

MATERIAL RECOVERY FROM WASTES: AN EMPLOYMENT AND POVERTY ALLEVIATION TOOL

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Abstract

Waste management is not only about removing waste from the environment but also a tool of social integration and economic well-being. Waste management through the three Rs offers advantages of employment, sustainable development and poverty alleviation. The environment requires attention because it is rapidly degrading amidst dwindling natural resources, mounting amounts of wastes while poverty continues to increase. This paper focused on material recovery from wastes through recovery, re-use, and recycling of municipal solid wastes in the north-eastern city of Maiduguri in Nigeria over a period of 24 months between 2011 and 2013. Three waste management scenarios were thought of and adopted within 7 groups made of the major wards, areas of the Maiduguri metropolis and the University of Maiduguri; involving 5000 respondents/participants working under waste collection outfits or operating at open dump areas. Data obtained were analyzed using simple statistical methods. Findings revealed an annual estimate of the recovery as 16.8 tons of bottles/glasses, 158.4 tons of plastics/rubber, and 264 tons of metal. It also indicated that considerable amount of money could be made from material recovery and recycling= $N=97,600$ was made from the sales of bottles/glasses, = $N= 652,800$ from plastic/rubber and = $N= 1,408,000$ from sales of scrap metals. Material recovery, re-use and recycling have many economic and material benefits. They also constitute human capacity development schemes. These recoverables have paved great means of livelihood to many people involved in this activity. There is need for support from either government or private sector.

Keywords: waste, three Rs, sustainable development, employment, poverty alleviation.

1. Introduction

Poverty results from the percentage or portion of the population in a country which does not, voluntarily or not cater for its natural or biophysical needs as: sustenance (safe and secure food and water), shelter (housing), clothing, information, communication, health, access or mobility, and recreation. Poverty across the world has many manifestations and dimensions which include: joblessness, economic dependence, inability to save or own assets, etc. Economic and physical aspects of poverty focus on material needs and their availability or not.

As towns and cities around the world expand and population grows, so do volumes of waste produced increase and the challenges of solid waste change. In Nigeria at present, the amount of municipal solid wastes (MSW), which are predominantly synthetic, fabrics, scrap metals, glass, plastic, ceramic, is reaching proportions that are sources of major concern on the streets, in and

around the residences (Oumarou *et al.*, 2011). The annual generation of Municipal solid waste (MSW) in Nigeria was estimated at 29.78×10^3 tonnes (Ojolo and Bamgboye, 2004).

Recyclable items obtained from MSW rely largely on the informal recovery of materials from solid waste carried out by scavengers. They constitute disadvantaged and vulnerable segment of the population; they are sometimes, orphans, women, widows, and even children. They face multiple hazards and problems due to their daily contact with garbage, also are usually dirty. Often, scavengers are associated with diseases; violence, drugs and other related vices; and are perceived as a nuisance, a symbol of backwardness and even as criminals. Scavengers recover materials for sale, re-use and/or recycling; these waste pickers or rag pickers are often referred to as “Baban Bola” (loosely translated as Father of Wastes’ Dump) in northern Nigeria.

MSW has received growing attention both on the local and international scenes (Dauda *et al.*, 2012; David, 2013). Moniruzzaman *et al.*, (2011) believe that a solid waste recycling approach is a part of the sustainable and effective waste management system for most of the cities in the world. Their work investigated and analyzed a traditional recycling practice of solid waste in the Khulna city of Bangladesh. A complete hierarchy from waste collectors to recycling industries in the private sector was identified. The private sector was found to deal with only Recyclable Solid Wastes (RSW).

This paper investigates materials recovery from MSW through scavenging for recovery, re-use and recycling using direct collection and qualitative separation method of re-usables and recyclables, and evaluates the income of the collectors. The impacts of the materials recovery on job creation, poverty alleviation, socio- economic re-insertion were thoroughly examined.

