

# Community based solid waste management strategy: a case study of Kaduna metropolis

Y. A. Rigasa<sup>1</sup>, A. G. Badamasi<sup>2</sup>, N. Galadimawa<sup>1</sup>  
& G. U. Abubakar<sup>3</sup>

<sup>1</sup>*Department of Environmental Management,  
Kaduna State University, Nigeria*

<sup>2</sup>*Department of Applied Science, Kaduna Polytechnic, Nigeria*

<sup>3</sup>*Zaitun Engineering and General Services, Nigeria*

## Abstract

Kaduna Metropolis is the capital city of Kaduna State, Nigeria and comprises four local governments. It is experiencing rapid urbanization and its associated challenges, including management of municipal solid waste (MSW). Solid waste management is currently handled by government engaged contractors who are paid for their services from public funds. Such contractors operate around public land uses and major roads. Other areas of the metropolis are serviced by the informal sector. Since transfer stations, public waste bins and official waste dumps are not easily accessible to the populated, low income areas, the informal waste contractors readily dispose MSW in drains and streams leading to floods during the rainy season. Residents of such areas are at risk and lack the organization, funding and structure to mitigate and adapt to the situation. Recently, MSW has become a resource, an opportunity for the poor to earn a living. Non participation of communities in MSW management constitutes a challenge. This study examined the development of community participation in MSW management in Kaduna and recommends the way forward. Data for the study was collected through questionnaires, focus group interviews and field inspection of six locations of mostly low income and densely populated areas of Kaduna. An average 88% of these people want free solid waste management services, a difficult desire in view of the resultant zero cost recovery. The study recommends an integrated MSW management structure involving government waste contractors, the informal sector and the communities.

*Keywords: municipal solid waste, solid waste disposal, community participation, waste management, sustainability.*



## 1 Introduction

Kaduna is an emergent city evolving from a colonial centre of administration and the capital city of Northern Nigerian, North central State and present Kaduna State. The city is located on the plains of north central Nigeria bounded by Latitude 9° 03'N to 11° 32'N and Longitude 8° 05'E to 8° 48'E on the foot slopes of the Jos plateau. The climate is tropical continental comprising of dry harmattan north east winds and warm, humid south west winds that usher in the rainy seasons. Vegetation is typically guinea savannah woodland and Sudan savannah grassland. The metropolis comprises of four local government area councils namely; Kaduna north and south with segments of Chikun and Igabi. The four councils have a combined population of about 1.56 million (National Bureau of Statistics [1]). The city is experiencing rapid population growth which is believed to be responsible for the increased pressure on public services, infrastructure and challenges such as municipal solid waste (MSW) management.

The legal framework for the management of Municipal Solid Waste (MSW) in Nigeria is the Federal Environmental Protection Agency (FEPA) now the Federal Ministry of Environment legislations. These legislations are the National Protection Management of Solids and Hazardous Waste Regulations of 1991 and the Pollution Abatement in Facilities Generating Wastes Regulation of 1991 (Okorodudu-Fubara [2]). The concept of waste management is not yet well defined especially in relation to type, quantities, spatial variation, management methods, and environmental impacts. The subject is increasingly becoming important, because waste is growing in quantity and has the high potential for land, water and air pollution, and is also expensive to manage. The major problem of waste management in rapidly growing cities of developing countries like Kaduna is the wholesome adoption of “modern” waste management strategies with total disregard for economics, social harmony, local values and culture (Wilson *et al.* [3]). These “modern” strategies are failing to meet prevailing targets in advanced countries in spite of huge investments. The contribution of the “informal sector” in recycling and evolution of resource recovery based strategy in the management of MSW is not being fully appreciated. Currently Kaduna state government is expending an average one billion Naira (\$USA 5 million) annually on services of waste contractors (Hyuwa, [4]). They are responsible for street sweeping, cutting grasses, cleaning drains, solid waste collection and its transportation to the existing waste dumps. Waste contractors are selected based on patronage with total disregard for competence and professionalism. Access to services of waste contractors is limited to metropolitan road networks that can accommodate the compactors meant for modern waste management services. Communal bins are small and insufficient and frequently overflowed with garbage. There are no transfer stations in the metropolis, hence communities are not sufficiently motivated and encouraged to invest and participate in solid waste management in the city.

