

Informal sector initiative in the primary sub-system of urban solid waste management in Lagos, Nigeria

Abel Omoniyi Afon

Department of Urban and Regional Planning, Obafemi Awolowo University, P.O. Box 2014, O.A.U. Post Office, Ile-Ife, Nigeria

Abstract

The study investigates the operations of an informal initiative; the “*barro*’ boys” in the primary sub-system of urban solid waste management. The study is focused on 2 of the 20 local government councils in Lagos State, Nigeria. All the *barro*’ boys identified in Mushin and Kosofe local government areas were purposively sampled through structured interview. Information on the residents’ perception of the operators’ services were obtained from 392 households through systematic random sampling technique.

The study identified that the operators of the initiative are educationally low in status, single by marital status, young adults all of whom are below the age of 35 years. The main activity of the initiative is collection of waste from the source of generation and no form of sorting is practiced. The equipment used is human driven cart which is either owned or rented. No definite method of service charge exists. The service is available throughout especially from Monday to Saturday. The operators’ minimum daily income is Naira 1000 (Naira 128 = US\$1). The initiative also produced dump site touts and several clandestine waste dump sites. The study further established that residents use environmentally unfriendly storage receptacles which aggravate the problems of effective collection. Though the residents were apprehensive of their properties’ security in the hands of the initiative’s operators, it is still the most popular means of disposal as 71.3% of the waste produced in the two council areas is disposed through them. In addition, the index of satisfaction (residents’ satisfaction index, RSI) on each attribute of “service availability”, “cost, in relation to the service provided”, “politeness of the initiative’s operators” and “reliability of the service rendered” is higher than the aggregate satisfaction (\overline{RSI}) of their service.

The study concludes that with the popularity of the illegal, but highly cherished service of the *barro*’ boys, integrating them into the existing system to evolving an effective and efficient urban solid waste management is more realistic than the consideration to outlaw the initiative.

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Keywords: Informal sector; Primary sub-system of solid waste management; Residents’ perception; Residents’ satisfaction index; Dump site touts; Waste storage receptacles

Introduction

Nigeria, a third world country, operates a Federal System of Government. There are three tiers of federating units. These are the central, state and local governments. Each of these federating units performs distinct functions as provided for in the constitution.

E-mail address: abelafon@yahoo.com.

Urban solid waste management in the country is constitutionally the responsibility of the third tiers of government; that is, the local government (Federal Republic of Nigeria, 1999). It is evident, however, that the financial, material and human resources committed to waste management by this level of government have not been able to match the responsibility. This is because there are heaps of solid waste dumped on open spaces, along river banks and at road junction in major urban centres. The most affected cities are the federal, state and local government headquarters.

As a result of the failures recorded by the local government in solid waste management, many state governments have put in place bodies that are regional in outlook (that is, covering more than one local government). For example, in Oyo state, Ibadan Waste Management Authority was established in 1996 to oversee all the local government areas in Ibadan region (Oyo State of Nigeria, 1996). Similarly, Ondo State Waste Management Authority was established in 1999 (Ondo State of Nigeria, 1999). In the former federal capital city of Nigeria: Lagos, which is the focus of this study, a regional body to manage waste was established. At the time of its inauguration, it was known as Lagos State Waste Disposal Board (Adefemi, 1980). The body has been changing name to reflect expected functions and responsibilities. The body is known as from 1999 as Lagos State Waste Management Authority (LAWMA).

Evidence abounds that not much is achieved through the activities of the regional bodies and the private operators licensed by them. On the one hand, both the regional body and the licensed operators found it impossible to effectively collect and dispose waste from the source of generation and those indiscriminately dumped in space. Second, as a result of this and the behaviour of their workers, the members of the public had a negative perception on their activities. Recent studies (Adediji, 2001; Ayeni, 2006; Onamusi, 2005) did not only confirm this but also draw conclusion that residents were dissatisfied with services rendered in the primary sub-system of solid waste management. The failures in the sub-system are not peculiar to where there are regional bodies like the three states mentioned above. Even where no regional body in outlook is set up, the local governments' efforts in managing waste do not match the responsibility. This has been the situation in all the federating states of the country over a long period of time now (Adedibu & Okekunle, 1989; Afon, 2005; Ayeni, 2006; Daura & Kagu, 1997; Umeakuka & Mba, 1999).

