



THE INFORMAL WASTE SECTOR AND SUSTAINABILITY OF MUNICIPAL SOLID WASTE MANAGEMENT IN BIRNIN KEBBI, NORTHWEST, NIGERIA.

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Abstract

This study was carried out with the aim of identifying the important roles the informal waste sector play in the municipal waste management system in Birnin Kebbi, the state capital of Kebbi State; one of the 36 states in Nigeria, and how these roles can be enhanced to bring about the sustainability of municipal solid waste management service in the town. It is reckoned that for a long time now the informal waste sector has been active in providing municipal solid waste service in urban areas of developing countries in spite of the dwindling revenues accruing to city governments in real terms. But this important activity is neither acknowledged nor integrated into the formal sector waste management system. In fact, instead of recognition and integration, the relationship between the informal waste sector and the authorities has been that of hostility and complete ban. The result from the study, however indicates that apart from diverting waste from the disposal site and thus providing environmental benefits, it has also been able to provide employment to youth who are mostly without the requisite skills, experience and education that will enable them secure jobs within the formal sector. In addition, it has the capacity to lower costs of municipal solid waste service provision when properly integrated with the formal service providers. The study has therefore recommended the need for enactment of a municipal solid waste management law or policy that will provide for the recognition and integration including improving the welfare of the informal waste sector workers. This is in addition to designation of a regulator by the proposed

law for monitoring of performance of all service providers in order to ensure value for money

Keywords: *informal waste sector, formal sector, sustainability, municipal solid waste management, recognition, integration, waste brokers, itinerant buyers, recyclables.*

Introduction

Municipal solid waste is viewed differently but has been simply defined by Mundal (n.d) as waste from non-hazardous sources such as homes, commercial areas, institutions and industrial facilities, (excluding waste from industrial manufacturing), which requires collection, transportation and treatment before final disposal. The management of municipal solid waste is therefore, viewed as the process of generation and handling, collection, transportation, processing and/or treatment and disposal of solid waste that has been discarded including the supervision of such operations (EU directives 2008/98/E; Nathanson, 2018). This important service, has over the years become one of the most critical environmental problems that is bedevilling cities of developing countries and it is expected to even get worse with increasing urban population and demand for the service to satisfy about 73% that shall reside in urban centres of Asia and Africa. This is coupled with the fact that only 30% of the municipal solid wastes is currently collected and the remaining 70% are indiscriminately disposed (United Nations, 2014). Consequently, until new strategies are evolved, cities or urban centres of developing countries will continue to suffer from the negative consequences of poor municipal solid waste management services that have health, safety and environmental implications including disruption of tourism activities and thus reduction in source of revenue for cities that depend on tourism (Kaza et al. (2018).

In this scenario, Nigeria is expected to be crowned the ‘waste capital’ of Africa because according to Arogundade (2018) by 2025, the country is expected to generate about one-fourth of the total solid waste generated in Africa. This is in the face of inadequate budgetary provision, absence of legislation, regulation or policy that will guide the implementation of integrated waste management programmes as well as inadequate technical

and administrative personnel that could transform or ‘modernise’, the municipal solid waste management sector. With these colossal problems and dwindling oil revenues in real terms, Nigerian cities will need to find a cost-effective solution that will ensure sustainability of municipal solid waste management. Consequently, Nigerian cities can look at the prospects of recognising the roles of the informal waste sector and subsequently integrating it into the formal waste sector activities or programmes. This has been done in some countries in Latin America and Asia with huge success. Unfortunately, however, most African countries including Nigeria still regard informal waste sector as nuisance and a dirty job carried out by those in the low social status and consequently, they are despised, stigmatised and sometimes banned from operations. For instance, Lagos State Government once banned the operations of ‘barro boys’ that collect solid waste in parts of Lagos for a fee, thus augmenting the services of Lagos Waste Management Agency (LAWMA) that had low coverage (Afon, 2007)

Role of the Informal Waste Sector in Sustainable Municipal Solid Waste Management

The informal waste sector is defined (Gupta, 2012) as encompassing those individuals or group of individuals including small and micro enterprises that provide municipal solid waste management services but are neither registered nor recognised by the authorities. These services include waste picking, scrap collections and storing including trading (itinerant buying). For ease of comprehension of the concept, Gunsilius, et al (2011) has however, categorised the informal waste sector into the *informal service sector* that is involved in street sweeping, drainage evacuation, collection, transportation and disposal of waste while the *informal valorisation sector* focuses on the collection, processing and transportation in addition to purchase or barter mostly household or children toys with reusable and recyclable materials. Some striking characteristics of the informal waste sector workers is their inability to secure financial support or loan because of the demand for collateral which they lack, as well as lack of job security because they are not protected by Union laws, low wages, absence of official recognition and worst of all they do not have welfare and other

fringe benefits notwithstanding the hazard of their occupation. But in spite of these, the informal waste sector has been reckoned to have immensely contributed to the sustainability of the municipal waste management in most cities of the developing world by increasing coverage of the service at low cost to residents and government.