The Government of Kaduna State had adopted different methods of solid waste disposal. Previously, incinerators/burning were used and currently solid waste compactors and dump sites are in use, yet solid waste still constitutes a



major health hazard in the Metropolis. It is believed that the refuse disposal vehicles are insufficient to cover their designated areas. In high populated low income areas of Kawo, Ungwan Shanu, Ungwan Kanawa, Doka, Tudun Nupawa, Hayin Banki and Ungwan Rimi, households resort to the use of informal sector or self-disposal services that dump waste into public drains, in streams and on bridges within the metropolis. Storm water flushes these MSW into local drains, channels and rivers contaminating sensitive ecosystems and floodplains. In a city without a sustainable urban drainage system and a functional MSW management strategy, drains are frequently clogged resulting in flash floods and loss of sustenance and livelihood. Poor urban governance and the absence of appropriate community structures worsen the impacts of these problems on man and the environment. The reality is that current waste management strategies are grossly inadequate and community participation is lacking and where obtainable, is restricted to informal activities.

The eight targets of the Millennium Development Goals (MDGs) by the United Nations are aimed at reducing poverty and improving quality of lives in developing countries. The targets are narrow, and Community participation in the program is subject to manipulations by politicians in power. Implementation of MDGs started in 2000 to terminate in 2015. In contrast, Sustainable Development Goals (SDGs) contain 17 targets meant for the whole world, to be funded by the developed countries and supported by developing countries. The targets were designed to reduce poverty, promote equal opportunities and improve quality of human lives worldwide. Implementation is to commence in 2016 and terminate in 2030. A common factor in MDGs and SDGs is environmental sustainability. Though portable water and sanitation are included in the MDGs, SDGs expanded the scope to include integrated sustainable waste management strategies – Reduce, Reuse and Recycle (3 Rs). In the SDGs, there is opportunity for community participation in conception, design, funding and implementation of set targets.

### 1.1 Aim and objectives

This study was aimed at driving sustainability through community participation in waste management in Kaduna Metropolis. The study identified and evaluated the potentials for community participation in existing waste management strategies. The roles of formal and informal sectors were also examined with the hope that the outcomes would assist in the attainment of MDGs and SDGs in Kaduna and its environs.

## 2 Relevant legislations

Environmental issues are administered by the Federal Ministry of Environment at the Federal and State levels with Environmental Health departments at Local Government level. Established legislations relating to waste management include; (a) The Harmful Waste (Special Criminal Provisions, etc.) Act, 1988 (b) The National Environmental Standards and Regulations Enforcement Agency Act 2007 (NESREA ACT, which repealed the Federal Environmental Protection



Act of 1988), (c) Environmental Impact Assessment Act of 1992 (d) National Environmental (Sanitation And Wastes Control) Regulations, 2009, and (e) The National Environmental Protection (Pollution Abatement In Industries And Facilities Generating Waste) Regulations.

### **3 Integrated waste management**

The adverse impacts of waste management are best addressed by establishing integrated programs where all types of waste and all facets of the waste management process are considered together. Despite their importance, limited resources may prevent these programs from being implemented, and only a piecemeal solution may be possible. However, the long-term goal should be to develop an integrated waste management system and build the technical, financial, and administrative capacity to manage and sustain it. Whether pursuing a holistic approach or a piecemeal one, managers should ensure that the program is appropriately tailored to local conditions, and that practical environmental, socioeconomic, and political needs and realities are balanced. Answering the following key questions will help achieve this goal: Are adequate financial and human resources available to implement the policy, program, or technology? Is this the most cost-effective option available? What are the environmental benefits and costs? Can the costs be mitigated? Is the policy, program, or technology socially acceptable? Will specific sectors of a community be adversely affected? If so, what can be done to mitigate these impacts?