2. Materials and Methods

2.1 Study area:

The city of Maiduguri (Plate 1) was considered as the study area. Maiduguri metropolis had an estimated population of 626,486 (National Bureau for Statistics, 2006) which by far may not be an exact figure due to the “Boko Haram” insurgency the state had witnessed between 2009 and 2015. The city of Maiduguri served as major base for local and international commercial activities for the North Eastern region of Nigeria and neighboring communities from Niger republic, Cameroon and Chad. It also houses the major industries in the state. Thus the city has high human traffic, partly due to the Islamic scholars mainly youth and below the age of 15-17 years, commonly known as “Almajiris”. For the purpose of this research, the study area has been divided into seven (7) groups (Table 1) comprising of wards and the University of Maiduguri which is home of more than 44,000 people; students, staff and business owners. The University of Maiduguri campus constitutes the collation and analysis centre. In the city, the starting point was the “Layin Bola” (i.e.: refuse street) in Gwange ward, where all re-usable dealers, pot makers are located.

Table 1: Constitution and composition of groups of the study area.

Groups	Areas covered (wards/area)
1	Zajeri, Umarari, Bolori and Pompomari wards
2	Bulumkutu ward, Dala ward, Ngomari ward
3	Shakwari ward, Goni Kachallari, Ngomari Costin
4	Lamisula, Mafoni, Shehuri North
5	Hausari, Limanti, Gwange Wards
6	Old G.R.A, Jiddari, Galtimari
7	Mairi, New G.R.A, University of Maiduguri Campus, 202 and 303 Housing Estates