Since waste production is an inevitable by-product of human existence, consequently, its disposal is a must. This is either done sanitarily or otherwise through formal or informal setting. The response of young and able bodied people and the residents to the failures recorded by LAWMA and the emergent registered waste collectors is therefore worthwhile to be examined. While the young and able bodied men thought that they have services to render in solid waste collection on a house-to-house basis, there are residents who want waste to be evacuated from their premises at an affordable financial cost and at a very convenient time of the day. The operators of this informal initiative are popularly referred to as the *barro*' boys. This is a name coined from the main equipment used in the collection of waste: wheel barrow or cart. They are occasionally also referred to as *mallam*. In this study, the former name is used, since it is more popular.

As at 2006, the *barro*' boys and their activities have become visible in almost all the 20 local government areas of Lagos State. Indeed, they operate side by side with LAWMA and the licensed operators. Their growth is alarming. With the present state of the initiative's popularity, it becomes very difficult if not impossible to outlaw their activities. This study therefore is an attempt to examine a number of issues concerning this informal initiative in the primary sub-system of urban solid waste management in Lagos, Nigeria. Of interest to the study is to provide answers to questions like: Who are those that are involved in this informal initiative? Why is it so easy to enter the initiative and where lies the power of its sustainability? What are their modes of operation? How are the operators and their activities perceived by residents who patronize them? What are the environmental implications of their activities in urban solid waste management? Successfully providing answers to these questions will be a good pivot to suggesting workable means of integrating the initiative into an effective and environmentally friendly waste management system. This could be a model not only in Nigeria, but also in other developing countries of the world facing similar challenges in urban waste management sub-system.

The theoretical context of the informal sector in urban solid waste management

The term informal sector, which was coined in the early 1970s (Hart, 1973), relates primarily to the third world countries. It is used to describe small-scale, non-agricultural activities through which the means of

livelihood are provided for people. Such activities are not recorded in official statistics. The economic significance and importance of informal sector became very popular as from the 1970s.

It has been put forward that, in any economy, the informal sector plays both important and controversial roles (Elkan, 1988). In the first place, its importance lies in the fact that it is formed by the coping behaviours of individuals and families in economic environment where earning opportunities are scarce. By its formation, it provides employment and reduces unemployment and underemployment. Indeed, it is estimated that the sector accounts for between 45% and 60% of the urban labour force in Nigeria (Nwaka, 2005). On the other hand, it is very controversial in the sense that it is a product of rational behaviour of entrepreneurs that desire to escape the state regulation. In this regard, the informal sector is characterized by low paid jobs, poor job security, tax evasion, avoidance of labour and other government/institutional regulations and no registration of the company (Akerle & Chete, 1996; Bromley, 1990; Elkan, 1988).

In another dimension, it is defined by the ILO (1991) as a way of doing things characterized by ease of entry, reliance on indigenous resources, family ownership, small scale operations, labour intensive and adaptive technology, skilled acquired outside the formal sector and unregulated and competitive markets among others. Furthermore, scholars which include Van de Klundart and Lardinois (1999), Furedy (1990), and Cross (1998), posited that the operators of the informal sector hardly have access to banks and other formal credit facilities. This they opined is due to absence of assets and securities. The people involved are considered to be less credit-worthy, and low in social status.

From the submissions of Hart (1973), McNeil (1993), Abumere (1995), Akerle (1995) and Akerle and Chete (1996), informal sector workforce can be categorized into three broad groups. These are: first, owner-employers of micro-enterprises—the enterprise may employ a few paid workers with or without apprentices; second, own-account worker—the person owns and operates one-person business, who works alone or with the help of unpaid workers generally family members and/or apprentices; and third, dependent workers which may include paid or unpaid workers and wage workers in micro-enterprises.

Operators of the informal sector could participate in almost all sectors of the economy. Thus, informal sector initiatives are involved in street trading, carpentry and metalwork and a wide range of basic services provision which include health (Akerle & Chete, 1996), urban water supply (Wittington, O’Korafor, Akore, & McPhail, 1990) and, of concern to this study, solid waste collection and disposal. It has been rightly observed that the informal sector continues to exist in these different areas because it produces goods and services that ordinary people would want to buy, and at prices they can afford (Van de Klundert & Lardinois, 1999).

The informal sector participation in urban solid waste management refers to unregistered, unregulated or casual activities carried out by individuals and/or family or community enterprises. The emergent of the initiative is a response to either failures of the formal sector in this urban sub-system or lack of employment or under-employment or all of these.

Informal sector participation in solid waste management had taken different dimensions in some third world countries. For example, in Indonesia, the sector hires and manages the neighbourhood workers who provide door-to-door waste collection. The main equipment used in collection is the human driven cart (push-cart). As recorded by USAID (1990) the local leaders collect fees from residents to fully cover the neighbourhood costs. Such costs include those incurred on salaries, equipment replacement, supplies of various kinds and to keep the system on a sustainable part.