#### **3.1 Community-based solid waste management (CBSWM)**

Community participation in solid waste management covers a variety of types, and encompasses several forms of local involvement, including: awareness and teaching proper sanitary behaviour, cost recovery schemes, resource recovery actions, and participating in consultation, administration, and/or management functions. At the most basic level, participation might be providing separated waste to the waste collector, handing over separated waste at a particular time to the waste collector or granting space to park waste management vehicles. With greater public participation, the community can cooperate with public or private agencies to set payment rates for service charges. Community management, the highest level of community participation, gives the community authority and control over operation, management and/or maintenance services. It may come about through partnership with governmental agencies and Non Governmental Organisations (NGOs). Community-based waste management CBSWM projects require institutional support and recognition in order to be successful. An integrated system including waste separation at the source, resource recovery, and composting of organic waste requires the involvement of waste pickers, and integration of the community to work with all stakeholders. Local leaders are often active in the management of the service or maintain close contact with the municipality or community management agency. Women and teens can play crucial roles, such as initiators, managers, operators, political activists, educators,



and watchdogs for the community. Some issues can also be addressed by CBSWM such as the following social and management problems; low participation of households, management problems, operational problems, financial difficulties and, lack of municipal cooperation.

Long term waste management has to be an integral part of a sustainable integrated resource management and requires understanding of local human interactions with natural cycles (ISWA [5]). In practice no single disposal technique can deal with all wastes in a sustainable way. To achieve sustainability, a combination of management options is required. The performance of any integrated waste management system (IWMS) will ultimately depend on environmental burdens, cost and acceptability by local communities (McDougal *et al.* [6]). Recently, solid waste management has been moved to the forefront of the public agenda in Kaduna metropolis. More than ever before, solid waste management policy-makers world-wide require reliable information on the technical performance, environmental impact and costs of solid waste collection, recycling, treatment and disposal. The problem of waste disposal is international, often with serious local implications (Clarke *et al.* [7]). Waste management in Kaduna metropolis is the duty of the State Ministry of Environment in conjunction with Kaduna State Environmental Protection Authority (KEPA).

Currently, no data is available on the composition and quantity of municipal solid waste generation within the metropolis. Waste collection, transportation and disposal are the responsibility of contractors appointed by Kaduna State government based on political patronage. The current MSW management strategy has no clear functional regulatory framework for effective monitoring of the contractors and the “informal sector”. The roles of the Ministry of Environment and KEPA are also not clear. The activities of the “informal sector” are critical in job creation, poverty alleviation, sanitation and set up of small and medium scale enterprises. Several authors (Wilson *et al.* [3], Medina [8], Wilson *et al.* [9] and Nzeadibe [10]) have reported strong relationship between the attainment of Millennium Development Goals (MDGs) and the activities of the “informal sector” in developing countries. Although the potential exists for waste management cost recovery from a proportion of waste producers, this opportunity is being wasted, yet the potential is high. This is evidenced by the activities of itinerant waste buyers and the “informal sector” operating in the official and unofficial waste dumps. As the dumping of MSW within or near population centres becomes less desirable and less sustainable, the challenge of Kaduna metropolis and other emergent and established urban centres in developing countries is the establishment of a functional and sustainable solid waste management strategy.

### 3.2 Waste management services in Kaduna Metropolis

The major components of MSW in Kaduna are food wastes, polythene bags/sachets, paper, plastics, glass bottles and metals. KEPA in conjunction with its contractors is responsible for kerbside collection and transportation of waste to disposal sites. There is no functional landfill in the metropolis but KEPA operates two waste dumps. One is located 3 km from airport junction along Kaduna-Lagos



road while the other is sited 6 km along Kaduna-Abuja Express way. Waste management services are restricted to only the affluent and “visible” parts of the metropolis while the low income slums and surrounding districts are served by the “informal sector”. Waste collection is more regular in the city centre and the affluent districts of UnguwanRimi, UnguwanSarki and Malali, less noticeable in TudunWada, Badarawa, Nassarawa, Kabala, and totally absent in Mando, Rigasa, Sabo and UnguwanSunday. Waste management services by KEPA and waste contractors are funded by Government. The informal sector charges a fee for collection of waste of little or no resource value, but may pay out a token for waste of high resource value.