Apart from increasing coverage, the informal waste sector has been responsible for diversion of more of recyclable waste materials than the formal sector thus reducing the amount of municipal solid waste that goes into the waste stream for collection by the formal sector provider. This also provides savings to Government by reducing the quantity and the amount that will be sourced to purchase vehicles and equipment in the face of competing demands. This was noted in the study of Delhi by Gupta (2012) where he estimated that a saving of about EUR 6.7-7.5 million was made from diversion of waste by the informal sector alone. Aside from the financial benefits, reduction in number of vehicles could impact positively in the reduction of vehicular emission consisting of mostly carbon dioxide that damages the environment by contributing to global warming and climate changes. With huge collection of recyclable or salable waste materials by the informal waste sectors for recycling, the exploitation of resources is also reduced thus further saving the environment as well as promoting the concept of sustainable development that requires the present generation to meet its needs without compromising the ability of future generation of meeting its own needs. It is expected that recovery of recyclables which could be up to 30% (Medina, 2008) could assist greatly in reducing unsustainable exploitation of natural resources for manufacture of new products. For instance, each ton (2000 pounds) of recycled paper can save 17 trees, 380 gallons of oil, three cubic yards of landfill space, 4000 kilowatts of energy, and 7000 gallons of water. This represents a 64% energy savings, a 58% water savings, and 60 pounds less of air pollution (University of Southern Indiana, 2021)

Birnin Kebbi: The Study Area.

Birnin Kebbi is located on latitude 12° 27' 14" N and longitude 4° 11' 51" E with an elevation of about 234 metres above sea level. Birnin Kebbi is said to be an administrative headquarters right from the days of the Fulani

jihad when it was made the headquarters of the southern part of the Sokoto Caliphate created by the Jihadist in 1805. With the arrival of the Colonialist, it later became the headquarters of Gwandu Native Authority and during the post-Colonial era, it was transformed into the headquarters of Birnin Kebbi Local Government. Upon the addition of more states in the country, in 1991, Birnin Kebbi was upgraded from the status of a local government headquarters to become the capital city of Kebbi State. Following the change in its status to a new state capital, it began to witness the influx of persons from its vast rural areas as well as from other parts of the country in search for or to explore job and business opportunities.

As a result of the influx of persons, the town increased in both physical size and population. Its physical size increased almost two and half fold from 567 hectares (5.67 sq kms) between the period of 1991 and 1995 to 1,603 hectares (16.03 sq kms) in the period of 2006 and 2010 (Ankeli et al, 2015). In terms of population, it rose from 151,457 in 1991 to 268,420 in 2006 (Kebbi State Bureau of Statistics cited by Ankeli et al, 2015). Thus, the population of Birnin Kebbi as of 2019 was estimated by Macrotrends (2019) as 352,000 persons. This rise in population estimated to grow at 3.45% annually (Ankeli et al, 2015) will certainly demand for infrastructure and services to satisfy this rise in population. One of the services whose demand has increased was the need for collection and safe disposal of an estimated 155,000 kilogrammes of solid waste generated daily based on 2019 population estimates. Based on the 2019 population of 352,000 persons and an average of 0.44kg/pers/day as suggested by Abila and Kantola, (2013) for medium urban centres like Birnin Kebbi, the 155,000 kilogrammes (171 tonnes) per day will translate to 62,000 tonnes per annum. It is observed, however that most of the waste is organic laced with a lot of polythene nylon bags. The presence of polythene and water sachet bags have not only degraded the quality of the urban environment but also reduced the quality of the organic materials that is mostly utilised by some residents for composting as manure on their farms or gardens (Abdullahi, 2014)

It is obvious that meeting this demand will require the sustainable provision of municipal solid waste services especially now that the funds accruing to the governments from the federation account as grants have been dwindling

in real terms. Consequently, cities like Birnin Kebbi must explore and exploit strategies that are not only effective but efficient that will free the city from badly managed solid waste and its effects on human health and the environment. A strategy that will not only be deployed to tackle the menace of improperly managed solid waste but also provide employment to majority of youth who, left alone, without the requisite skills, education and capital could not afford to secure formal job or establish formal business. One such strategy involves the acknowledgement and integration of the informal waste sector into the formal sector. After all, over 90% of Nigeria nay Kebbi State operates in the informal sector (This day Newspaper, 2016). The aim of the study therefore, was to examine the municipal solid management service in Birnin Kebbi and the role of the informal waste sector as a service provider as well as make recommendations on how the informal waste sector could assist in providing sustainable municipal waste management service in Birnin Kebbi. Sustainable municipal solid waste management here follows Imran, (2008) description that sees sustainable waste management as concern with the improvement of human life by providing healthy living condition and economic advantages for human while at the same time keeping the effect of waste from damaging the ecosystems.