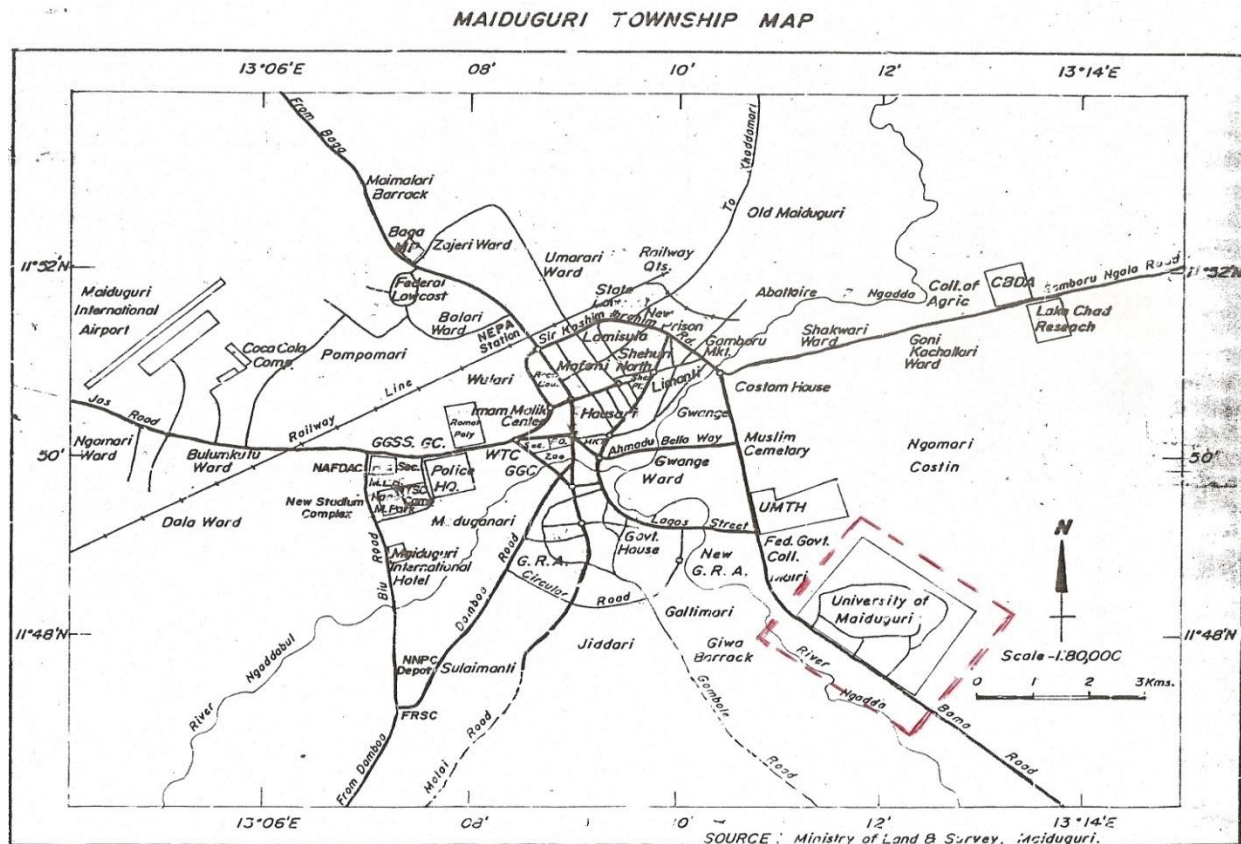


Plate 1: Map of Maiduguri (source: Borno State Ministry of Land and Survey, 2011).

2.2 Data collection:

A questionnaire was designed to ensure that adequate information pertaining all people involved in MSW collection and picking (scavengers) were obtained. The various open dumps within the study areas were sectioned so as to give equal chance to the respondents of the different areas. Five thousand questionnaires were distributed, of which seven hundred and fourteen (714) respondents were chosen from each of the groups selected. The state government waste collection outfit, BOSEPA and three private local waste collection outfits staff were involved over a period of 24 months between 2011 and 2013 (April 2011- April 2013). The private wastes

collection outfits are CONFER, MARION, and MUSFAT cleaners as well as independent scavengers (the Almajiris, women, girls and boys).

2.3 Data Analysis:

Three waste collection scenarios were designed as shown in Figures (1, 2 and 3) for material recovery, re-use and recycling processes in the study area. Data were analyzed using Microsoft Excel software programme.

Monthly analysis was achieved considering four weeks in a month therefore eight category 1 and 20 category 2. Annual analysis is achieved by multiplying the previous results by 12 in Tables (6 to 11).