In Nairobi, Kenya, the informal sector had been in operation for over a long period of time. The sector collects waste from private homes (most especially from middle and high income areas), industries and offices, disposes and recycles. However, their operations existed without official approval (Karuga, 1993). The outfit recorded success to the extent that by March 1991, the initiative came under the jurisdiction of the Public Health Department of the Nairobi City Council.

In Egypt, another third world country, Kamel (2000) documented it that no formal private sector companies with a strong record exist. The existing informal system is recovering 80% of waste collected. In addition, 7–8 jobs are generated on a ton of waste collected. Furthermore, indigenous informal sector workshops where old clothing, paper, cardboard and plastic were converted exist. A normal form of waste sorting is carried out. By 1990, two of such informal groups have gained prominence in waste collection, partial sorting and recycling. These are the Ewaahisi and the Zabbaleen (Kamel, 2000).

Despite the advantages attributable to the informal sector initiative in urban waste management, a number of serious negative conditions associated with the sector's operation have been identified. In the first place, waste may not be sorted and where sorting is carried out, what is not fit for recovery is left on the streets to rot. In many instances, such portion of waste is burnt. It is also observed that sorting waste manually by women and adolescent girls encourages health hazards. This could be from broken bottles, infection from syringes and sharp pieces of metal. Thus, while the livelihood of the community improved drastically through the activities of the informal sector initiative in waste management, its operators' living conditions are not improving by the same quantum leap. Furthermore, the creation of illegal dump sites is encouraged. Cointreau (1989) commented that in 1988, more than 600 clandestine dumps were created by collectors using donkey carts in Barranquilla (Colombia).

One observable characteristic of informal sector initiative in the primary sub-system of waste management is that it is confined to big cities. This is also the situation in Nigeria. Lagos, the formal federal capital city is one of these cities where the informal operators in the primary sub-system of solid waste management are flourishing. This is so as residents do patronize them on a daily basis. However, how environmentally friendly their operations are should be of great concern to government at all levels, the citizens and scholars.

The study area: an overview

The focus of the study is Lagos, in Lagos State of Nigeria. The city is the formal capital city of the country. Ikeja is its capital town. The state is presently made up of 20 local government areas. Two of them were selected for study. These are Mushin and Kosofe Local Government Councils. Mushin is the second most populous local government in the state. The estimated population of the local government was 586,847 in 2004. This accounted for 17.4% of the state's population. Kosofe local government on the other hand is characterized by bustling commercial activities. The projection made from the 1991 Nigerian National Population Census figure indicated that there were 325,552 people in the area in the year 2004.

Like in any other residential environments of Lagos State, there are physical manifestations of ineffective waste collection. There are cases of indiscriminate waste dumping in open places, drains, streams cumulating into occasional flood, blockage of the free flow of human and vehicular traffic and the creation of environment not conducive to human healthy living. This is despite the fact that there exist two formal outfits for managing waste in the state. These are LAWMA and private operators registered by it.

However, the fact that the *barro*' boys are operating all over the study area is an indication that they are highly patronized by residents who are automatically the waste generators.

Methodology: data collection

The data for the study were collected through the use of questionnaire administration and structured interviews. While the questionnaire was administered to the residents (waste generators), interviews were conducted for the operators of the informal sector. In the administration of the questionnaires, each local government under investigation was stratified into the different political wards delineated by the country's Independent National Electoral Commission (INEC) for election purposes.

There are 10 of such wards in Mushin Local Government Area while seven exist in Kosofe. The 40% of these wards were sampled. This sample proportion was considered representative enough. Thus, four and three political wards were, respectively, sampled in Mushin and Kosofe local governments.

Houses to be sampled would have been better selected through the house list prepared during street naming and/or rating exercises. The availability of such data would have provided information on the total number of buildings existing in each political ward. Houses to be surveyed would have been selected using random sampling technique having determined the sample size. With the absence of this information, and with the decision to sample 10% of the buildings in each of the selected wards, the systematic random technique was adopted. The first house to be sampled was randomly selected. Every 10th unit was subsequently selected thereafter.

Managing household waste in the study area, like in the other parts of the country, is usually the responsibility of the female members of the family, especially the married. To this end, questionnaires were

targeted at females in the selected buildings except where this condition is not met, like in the case of spinsters and bachelors. All households found in selected buildings were sampled. Resulting from this sampling technique, 205 and 187 questionnaires were administered, respectively, in Mushin and Kosofe local governments. Thus, a total of 392 households were surveyed in the two local government areas.