Methodology

In this study, the mix method was implored to collect both qualitative and quantitative data concurrently within a period of three months. With focus on the contribution of informal waste sector, the case study methodology was chosen for the research so as to provide proper insight of the municipal solid waste management operations by both the formal and informal waste sector operators. The choice of combination or mixed methods for the collection of data and analysis rests on the fact that it assists in strengthening weaknesses as well as remove biases that could be found in both qualitative and quantitative methods. Questionnaire was the main instrument used in data collection and was administered on the formal and the informal waste sector operators while interviews were carried out concurrently so as to get more insight into the phenomena under study as well as validate the data received during the conduct or administration of the questionnaire. Focus

Group Discussion (FGD) was conducted with 15 participants focussed on eliciting for different opinions from, amongst others, the experts on the field on the topic under study while observations were carried out to record or observe the mode of operations of both the formal and informal waste sector operators. During the FGD, participants were requested to participate voluntarily and were cautioned of the need to ensure confidentiality of whatever was discussed in the FGD.

In administration of the questionnaires both qualitative and quantitative data were obtained through the mixed method approach by employing closed- and open-ended questions. For the informal waste sector, questionnaires were distributed and administered in Hausa; the local language, based on the size of neighbourhood or what is locally called 'unguwa' or 'shiya'; which is an established political entity that is under a traditional ruler. In each of the neighbourhood, selection of participants and administration of questionnaires followed the convenience sampling technique because the informal waste sector is unregulated and unregistered and, therefore, it is difficult to carry out any randomised sampling for lack of actual figures that would provide sampling frame and specific location of participants. In all, a total of 25 informal waste sector workers consisting mostly of waste pickers, scavengers and itinerant buyers of recyclables were selected based on convenience sampling technique for the quantitative study. Structured interviews were also conducted in the local Hausa language with 10 waste brokers or middlemen on their role in the recycling chain. The other set of questionnaires were administered separately, based on self-administration, on the only private sector municipal solid waste operator; Black Suede Investment Limited (BSIL) and the sole public solid waste operator namely the Kebbi Urban Development Authority (KUDA). The questions were generally geared towards recognition or social acceptance of the informal waste sector workers, their integration and empowering them through organisations or cooperatives.

The analysis of data obtained in this study was carried out through descriptive statistics or analysis, which involved the use of percentages, frequency distribution and measures of central tendency including measures of dispersion. Thus, quantitative data such as on quantity of municipal solid waste collected and transported, frequency of collection,

average distance to dumpsites, quantity of recyclables including income generated was analysed using the descriptive statistics. Qualitative data obtained through interviews and observations, was, therefore, used to complement the quantitative data and also provide further explanation on factors influencing or responsible for these outcomes. In addition, the qualitative data further provided understanding or the comprehensive picture of the relationships between these data.

Results and Discussions.

The Municipal Solid Waste Management Operators.

It was observed that the responsibility for formal provision of municipal solid waste management services lies mostly with the public and private sector providers. The public service provider is the Kebbi Urban Development Authority (KUDA) while the only private sector provider is Black Suede Investment limited (BSIL). The informal waste sector albeit unrecognised and unregulated has also been found to be active player in the municipal solid waste management system.

The KUDA was established in 1991 via Edict No. 2 of 1991 and was saddled with the responsibility for waste management generally including the collection, transportation and disposal of municipal solid waste. This is in addition to several other state-wide urban development activities that include urban planning and development, provision of street lights, urban beautification and maintenance of urban roads. The Department of Health of the Authority is in charge of municipal solid waste management and has a total of 124 staff and four functional vehicles including a pay loader that loads waste into these vehicles due to their height. The Department rarely carries out house to house collection except on request, but focuses on mostly waste collection from communal facilities and transport the waste to illegally designated dump sites. KUDA's collection coverage is abysmally low and the frequency of collection is irregular and depends very much on the availability of the only functioning pay loader that feeds the four functioning waste collection trucks. In addition, unlike the private sector, the KUDA does not charge fees for its collections because government policies do not allow the Authority to do so.

