

Municipal Solid Waste for Economic and National Development

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Abstract

MSW are refuse generated from our daily activities, which are disposed in the environment by the residents, and represents a valuable source of resources for recovery to waste pickers and serves as raw material for the industrial recycling products, while both end product is for reuse, which subsequently reduces adverse mining activities and similarly serves as a major source of income for national developments. Ineffective MSW disposal are always a major cause for environmental pollutions, which remains to be of serious concern for the local inhabitants if not well managed. This research highlights eight (8) randomly selected research locations (RL) among several others in Keffi LGA. Metropolis with the view to critically analyse the valuable components of MSW stream Metals and Nonmetals for economic profitability table 2 and table 3. To achieving this research objective, SW composition data for eight RL were conducted table 1, concurrently with twenty-four (24) streets and five (5) major waste disposal sites were similarly conducted in line with field survey, oral interview of several residents inclusively, are seventy-three (73) waste-pickers. Hence, this research reveals that, all the RL deals in metals and non-metals on an average value per kg trip and for 308 days, of metals and non-metals is 175,056.5 kg, and 115,212.5kg, of economic profitability value price of ₦542,627 and ₦4,444,141 respectively. While employability rate of these eight RL, is a staff strength of 590. It can be concluded that, none recognition of waste pickers by all tiers of government is a major setback. Hence, states and the national government should integrate waste-pickers or their organizations into the formal solid waste management system. And provide them with effective environmental health and safety (EH&S) training and supports, while adopting Polluters Pays Principle (PPP).

Keywords: Keffi LGA; Municipal Solid Waste; Waste-pickers; Recovery; Reuse; and Recycle

Introduction

Solid Waste (SW) is defined as a non-liquids and nongaseous compositions resulting from regular human actions within the environment that are regarded to be non-valuable and are either through refuse as well as sludge dumping (Leton and Omotosho, 2004). However according to (Williams, 2005 and Karibo, 2008) waste definition are always subjective as a result of what constitutes waste to an individual and however which may represent a valuable sources of resources to another. Generated Waste and disposals are always environmental problems which remains to be of serious concern for both the local inhabitant, state and the central government and the world at large (Ahmed 2006, Ishoka 2008, Babayemi and Dauda 2009) Solid waste disposal has been a relative problem and issues affecting the human existence in our present days environment.

However, the global populations have rising over the past centuries as well as the bulk of waste that has been generated. The increasing need for urbanisations has contributed to the increasing bulk of waste generated (Hoornweg *et al.* 2013 and Ogu 2000). The global urbanised population figure is 220 million residence contributing to the production of 300,000,000 kg solid waste generated daily by early 20th century, and by early 21st century with a population of 2.9 billion persons duelling in urban areas, however greater than 3,000,000,000 kg of solid waste are generated per day (Hoornweg *et al.* 2013). According to (Ogu, 2000), the resultant consequences to rapid urbanisations is the bulk composition of waste, which many cities authority are faced with, which is an unprecedented challenge in solid waste management.

However, the term “Waste” is usually subjective, but some analyst consider waste to be associated to uncertainty to the general public health’s, inhabitant and the ecosystem within the environment, while some persons considers it to be an inconveniences and nuisance that are necessary, because waste is inevitable and its generation cannot be avoided with human existence and his regular activities in the environment and the world. With this concept waste is termed to be source of resources and income (Karibo, 2008). Similarly, (Williams, 2005) has shown in his research that waste are generally classified as physical state (solids, liquids, gaseous). Solid form of waste are classified by the nature of their usage (construction waste, packaging and, processing waste, consumable foods waste, etc.), and material waste as (steel and metals, rubber and plastics, cardboards and papers, glass etc.), so also physical properties waste (recyclable, compostable etc.), and however by origins (households, commercial etc.) finally safety level waste are either hazardous or non-hazardous.

According to (Makinde, 2000), disposals and management for solid wastes in developing nations has continuously been faced with consistent adverse challenges as a results for the absences to effective and organised solid waste disposals, management system and supporting technology as a result of financial constraint, and this is however linked to the rapid population growth that is connected to urbanisation, which is a major characteristic for the 21st century phenomenon. However, according to (Ogwueleka, 2009), there are several economic benefits of applying effective policies on SWM options such as the application of mechanically and biological treatments, composting process, effective landfill method, as well as utilisation of gas for electricity generating process through incineration of solid waste.

The study area

Keffi Local Government Area (LGA) formally known to be Keffi town was founded in the year 1802, by its then paramount leader known as Emir Abdu Zanga. with its headquarters located in Keffi Metropolitan. From *figure 1* below, Keffi is one of the thirteen (13) LGA in Nasarawa State (North Central Zone). Keffi local government has a total area of 138 km², with 92,664 populations as at 2006 population census figure. This however puts Keffi LGA the smallest LGA in Nasarawa state in terms of landmass. Similarly, Keffi LGA is surrounded by Karu and Kokona local government areas. While Nasarawa state is demarcated by the same boundaries the following states, namely; Kaduna, Plateau, Taraba, Benue, Kogi and Abuja the federal capital territory (FCT). (Keffi Encyclopaedia, 2019) and (Dusgate, 1985).