The second set of data obtained through the use of structured interview was from the informal operators of the primary sub-system of solid waste management. All the *barro*' boys identified during the survey were interviewed. The *barro*' boys are easily identifiable as they move along the streets. Each is either with a wheel barrow or cart that is about to be filled or already filled with solid waste. No information on the total number of the initiative's operators exists. They cannot also be traced to any specific point in space where they can be contacted except the dump sites where they hurriedly dispose the contents of their wheel barrow or carts. Interviewing them at the dump site was considered inappropriate as they may be operating outside the study area.

With these characteristics, it was decided that all the *barro*' boys identified during the survey (that is, questionnaire administration) would be purposively sampled. In this sense, all identified operators who volunteered to attend to the research assistants were interviewed. The interview, as a means of data collection, was considered appropriate for two main reasons. In the first instance, the literacy level of the operators of this informal initiative is generally very low and therefore they could not read and understand the questionnaire. Second, to track them down so they could respond to questionnaires would have been very difficult. This is because they can hardly spare their time for any other thing since how much they make per day depends on the number of trips they could make to the disposal site. In essence, the few questions that were asked were actually during the time when the barrow boys were collecting or transporting waste. Using the above method, only 25 *barro*' boys were identified in the two local government areas.

Questions that were in the interview guide provided information on their educational and marital status; the daily hours of operations; the days of the week that they operate and the busiest day; the average amount of money made per day and the method of arriving at charges to be paid by clients. Others included: whether the wheel barrow or cart used is rented or owned; and if rented, how much does it cost per day; the number of carts and/or wheel barrows owned; how many times is the dump site visited per day to dispose waste; how much do they pay at the dump site per visit and to whom.

The descriptive method was used to analyse the data obtained. The analysis resulted into measuring the satisfaction derived from the *barro*' boys operations through the residents' satisfaction index (RSI). To achieve this, seven major attributes of the *barro*' boys were identified. These are: service availability, cost of service relative to service provided, politeness of the initiative's operators, environmental friendliness of the collection method, reliability of the service, assurance of disposing safely the waste collected and safety perception of the initiative's operator. Residents were instructed to rate each of the attributes using the Likert's scale of 'very much satisfied', 'satisfied', 'just satisfied', 'not satisfied' and 'not at all satisfied'. Several studies where the level of satisfaction enjoyed by residents on the various attributes of urban environment or services were determined through such ratings existed in both the developed and developing nations. Such works include Anand (1999), Opricovic and Tzeng (2003), Central Connecticut State University (2005), Afon (2006) and Afon, Abolade, and Okanlawon (2006). Indeed, the approach is an extension of the multi-criteria model where different attributes of a service or alternative rating are generated, weight is assigned to each of the rating generated (Opricovic & Tzeng, 2003), and arriving at an index for each rating to produce ranking showing the respective level of satisfaction enjoyed. How the RSI was determined on the overall operation of the *barro*' boys and on each of the identified attributes are further discussed under the findings of the research.

Research findings

The information collected from the above research methodology is discussed under the various sub-headings below:

The characteristics of the operators and operations of the informal initiative

All the identified *barro*' boys are males. Responsible for this may be that the collection and transportation of waste is done by human driven cart or barrow. This is an activity that is too difficult for women. It is also

very dirty work that poses health hazards and risks to the operators. Of the 25 *barro* boys, 68% are single. The rest are married. Indeed, all of them are below the age of 35 years. This is an indication that anyone who is to engage in this informal activity must be youthful and full of energy. A breakdown of the operators confirms that they are educationally low in status. Of the identified operators, 64% of them had no formal education. Only 28% of them had up to primary school level while the remaining 8% were dropouts from secondary school education.

The study established that the main activity of the *barro*' boys is the collection of waste from the source of generation and disposal at the government's designated open dump sites. Waste sorting is not practiced. The human driven cart is more commonly used than the wheel barrow. Supporting this claim is the fact that 84% of the surveyed *barro*' boys are using carts. This collection equipment is preferred to the wheel barrow because of the quantity of waste that it can collect at a time. The research further revealed that the initiative is generally a one man business.

