

THE NEED FOR PUBLIC-PRIVATE PARTNERSHIP PROGRAMS IN SOLID WASTE MANAGEMENT FOR A SAFER ENVIRONMENT IN TARAUNI LOCAL GOVERNMENT AREA OF KANO, NIGERIA

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Abstract: Nigeria is faced with the challenge of solid waste management due to population growth and inadequate government commitment. The study aims to evaluate the waste management impact on the environment in Tarauni Local Government Area of Kano, Nigeria. The study involved the collection of primary data through structured and semi-structured survey questionnaires and field interview questions to analyze waste generation, examine waste management practices, and identify challenges faced by the waste management system. Data analysis was carried out using descriptive statistics, and the results were presented using frequency tables and charts. The study found that the waste management system was less effective due to less participation by people and inadequate government commitment, leading to the indiscriminate disposal of waste and lack of access to safe disposal facilities in the area. The study recommends the implementation of Public-Private Partnership (PPP) programs, involvement and support for scavengers in the waste management system, and better government commitment to address waste concerns in the region. Waste recycling can provide job opportunities, improve the environment and produce valuable items such as lamps and cooking utensils. An efficient solid waste management system remains a tool for achieving sound environmental health in Tarauni area. Therefore, the government should increase its public services regarding solid waste treatments, enlighten producers, and people working in the waste sector. The government should also encourage the use of less hazardous alternatives to hazardous chemicals during production and initiate policies to force industries to treat their sewage before discharging it into the environment.

Keywords: Waste, Impact, Municipal, Environment, Health, Nigeria, Solid waste management, Public-Private Partnership, Indiscriminate disposal.

1.0 Introduction

The need for waste management in any nation cannot be over emphasized regardless of their size, knowledge of the environment and level of technological advancement, as human settlements are characterized generally with wastes generation resulting in various degrees of air, water and land pollution. Waste management in general is the process of collecting, transporting, processing or disposing and managing waste materials (Adeoti 2001). Adeoti

(2001); further state that “wastes management practices encompass all activities undertaken from the point of waste generation up to the final disposal”. In developing countries, waste management especially solid waste management according to UNEP (2018) is a major environmental issue particularly in their municipalities as they estimated 11.2 billion tons of solid waste collected yearly worldwide with most from the municipalities. This calls for the crucial need of waste management to avert the negative impacts of waste on the environment, and its consequences on man and animals, as studies reveals that disposal methods are directly related to human health issues, as well as the environment.

Municipal solid waste management constitutes one of the most crucial health and environmental problems facing governments of African cities. This is because even though these cities are using 20–50 percent of their budget in solid waste management, only 20–80 percent of the waste is collected. The uncollected or illegally dumped wastes constitute a disaster for human health and the environmental degradation (Nabegu, 2017). The failure of the government and waste management agencies to address the issues of waste holistically has resulted to environmental problems (water, air and land pollutions), obnoxious odour, breeding place of mosquitoes and rodents, irritation, making the environment filthy for habitation and blocking of gutter and roads which can lead to flooding. Other problems are diseases such as cholera, typhoid, and malaria infections. These health and environmental problems are facilitated by the poor wastes management. For example, the study of UNEP (2018) shows that landfills are highest source of methane emission, a green house gas contributing to global warming. the studies of Vincent (2000) and Alamgir, *et al* (2005) also shows that the increase in the production or generation of solid wastes in most municipalities of middle and low income countries is exacerbated by illegal wastes dumps on streets, open spaces and wetlands, urban population growth and economic development and increasing unplanned urbanization along with user’s mind set of ‘out of sight out of mind’ of wastes disposal. Thus, issue of solid wastes management is a major concern in African municipalities and Nigeria is not excluded.

However, as countries in the world are committed to establishing safe and efficient waste management techniques to minimize the negative impacts of waste on their environment. Nigeria on the other hand is also expanding its waste management efforts in order to deal with its huge quantity of waste. As the most populous country in Africa, the current thinking is that poor waste management reflects largely the failure of the existing institutions to adequately address the waste management challenges (Yekeen, 2010). In Nigeria, urban solid waste management is constitutionally the responsibility of the third tiers of government, which is, the local government council. Financial, material and human resources that have been committed to waste management by this tier of government have not matched this responsibility. This is evident by the poor management of many landfill sites, soil and groundwater pollution due to often mixing of household, industrial and toxic waste (UNEP, 2017). This current trend in waste generation and management in Nigeria requires application of more desirable methods of waste management so that we can reduce negative impacts of waste on the environment. It is based on this backdrop that this research seeks to assess waste management impact on the environment in Tarauni Local Government Area of Kano State.