Although the services of the informal sector are recognised and appreciated by the public, their services are not formally accepted by the regulatory agencies. Household and communal bins are supplied free in serviced areas from where waste is collected by trucks while the wheel barrow is most frequently used for household waste collection by the “informal sector”. Transportation of waste to the official waste dumps is expensive and may account for between 70-80% of total cost of waste management in Nigeria (Imam *et al.* [11]). The “informal sector” usually disposes their waste in unofficial waste dumps or on eroded land where such waste is used for reclamation. A few instances abound of unscrupulous contractors disposing waste within or near population centres. KEPA and the appointed waste contractors have no formal treatment and disposal mechanisms for MSW at the waste dumps, however resource recovery activities by the informal sector and especially scavengers thrive in the official and unofficial dumps. The recyclable content of MSW is 28% in Nigeria (Imam *et al.* [11]).

### 3.3 Cost versus resource recovery systems

Resource recovery based systems are critical in areas characterized by high energy cost, scarcity of soil conditioners and high food prices. In low-income countries where the national wealth is concentrated in a small segment of the population, the provision of free waste management services to certain segments of the metropolis is not sustainable. The wholesome adoption of resource recovery based strategies for all residents is also not desirable where certain segments of the city can afford to bear the full cost of managing their waste. Both cost and resource recovery are required for an all-inclusive and sustainable management of MSW.

### 3.4 Role of communities in waste management

Community-based projects are those whose operation is limited to a particular neighbourhood. The CBSWM projects are activities carried out by members of communities to clean up their neighbourhood and/or to earn an income from solid waste. Examples are the collection of solid waste, the sale of recyclables, recycling and composting activities.



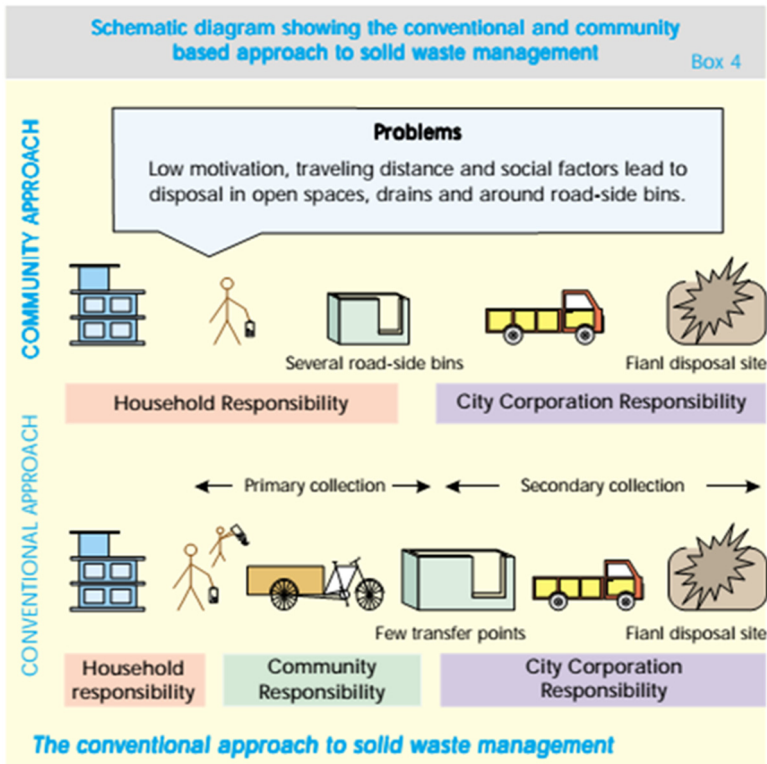


Figure 1: Community based approach to solid waste management (Field note [12]).