The only formal private sector operator providing municipal solid waste management in Birnin Kebbi is Black Suede Investment Limited (BSIL). It came to existence in August 2014, with the sole aim of providing municipal solid waste management services to individual customers, private and government organisations. Unlike KUDA, the company provides its services based on monthly billing and collection of user charges from its customers. It has two 5-tonnes waste collection vehicles and 45 crews (43 labourers and two drivers). BSIL adopts a once-a-week frequency of collection based on door-to-door collection method to empty the waste bins it collected from customers. No customer is surcharged for extra solid wastes that are found outside a particular bin. It collects municipal solid waste from 743 households covering six neighbourhoods of Badariya, Bayan Kara, Gesse phase one and phase two including GRA and Tudun Wada. The user charges range from N2,000 (\$4.00) per household/month to N5,000 (\$10.00) per government or private organisation/month (at a black market exchange rate of \$1.00 to N485.00). Further interview reveals that KUDA transports municipal solid waste using vehicles with a capacity of 10 tonnes each, which were foisted on it in 2005 by the state government for possible reason of fulfilling certain political patronage. As a result of poor maintenance, however, the vehicles are already becoming inefficient to maintain coupled with incessant theft or cannibalisation of some of their accessories such as batteries. But unlike the KUDA, BSIL has just two vehicles, with a capacity of five tonnes each, that are deployed for collection of municipal solid waste. These vehicles are not only easy to maintain but can also be easily loaded and off-loaded by the labourers. The two BSIL vehicles each make about seven trips per day which is equivalent to collection, transportation and disposal of 35 tonnes of waste per day. Consequently, from the capacity of vehicles and trips made each day by both KUDA and BSIL, it can safely be estimated that the annual collection is about 41,400 tonnes, based on a frequency of collection of once a week which USEPA (n.d) consider adequate even in the tropics. This total collection (41,400 tonnes) falls short of the estimated total generation of 62,000 tonnes per annum being generated by residents and, therefore a gap of 20,200 tonnes of municipal solid wastes that either

remain uncollected at communal waste facility or partly diverted away from municipal solid waste stream.

It is important to point out that apart from low collection by the formal providers, it was observed that municipal solid waste collected from the town is sometimes indiscriminately disposed at any available space at the fringes or periphery of the town or alternatively dumped at farmlands for farmers that normally purchase and use the wastes as farm manure. The final disposal is, however carried out without treatment or processing for lack of facility. Further enquiry indicates that while the private provider; BSIL officially charges N2,000 (\$4.0) per 5-tonne truck load of the comingled waste that is off loaded on farms and thus add to its revenue base, the operational policy of KUDA however does not allow it to charge any fess in respect of waste management services rendered to residents.

The common challenge, however, been faced by the public service providers is the lack of even a single small transfer station (STS) as the so-called dumpsites get farther away from the town. In addition, the KUDA also indicated the inadequacy of fund. As a typical agency of government, the KUDA depends solely on funds allocation from government which has over the years become too meagre to tackle the numerous urban development functions it is expected to execute, which includes provision of waste management services free of charge to residents. This is notwithstanding the fact that the Authority generates revenue from other services, which it has been forbidden to spend to at least augment the paltry funds it receives from government as well as cross-subsidise provision of services such as municipal solid waste. KUDA also complained of inadequate and inappropriate vehicles including shortage of unskilled staff owing to freeze on employment by government, which prevents the hiring of relevant staff. The complaint by the private sector; BSIL, is on irregular payment of user charges as one of the challenges the company faces in providing municipal solid waste services. The company considers this attitude as affecting its operations in terms of deployment of vehicles and coverage.

Apart from the recognised formal sector (KUDA and BSIL), the informal waste sector also contributes immensely to the municipal solid waste management services in Birnin Kebbi albeit with the dominance of

itinerant buyers. Unlike some large urban centres, it has been observed, however, that waste pickers and scavengers are few probably because of the physical size and the population of the town including the intensive sorting of recyclables at household level. In fact, the few waste picking and scavenging activities are carried out by children in the Islamiya School tagged as the *almajiris* (in the local Hausa language) that utilise the free days (mostly Thursdays and Fridays of each week) to engage in activities that will earn them some up-keep money. During waste picking, some of these children were observed to collect and dispose solid waste from either commercial shops or from house-holds at a fee which has not been standardised and thus depends on how the generator can afford to pay. These children could not afford to own primary collection equipment and therefore majority utilise a sack, which they hang on their backs to collect waste. They also use small size magnet tied to a rope which is dragged along the road or over communal dumpsite to pick up metals and aluminium. The magnets are normally supplied to these children free of charge by middlemen who normally have the first right of refusal when the metals or aluminium are offered for sale.