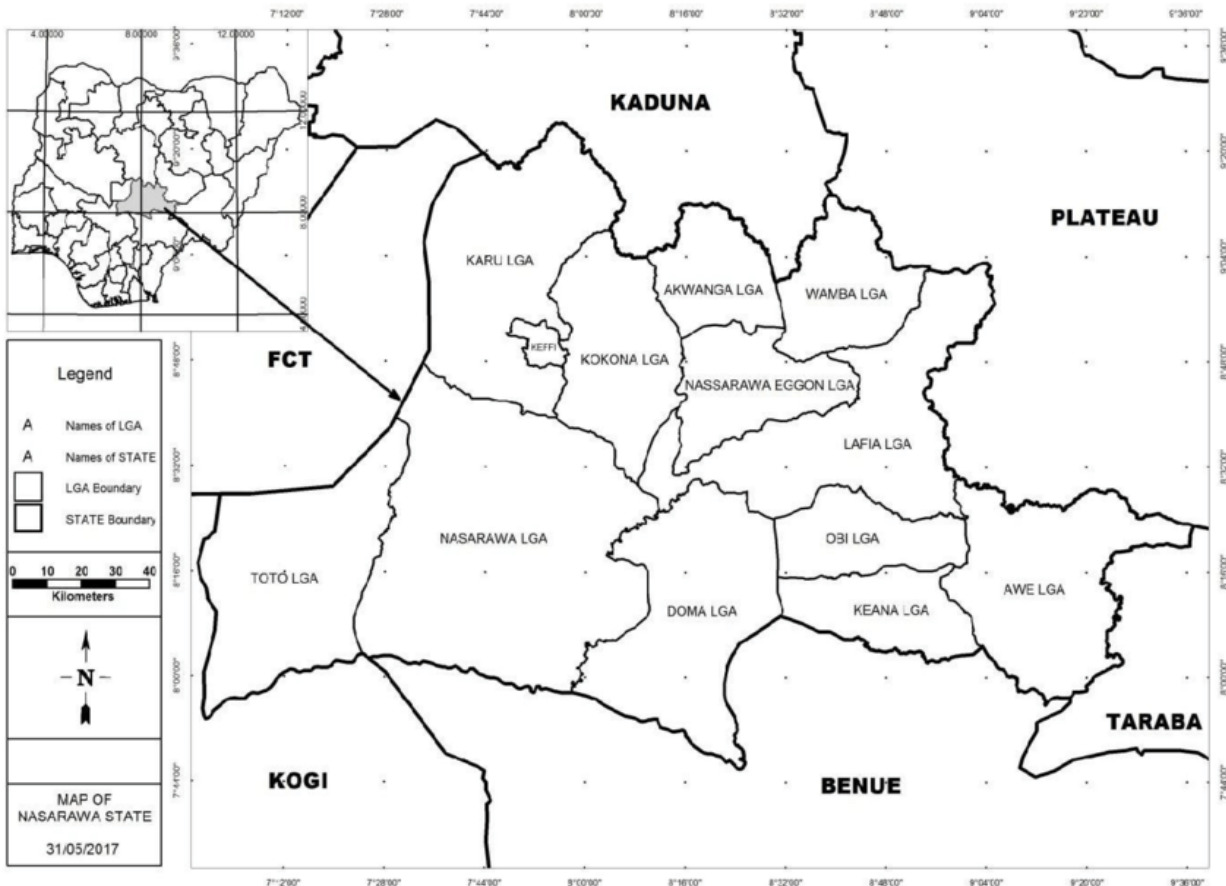


Figure 1: Map of Nasarawa State having 13 LGA and the sturdy area
Source: (Keffi Encyclopaedia, 2019)

Research Aim

This Research aimed at exploring the economic benefits of some Municipal Solid Waste (MSW) in Keffi local government area, as an economic tool for entrepreneurial development to providing jobs and for wealth creation.

Research Objective

To examine waste stream on refuse dump sites, and to evaluate economically productive SW feeding some selected waste collection centres (first middlemen) known to be buyers in Keffi LGA. Metropolis.

Research Materials

Some of the major materials used during the cause of this research includes the following:

- 1) Thirty-Six (36) Streets and Five (5) major unit area waste disposal sites;
- 2) Eight (8) randomly selected stationary waste buyers, from a total of thirty (30) within Keffi Metropolitan area;
- 3) One hundred and fourteen (114) male waste vendor/waste scavenger/waste-pickers. Age array 09 years to 53 years respectively; and
- 4) Published and unpublished relevant articles among other materials.

