determinant factor for using public waste collection service in Ibadan (Ajani, 2007). Therefore, according to this study, Table 4 (see page 20) shows the relationship between educational status and waste disposal methods. The well educated predominated in the classes of those that utilize disposable nylon /sac and mobile waste van as means of disposing their solid wastes. It is worthy of note that in some indiscriminate waste disposal methods like dumping in the stream / gutter, burning and dumping inside bush or open plots, the literates too are not left out.

#### **v. Age of Respondents and its relationship with waste disposal methods**

As presented in Table 5 (see page 21), the young population of respondents predominated in the class of people that make use of skip bin and mobile waste van followed by middle aged (i.e. those aged between 36 – 45 years) and then the elderly (i.e. those aged between 46 - 50). Also, young population of respondents has a significant contribution in the utilization of open ground dumping as a means of disposal wastes. They also contribute appreciably to the population of those that utilize burning followed by an elderly people. However, the middle aged (i.e. those aged between 36 – 45 years) has the highest percentage for those that dispose refuse wastes by environmentally unfriendly methods as means of solid waste disposal e.g. dumping in bush and open plots.

#### **vi. Monthly Income of Respondents**

The monthly income of the researched population was examined in the process of this research. Table 6 (see page 22), It was observed from the analyzed data that two – third of the research population earn less than N 20,000 as monthly incomes (as at this time of study) while the other one – third of the research population fell in the category of respondents that earn between N 20, 001 – above as monthly income (as at the time of study). This is a clear indication of the level of under – employment that encompasses our society in which we abide and this also indicates the level of poverty that spreads through the major part of the society.

#### **vii. Occupational Status of Respondents and its relationship with waste disposal methods**

As presented in the Table 7 (see page 23), the traders predominated in the group of people that dump their refuse inside stream / gutter followed by the respondents in the category of students. Similarly, respondents in this class of traders utilize open air burning as a means of disposing their wastes; in which respondents in the class of artisan also have high considerable contribution. On the contrary, it is worthy of note that respondents in the class of traders also utilizes drums in disposing their wastes.

#### **viii. Waste disposal methods and housing type of respondents**

Table 8 (see page 24) shows the relationship exists between waste disposal methods of respondents and housing type was investigated in this study. Face – to – face type of building predominated and had a higher percentage in all the research population studied except Egbeda LGA. Considering the environmentally, unfriendly and indecent ways of disposing solid wastes, the respondents that live in face – to – face type of building have a higher and significant contribution. Face-to -face buildings serve as a shelter for low income earners which invariably means that they will have low standard of living and as such may not be able to afford proper and decent waste disposal methods. However, some of the people in this category utilize the decent and authorized solid wastes disposal methods for disposing their wastes.

### **IMPACTS OF IMPROPER WASTE DISPOSAL METHODS**

**i. Health Impact:** Exposure to hazardous wastes particularly when they are burnt can cause various diseases and illnesses like cancers, yellow fever, plagues, etc. Also, wastes attract rodents and insects which can cause gastrointestinal diseases, worms, plagues and other unpleasant conditions for human. Wastes can contaminate surface water, underground water, making unfit for domestic uses. Also, it can contaminate soil and air thereby making humans, other living organisms and ecosystems vulnerable to all forms of air –borne and venereal diseases (Diaz, 2006). Improper waste disposal is still a significant problem in many part of the world especially in developing and under - developed countries. World Health Organization (WHO) estimates that more than 20% of the world population has unhealthy environment and more than 40% of all populations lack adequate sanitation (Oastridge and Trent, 1999).

**ii. Economic impact:** The cost of treatment of ailments caused as result of improper ways of waste disposal can not be overemphasized (Muck, 2009). Money can often be saved with public awareness / education, providing waste conveyed vehicles and more effectively designed collection routes. Waste recovery either by recycling or reuse can also control economic costs in that, costs of transportation will be reduced and extraction of raw materials will be avoided (Carlsson, 2005). The informal waste sector comprises mostly of waste pickers who scavenge for metals, glass, plastics, etc. they sell the materials in order to earn profit. This unofficial sector can reduce the quantities of wastes to some extent but it has negative economic effects like exposure to diseases, poverty, exploitation and abuse of workers (Wilson et al., 2006).