The itinerant buyers, however, are the dominant informal waste sector workers because of the probable high economic returns. They are found in most nooks and crannies of the town daily calling out for recyclables for purchase or barter. They use hand cart as the major means of transporting recyclable items to the depot or junk yard owned by the waste brokers or middlemen. This activity by the informal waste sector workers helps divert most materials away from the communal waste collection points with consequent reduction in weight and volume of the wastes that are finally collected by KUDA for direct disposal at the unofficially designated dumpsites that are found scattered at different directions of the town.

The study has, however revealed the non-involvement of the residents in the municipal solid waste management system. This is in spite of the fact that any sustainability of municipal solid waste system demands the contribution of relevant actors that include residents in the system. For instance, the residents, with sustained education and sensitisation, can be involved in source separation, reuse, recover and recycle of municipal

solid waste. It is unfortunate however, that in the current scenario, there is no synergy between the service providers. Each of the formal waste sector service provider works independently with grave consequences on service coverage and collection. In fact, the services provided by the private sector is neither regulated nor monitored by any agency of government in order to ensure value for money. Without monitoring of performance and quality of service, left alone, the private sector could lower service level so as to make more profit for its owner(s). Under this situation, the informal waste sector was found to be the biggest loser. This is because it was not acknowledged or accepted by the formal sector service providers as an integral part of the Birnin Kebbi municipal solid waste service delivery system.

One of the challenges confronting the informal waste sector workers, therefore is that of acknowledgement of their contributions to the municipal waste management of the town and their possible integration into the formal waste sector. In fact, result from the interview revealed that the two formal service providers have never acknowledged the contribution of informal waste sector talk less of integrating them into the formal waste sector. The informal waste sector also complained of harassment, extortion and lack of fund to purchase basic solid waste collection equipment like hand or push cart. Indeed 56% of the informal waste sector workers interviewed claimed they have suffered extortion by security agencies. That was in fact, the genesis of establishing an association known as the *Kungiyar Yan Jari Bola* in Local Hausa language or translated as Scrap Collectors Association with retainership of a lawyer solely to protect the informal waste sector workers and their bosses; the middlemen. While itinerant buyers face extortion and harassment, there has been public outcry on their activities of the informal waste sector especially on the itinerant buyers who many residents claim aid in stealing valuable items for sale to the itinerant buyers.

During the FGD, majority or 80% of the participants revealed that they have either banned the itinerant buyers from their neighbourhood or are preparing to do so because they believe that they (itinerant buyers) have encouraged theft of metals, aluminium and other recyclables that are yet to turn to scraps. The meeting with the officials of the Scrap Collectors Association during the study also revealed that though some of the members have been involved in

buying stolen items but the Association has clear rules that forbid such acts and anyone that flouts the rule does that at his peril and therefore does not enjoy its support or protection. These rules include:

- i. No purchase of item(s) from a child that is less than 18 years old and who is not accompanied by an adult of known address. In the absence of an adult, the child is requested to lead either the middleman or itinerant buyer to the source of the item(s).
- ii. No purchase of item(s) after 6:00 pm daily until 8:00 am the following day in order to forestall buying item(s) that are stolen under the cover of the night.
- iii. Forbids the purchase of any government item(s) without issuance of genuine receipt or evidence of the fore-knowledge of the respective government organisation.
- iv. Forbids the purchase of any new item except the one that has been used and needed to be disposed.

Although the middlemen are less exposed to extortion and harassment but they are faced with the problem of paying taxes to different organisations such as the KUDA, for using the space, and the Birnin Kebbi Local Government Council, for issuance of permit to carry out the scrap collection business. When the taxes and fees are put together, it was revealed that some (12.5%) pay up to between N5,100 and N10,000 (\$11.00 and \$21.00) per annum and the majority (62.5%) pay from N500 – N2,000 (\$1.00 to \$4.00) per annum. The payments are receipted and therefore expected to go into the coffers of the government. The study, did not however, go further to probe whether the revenues collected actually appear in the books of the KUDA or Birnin Kebbi Local Government Council.

From the foregoing it is clear that the current municipal waste management process in Birnin Kebbi is typical of what is obtainable in most cities of developing countries where generation, collection, transportation and final disposal takes place without treatment or processing. It is also clear that the final disposal is carried out indiscriminately not at a legally designated dumpsite without regards to the consequences that this action poses to the environment, the eco-system and human health. Sustainable solid waste management process, however requires the involvement of actors or

stakeholders as well as treatment and processing of solid waste in order to ensure that waste should only be finally disposed if it cannot be further reused, recycled, treated or processed. In addition, the use of inappropriate and low-capacity vehicles for the collection and transportation of the municipal solid waste may have resulted in low collection and coverage by the two formal municipal solid waste service providers.