Other important characteristics of this informal initiative are:

- (i) A large proportion of the boys (68%) do not have permanent clients. It is also established that some of them operate far beyond the geographical boundary of the local government where they were identified.
- (ii) The number of houses where waste is collected per day by a *barro*' boy ranges from 3 to 13. This, however, depends on the quantity of waste to be evacuated from residents in the buildings they had contact with.
- (iii) The waste collectors have no disposal permit. In other words, they are not registered.
- (iv) There is no standard method of charging fees on the waste collected. The amount of money collected from a client is a function of the quantity of waste in question and the bargaining power of the two stakeholders (the waste generator and the *barro*' boys). However, as a result of the everyday practice, the *barro* boys charge on the basis of the storage receptacles employed by the generators. Usually, residents use any or a combination of drum, bucket, sack and nylon and polythene bag.
- (v) The common mode of collecting charges is on "per visit" basis. It is established that 84% of the operators collect charges as they visit a household for waste collection. Only 16%, probably out of the seven *barro*' boys who claimed that they have permanent clients, collected their charges on weekly basis.
- (vi) Most of the *barro* boys operate from Monday to Saturday. The survey revealed, however, that the majority (76%) do not work on Sunday. The busiest day for the *barro* boys is Saturday. This is the day when residents engage in general cleaning of their compounds. Other relatively busy days are Friday and Monday.
- (vii) The daily operations of the *barro*' boys earn them between Naira 1000 and 2000 (Naira 128 = US\$1). However, none of the identified *barro* boys made less than Naira 1500 on Saturday.
- (viii) There are two designated open dump sites in Mushin local government. These are located at Itire canal and Oshodi-Isolo. There is no designated disposal site in Kosofe local government. The nearest open dump site is at Olushosun, in Ojota located in Ikeja local government. The study identified that this is the one patronized by operators of this initiative in Kosofe local government.
- (ix) The average number of trips to disposal site is two per day. Only 16% of the identified *barro*' boys claimed that they visit the disposal site once daily, while 12% dispose of waste three times daily.
- (x) All the operators in this informal waste management activity pay a certain amount of money at the disposal site. The amount is paid per visit. The amount of money varies from one dump site to another. The people they pay are "touts" known as "area boys". The minimum amount paid per visit is Naira 50.00.
- (xi) The carts and the wheel barrows used in their operations could either be owned or rented. It was established that 36% of the *barro*' boys owned carts. Only 8% of the operators owned two carts each. Twelve of the interviewed operators indicated that the carts they operated were rented. Few of the operators had wheel barrows. The reason for this is that more money is made through carts. Moreover, since the same amount of money is paid at disposal site irrespective of the quantity of waste to be disposed, operators preferred to use carts. The cart is, however, more costly to build. There are thus some operators who own a cart or carts but are not operating it or them.
- (xii) The amount paid for a rented cart is between Naira 200.00 and 300.00 per day.

- (xiii) There are several illegal open dump sites created by *barro*' boys, especially in Kosofe local government jurisdiction where there are no designated open dump sites.

Residents' perception of the activities of the barro' boys

Before the different views held by residents on the different activities of the *barro*' boys are discussed, it is imperative that a quick look is made at the two main activities that mostly affect the operations of the initiative. These are the existing storage and disposal practices in the various households.

Existing storage and disposal practices.

Residents were asked to indicate the different solid waste storage receptacles used in their household. Presented in [Table 1](#) is the analysis of the information obtained in the two local governments.

It is established that the common storage receptacles are not environmentally friendly. This is not, however, peculiar to residents in the study area. This is a general practice in most of the Nigerian urban centres (Afon, 2005). Residents prefer to store waste in smaller containers, such as unused buckets (plastic and metal), nylon and polythene bags and bowls. The practice helps residents to bargain effectively which usually leads to paying less for disposal. This explains why the most popular means of storing waste is the use of plastic buckets. Another smaller container (nylon and polythene bags) ranked second. The residents' storage practices expose the waste to flies, rats, cockroaches and other diseases carrying vectors. Moreover, collectors are prone to health hazards and risks and indeed, collecting becomes very difficult. It is obvious, however, that the lack of standards designed and enforced by any statutory body is responsible for individuals using any environmentally unfriendly receptacles deemed convenient and affordable.

Similarly, the residents' disposal practices have the same effect on the environment. The study establishes that in addition to disposing of waste through burning, dumping into drains and open spaces, there exist three major agencies in the study area through which residents dispose their waste. These are the LAWMA, registered private operators and the *barro*' boys. From the information presented in [Table 2](#), residents patronize more than one agency in disposing waste. It is evident that the *barro*' boys in the primary sub-system of waste management in Lagos are very popular. Their popularity is reflected by the number of respondents who patronize their services. While 74.7% of the waste generated within Mushin local government is disposed via the operation of the *barro*' boys, they collect 66.8% of waste produced in Kosofe local government jurisdiction. On the whole, 71.3% of the waste generated in the two local governments is collected and disposed of by the *barro*' boys. With this popularity, it is essential to examine the residents' frequency of patronage and level of satisfaction with *barro*' boys' operations.