Community members and local leaders in urban communities play different roles in solid waste management. These roles correspond to different levels of community participation as derived from the water literature and adjusted for solid waste management. Community members can participate in solid waste management by showing proper sanitation behaviour, contributions in cash, kind or labour, participation in consultation, administration and management of solid waste services (like performance evaluation, collection of charges, engaging personnel, and administration among others), keeping in contact with the municipality and the community. Generally, there are three phases of implementation of a CBSWM system. They include: project initiation, community organisation, and operation of primary collection system

#### 4 Methodology

Research design method was used to elicit data for this study since the study is largely interpretive and it focuses on qualitative and quantitative data. Primary and secondary sources of data collection were employed to obtain data for this

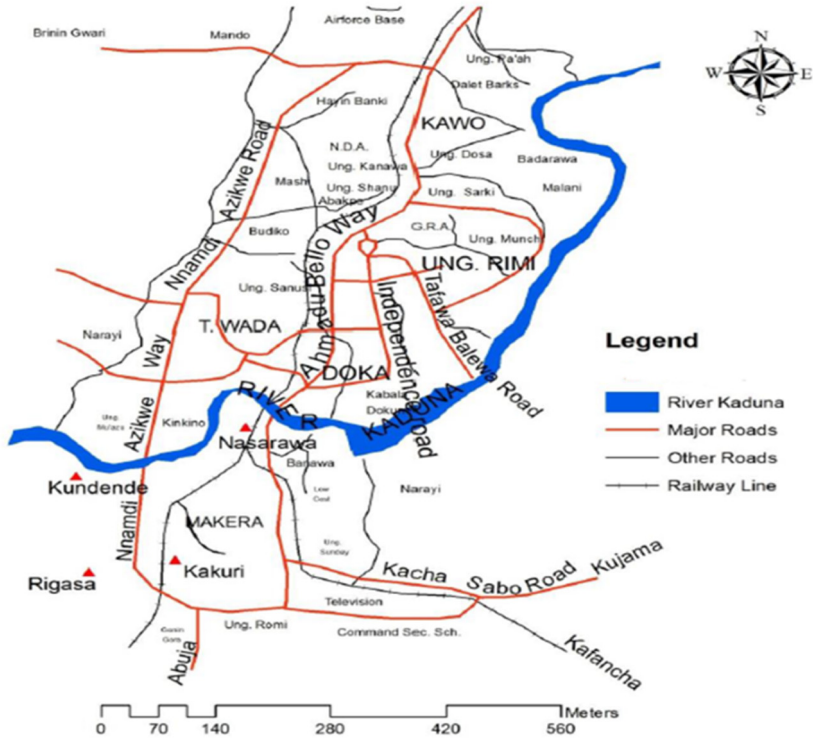


Figure 2: Map showing districts and study areas in Kaduna metropolis.

research. The primary sources involved the use of questionnaire survey which involved the administration, completion and collation of the research instrument (Questionnaires) while interviews and the researchers' direct observations were also conducted to ensure an in-depth understanding of the subject matter under investigation and to verify some information provided by respondents. The secondary sources of data collection involved information from text-books, journals and documentaries. The population of the study is made up of house-hold heads in the residential areas that fall within the study area and shop owners in markets and along the streets. The choice of the use of market areas and highly populated residential areas within the study area was prompted by the fact that these areas are observed to be the main generators of the highest quantity of waste in the districts. A total number of 120 people (residents and shop owners above 18 years old) were used for the questionnaire survey while four groups were interviewed within the areas as follows; the elders (comprising of house-hold heads) and youth group (comprising of street-shop keepers) around the residential areas and a cross-section of market men and women group within the market areas. The researchers adopted a systemized random sampling technique for this study



where, 120 people/respondents were selected from each study site (20 questionnaires were distributed in each of the 6 selected study sites) making up the target population for the study. Questions asked included personal details, access and role in formal and informal waste management services as well as willingness to pay or participate in local waste segregation and other management initiatives.

## 5 Results

Results from the study indicated that majority of respondents are males (85%) from low income high density neighbourhoods (90%). In these neighbourhoods, most households (85%) accumulate, store and dispose their solid wastestream in a comingled form (Garbage). Segregation is limited to only items of value (end-of-life resources). Green waste (plant residues), food waste (left overs), recyclables (plastics and glass) and metal scraps (iron, aluminium, copper among others) are sorted by households where their value is recognized usually for exchange with other goods by itinerant buyers. Wheel barrow boys also engage in waste segregation where collected wastestream is rich in end-of-waste resources. Formal waste collectors or waste contractors rarely engage in waste segregation as their services are subsidize by the government. The bulk of resource recovery occurs at the waste dumps where the informal waste managers recover any item of value. This has led to the evolution of viable solid waste value chains in Kaduna metropolis.