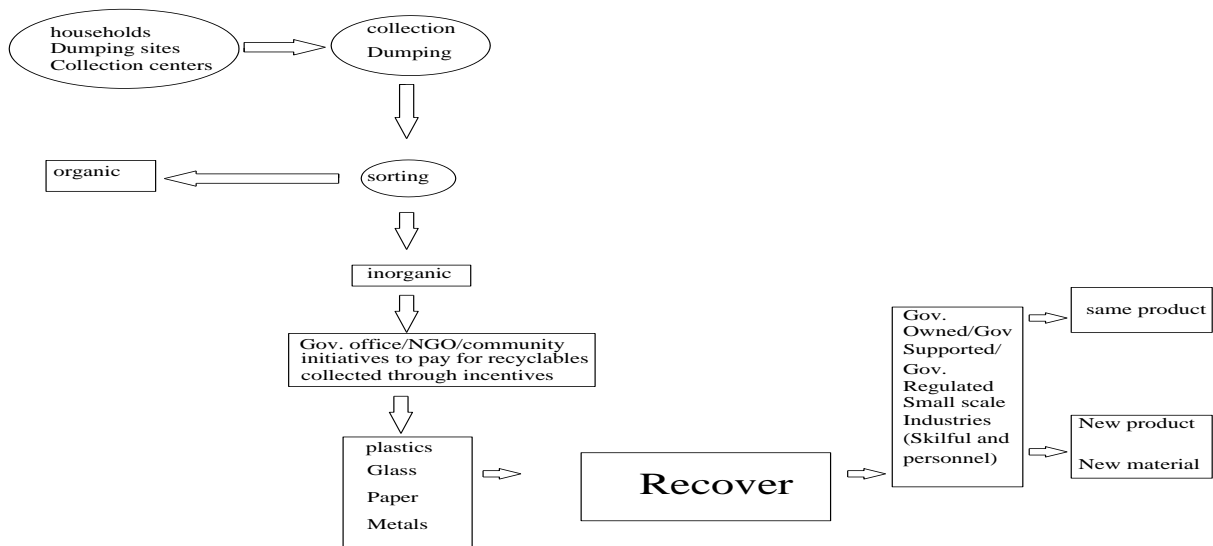


Figure 1: Waste Collection and job creation opportunity in the Recovery scheme

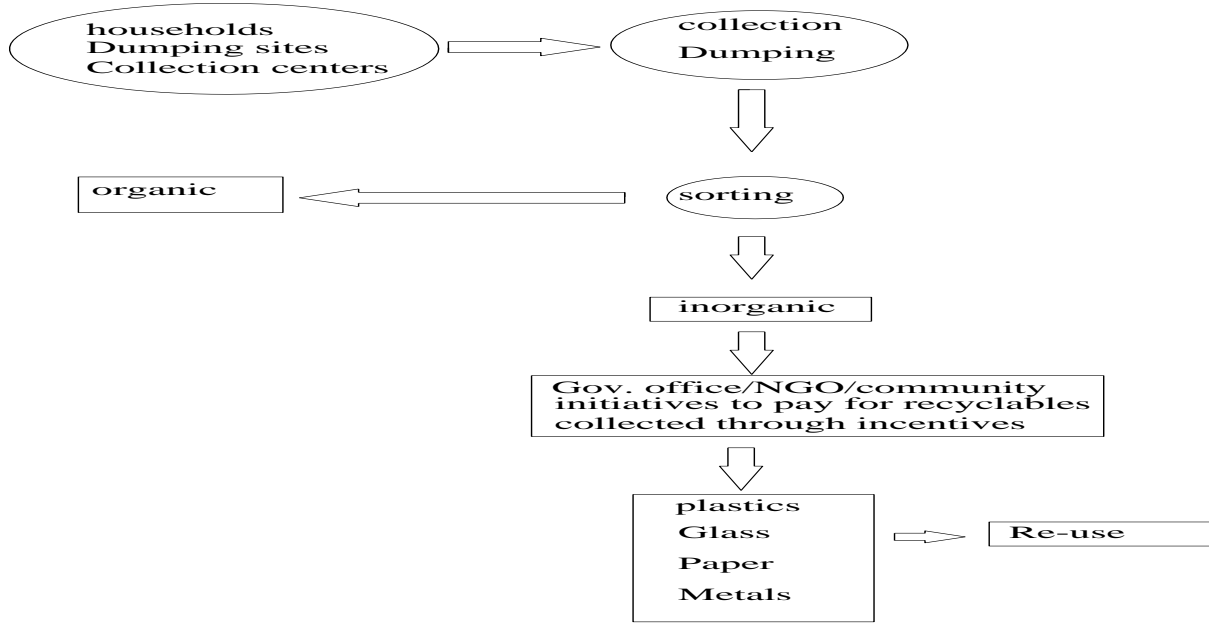


Figure 2: Waste Collection and job creation opportunity in the Re-use scheme.