Residents' patronage of, and expressed satisfaction with, the barro' boys' operations

To be examined first under this sub-heading is the frequency with which collections of waste take place. As shown in [Table 3](#), close to three-fifths (58.5%) of the residents are in the habit of disposing of waste generated in their households once a week in the whole of the study area, 66.1% in Mushin and 49.3% in Kosofe.

The people who dispose of waste as the need arises are those who generate large quantities of waste. Noteworthy among this category of residents are the food sellers and operators of businesses. They dispose of waste irregularly. At times *barro*' boys' services are patronized more than once daily, depending on the quantity of waste generated from their daily activities. It was found that 15.3% of residents are in this category.

As a larger proportion of waste generated in the tropics is organic in nature, a collection per week implied that a large proportion would have decomposed. This practice is certain to produce offensive odours and the breeding of flies, cockroaches and rats, as the storage receptacles are not environmentally friendly. Nevertheless, it can be concluded that the *barro*' boys play important role in the collection of waste from the source of generation.

A large proportion of the surveyed residents do not employ the services of *barro*' boys on a permanent basis. This is to avoid too close contact with the operators. Residents claim that the *barro*' boys do commit crimes ranging from stealing and house breaking to robbery, on the pretext of collecting waste.

Table 1
The percentage of residents' using the different solid waste storage receptacles

Different storage receptacles	Local government areas		Total
	Mushin	Kosofe	
Nylon and polythene bag	21.1	23.1	22.0
Plastic bucket (out of use)	22.4	30.0	25.7
Woven basket from palm fronts	14.8	18.9	16.7
Covered drum	20.5	6.2	14.2
Plastic bowl (out of use)	8.8	7.8	8.4
Sacks	7.5	5.8	6.6
Metal basin (out of use)	2.3	4.5	3.3
Open space (any available ones)	2.6	3.7	3.1
Total	100	100	100
<i>N</i>	308 ^a	243 ^a	551 ^a

^aThe number of responses exceeded the number of questionnaires administered as residents use more than one of storage receptacle.

Table 2
Percentage distribution of residents according to the different agencies through which waste is disposed

Agency	Local government areas		Total
	Mushin	Kosofe	
LAWMA	15.8	13.9	14.9
Registered private operators	19.5	18.4	13.7
The "barro" boys"	74.7	67.7	71.4
Total	100	100	100
<i>N</i>	221 ^a	201 ^a	422 ^a

^aThese figures exceed the number of questionnaires administered, since residents employ more than one means of disposing waste.

Table 3
Residents' frequency of patronizing the "barro" boys" service expressed in percentage

Frequency of patronizing "barro" boys" service	Local government area		Total
	Mushin	Kosofe	
Daily	13.3	16.9	15.0
Once weekly	66.1	49.3	58.4
Twice weekly	13.9	8.1	11.3
As the need arises	6.7	25.7	15.3
Total	100	100	100
<i>N</i>	165	136	301

The residents' level of satisfaction with regards to the operations of the *barro* boys was assessed. This is through the RSI, computed for each of the seven attributes of the initiative. To calculate the index, the ratings "very much satisfied", "satisfied", "just satisfied", "not satisfied" and "not at all satisfied" is, respectively, assigned a value of 5, 4, 3, 2 and 1. The total weight value (TWV) for each attribute is obtained through the summation of the product of the number of responses for each rating to an attribute and the respective weight value.

This is expressed mathematically as

$$TWV = \sum_{i=1}^5 P_i V_i,$$

where TWV is the total weight value, P_i the number of respondents rating an attribute i ; and V_i the weight assigned to attribute i .

The RSI to each attribute is arrived by dividing the TWV by the summation of the respondents to each of the five ratings of an attribute. This is expressed mathematically as

$$RSI = \frac{TWV}{\sum_{i=1}^5 P_i}$$

where RSI is the residents’ satisfaction index and P_i is as defined previously.

The closer the RSI of an attribute is to five, the higher the assumed residents’ satisfaction. The RSI obtained for each of the identified attributes of the *barro’ boys’* operation is as presented in Table 4. Also shown in the table is the average RSI denoted by \overline{RSI} for each local government. This is obtained by summing up the RSI for each attribute and dividing it by the number of the identified attributes ($n = 7$). Thus, the aggregate satisfaction for Mushin is 3.48. Similarly, the obtained \overline{RSI} for Kosofe local government is 3.49. From these figures, it is concluded that the level of satisfaction from the *barro’ boys’* service in the two local government areas under investigation are very close.

Further analysis indicated that four of the seven identified attributes have positive deviations about the \overline{RSI} of their respective local government. These attributes are “service availability”; “cost of service relative to service provided”; “politeness of the initiative’s operators” and “reliability of the service”. The implication of this is that the satisfaction derived on each of these aspects is higher than the satisfaction derived from the aggregate operational performance of the *barro’ boys* in each of the local governments.