The Informal Waste Sector Contribution

The informal sector activity in Birnin Kebbi is clearly a male dominated affair because of the waste pickers, itinerant buyers and scavengers interviewed, 86% were found to be adult male while the remaining 14% were male children. This may be attributed to the social construct found in the Muslim dominated North, where communities view the participation of women as abnormal although women can and do contribute to sorting the recyclables for sale to itinerant buyers in order to earn some money. Similarly, the middlemen or waste brokers interviewed showed a 100% dominance of adult male and no child was found as waste broker because it requires capital to start the trade and tutelage of a minimum of 5-7 years. The level of literacy among the informal waste sector workers was found to be low. About 40% of the informal waste sector interviewed do not have any formal education and 24% have had some education that can only enable them to read and write in Arabic or in the local Hausa language. The low level of education may be attributed to the nature of activities that the informal waste sector carries out daily which is considered by some as dirty and lacks social acceptance.

In spite of the low literacy level and operating under the middlemen or waste brokers that exploit them, the study still revealed that the informal waste sector has made significant contributions to the municipal solid waste management system in Birnin Kebbi, which has not been documented. This is not surprising because the state government does not recognise the sector talk less of keeping its records of activities. The informal waste sector itself rarely keep records of its activities even in the face of an exiting association. However, One of the major contributions of the informal waste sector is the provision of employment to especially youth because of its ease of entry and exit. It is estimated that of the 70 middlemen popularly known as *maisikeli*,

in the local Hausa language, there are about 20 itinerant buyers that are “engaged” under them to roam the street, nooks and crannies of Birnin Kebbi every day in search of recyclable and reusable materials to purchase or barter on behalf of the *maisikeli*. In the absence of official records, estimate suggests that there could be around 1,400 (0.4% of the total population) that are engaged as itinerant buyers excluding waste pickers and scavengers that are considered to be relatively few. This is against the 146 persons employed by the formal waste sector, which forms just only 10% of those engaged in the informal waste sector activities. It is believed that providing employment to this category of youth will further reduce poverty, crime as well as raise the standard of living of some families of the urban poor.

It is pertinent to note that in spite of low social acceptance of the occupation, youths are still becoming attracted to the occupation. This is because of the high reward derivable from recovery and sale of recyclables. For instance, the low level of literacy of the informal waste workers does not preclude them from sometimes earning higher than the formal sector worker. Majority or 86% of the respondents interviewed earn between N1,000 and N2,000 (\$2.00 - \$4.00) a day which translates to between N30,000 – N60,000 (\$62 - \$124) a month. The new national minimum wage in Nigeria currently stands at N30,000, which clearly shows a ratio of 1:1 – 2:1 in favour of the informal waste sector workers. This signifies that some of the informal waste sector workers could still earn twice the amount, which formal workers in same category earn as minimum wage. It is noteworthy that although the informal waste sector workers carry out more vigorous and ‘dirty’ work that is more hazardous than that performed by the waste brokers, the later earns more than the former.

The waste brokers could earn more than N90,000 (\$186.00) a month. This difference in income may be explained by the fact that the waste brokers own both equipment and capital from which they ‘sponsor’ the informal waste sector workers against the claim of Gunsilius, *et al* (2011) that describes the informal waste sector workers in some cities as neither ‘sponsored nor recognised’. In Birnin Kebbi, the waste brokers actually sponsor the informal waste workers that register with them. They provide free push cart (that is returned after the day’s work) and advance funds to enable the workers buy recyclables on behalf of the waste brokers. In some cases, however, the

informal waste sector could breach the agreement between his sponsor and offer the recyclables for sale to the highest bidder without the knowledge of the initial sponsor. Whatever is the case, at the end of the day, the beneficiary is expected to return either the funds advanced to him in full or submit balance together with the recyclables bought or return recyclables equal to the amount earlier advanced. He gets his reward from the difference between the weighed recyclables and the amount advanced to him. The weightier and of more quality the recyclables the more the amount he collects as rewards and vice-versa. The informal waste sector workers could, however, earn more if they are organised into an association that could take care of their interest instead of relying on the middlemen who purchase recovered items on terms dictated by them. This is because the informal waste sector workers cannot negotiate individually with middlemen for higher reward.

The informal waste sector dominated by itinerant buyers in Birnin Kebbi has also contributed to the diversion of the solid waste from the waste stream. Further enquiry reveals that the public sector is not even involved in the recycling of materials except for its crew that sometimes carry out unofficial recovery of recyclables during the collection and transportation of municipal solid waste. However, the few recovered materials by the crew are sometimes sold directly to middlemen or to the itinerant buyers. Except for its crew, the private sector service provider; BSIL has not also officially taken the advantage of non-involvement of the public sector to establish a material recycling facility (MRF) in order to generate more income. Although no record exists on the amount of solid waste diverted from the waste stream or disposal site, information provided by the Scrap Collectors Association, Birnin Kebbi, reveals that an estimated 7.5 trailers are loaded every week with recyclables comprising mostly metal scraps and few other recovered materials, which are conveyed to manufacturing plants in Lagos. In addition, it was further revealed that each of these vehicles carry an average of 30 tonnes of materials worth N3.00 million (\$6,185).