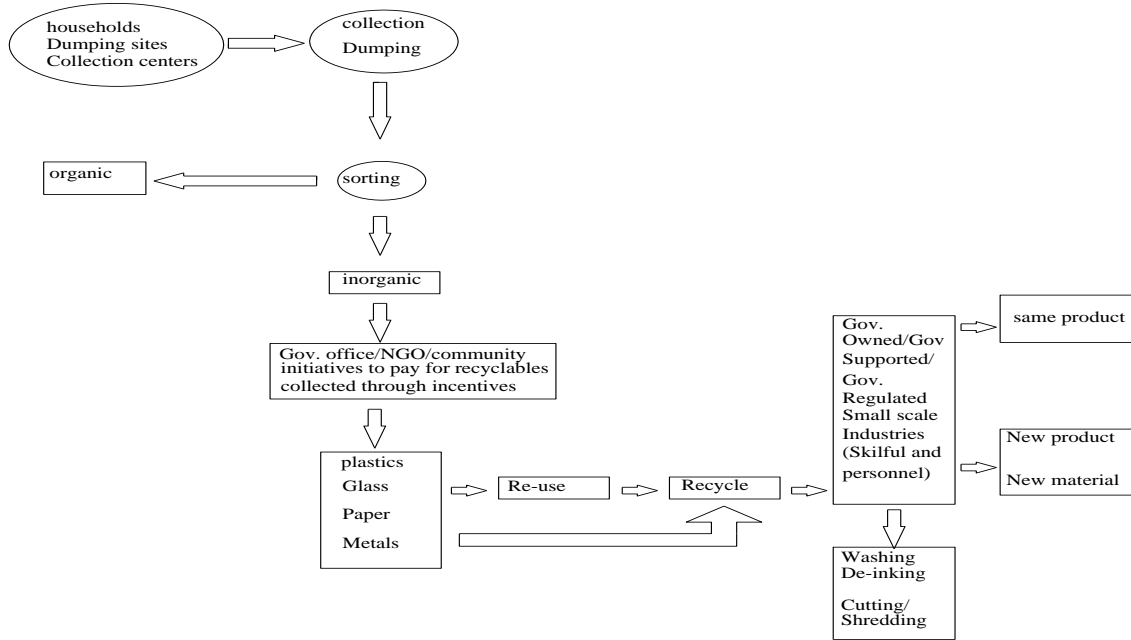


Figure 3: Waste Collection and job creation opportunity in the Recycling scheme.

3. Results and Discussion

It is increasingly evident that a waste management programme or treatment technique that ignores social aspects is bound to fail. Issues dealing with problems of public acceptance, public

participation in planning and implementation, and consumer behaviour are equally important to technical and economic aspects in waste management and decision making. Tables (2 and 3) show the occupation of respondents and origin of materials recovered. Findings during the course of this research revealed that the cleaners/collectors under the selected waste collection outfits, government or private owned receive a monthly average wage of =N= 9,000.00 each.

Table 2: Occupation of the respondents

Occupation of Respondents	No. of respondents	Percentage
Sorting and collection of waste	3600	72%
Scavenging only	1150	23%
Small dealers buying Waste Materials From scavengers/Collection= Middlemen	222	4.4%
Major Dealers/ Buying Waste Materials for transfer to Lagos	28	0.56%

Table 3: Sources of materials recovery

Sources	No. of respondents	Percentage
Direct collection at houses/sources	2300	46%
Route Collection	920	18.4%
Municipal Open dump	1010	20.2%
Others	535	10.7%
Blank questionnaires	235	4.7%

Waste management cannot be answered with mere technicalities through process or system choices often driven by prominent but even inadequate aesthetic attempts according to the current waste flows. Instead it demands the adoption of new eco-political strategies clearly based upon a greater sense of environmental justice. Just as planning, health-care services, traffic and transportation, education and cultural activities are tasks commonly addressed by cities officials; less appealing challenges associated with solid waste management have been less frequently considered by most policy makers. Countries which have long-term experience in waste management put social aspect at the top of the decision making process, while the beginners, countries which are starting to implement waste source separation and recycling schemes often ignore this aspect (Sviatlana *et al.*; 2010). Awareness, raising campaigns using messages such as reduction by Recovery – Re-use – Recycle can be used to change attitudes and modify behaviours amongst households and businesses.

Maiduguri and Borno state as a whole have witnessed an unprecedented situation of losses, destruction of both human and material properties and a high population migration flux. This was due to the “Boko Haram” insurgency. The situation added a new category of waste into the already existing stream. This new category of disaster wastes resulting from the insurgency and insurgents activities were mainly scrap metals from burnt, destroyed cars, tricycles and

demolition wastes. To this, should be added the worldwide economic crisis which is continuing to bite.

The need to adopt the three Rs has never been that urgent as cutting costs through resource re-utilization and minimizing waste become more than a priority. Eventually, only those economies able to reduce costs and abate the environmental impacts of their activities will be better equipped to survive during the current economic downturn. Therefore interdisciplinary planning programmes are of crucial importance in order to identify policy instruments and strategic decisions that contribute to the development of sustainable waste management (Giovanni, 2009).

Table 4: Types of materials recovered.