2.0 MATERIALS AND METHODS 2.1 Location

Tarauni Local Government Area (LGA) has its administrative headquarters located at Unguwa Uku. It is among the eight LGAs that formed Kano metropolis; the populous (4194635) and largest (499Km) urban centre in Northern Nigeria. Geographically, it is located within Latitude 1157'00"N and 12002'00" North of the Equator and Longitudes 080033'00"E and 082 36'00"E of Green wic h Meridian (Mshelia *et al*, 2020; NPC 2012; Abdullaziz, 2014). The 2019 projected population of the LGA is 329,430 and covers an area of 28Km as shown on Figure 3.1 (Nabegu and Mustapha, 2005; Mshelia *et al* 2020). It shares boundaries with

Nasarawa LGA to the North, Kumbotso LGA to the east and south, it is also bounded to the west by Kano Municipal Council (Abullaziz, 2014; Butu and Mshelia, 2017).

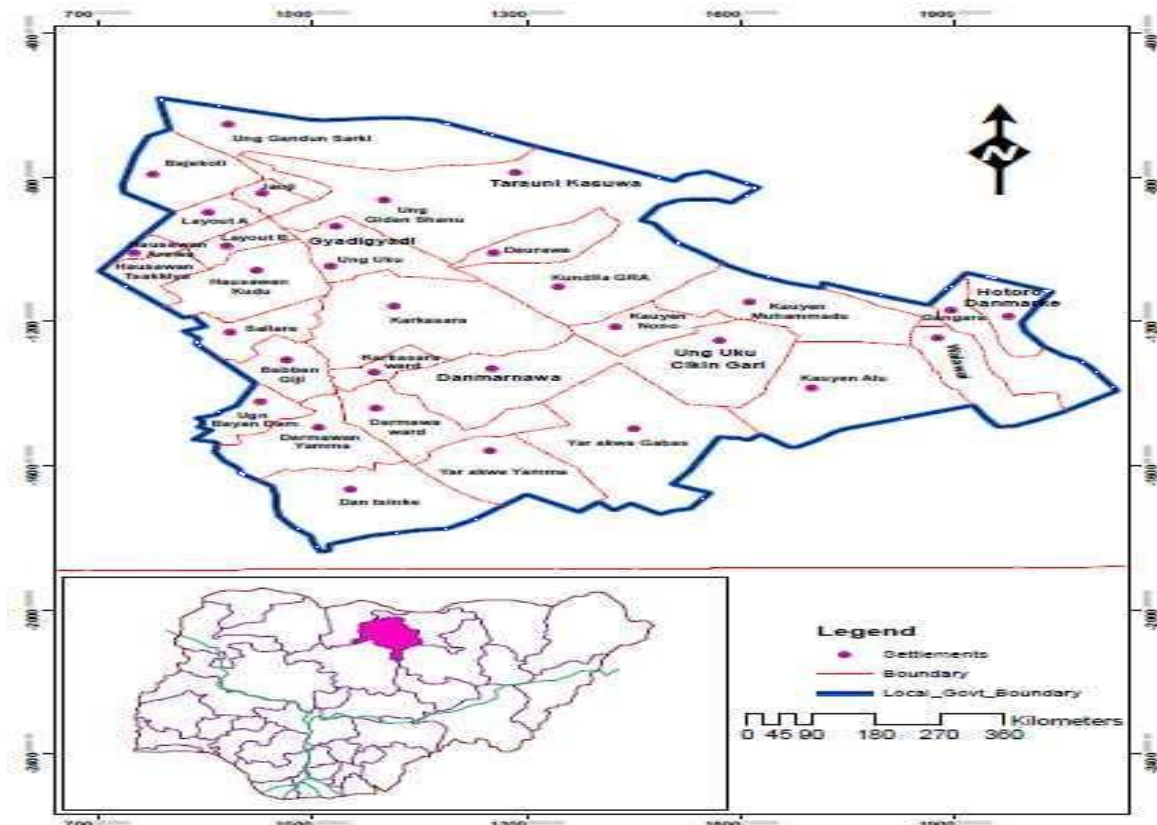


Figure: Map of Tarauni L.G.A

Source: Adopted from Administrative map of Kano Reproduced with Arc GIS 10.2), 2020.