The accessibility of waste management services in the selected communities vary from those offered by waste contractors (32%), to those of wheel barrow boys (56%). A small proportion of households do engage in self-disposal (12%). The selected communities showed only 30% of households are satisfied with available waste management services. This illustrates the desire of communities for change and improvement. The study showed 65% of respondents are willing to pay for management services but only where services are satisfactory. However, 85% of households in the study expressed their willingness to segregate their solid waste streams at source.

Over 90% of respondents expressed their desire to work with others to ensure sustainability of solid waste management in their districts. When asked of disposal options available to the households, most respondents reported using the unofficial road side dumps for their waste. Kaduna metropolis has only two official dump sites with no transfer stations. The dump sites are too far from the city. As a result, formal and informal waste managers dump waste at unofficial waste dumps. Generally, 85% of the respondents are unhappy with the status quo and expressed their desire for change. The study showed that expected change lies in increased community participation in solid waste management services across Kaduna metropolis, especially in low income high density areas.



Table 1: Response to questionnaires.

S/No	Questions	Response
1	Personal details	Male: 85%; Female: 15%
2	Neighborhood	Low income high density: 90% High income low density: 10%
3	Waste composition	Comingled garbage: 85% Green waste: 4% Food waste: 6% Recyclables: 3% Metals: 2%
4	Available waste management services	Waste contractors: 32% Wheel barrow boys: 56% Self-disposal: 12%
5	Adequacy of available waste management services in communities	Adequate: 30% Inadequate: 70%
6	Willingness to pay (cost recovery)	Yes: 65% No: 35%
7	Willingness to segregate (resource recovery)	Yes: 85% No: 15%
8	Willingness to maintain status quo (waste contractors or self-disposal)	Yes: 15% No: 85%
9	Willingness to work with others to manage waste in the community	Yes: 90% No: 10%
10	Local waste disposal options	Household bins: 6% Communal bins: 15% Unofficial open dumps: 75% Transfer station: 0% Burning: 2% Burial: 1% Open drains: 1%



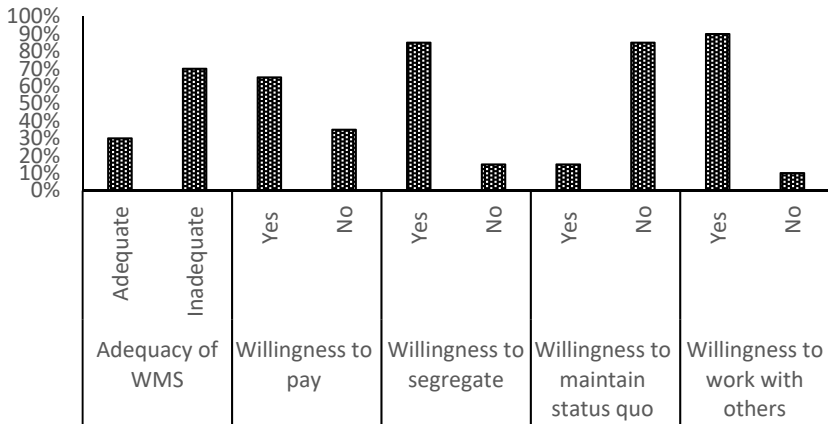


Figure 3: Households' response to key factors in community driven waste management services.

## 6 Conclusions and recommendation

This research shows that most residents in Kaduna metropolis (85%) are not satisfied with the quality of waste management services. It also revealed that some of the MSW is recoverable and recyclable (not measured). The study exposed the limited access of low income high density areas to services of government funded waste contractors, leading to Wheel Barrow boys or "Mai Bola" dominating waste management services in such areas. The study also showed that households in low income areas are more likely to segregate waste at source and participate in a community driven solid waste management initiative but are less likely to pay for the services. It is believed that resource recovery based community solid waste management initiative can be sustainable in the studied districts.

This study recommends the creation and integration of community based solid waste management initiatives especially in low income high density areas of Kaduna metropolis. The initiatives would save cost, generate income and services opportunities, safeguard local values, encourage public participation and minimize government investment in solid waste management services.

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