Research Methods

In order to ensuring uniform representation of MSW compositions in Keffi LGA, solid waste composition data from eight (8) research locations were obtained *table 1* and *figure 2*, through a field survey of waste disposal sites, oral interview with several residents, waste scavengers and stationary waste buyers. The result of the field survey has been conducted under two (2) main headings, namely: Metals (iron, aluminium, copper, and brass) and Non-metals (plastics containers, rubber, and empty cartons). *Table 2* and *table 3* respectively.

Results and Discursions

Table 1: Research location (RL) stationary waste buyers (first middlemen)

RL	Locations Address	RL Owners and Buyers (first middlemen)
A	Gidan Bola Kofar Kokona	Malam Yahaya Jibrin & Malam Musa Ado
B	Kofar Kokona Masallacin Yarabawa	Malam Saminu Rauda
C	Lungun Yan Zaria, Babban Gareji	Taufik Muhammad & Mal. Muhammad Nuhu
D	Dan Sauka Scraps Enterprises	Alhaji Mahmoud Talle
E	Babban Garejin Kaduna	Alhaji Hamidan Sabo
F	Gidan Bola Kofar Kokona	Alhaji Mati Sani
G	Piyanku, Keffi – Nasarawa bypass	Alhaji Mati Sani
H	Masallacin Edi, old Nasarawa road	Malam Mubarak Sani & Mal. Dalladi Haruna

*All Research Locations (RL) are in Keffi Local Government Area (LGA) Metropolitan and are stationary waste buyer (first middlemen)

Source: (Industrial field survey, 2019)

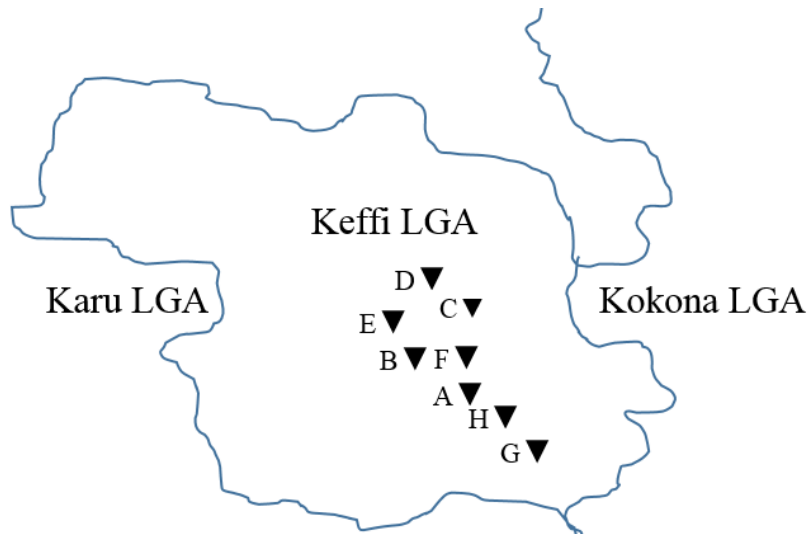


Figure 2: Map of Keffi LGA showing 8 randomly selected research locations in the metropolitan

Source: (Industrial field survey, 2019)

Compositions of MSW in Keffi LGA

The major composition of MSW stream in Keffi LGA comprises of the followings:

- Metal/steel components (iron, aluminum, brass, copper, beverage cans etc.);
- Non-metal components (plastics, glass, rubber, polythene bags etc.); and
- Biodegradable materials (food materials, used cartons, fabric cloths, agricultural vegetation products/items, paper, forms etc.)

The MSW considered in this research locations includes; iron, aluminium, brass, copper, rubber, plastics, used cartons, and bottles *table 2* and *3* respectively. The availability and the composition of these wastes stream, plays a greater role in the life and the activities of waste scavenging in this area and the country at large. Subsequently, these wastes are directly utilized in 3R and as major components of the waste management hierarchical structure to achieving ISWM system.