The deviations about the \overline{RSI} for Mushin for the above respective attributes are 0.53; 0.43; 0.47 and 0.33. Similarly, in Kosofe local government, the respective deviations are 0.50; 0.29; 0.59 and 0.39. Combining the data for the two local governments, the RSI for each of the above attributes is, respectively, 4.00, 3.84, 3.85 and 4.02. The attribute of the *barro’ boys’* operation that provides the highest satisfaction to the patrons is the

Table 4
Residents’ expressed satisfaction on the different aspects of the “barro’ boys” operations

Some identified attributes of the “barro’ boys” operation	Local government								The combined data for the two local governments			
	Mushin LGA				Kosofe LGA							
	TWV	RSI ^a	RSI – \overline{RSI}	(RSI – \overline{RSI}) ²	TWV	RSI ^b	RSI – \overline{RSI}	(RSI – \overline{RSI}) ²	TWV	RSI ^c	RSI – \overline{RSI}	(RSI – \overline{RSI}) ²
Service availability	662	4.01	0.53	0.281	543	3.99	0.50	0.250	1205	4.00	0.51	0.260
Cost of service relative to service provided	645	3.91	0.43	0.185	514	3.78	0.29	0.084	1159	3.85	0.36	0.130
Politeness of the initiatives operators	655	3.97	0.47	0.221	555	4.08	0.59	0.348	1210	4.02	0.53	0.281
Environmental friendliness of the collection method	510	3.09	–0.39	0.152	429	3.15	–0.34	0.116	939	3.12	–0.37	0.137
Reliability of the service	628	3.81	0.33	0.109	528	3.88	0.39	0.152	1156	3.84	0.44	0.194
Assurance of disposing safely the waste collected	483	2.93	–0.55	0.303	421	3.10	–0.39	0.152	904	3.00	–0.49	0.240
Safety perception of the initiative’s operator	439	2.66	–0.82	0.672	336	2.47	–1.02	1.040	775	2.57	–0.92	0.845
Total	24.38		1.923		24.45		2.142		24.40		2.087	

^a $\sum P_i = 165$.
^b $\sum P_i = 136$.
^c $\sum P_i = 301$.

level of decorum shown by the operators. It has an RSI of 4.02 in the combined data of the study areas. The level of satisfaction expressed by residents on “availability and reliability of service” of the initiative is explained by a number of reasons. Perhaps the most important is that the *barro*’ boys are available every day of the week, though many of them do not work on Sunday. During these days, the operators are usually available for several hours. This makes it possible for residents to engage their services at their convenience. It is established further that the cost actually incurred on waste disposal by generators on their services is less than that incurred on LAWMA or the licensed private operators. While some households may spend as little as Naira 50 per week in engaging the services of the *barro*’ boys, the minimum monthly service charge of LAWMA or the licensed agent is Naira 500. In addition to this is the incessant breakdown of collecting equipment experienced by LAWMA and the licensed waste agents. The latter’s effectiveness is also hindered by, among other factors, traffic holdups and workers’ strikes. These do not happen to the *barro*’ boys operations; hence, their services are considered not only to be easily accessible but also reliable.

It is also important to carefully consider those attributes of the *barro*’ boys’ operations each with a RSI that is less than the \overline{RSI} of their respective local government. These attributes are the “environmental friendliness of the collection method”; “assurance of disposing safely what is collected” and “feel of security with the initiative’s operators”. These aspects of the *barro*’ boys’ operations cast doubts in the mind of those who patronize them. As a result of greed for making a large amount of money per trip, the quantity of waste collected is usually beyond the tolerance limit of both the equipment and the operator. Hence, waste which has fallen off the carts or wheel barrows litters the streets during transportation to the open dump sites, some of which are as far as 2 km away. It was also established that the operators of the informal initiatives dump waste indiscriminately close to where they are collected. This is known to residents but many have no choice other than to engage their services. With this situation, residents are aware that the *barro*’ boys’ service is not very conducive to human healthy living.

One of the most fearful aspects of engaging the *barro* boys is the issue of security of the houses of those who use their services. The study establishes that this is the attribute of the *barro* boys whose residents express the least satisfaction. The respective RSI are 2.66 and 2.47 in Mushin and Kosofe; with a deviation (about their respective \overline{RSI}) of -0.82 and -1.02 . Residents felt most at risk in Kosofe. Residents suggest that the operators could freely commit crimes since they easily relocate to other parts of a local government or move away from it completely. Indeed, there are numerous instances where *barro* boys have been arrested for such crimes.