Types of Materials	Percentage
Metals	27.5%
Plastics	15.5%
Bottles	11.0%
Paper and Magazines	9.0%
Ceramics	2.0%
All of the above	35.0%

Table 5: Reasons why people engage in MSW collection or picking.

Reasons	Percentage
Source of Livelihood	66%
Source of extra earning	3%
Employment	30%
Interest	1%
Any other reason	0

The overall calculations in the subsequent sections were divided into two categories: Thursdays and Fridays; due to the high population flux on those days; as category 1 on one hand and the remaining days of the week on the other hand as category 2.

Table 6: Annual collection of Bottles/Glasses

Collection of bottles	Daily collection (kg)	Monthly Collection (kg)	Annual collection (kg)
Category 1	100	800	9,600
Category 2	30	600	7,200

Table 7: Annual Estimate of Rubber/Plastic Collected

Days of collection	Daily Collection (kg)	Monthly Collection (kg)	Annual Collection (kg)
Category 1	10 bags of 70kg	5600	67,200
Category 2	2 bags of 50kg	2000	24,000
Total:			91,200

Table 8: Annual Estimate of Metals scraps

Days of collection	Monthly Collection (kg)	Annual Collection (kg)
Category 1	8000	96,000
Category 2	14000	168,000

On one hand, Tables (2 and 5) show an alarming statistics. In Table (2), 4750 respondents were directly involved in the waste collection scheme at the bottom of the ladder. This shows the level of poverty and lack of other alternatives. Only 28% are major dealers who could eventually sustain themselves. In Table (5), 99% of the respondents were involved for reasons other than interest. These reasons could be a means of livelihood, loss of a parent, guardian, sponsor, family head, relative, or even a loss of both parents in the case of children. On the other hand, Tables (6, 7 and 8) show that bottles have higher collections in kilograms on Thursday and Fridays throughout the year. Moreover the result shows that about 9600 kg/annum is obtainable in the said two days as compared to other days which has only 7200 kg of the waste material per annum. This is due to the fact that these are days when Muslims from all areas within the state gather for their Juma'at (Friday) congregational prayers and also attend the market for their weekly transactions. To this should be added the fact that, for security and safety reasons, most people from the surrounding local government areas took refuge in Maiduguri. Water, food, snacks and other commodities are used in excess. Also, these two particular days are exceptional due to the fact that most of the children engage themselves in scavenging activities are "Al-majiris" also are being brought from other states and villages to acquire Islamic knowledge (i.e.: to memorize the Qur'an). Thus, scavenging activities on Thursday and Friday of all the week supersedes that of the remaining days within the week.

The annual estimate of metal collection shows that a hundred of thousands kilograms of metals were obtained annually by scavengers. A major contributing factor is the fact that there is a very bad maintenance culture regarding items such as fridges, trucks, containers and other metallic parts. No daily collection was recorded as there were days where the outing was fruitless. These results simply indicate that metals were the most abundant solid waste materials being collected in MSW of the study area. However, their bulkiness makes the generation high thereby giving rise to high recovery activity. Such scrap metals, destroyed vehicles/tricycles were mostly collected by the dealers themselves and could only be sold upon explicit permission from the authorities.

The independent scavengers tend to have low incomes, but they can obtain decent earnings as they are not exploited by middleman. Those supplied by the dealers with an amount of money; scout for the material to be reused, recycled and or re-injected into the economy directly or after a transformation. This category of scavengers is often exploited by middlemen who tend to derive the double benefit of exploiting both the dealers and scavengers. Apart from the monetary aspect, scavenging also renders significant environmental benefits. Material collection and picking for recycling purposes saves energy, reduces pollution and improves the economic situation of the people. Tables (9, 10 and 11) show the economic benefits of bottles, plastics and metals recoveries respectively.