Table 2: Screened recyclable metal materials and their mean prices

Research Locations (RL)	Recyclable items (Goods)				Price Per kgs. (₦)	Truck Departure period (days)
	Iron (Fe)/kg (₦)	Alum. (Al)/kg (₦)	Brass (Br)/kg (₦)	Copper (Cu)/kg (₦)		
A	50	200	500	1300-1500	2150	40
B	50	150	400	1300	1900	60
C	50	180-200	600	1350	2190	21
D	50	200	500-600	1400-1500	2250	07
E	50	150-200	450	1400	2075	60
F	50	200	500	1300-1500	2150	40
G	50	200	500	1300-1500	2150	40
H	50	150	400	1300	1900	35
Total	400	1502.856	4000	11085.712	16,765	302
Mean Price	50	187.857	500	1385.714		

Source: (Industrial field survey, 2019)

However, from *table 2* above, it can be deduced that the average cost of Fe (all forms of steel components) per 1 kg is ₦50, while for Al is ₦188, Br is ₦500 and for Cu is ₦1386. From the above it can now be evaluated that, the first middlemen spend an average of prize per 4 kg of metals to be ₦ 2,096 and per 4 kg of an individual RL is ₦ 16,765. Similarly, for *table 3* below, the average cos of each bottle is ₦19, while an average cost per 1 kg of plastic ₦22, rubber is ₦30 and used cartons ₦24, with an average spending cost of the four (4) nonmetals to be ₦615 for an individual RL respectively.

Table 3: Screened recyclable nonmetallic materials and their mean prices

Research Locations (RL)	Recyclable items (Goods)				Price Per kilograms (₦)	Truck Departure period (days)
	Bottles Per each (₦)	Plastic Per 1 kg (₦)	Rubber Shoes per 1 kg (₦)	Empty Cartons Per 1 kg (₦)		
A	20	20	30	X	70	35
B	20	20	30	X	70	X
C	20	25	35	20	100	21
D	20	25 - 30	30	25 - 30	105	07
E	15	20	25	X	60	X
F	20	20	30	X	70	35
G	20	20	30	X	70	35
H	20	X	30	20	70	40
Total	155	152.5	240	23.75	615	173
Mean Price	19.375	21.786	30	23.75		

Source: (Industrial field survey, 2019)

Table 4: Truck characteristics and goods departure periods

RL	Staff Strength	Truck Loaders (No.)	Truck Type	Goods Type		Truck Departure period (days)
				Metal	Nonmetals	
A	90 - 100	14 -15	TT4	√	√	40
B	30 - 40	10	ST2	√	X	60
C	70 - 100	14	TT3	√	√	21
D	95 - 100	15	TT4	√	√	07
E	40 - 50	14	ST2	√	X	60
F	35 - 50	14 - 15	TT3	√	√	40
G	30 - 50	14 - 15	TT3	√	√	40
H	35 - 40	10	ST3	√	√	40
TOTAL	478	92	08	100%	75%	308

Source: (Industrial field survey, 2019)

Truck characteristic Legend

Truck Characteristics		
Trucks	Description	
TT4	Trailer Truck	Long Module 4 axles, steel body work (18 metres long module)
TT3	Trailer Truck	Long Module 3 axles, steel body work (16 metres long module)
ST3	Trailer Truck	Long Module 3 axel, steel/wooden body work (13.6 metres long module)
ST2	Semi-Truck	Medium Module 2 axles, steel body work (9.6 – 10.3 metres long module)
X	Distance measured from centre of front axle to centre of rearmost axle in metres (m)	