It is further estimated that at an average of 7.5 vehicles a week, 30 truckloads of 30 tonne each can be generated every month. This signifies that each day a truck load of 30 tonnes of recyclables or recovered materials are collected, which is equivalent to 10,800 tonnes per annum. This forms part of the 20,200 tonnes of uncollected solid waste, which is diverted annually by the informal

waste sector. This means that the informal waste sector can be said to be responsible for removing from the waste stream about 17% of the total estimated 62,000 tonnes of municipal solid waste generated annually in Birnin Kebbi. This estimate excludes those recyclables that are purchased daily from mostly the middlemen and utilised by artisans for remanufacture of new products or those recyclables that are purchased by individuals for personal or commercial use. The diversion of the recyclables by the informal sector saves the urgency for more land for establishing dumpsites and purchase of new vehicles for the collection and transportation of municipal solid waste. It could also lead to reduction of accumulation of more solid waste that contributes GHG (greenhouse gasses), which have negative effect on human health and the environment. However, with only 10,800 tonnes diverted annually out of the 20,200 tonnes of uncollected municipal solid waste per annum in Birnin Kebbi town, it is clear that there is still a gap of 9,600 tonnes that would need to be collected and disposed of annually by the municipal solid waste management operators. This is equivalent to adding 27 tonnes of solid waste to the stream every day and which remains uncollected but indiscriminately disposed. This amount of uncollected waste is however expected to increase with increasing population and continued irregularity of collection especially by KUDA due to lack of personnel, vehicles, equipment and above all legally designated community collection points and final disposal site.

Recommendations.

With the dwindling revenues accruing to state government from the federation account and the increase in the size and population of Birnin Kebbi, the role of KUDA to provide effective and efficient service has continued to diminish. Currently, it has vehicles that are not only old and have become inefficient to operate but also inappropriate to be used as waste collection vehicles. The cannibalisation of other appropriate and old waste collection vehicles has therefore restricted their usage for service provision. Moreover, KUDA does not charge for the municipal solid waste it provides to residents of Birnin Kebbi which could be used to augment the meagre monthly grants it receives from government. This thus, further compounds its financial problem, which has contributed to the present poor service in existing areas as well as its inability to expand coverage. The only

private municipal solid waste service provider; BSIL is not faring better either. This could be due to the poor investment decisions of the management of the company that have limited the purchase of additional vehicles for effective coverage citing problems of irregular payment and not lack of patronage of its services.

With these numerous problems facing formal waste sector service providers, a more cost-effective solution must be found in enhancing the role of the informal waste sector for sustainable provision of municipal solid waste service in Birnin Kebbi. The involvement of the informal waste sector will be a win-win situation. While on one hand jobs are created for some of our teeming youths that do not have sufficient education or capital to venture into the formal sector, on the other hand, the environment becomes cleaner as the involvement of the sector is expected to go beyond the 17% diversion of solid waste to include collection of municipal solid waste in the core inaccessible parts of the town at least cost to the State Government and the residents. To achieve this, it is expected that the Kebbi State Government will take the following steps.

The first step should be acknowledgement or recognition of the role of the informal waste sector by government and subsequently integrating it as part of the solution to the problems of sustainability of municipal solid waste management in Birnin Kebbi. This was indeed one of the consensuses reached during the FGD. Unfortunately, however, the law, regulation or policy to establish a proper structure for sustainable municipal solid waste management service in Birnin Kebbi to even integrate the informal waste sector is absent. In this situation it has become difficult to think that the role of the informal waste sector can easily be recognized and integrated without a regulator monitoring performance and making recommendations to government. The Kebbi State Environmental Protection Agency (KESEPA) established as a parastatal under the auspices of Ministry of Environment Solid Minerals can be designated as regulator that monitors the performance of both the informal and formal waste sectors. KESEPA was created by Edict No 4 of 1995 to perform a supervisory role by setting standards and monitoring compliance with the standards as they affect waste discharges into the environment. This means, however that a waste management law, which has not been in existence since the creation of the

state in 1991, should be enacted because the informal waste sector cannot be integrated in isolation. In the interim, the KUDA can, based on existing cordial relationship with the informal waste sector as revealed by the study, give recognition to the activities of the informal waste sector, even if superficially, until the formal recognition and integration is carried out through legislation or policies. This, the KUDA can do by fully engaging the sector in complimenting its services so as to achieve effective coverage of neighbourhoods especially those which the Authority cannot easily accessed. The media could play significant role in the recognition (social acceptance) and the integration process especially now that the public views the itinerant buyers, as criminals that are either involved directly in theft of recyclable items or indirectly by purchasing such items from criminals. The Scrap Collection Association of Birnin Kebbi could also appeal to public sympathy by engaging the media to carry out enlightenment and sensitisation campaign on the rules governing the operations of its members including their foot soldiers; the itinerant buyers.