Table 9: Economic benefits of small bottles/glass recovered from MSW

Perfume/Scent bottles (=N=5.00/ 3pieces)	Amount collected(pieces)	Monthly sales (=N=)	Annual sales (=N=)
Category 1	400	2,666.80	32,001.60
Category 2	400	2,666.00	31,999.00
	Sub – Total	5,332.80	64,000.60
Syrup bottles (4 pieces at = N=5.00).	Amount collected (pieces)	Monthly sales (=N=)	Annual sales (=N=)
Category 1	100	1,000.00	12,000.00
Category 2	250	1,250.00	15,000.00
	Sub-Total	2,250.00	27,000.00
Total Amount:			= N= 90,993.60

Table 10: Economic Benefits of Plastic/Rubber recovery

Plastic / Rubber (2kg/ =N= 15.00)	Amount collected (kg)	Monthly sales(=N=)	Annual Sales (=N=)
Category 1	4,000	30,000.00	360,000.00
Category 2	2,800	21,000.00	252,000.00
Total Amount:			=N= 612,000.00

Table 11: Economic Benefits of Metals/scraps recovery

(1kg at=N= 5.00)	Amount collected (kg)	Monthly sales (=N=)	Annual sales (=N=)
Category 1	8,000	40,000.00	480,000.00
Category 2	14,000	70,000.00	840,000.00
Total amount:			=N= 1,320,000.00

Despite some progress, MSW still poses pressure on cities and remains one of the major challenges in environmental management. There is no single solution to the problem since the drivers behind MSW systems may vary significantly from city to city. In this context, the development of a common strategy to attain a sustainable management has increasingly been difficult. Drivers of relevance over time remain: laws and regulations; available technologies; solid waste flow as recyclable resources; population trends and public awareness. In this regard, some of the scavengers suggested that a Local Union that would bring scavengers within the Metropolis together was desperately required. They claimed that doing so would bring about standardization in all activities of scavenging. This is in line with Francisco *et al.* (2010) who went further to suggest that waste-to-energy alternatives, strong waste reduction policies, a shift on waste composition and generation triggered by a demographic change, could be part of the scenario of the future.

In all the areas under study, metal (mainly Aluminum and Iron in form of cans, beverages, and scrap iron of any type), plastics (water bottles, juice containers), glass, batteries, etc. constitute the most valuable items collected. The organic portions of the wastes are usually left unattended and allowed to putrefy. The organic portion of the waste has economic and agricultural values in terms of monies from sales to farmers or gardeners as manures, or even set up compost manufacturing small scale industry.

Developing countries are economically poor and some of them badly governed but extremely rich when it comes to natural resources. Waste management is an area where supply cannot meet demand. There is need to involve more people in waste collection at the source, sort it before heading to the treatment centres. Compost manufacture centres could be set up with waste collection. However, as David (2010) pointed out; a look back at relatively recent history can be a cause for some optimism. It was perhaps only 60 years ago when solid waste management practices in today's developed countries resembled what it is commonly obtainable today in the developing countries. For instance, it was not unusual to see informal scavenging in residential and commercial neighborhoods and at the dump sites, animals foraging on freshly deposited trash, open burning dumps, uncontrolled incineration, and littered streets in the United States of America.

There is also need for: National Legislation to promote recycling activities in Nigeria as well as to ban the importation of non-reusable and non-recyclable materials into the country; Nigerian government to establish a micro-credit schemes in order to provide loans to potential scavengers so that modern techniques of materials recovery would be adopted; Public enlightenment programmes, awareness and training on the benefits of harnessing waste via scavenging; Setting-up of scavengers' micro-enterprises, scavengers' co-operatives and Public private partnerships; and Provide land for sorting of materials recovered from municipal solid waste activities in an environmentally sound manner.

The government could register and license all the operators involved in buying materials recovered from Municipal solid waste.

4. Conclusion

The following conclusions were drawn at the end of this research work:

- i. The study revealed that an important amount of reusable and recyclables was obtained.
- ii. The money made out of the MSW was considerable and could solve some financial issues of the workers from the waste collection outfits or scavengers.
- iii. Material recovery, re-use and recycling of MSW are indeed a viable alternative to fight poverty, and contribute immensely towards social re-insertion of marginalized people.
- iv. The recovery of MSW represents a means of job creation and generation of income especially among these low income groups, having in mind the wages are low compared to their counterparts in developed countries.

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