**iii. Social impact:** Many of the environmental burdens cited above are more often borne by marginalized groups such as racial minorities, women and residents of developing nations. Not – in – my – back - yard (NIMBY) is a popular term used to describe the refusal of residents to a proposal for a new development close to them (Wolsink, 1994). However, as wastes increases, there is a need for an increase in citing and expansion of waste treatment and disposal facilities worldwide. There is now a growing market in the trans boundary movement of waste though a significant amount of wastes are moved from developed to developing nations (Ray, 2008).

### **CONCLUSION AND RECOMMENDATIONS**

The effects and impacts of incessant and improper disposal of solid wastes seems to be more pronounced in urban areas, due to the constant pressure exerted by increased human activity and population density on the immediate environments. In this study, it was observed through the questionnaire administered to household that the most practiced municipal solid waste disposal in Ibadan region is open burning.

This open burning is practiced generally irrespective of educational status, financial status or level of exposure of the people and the adverse effect is nothing but a filthy and unsightly surrounding. Improper

disposal of municipal solid waste can create unsanitary conditions and these conditions in turn can lead to pollution of the environment and the outbreak of vector borne diseases (i.e. diseases spread mostly by rodents and insects).

Moreover, there is indiscriminate dumping of refuse or waste at any site that is abandoned or vacant. This refuse can also be burnt whether in an incinerator or in an open space. These occur either through the negligence of Government in not providing proper means of disposing wastes to people or through the nonchalant attitude of people towards this improper refuse disposal. This can potentially cause health hazards to people living around the dumping sites if there is no adequate monitoring of the sites. Also, it can have a lot of adverse effect on the environment.

Based on the findings observed in this study, the following recommendations are made:

1. For effectiveness, the governments and Ibadan Waste Management Board (IWMB) should encourage the production and introduction of appropriate technology, equipment/machines including waste disposal vehicles for sound waste management procedures and practices. The equipment should include machines capable of producing recyclable materials.
2. Adequate information and training should be given and disseminated to all on information pertaining to the negative impacts of waste on, and in, the environment. Waste disposal techniques, new technologies and their applications, could be communicated through seminars, workshops, lectures, TV and radio enlightenment programmes. This form of training and education is of outmost importance for all in the urban and rural communities. The training should include instructions on how to keep the environment clean by making proper use of the trashcans provided and not by throwing dirt and waste polythene on the bare ground / floor indiscriminately.
3. The government should ensure that waste disposal facilities are available in the different local government areas of Ibadan so as to enable the public to dispose their waste appropriately.
4. Solid waste management policies and enforcement of sanitation laws in every part of the state should be energized, and various environmental organizations and societies to do more until the dreamed clean environment in Ibadan becomes a reality.

**Table 1: Relationship between locations of Respondents and Waste Disposal Methods**

OVERALL Method of waste disposal in Ibadan	Locations (LGAs)	Locations (LGAs)										Total
		Ona Ara	Ido	Lagelu	Ibadan North	Egbeda	Ibadan SW	Ibadan NW	Ibadan SE	Ibadan NE	Oluyole	
Dumping in stream / gutter (%)		0	2.5	1.2	1.2	0	0	7.4	2.5	0	2.5	17.3
Disposable nylon / sac (%)		1.2	0	1.2	0	0	1.2	1.2	2.5	1.2	0	8.5
Inside bush or open plots (%)		4.9	2.6	7.7	0	5.4	0	6.3	4	1.2	1.2	33.3
Skip bin (%)		0	2.8	1.4	4.2	0	5.6	0	4.2	12.7	2.8	33.7
Open air burning (%)		0	9.9	3.7	3.7	8.6	4.9	1.2	2.5	2.5	3.7	40.7
Mobile waste van (%)		0	0	0	7	9.9	5.6	0	1.4	0	0	23.9
Drum (%)		0	0	1.4	2.8	1.4	1.4	0	1.4	1.4	2.8	12.6

**Table 2: Relationship between Gender and Waste disposal methods**

Overall methods of waste disposal in Ibadan	Gender	Gender	
		Male	Female
Dumping in streams / gutter (%)		6.2	11.1
Disposable nylon / sac (%)		11.8	9.5
Inside bush or open plots (%)		7.4	13.6
Skip bin (%)		15.5	18.3
Open air burning (%)		17.3	23.5
Mobile waste van (%)		16.9	8.5
Drum (%)		2.8	9.9