The second step shall be the support of the informal waste sector in establishing cooperatives or association to at least protect its members from the exploitation by the middlemen or waste brokers. The Scrap Collectors Association has been established by the middlemen to protect mostly their interest and not the informal waste sector workers and that may explain why they earn lower than the middlemen. With the establishment of the cooperative or association, it is expected that the informal waste sector will use the avenue provided by the cooperative or association to achieve independence in valorisation of materials for better price. The informal waste sector can do this by pooling resources together to acquire or hire equipment that could help, for instance, to compress some of the recovered materials before sale to middlemen and thence transportation to the manufacturers in order to obtain higher price because the more the recyclables are sorted and processed the higher the price within the recycling chain. This, the informal sector cannot do individually. Presently, the materials are unprocessed and are transported without being compressed, thus, occupying more space and limiting the capacity of the truck to transport more materials. Experiences, for instance from Brazil suggest that apart from purchasing compressing machines through

cooperatives, the informal waste sector was able to build and own a store for the storage of baled materials until the right price is achieved through negotiations (Kisanja and Tilley, 2018).

In Birnin Kebbi, just like most cities in developing countries, there will be need for external technical intervention either directly from government or Non-Governmental Organisations (NGOs) extends to informal waste management because of its low literacy levels and exposure. Left alone in a situation without external assistance and coupled with low level of education and exposure, it will be difficult for the informal waste sector workers to understand the gains derivable from establishing and belonging to a cooperative or rival organisation to the Scrap Collector Association established by the middlemen in Birnin Kebbi to which the informal waste sector workers are not members. However, external assistance to establish cooperatives or form associations should come along with provision of education on organisational and cooperative management for members even if it is in the form of adult and non-formal education. The external assistance should also consider introducing the informal waste sector workers to ways of accessing funds to purchase their own equipment as well as sustain their cooperatives or associations so as to remove them from the clutches of middlemen. For instance, the informal waste sector workers under their organisation or cooperatives can be assisted by government or NGOs to access funds made available by the federal government under the 2013 revised policy on micro, small and medium enterprises (MSMEs).

The third step is enhancing the productivity of the informal waste sector workers by improving their working conditions. It was observed during the study that most of the informal waste sector workers do not use personal protective equipment (PPE) or even keep a first aid box despite their exposure to occupational health hazards resulting from the activities of collection and sorting of recyclable materials especially at the junk shops. During the interview, some of the itinerant buyers and middlemen claimed ignorance of the availability and use of PPE to protect themselves from physical injury and exposure to other health hazards. In this regard, government can directly or in association with NGOs and through cooperation of the cooperatives or associations, initiate awareness campaigns on the dangers of not using PPE and the dire need to keep for every middleman and informal waste worker to have access to a first aid box. Thereafter, government can make mandatory to possess first aid box

as well as the wearing of PPE by all municipal solid waste service providers that are on duty including the middlemen. Government, through the association or cooperatives should, however, subsidise the sale of the first aid box and the PPE to the informal waste sector just like government does for other profession.

Conclusion

It is clear that generation of municipal solid waste has outstripped collection despite the diversion that takes place through recovery of recyclables by the informal waste sector. Out of the estimated 62,000 tonnes of municipal solid waste generated annually in Birnin Kebbi only 41,400 tonnes or 67% could be collected by the formal waste sector service providers while 10,800 tonnes or 17% is diverted by the informal waste sector. The remaining 16% or 9,600 tonnes remain uncollected. This estimate is however based on the condition that KUDA's vehicles are always available and the pay loader is functioning to enable unhindered collection and loading of solid waste unto the vehicles. It also depends on the ability of the BSIL to effectively carryout the normal 14 trips daily. Premise on these conditions, however, and the consideration that Birnin Kebbi is increasing in both population and physical size coupled with dwindling revenue, there is need to search for an alternative cost-effective solution that could tackle the existing and future accumulation of municipal solid waste. In this study, it has been recommended that this solution could be found in recognising and integrating the informal waste sector into the formal sector as partners and not as appendages. This is however contingent on enactment of a municipal solid waste law or policy that will provide for recognition and integration as well as ensure the enhancement of the welfare of the informal waste sector in addition to designating a regulator to establish standards and monitor performance.

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