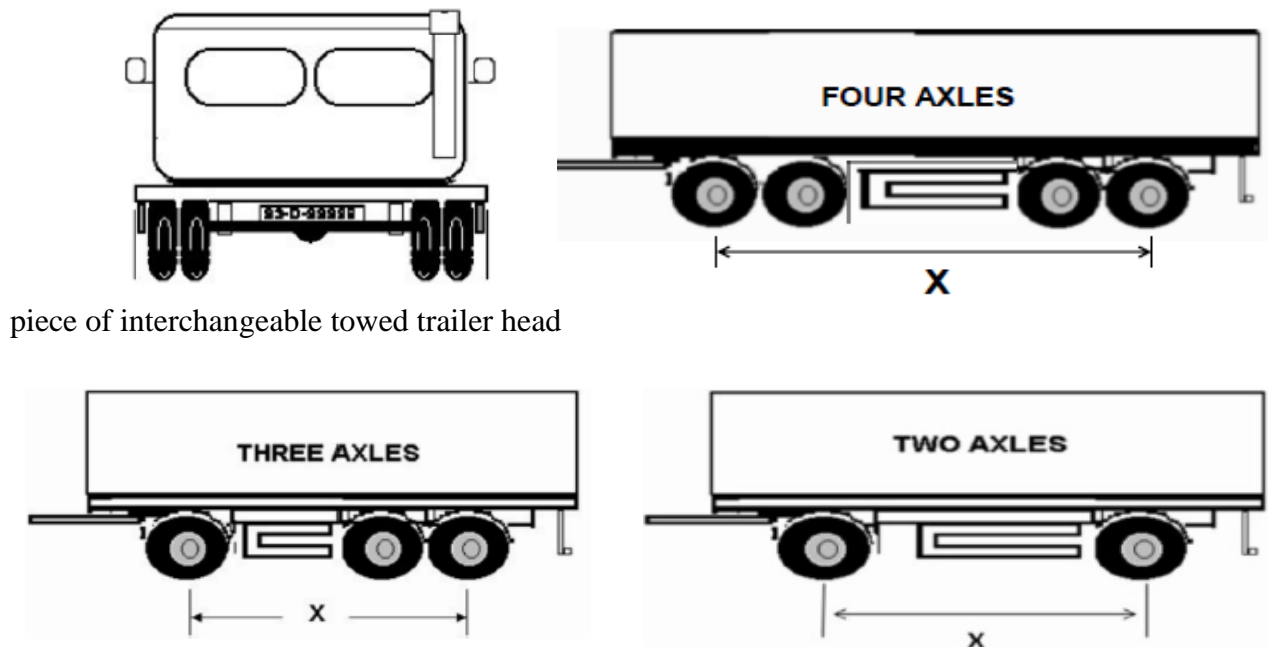


Figure 3: Trailer truck axel and length characteristics

Source: (Industrial field survey, 2019)

Economical Evaluation of MSW in Research Locations (RL)

Furthermore, it's important to evaluate the economic value of MSW in the above RL, which majorly comprises of unit areas / streets dumping sites and house to house collections. It can now be evaluated that the employability of eight (8) RL *table 4*, has a minimum of 425-person employment rate, with an average of 478, and a maximum of 530 persons. Hence, considering the expected average staff strength of an individual RL to be 92 persons. While a total expected trucks loaders are 107, with an expected average for an individual RL to be 13 truck loaders. Two of the RL (B and E), has little or no transactions in non-metals goods, while three RL (C, D and H) also has special transactions in used cartons. Similarly, there are several second middlemen (buyers) coming from all over the nation to buy from the first middlemen in Keffi LGA for further sales and distributions to the third middlemen with major destinations to be; Abuja, Suleja, Kano, Ileife, Oshogbo, Wari, Lagos etc.

Table 5: Economical evaluation for the cost of goods per trip and per year

RL	Truck Goods (TG) (kg)		Max. Truck Departure period (days)	TG Price (₦) (1) + (2) Per Trip	TG Price (₦) (1) + (2) Per Year
	Metals (1)	Nonmetals (2)			
A	29029.9	24494.0	40	53523.9	488405.6
B	16329.3	X	60	16329.3	99336.6
C	22679.6	18143.7	21	40823.3	709547.8
D	29029.9	24494.0	07	305851.6	2790895.9
E	16329.3	X	60	16329.3	99336.6
F	22679.6	18143.7	40	40823.3	372512.6
G	22679.6	18143.7	40	40823.3	372512.6
H	16329.3	11793.4	40	28122.7	256618.6
Total	175,086.5	115,212.5	308	542,626.7	4,444,141.1

Source: (Industrial field survey, 2019)

Therefore, the economic transaction made on MSW in Keffi LGA by the first middlemen indicates that an average of 175,087 kg of metals and 115,213 kg of non-metals are generated in forty (40) days for further profit transaction to the second middlemen at an average value of ₦542,627 per trip. This implies that for 360 days, which is approximately 9 trips in a year, with a capital expenditure of ₦4,883,643. The field investigation reveals that, the price of the goods are sold at fifty percent (50%) increase from first middlemen to the second middlemen. Therefore, 50% increase of ₦4,883,643 is ₦2,441,821.50. the total cost of goods purchased by the second middlemen buyers is ₦7,325,464. However, if this is an average worth, then 100% purchase income is ₦14,650,928 for eight research locations only.

Evaluation of MSW in Keffi LGA

The economic evaluation of MSW in Keffi LGA can be elucidated from *table 2, 3, 4 & 5* respectively. This is hinged on the volume of wastes in kilograms (kg) and the nature of waste generated from each of the eight (8) randomly selected research locations as detailed in *table 1* below, aided by waste pickers known as waste scavengers (WS). Generally, three (3) forms of wastes buyers (middlemen) exist in this research, with emphasis on the first namely:

- 1) First middlemen: They are waste buyers in the RL *table 1*, having mutual relationship with direct business contact to the WS;

- 2) Second middlemen: they are distributors to the recycling streams, that buys their wastes directly from the first middlemen; and
- 3) Third middlemen: Are usually national and international companies and or industries that buys bulk of wastes from the second middlemen as raw materials for recycling products. They manipulate the wastes market in order to make more profits in their day to day business transactions.