2.2 Climate and Weather

The LGA falls within the tropical climate characterized by divergent seasons of dry and rain. The mean annual temperature is 27°C with daily temperature in the months of March to April which often reach 38 – 42°C. The climate is often influenced by the movement of the two air masses, the maritime air masses originating over Atlantic Ocean and the dry air masses from the Sahara desert. The wet season usually begins May/June – September and the dry period starts October and ends April/May (Ahmed *et al* (2012).

2.3 Sources of Data and Methods

The types of data used for this study includes: socioeconomic and demographic characteristics of the respondents, municipal solid waste management methods, institutions/agencies or stakeholders involve in the management practices in Tarauni LGA of Kano metropolis, functions, effectiveness and capacities of the agencies responsible for the management of wastes in the study area. Other data are on problems or constraints of municipal solid waste management practices by the households and the waste management agencies. The data were obtained firstly, through the reconnaissance survey. Primary data were generated from structured and semi structured survey questionnaires and field interview questions of municipal solid wastes mismanagement practices by the three major stakeholders; Households, Refuse management and Sanitation Board (REMASAB) and Private Waste Management Institutions/Agencies. The interview questions were selfstructured, open and closed-ended questionnaire in a pre-formulated form where follow up questions were asked for further clarity.

The study aimed at assessing the impact of waste management practice in Tarauni local government area, by identifying the types of wastes generated, examine the challenges of the waste management practice and examine the effectiveness of the waste management practice as well as identifying some of the major causes of indiscriminate waste disposal. A multi stage sampling technique was adopted where involves dividing the local government into localities. Stage two involves the purposive sampling technique which was adopted in selecting locality with high population and low population density area sampling method was used by the researcher to derive its samples out of the population, a total of 125 households from both stratum were interviewed. Descriptive statistics was used to analyse the information from the questionnaires and results were presented using frequency tables and charts were presented using tables for easy understanding.

3.0 RESULTS AND DISCUSSIONS

Table 1 shows the socio-demographic data of respondents for age, revealed that 48% falls between 37-45 years, 31.2% were between 60 years and above, 16% were between 46-60 years while 5.6% falls within 18-36 years. Since majority of the respondents fall within 37-45 years (48%) invariably, that may be why many of the respondents were married. males were made up of 72.8% of the respondents while 27.2% were females. There is more likely have a cleaner environment, this is because married people are likely to be more responsible to keep the environment clean. Consequently, in the area, 75.2% of the respondents were married while the remaining 24.8% were single. This is an indication that they are more likely to be more conscious towards environmental sanitation since there marriage is intact.

Table 3.1: Socio-Demographic Data of Respondents.

Age (years)	Frequency	Percentage
18-36	7	5.6
37-45	60	48.0
46-60	20	20.0
60 years & Above	39	39.0
Total	125	100.0
GENDER		
Male	91	72.8
Female	34	27.2
Total	125	100.0
MARITAL STATUS		
Single	31	24.8
Married	94	75.2
Total	125	100.0
FAMILY SIZE		
1-2	12	9.6
3-4	64	51.2
5-6	6	4.8

7 and Above	43	34.4
Total	125	100.0
OCCUPATION		
Farming	49	39.2
Civil Servant	35	28.0
Unemployed	23	18.4
Others	18	14.4
TOTAL	125	100
EDUCATION		
No formal Education	18	14.4
Primary School	27	21.6
Secondary School	55	44.0
Tertiary	25	20.0
Total	125	100.0

Source: Field survey, 2021.

Family sizes of 1-2 constitute 9.6%, 3-4 (51.2%) where as 5-6 constitute only 4.8% as against the family size that is 7 and above which constitute 34.4%. Table 3.1 also shows that 39.2% of the respondents were farmers, 28% were civil servant, and 18.4% were unemployed while 14.4% engage in one thing or the other. area. This means that majority of the respondents were farmers between the ages of 18-45 years.