**Table 3: Relationship between Marital Status of Respondent and waste disposal Methods**

		Marital status	
		Single	Married
Overall methods of waste disposal in Ibadan	Dumping in streams/gutter (%)	3.8	13.8
	Disposable nylon / sac (%)	1.3	7.5
	Inside bush / open plots (%)	10.7	22.2
	Skip bin (%)	5.7	28.6
	Open air burning (%)	13.8	27.6
	Mobile waste van (%)	8.6	17.1

**Table 4: Relationship between Highest Education of Respondent and Waste disposal Methods**

		Highest Education Qualification				
		No formal Education	Primary Education	Secondary Education	Tertiary Education	
OVERALL Method of waste disposal in Ibadan	Dumping in stream / gutter (%)	4.9	3.7	4.9	3.7	
	Disposable nylon / sac (%)	1.2	2.5	1.2	3.7	
	Inside bush or open plots (%)	2.6	6.2	14.2	10.5	
	Skip bin (%)	4.2	8.5	12.7	8.5	
	Open air burning (%)	7.4	6.2	13.6	12.3	
	Mobile waste van (%)	1.4	0.0	8.5	15.5	
	Drum (%)	2.8	0.0	7.0	2.8	

**Table 5: Relationship between Age of Respondents and waste disposal Methods**

		Age of Respondents				
		18 – 35	36 – 45	46 – 50	51 and above	
OVERALL Method of waste disposal in Ibadan	Dumping in stream / gutter (%)	3.8	8.8	1.3	3.8	
	Disposable nylon/sac (%)	0.0	2.5	2.5	3.8	
	Inside bush or open plots (%)	13.3	11.4	5.5	2.5	
	Skip bin (%)	15.5	9.9	7.0	1.4	
	Open air burning (%)	17.5	6.3	8.8	8.8	
	Mobile waste van (%)	9.9	7.0	5.6	2.8	
	Drums (%)	4.2	2.8	4.2	1.4	



**Table 6: Relationship between Monthly income of Respondent and Waste disposal Methods**

		Monthly income			
		Less than 20,000	20,001 – 40,000	40,001 – 60,000	60,001 – 80,000
OVERALL Method of waste disposal in Ibadan	Dumping in stream / gutter (%)	7.6	6.3	2.5	1.3
	Disposable nylon / sac (%)	2.5	2.5	3.8	0.0
	Inside bush or open plots (%)	17.9	11.9	4.0	0.0
	Skip bin (%)	9.0	11.9	10.4	1.5
	Burning (%)	24.1	7.6	6.3	1.3
	Mobile waste van (%)	10.4	3.0	3.0	6.0
	Drum (%)	3.0	7.5	1.5	1.5

**Table 7: Relationship between Occupation of respondent and Waste Disposal Methods**

		Occupation					
		Professional	Civil Servant	Trading	Unemployed	Artisan	Student
OVERALL Method of waste disposal in Ibadan	Dumping in stream / gutter (%)	0.0	2.5	10.0	0.0	1.3	3.8
	Disposable nylon/sac (%)	0.0	2.5	2.5	0.0	2.5	0.0
	Inside bush or open plots (%)	0.0	13.2	10.6	2.70	8.1	6.8
	Skip bin (%)	1.4	10.0	7.1	1.4	10.0	2.9
	Burning (%)	0.0	7.5	13.8	1.3	8.8	10.0
	Mobile waste van (%)	1.4	10.0	4.3	1.4	4.3	4.3
	Drum (%)	0.0	4.3	5.7	0.0	2.9	0.0

**Table 8: Relationship between Type of House / Building of Respondents and Waste Disposal Methods**

		Types of House / Building			
		Face to Face	Blocks of flats	Bungalow	Semi detached duplex
Overall method of waste disposal in Ibadan	Dumping in stream / gutter (%)	14.8	0.0	2.5	0.0
	Disposable nylon / sac (%)	3.7	1.2	3.7	0.0
	Inside bush or open plots (%)	24.6	2.5	6.8	0.0
	Skip bin (%)	22.9	1.4	8.6	1.4
	Open air burning (%)	29.6	3.7	4.9	1.2
	Mobile waste van (%)	11.4	5.7	8.6	0.0
	Drums (%)	8.6	2.9	1.4	0.0

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