Waste scavenging are regular and daily human activities practiced in Keffi LGA and its environs by different age groups of male scavengers between 12 years to 53 years, as identified by this research. Therefore, waste scavenging is the act in which waste pickers goes around different streets and locations scouting or looking for refuse to recover valuable components, for immediate and future reuse and to serve as raw material for recycling process in the industries. Characterisation of these waste pickers, are basically those that scavenge at a specific or particular waste dumping site with abundance of wastes containing valuable waste stream, and subsequently, patronises specific stationary waste buyer. While others are mobile, they move from house to house, administrative and business places, schools, roadside mechanic works, and smaller waste dumping sites. Subsequently, their collected wastes are sold out to any available nearby buyers within Keffi metropolis. In line with this, the waste pickers grossly contribute to the followings:

- 1) Self-empowerment and economic developments of the encompassing society and beyond, through day to day regeneration of raw material for onward utilization in the industries for wealth creation to revitalize entrepreneurial development;
- 2) Other significant contributions are that, they serve as an effective tool in the propagations of environmental sanitation and management in both rural and the urban settlements;
- 3) MSW scavengers are major stakeholders in the propagation of integrated solid waste management (ISWM) system for observing recovering, reuse and recycling (3R) in Keffi LGA; and
- 4) WS makes it easy for the farmers to collect enough biodegradable waste for agricultural practices, after screening and collection of valuable waste materials, if not for the presence of polythene bags and broken bottles. Hence, this adversely reduces an unmeasurable amounts of pressure on the immediate environment.

Forecasting of MSW for Economic and National development in Nigerian Six (6) geopolitical Zones

Economical Evaluation of MSW in eight (8) research Locations in Keffi LGA metropolis, can be replicated into 774 Nigerian local Government Areas, forming the present Nigerian six (6) geopolitical zones as in *figure 4* below.

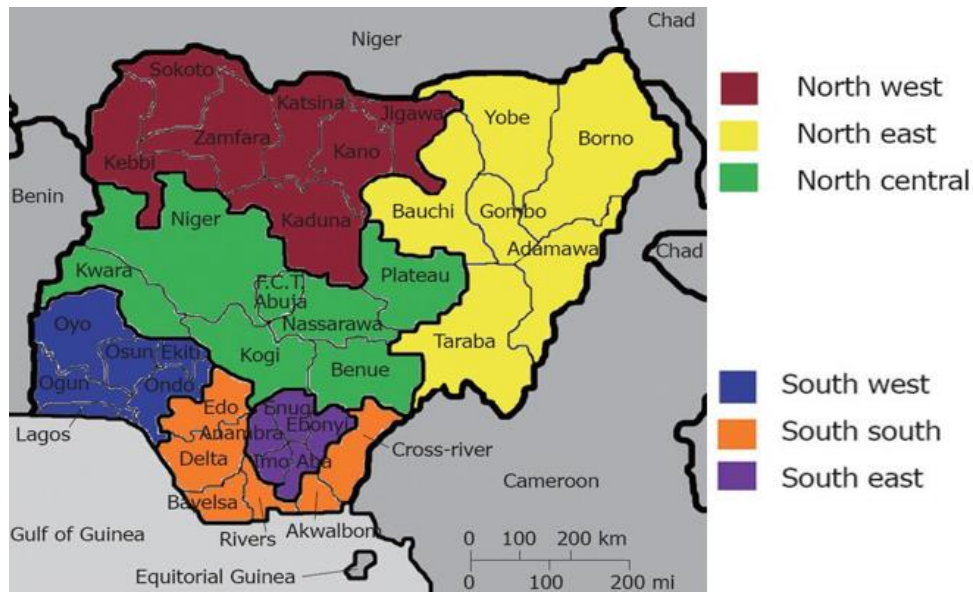


Figure 4: Map of Nigerian 6 geopolitical zones, showing 36 states and the FCT.
Source: (Saleh Mamman Abdullahi, 2016)

Furthermore, it has been established that there are thirty (30) waste collection centres known as the first middlemen byers of scavenged waste from waste vendors in Keffi LGA metropolis. However, this is not to include Keffi LGA villages and districts areas. Similarly, only eight (8) of these first middlemen were selected at random to form the bases for this research locations (RL), as an average range for the economic evaluation of an individual LGA in the Nigeria six geopolitical zones having 774 LGA.

Therefore:

(A) For one trip of goods in **fourty (40) days of 8RL**

This implies:

- Total Metal generated for 8RL = 175,087 kg (i)
- Total non-metals generated for 8RL = 115,213 kg (ii)
- Add equation (i) and (ii) = 290300 kg = ₦542,627 per trip (iii)

(B) For **360 days of goods from 8RL**

- 360 days / 40 days = nine (9) trips (iv)
- From Equ. (iii) 290300 kg = ₦542,627 per trip x (9) = ₦4,883,643..... (v)
- From Equ. (v) above. An average worth of 8RL for 8 trips = ₦4,883,643..... (vi)

(C) Plus 50 % increase of goods price from first to second middlemen

- From equ. (vi) above,
- This implies: ₦4,883,643 / 2 = ₦2,441,821.50 (vii)
- Therefore: ₦2,441,821.50 x ₦2,441,821.5 = ₦7,325,464.50..... (viii)