Its further shows that 44% had secondary education, 20% had tertiary education where as 21.6% of the respondents had primary education as against 14.4% who had no formal education. This data reveals that the literacy rate

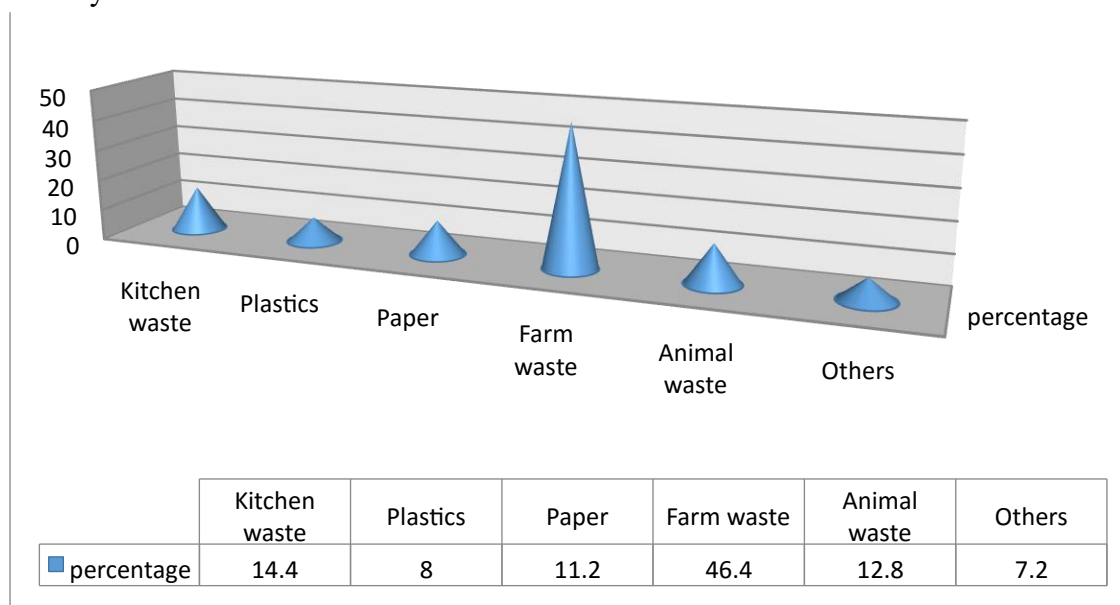


Figure 3.1: Major types of waste generated in households by respondents. Source: Field survey, 2021.

Figure 1 shows the composition of the major source of household wastes generated in the study area, in which farm waste accounted for 46.4%. Other sources of waste include kitchen waste (14.4%), animal waste (12.8%), and paper (11.2%), plastics (8%) other unidentified wastes (7.2%). This result apparently revealed that the inhabitants of the study area are predominantly farmers with agricultural waste being the major waste generated from households.

Table 3.2: Challenges of Waste Management practice

Challenges of waste management practice	Responses			
	Frequency		Percentage	
Increased in population		47		37.6
Urbanization		10		8.0
Low standard of living		22		17.6
Inadequate government commitment		28		22.4
Other		18		14.4
Total		125		100.0

Source: Field survey, 2021.

The table above, indicate the challenges faced by waste management practices within study area. Indicate that increase population account for 37.6%, 37.0% This is inline by the study of Oyebode (2018) as he testified that increased in urban population as a result of rural-urban migration is adding alot of pressure on the waste management system in Nigerian urban areas. While, inadequate government commitment and low standard of living having 22.4% and 17.6% respectively are the major challenges affecting waste management practices in study area. This was supported by Amosun et.al, (2018) as they also show that lack of government commitment at the local tier is a major challenge affecting waste management system in rural and urban areas of Nigeria. Additionally, study of Benedict and Onifade (2018) in their paper on waste logistics, also testifies to government commitment as one of the major challenges affecting waste management system in Nigeria”. Zarma (2014) disagreed with this as he indicated low standard of living as the major challenge facing waste management system in northern Nigeria. Modernization, technological advancement and increase in global population created rising in demand for food and other essentials. This has led to the increase of amount of waste being generated daily by each household (Dernbach and Henning, 1987; Hamer and Zwiefelhofer, 1986)

Table 3.3: Effectiveness of the waste management practice

effectiveness of the waste management practice	Responses			
	Frequency		Percentage	
Highly effective		19		15.2
Less effective		64		51.2
Totally not effective		42		33.6
Total		125		100.0

Source: Field survey, 2021.

From the table 3 above, the waste management practice in the study area can be seen to be less effective with a response rate of 51.2% respectively. This due to the fact that resident admit less facilities of waste disposal in the area, the only facility is the activities of the state environmental protection agency which only carries out duty of drainage cleaning every end of the month. They also complained of transport logistic and lack of authority to make financial and administrative decision as contributory factors to the less effectiveness of the system as it hinders waste collection, this is inline with the study of Amosun et.al (2018). Recycling activities have been more of the informal sector on selected valuable materials such as plastics and metals waste, as was agreed by Oyebode (2018) where he said in his paper “The Informal recycling sector is very active in waste management system in Nigeria, either as itinerant waste buyers or scavengers targeting valuable materials such as plastics, paper, used electronic electrical equipment, glass, metal making the system less effective”. the least response indicating highly effective with 15.2% are mostly from respondents that believes that waste management should be a public responsibility as such they come together to take care of their households waste within their street, this was also testified by Oyebode (2018)” that residents participation plays a greater role in effective waste management system in Nigeria”.