The scatter around the mean satisfaction (\overline{RSI}) expressed by residents on the *barro*’ boys’ service in each local government is very small. This implies that the level of satisfaction derived on each aspect is quite similar. The computed variance and the standard deviation for Mushin are, respectively, 0.275 and 0.524. The respective figures for Kosofe local government are 0.306 and 0.553. Similarly, the variance and standard deviation of the satisfaction derived by residents of the two local governments combined on the operation of the *barro*’ boys are 0.298 and 0.546. From these calculations, it is established that the highest level of satisfaction on the operations of the initiative is expressed in Kosofe; $\overline{RSI} = 3.49$. The highest range of satisfaction $(4.08 - 2.47) = 1.61$ is also recorded in the area. And this in turn results in the highest variance and standard deviation. Thus, while in Kosofe, residents rely strongly on the *barro*’ boys’ services in the management of the primary sub-system of waste generated in their houses; satisfaction levels are much lower. The relative dispersion of the residents’ satisfaction can be better appreciated through the coefficient of variation. This is the ratio of the standard deviation to the mean of a distribution expressed as a percentage (Lucey, 1992). In this regard, the coefficient of variation for Mushin and Kosofe are, respectively, 15.1% and 15.9%.

6. Conclusion

The study establishes that the informal initiative investigated plays an important role in the management of the primary sub-system of waste management in Lagos State of Nigeria. The initiative is a source of employment to the operators. The collection of waste from the source of generation is satisfactory to the residents. This the residents expressed in terms of service reliability and affordability of the *barro*’ boys. Moreover, the operators are perceived to be polite in their dealings.

Despite the above advantages, it is also noted that their operations in waste collection from the source of generation and eventual disposal are besieged with many problems. These emanate from some of the peculiarities that characterize informal initiatives. Like in many other parts of the world where informal groups exist, this initiative is not registered with any government institution. In essence, their operation is out of government regulation. Under this situation, the household environment from which waste is collected looks very friendly and clean; however, the outside environment is worse off as the operators dispose what is collected indiscriminately. Thus, the development of clandestine waste dump sites is highly associated with the operations of the *barro*' boys. In another dimension, their activities encouraged the emergent of another set of 'touts' who operate at dump sites. These dump site touts collect money forcefully from the *barro*' boys as the latter visit the sites to dispose waste. It is also evident that residents feel less secure in using the informal initiative to dispose waste. Despite all these problems, it is observed that buildings that are in the land locked areas are better served by *barro*' boys. This is because the human driven cart with which waste is collected could easily be moved in such physically disadvantaged areas.

It is concluded that the informal initiative in the primary sub-system of waste management in Lagos, Nigeria, plays both important and controversial roles. To this end, contemplating a total ban of their activities would create problems beyond the waste management system. On the other hand, unregulated activities as have presently evolved lead to serious public environmental and health hazards. Thus, the recent threat of Lagos State Government to ban the cart pushers as contained in the [Guardian Newspaper \(2006\)](#) may not be a right step in the right direction after all. Rather, the initiative should be integrated into the system of waste management that would be economically convenient and environmentally friendly.

The integration can proceed from registering the operators of this informal initiative. The registration fees should be at a cost that is affordable considering the fact that the operators have no access to loan for lack of collateral security. The activities of registered operators can be regulated further by instructing them to dispose waste collected through transfer loading stations. It is recorded that six new transfer loading stations are contemplated. Payments are to be made at the loading stations. The amount to be paid will be determined by the government.

The activities of the *barro*' boys can be regulated by restricting the operations of those registered to specific local government areas. When this is done, *barro*' boys operating in areas where illegal open dump sites developed will be appropriately sanctioned by the local government officials.

It is also imperative for government to discourage the use of open dumps. Apart from the fact that the practice is not environmentally friendly, it is also a good way of encouraging the *barro*' boys to create illegal open dump sites especially using open spaces, abandoned vehicles, buildings under construction and vacant plots of land amongst many others. The existing sites can be improved and converted to other reasonable uses. This will put an end to the indiscriminate dumping of waste by the operators of the informal initiative. Moreover, the collection of illegal money by dump site touts will stop.

It is further suggested that the *barro*' boys can be organized to form corporative societies. This will enable them pull their resources together to purchase modern equipment for waste collection. Similarly, it is safer for government to give financial assistance in terms of loan to such organized group. With this in place, *barro*' boys' will be able to offer their present illegal, but residents' cherished operations with the backing of the law. They will also be competing with other initiatives in waste management. Indeed, a successful integration of the informal initiative in a legal outfit in waste management will be a lesson to be learnt by most, especially the developing world where informal operators in waste management exist.

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