(D) 100% goods price

- This implies: Equ. [(viii) x (2)] = [₦7,325,464.50 x (2)] = ₦14,650,929 (ix)

Therefore, for a period of 360 days, scavenged waste is sold at ₦14,650,929 for one (1) Local Government Area having eight (8) first middlemen buyers only. (x)

(E) Hence, replicating this cost for **774 LGA** in Nigeria

This implies:

Minimum of 8RL (buyers) for each LGA only

$$= [(Equ. x) \times (774)] = [(\text{₦}14,650,929) \times (774)]$$

$$= [\text{₦}11,339,819.046] \dots\dots\dots (xi)$$

Therefore, the sum of ₦11,339,819.046 is an average worth of a minimum of 8RL per LGA of the 774 LGA in Nigeria. Hence, if thirty (30) first middlemen (buyers) are to be considered within a LGA and for each of the 774 LGA.

This implies therefore:

$$\text{For } 8\text{RL} = \text{Equ. (iii)} = \text{₦}542,627 \text{ (per trip)}$$

$$\text{For } 30\text{RL} = Q \text{ (per trip)}$$

$$Q = [(542,627 \times 30) / 8] = (16278810) / (8)$$

$$Q = \text{₦}2,034,851.25 \dots\dots\dots (xii a)$$

$$Q \text{ for nine (9) trips per year} = [\text{Equ. xii a} \times (9)]$$

$$Q = [(\text{₦}2034851.25) \times (9)] = \text{₦}18313661.25 \dots\dots\dots (xii b)$$

Then for 774 LGA

This implies:

$$R = \{[\text{Equ. (xii b)}] \times (774)\} = [(18,313,661.25) \times (774)]$$

$$R = \text{₦}14,174,773,807.50 \dots\dots\dots (xiii)$$

(F) Direct employment rate in Keffi LGA

$$\text{This implies: } 8\text{RL} = 478 \text{ workers} \dots\dots\dots (xiv)$$

if 8RL 478 workers, then

$$30\text{RL} = Y$$

$$\text{This implies: } Y = [(478 \times 30) / (8)] = [14340 / 8] = 1793$$

$$Y = 1793 \text{ workers} \dots\dots\dots (xv)$$

(G) Direct employment rate in 774 LGA

If Keffi LGA = 1,793 workers

This implies; 774 LGA = Z workers

$$\text{Hence, } Z = (1793 \times 774) = 1,387,782$$

$$\text{Therefore: } Z = 1,387,782 \text{ workers} \dots\dots\dots (xvi)$$

Hence, if 1,793 workers are an average employability rate for 30RL in Keffi, then for 774 LGA in Nigeria the employability rate is 1,387,782 workers.

Therefore, **R** is the worth earning from Municipal Solid Waste economic developments, from 774 LGA in Nigeria, while **Z** is the manpower employability rate. However, the major benefits that can be driven from these forecast includes the followings.

- The utilization of internally sourced material as raw materials for the Nigerian industrial development, which drastically reduces the quest for enormous mining activities, cost of exportations and transportation period for raw materials to be used in the Nigerian manufacturing industries. It can be noted that 54% of the smaller scale industries and

craftsperson in Ibadan, Kaduna, Kano, Lagos, Maiduguri, and Onitsha depends on 56% of raw materials collected from municipal solid waste disposals. If exportation of these waste material to Europe and Asia is restricted, it will allow for more springing of smaller scale industries, craftsperson and the resuscitation of the existing ones;

- Gross increase on the Nigerian internally generated revenue is expected, which in turn will boost Nigerian economy and its GDP. Owing to the fact that this will drastically change Nigerian GDP per capital income as well as the current Nigerian population living below poverty line; and
- The presence of unemployment among youths and adults roaming the streets will drastically reduce grossly, as the solid waste sector will provide more employment, jobs and empowering the teaming populace of the host communities and beyond. Similarly, entrepreneurial development will receive the utmost attention it deserves to promoting nation development

Problems associated to MSW scavengers in Keffi LGA

There are several problems associated to waste scavenging in Keffi LGA, metropolitan among which are:

- 1) Integrated waste management system (IWMS) is lacking in both technology, facilities and practice within our environments. Hence, waste scavenging became the only alternative and options for the recovery of vital components from our waste disposal sites for recycling processes;
- 2) This field research has revealed that 73% of the waste scavengers are into waste scavenging as a result of the present status of poverty and none employment rate in the country, as well as the quest to earn a source for a living. While 27% of the waste scavengers are into waste scavenging, because they were born and brought up in it, and that is the only source of living they tend to know and have at their disposal at the moment.
- 3) There is presence of under aged children (09 – 17 years) found in the activities of waste scavenging. However, out of the 114 scavengers interviewed on the field, 29 of them are under aged children involvement. Thereby making them not to attend school and learning process of either formal or Arabic;
- 4) The waste scavengers are lacking of formal education, technologies and methods of solid waste management (SWM) principles, hence this is an agent to creating future social insecurity;
- 5) National Environmental Standards and Regulation Enforcement Agency (NESREA) of Nigeria has no effective solid waste management policy to recognize waste scavenging groups and they are not having maximum government recognitions, attention and financial aids to support their business activities;
- 6) MSW business is being manipulated by the second and third middlemen within the business sector, this makes it difficult for the first middlemen to realize better profits in their day to day transactions;
- 7) The waste scavengers are completely lacking in health and safety protective trainings, equipment and materials, before, during and after scavenging activities;
- 8) Majority of the waste scavengers are suffering from different form of cuts and injuries, resulting from metals, broken bottles / glass and sharp waste material during and after scavenging activities;
- 9) The waste scavengers are faced with the problem of housing accommodation, as majority of them resides and sleeps in an unprotected wooden and or zinc sheet tents next to their

stockpiled waste materials, hence they are open to be attacked by malaria, typhoid and other incessant form of diseases;

- 10) Similarly, majority of their working and residential environments lacks proper hygiene and are not safe for day to day regular human activities. Hence, these phenomena present high risks and uncertainty to the life of waste scavengers and the immediate people they interact with daily;

Conclusions

MSW are unwanted materials which are being disposed in the environment by the inhabitants. Effective planning and coordination of waste scavenging activities will enhance grossly the recovery of waste materials for recycling products. However, about 47% - 51% of the total waste stream in Keffi LGA metropolitan are recyclable clean material, which subsequently provide for prudent environmental management and for wealth creation to enhance the economy of the local community. The recyclable percentage of waste stream in Keffi LGA metropolitan is majorly; metals (iron, aluminium, copper, and brass) and non-metals (plastics containers, rubber, and empty cartons). Therefore, any effort channelled towards its recovery will enhance economic growth of the local inhabitant of Keffi LGA and subsequently the 774 LGA of the nation at large.

The economic importance of MSW in Keffi LGA metropolitan as identified by the 8 RL indicates an average harvest of 175,087 kg of metals and 115,213 kg of non-metals are generated in forty (40) days at an average value of ₦542,627 per trip. This implies therefore for 360 days, which is approximately 8 trips in a year, will provide capital income of ₦4,883,643. The field investigation reveals that, the price of the goods are sold at fifty percent (50%) increase from first middlemen to the second middlemen. Therefore, 50% increase of ₦4,883,643. is ₦2,441,821.50. the total cost of goods purchased by the second middlemen buyers is ₦6,666,211.65. Hence, if this is an average worth, then 100% purchase income is ₦14,650,928 for eight research locations Keffi LGA only Therefore, this income value is for eight research locations out of thirty (30) numbers of first middlemen buyers within Keffi LGA metropolis and not to including its environs. Hence, replicating this cost for 774 LGA in Nigeria the worth implies ₦14,174,773,807.50 with a total employability rate of 1,387,782 workers.

Recommendations

- 1) Free basic education should be made accessible to the children of waste pickers and the general publics, in order to take underage children off waste picking and the streets during school hours;
- 2) NESREA should actively involve waste pickers in the collection of separated recyclables materials from the households and the waste sites;
- 3) Government and NESREA should provide extensive education and regular sensitizations to the waste scavengers, and as well provide them with adequate protective safety materials for scavenging activities;
- 4) It can be recommended that both local, state and the federal government should integrate waste scavengers into the formal solid waste management system. And provide them with effective environmental health and safety (EH&S) training and supports;
- 5) The Nigerian government should integrate the waste picker in to small scale groups, and provide them with loans and finances, in order to boost SWM businesses for optimum entrepreneurial developments and to eliminate the bottle neck and monopoly played by the second and third middlemen in the business;

- 6) The entrepreneurial development sector and NESREA should utilize some key stakeholders among the waste scavengers and first middlemen such as Dan Sauka Scraps Enterprises (Alhaji Mahmoud Talle) in various workshops, seminars and conferences to harness greater talents in the solid wastes businesses;
- 7) Similarly, Nigerian waste management system should adopt Polluters Pays Principle (PPP) in order to combat all form of waste materials;
- 8) Governments at all levels should ensure a prudent public private partnerships (PPP) investments in waste management sector and other environmental phenomenon which will provide checks and balances (control the increasingly pollution/environmental abuse);
- 9) Stringent promulgated environmental laws should be in place to ensure active participation of the general publics in waste management in line with both national and international guidelines as well as to prosecute violators;
- 10) The government should introduce affordable and cheaper housing and shelters for waste scavengers, their families and the general populace, in line with government policy that says “housing for all Nigerian citizens”

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