Table 3.4: Method of solid waste disposal Method of waste disposal

Method of solid waste disposal Method of waste disposal	Responses			
	Frequency		Percentage	
Open space method		47		37.6
Water bodies method		38		30.4
Refuse deports method		22		17.6
Other		18		14.4
Total		125		100.0

Source: Field survey, 2021.

3.1 Treatment of waste disposal

There are wide ranges of method involved in waste disposal. Disposal activities usually involve both the processing and release of solid waste into the environment. The disposal of solid waste principally should involve the use of modified technological methods. Current treatment strategies are focusing towards reducing the amount of solid waste that needs to be landfills, as well as recycling and utilizing the materials present in the discarded wastes as a resource to the largest possible extent. Different methods are used for treatment of solid waste, and the best solution is application of proper method which depends upon refuse composition, land area available and disposal cost they are as follows (Moeller 2005).

3.2 Impact of solid waste on environment

Dumpsite may be source of air borne chemical contamination via offsite migration of gasses, particles and chemical adhering to dust, especially during the period of active operation of the site (Wrensh, 1990). Contamination of soil and ground water may lead to direct pollution. In case volatile organic chemical into basement of hereby residents and in case consumption of home grown vegetable as well, the potential for

surface water contamination increase in rainy season because of flooding in low lying areas in proximity of open dumps (United Nations Environmental Programmes, 1996).

The decomposition of solid waste into constituent chemicals is a common source of local environmental pollution. This problem is especially acute in underdeveloped nations. Very few existing landfills are in the world's poorest countries that would meet environmental standards accepted in industrialized nations, and with inadequate budget, there is likely to be few sites rigorously evaluated prior to use in the future. The main problem compounded by the issues associated with rapid urbanization (Foday et al., 2013).

A major environmental concern is gas release by decomposing garbage. Methane is a byproduct of the anaerobic respiration of bacteria, and these bacteria thrive in landfills with high amounts of moisture. Methane concentrations can reach up to 50% of the composition of landfill gas at maximum anaerobic decomposition (CointreauLevine, 1997). A second problem with these gasses is their contribution to the enhanced greenhouse gas effect and climate change (Foday et al., 2013). Solid waste may eventually get washed away by rainfall water to contaminate water bodies or block drainage channels (Kjellen, 2001). Open dumps are associated with bad odours and unpleasant odours.

3.3 Effect of solid waste on human health and other living organisms

There are potential risks to environment and health from improper handling of solid wastes. Direct health risks concern mainly the workers in this field, who need to be protected, as far as possible, from contact with wastes. There are also specific risks in handling wastes from hospitals and clinics. For the public, the main risks to health are indirect and arise from the breeding of disease vectors, primarily flies and rats (Hamer and Zwiefelhofer 1986). Uncontrolled hazardous wastes from industries mixing up with municipal wastes create potential risks to human health. Traffic accidents can result from toxic spilled wastes. There is specific danger related to concentration of heavy metals in the food chain. A problem that illustrates the relationship between municipal solid wastes and liquid industrial effluents containing heavy metals discharged to a drainage/sewerage system and /or open dumping sites of municipal solid wastes and the wastes discharged thereby maintains a vicious cycle including these some other types of problem are as follows (Foday et al., 2013).

Consequently, dumping site have an economic and social cost on public health service and have not yet estimated by government, industries and families. The group at risk from unscientific disposal of solid waste include the population in areas where there is no proper waste disposal method especially the pre-school children; waste workers; and workers of facilities producing toxic and infectious materials. Other groups that are facing high risk include the population living close to waste sites and water supply has become contaminated either due to waste dumping or leakage from landfill of injury and infection (US law solid waste Act 2, 1999).

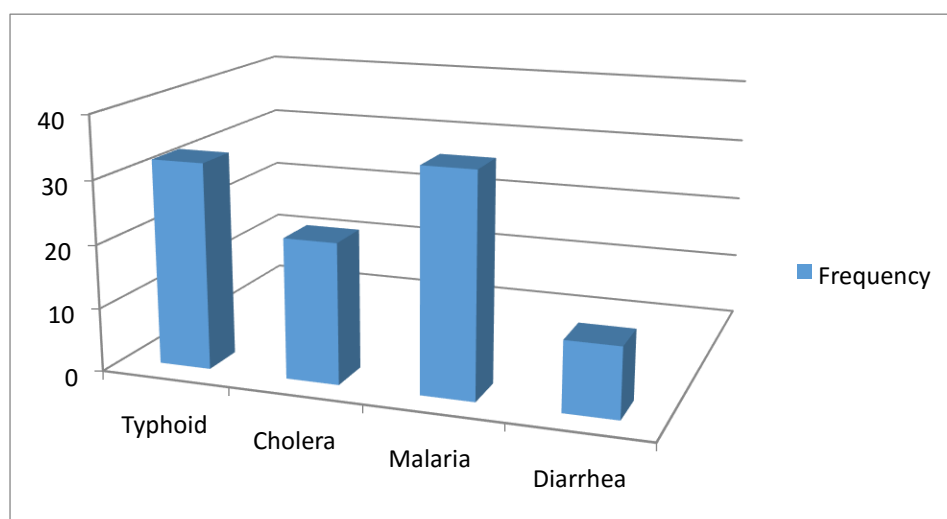


Figure 3.2: Opinion of respondents on Diseases cause by solid waste disposal Source: Field survey, 2021.

3.4 Preventive solution for minimization of adverse impact of solid waste

Proper care need to be taken by government and communities, on how waste could be handled in cities in order to ensure waste does not affect environment and cause health hazard to those people living in areas. At household level, separation of waste should be adopted and ensure that manure is kept aside for composting, which is the best method of handling household solid waste. Consequently, generation of organic matter attract insect and cause outbreak of diseases.

Generation of waste should minimize. Improve method of production to those that minimize waste generation after use. Items recycling and recovery should be encouraged. Kano state government should increase the level of its public services regarding solid waste treatments. Enlightens of producer, the public and people that work at waste sector should be increase. Government should encourage the use of less hazardous alternatives to hazardous chemical during production. Collection of hazardous waste at source points shall be safe, secure and performed in an environmentally sound manner. The Government should initiate policies that will force industries to treat their sewage before discharging it, to the environment. Community based organization should be encouraged by the government to help in evacuating waste in drainages.

CONCLUSION

The study assesses the waste management practice in Tarauni local area. The findings reveals the less effectiveness of the waste management practice in waste disposal and management of the urban and peri-urban areas of taruni which is exacerbated by inadequate government commitment in waste management and increase in urban population due to rural-urban migration. The study also examined the problems of solid waste disposal and environmental and health implication associated with improper disposal of solid waste. Access to safe disposal facilities is limited for the majority of households of Kano metropolis, and this circumstance resulted in indiscriminate disposal practices, improper burning, and burying of solid waste. Deteriorating environmental quality is a major cause of high infectious and parasitic diseases. These problems obstruct way of sustainable development possibilities in developing cities. An efficient solid waste management system remains as appropriate tool for achieving sound environmental health in Tarauni area. Improving access to safe disposal facilities, in addition to conducting awareness campaigns on health impacts of poor sanitation, will help alleviate the problems of improper waste disposal and eventually improve the quality of the environment in the city.

Recycling mountains of waste into useful resource will create jobs for recyclers, while also improving the environment by reducing indiscriminate disposal, the amount of waste being disposal of in open space, and the depletion of resource. Metals such as aluminum can be recovered and sold to small-scale recyclers to produce valuable items such as lamps and cooking utensils to compete with imported products, organic waste can be composted and used as manure in urban farming and help reduce reliance on inorganic fertilizers. Waste recycling is usually undertaken by informal recyclers can be mobilized into cooperative organizations to pull resources together for investment, which can be provided with training, protective clothing, and equipment to reduce accidents, infections, deaths and environmental problems (such as pollution, flooding and erosion).

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are put forward: ● The government can introduce a Public–Private Partnership (PPP) programme that can facilitate Waste management system.

● There should be an aggressive enlightenment campaign for segregation of waste and recycling Programmes and support for scavengers in every community in Nigeria.

● High investment in infrastructure and adequate human capacity to check the administrative and technical issues of the waste management system should be encouraged. ● There is the for proper planning high data management and controlled urbanization for an effective management system

● Coordinated institutional functions such as high academic research and industry linkages should be funded at all

● Levels to checkmate the waste management system and support innovative ideas for an effective waste management system.

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