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Integrated Approach to Municipal Solid Waste Management in a Rapidly Urbanizing Medium - Sized City in Nigeria

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Abstract

Municipal Solid Waste (MSW) generation is increasing daily in Ado-Ekiti, being a growing medium-sized city in South-western Nigeria. The thrust of the paper is to unravel possible way to sustainably manage the solid wastes generated in the city via small-scale business initiatives. The problem of waste disposal is a major concern in major cities in most developing nations like Nigeria, which residents could grasp as viable opportunity and medium to generate income. The study makes use of Survey Research Design (SRD) via questionnaire administration. Six slum neighbourhoods were identified in the city with a total number of 7,862 housing units out of which 3.5%, amounting to 275 housing units was randomly selected as sample size. Findings revealed the nature of waste generated in the area; ranging from domestic (household) wastes to paper, plastic and metal wastes. Very few (about 1.0%) of sampled respondents separate their wastes before disposal while 99.0% did not. This divulged the reason why waste management business is not recognized and embraced on larger scale in the area; except for a few that are involved in scavenging and those who work directly with the company in charge of street sweeping in collaboration with the State Waste Management Board. To this effect, the study put up probable measures to encourage residents in the establishment of business ventures in waste management enterprise via Municipal Solid Waste Scheme (MSWS). This is hoped will improve the environmental condition and income level of people in Ado-Ekiti.

Keywords

MSWS, Business Initiative, Slum Residents, Sustainability, Ado-Ekiti

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1. Introduction

The management of solid waste is one of the challenges facing any urban area in the World and one of the dreadful consequences of urbanization, particularly in terms of the environmental nuisance combined with the health hazards implications (Zerbock and Candidate, 2003; Onibokun and Kumuyi, 2000). According to Rode (2011), human activities create waste and the ways that waste is handled, stored, collected and disposed-off can pose risks to the environment and public health. He defined solid waste as non-liquid material that no longer has any value to the person who is responsible for it. It is mainly generated from houses, commercial, industrial, hospitals among other places as unwanted materials left from different processes. Solid waste comprises of plastic, paper, glass, rags, food items, vegetables and others.

Recently, there have been growing concerns about the environmental effects associated with solid waste generation as well as the increasing costs its management entails. Inappropriate solid waste management causes air, soil, and water pollution (Zewdu and Mohammedbirhan, 2014). Often time, solid waste materials block drainage systems thereby causing overflows during rainy seasons especially in urban regions. The arbitrary dumping of waste pollutes ground and surface water sources, and naturally, dumped solid wastes

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will generate a huge amount of polluted leachate that contains high concentration of toxic compounds which can cause severe damage to the ecosystem (Foul *et al*., 2009).

The world today is an urban world and it is anticipated that most of our future population increase will be absorbed by cities. The implications of population and settlement patterns in terms of demand on the physical environment and urban services are overwhelming. Sporadic refuse dumps and a breakdown in waste disposal arrangements are a few of the problems associated with municipal solid waste management in some Nigerian urban centers. The disposal of solid waste materials, principally garbage and rubbish, is primarily an urban center problem (Awosusi et al., 2012). However; unlike liquid waste, sewage and industrial effluents disposal, the problem of solid waste has received only limited recognition. It is commonly practice in many metropolitan areas to overlook or ignore the consequences of waste disposal programmes. Many areas, particularly in developing countries still have inadequate plans for waste management; poorly controlled open dumps and illegal roadside dumping remain a pattern. The dumping spoils scenic resources, pollutes soil and is a high potential health hazard to plants, animals and people. The indiscriminate dumping of wastes and the failure of the collection system in a community as well as the result of improperly managed waste for two to three weeks soon causes many problems.

The volume of waste generation in Ado-Ekiti has increased drastically from about 95tons to 120tons per day since the creation of the State in 1996 (ESWMB, 2011; Awosusi, et al, 2012). This is due to the influx of people into the town which has significantly increased the population of the town. A study on typology, characteristics and future trends of solid waste in South-western Nigeria examined by Akaninyere and Atser (2001) affirmed two major components of waste generated in urban area to include degradable materials (like food remnants, paper, and rags) and non-biodegradable materials (like plastics, tins, metals, bottles, glass, and bones). The study (as cited in Fakere et al, 2012) asserted that in several Nigerian cities, garbage contributes substantially more than other components. This could be explained by the fact that most activities which affect the environment stem from the need for food - its production, processing and preparation. From the study, the constituents of municipal solid waste generated in Ado-Ekiti was said to have ranged from Garbage (60.4%) to paper (21.4%), grit (11.5%), plastic (4.3%), glass (2.2%) and metal scraps (0.2%). These wastes are indiscriminately disposed in their respective communities. Most of them are dumped at roadsides, some in water channels, and some in open spaces littering the neighbourhoods. Agencies involved in the collection and disposal of these wastes are either not efficiently capable or not adequately fortified with sufficient tools in handling the volume of wastes being generated. This usually makes the environment look littered, unkempt and dirty. There is therefore the need to sensitize and encourage the involvement of private sectors through public-private partnership scheme in managing the wastes. The thrust of this paper, however, is to suggest viable approach for sustainable management of solid waste in Ado-Ekiti with a view to promote the living environment and improve the economy of residents.

2. Literature Perspective

Waste is a material discharged and discarded from each stage of daily human life activities, which leads to adverse impacts on human health and the environment (Bringi, 2007). whereas, solid waste refers to the leaves/ twinges, food remnants, paper/cartons, textile materials, bones, ash/dust/stones, dead animals, human and animal excreta, construction and demolishing debris, biomedical debris, household hardware like electrical appliances, furniture, etc. (Sha'Ato et al., 2007; Babatunde et al., 2013; Ebistu and Minale, 2013). Urbanization and modernization have rapidly increased the rate of municipal solid waste (MSW) production and disposal in many cities around the globe; therefore, waste management becomes a major concern in most cities in developing countries (Zhen-Shan *et al*., 2009; Zewdu and Mohammedbirhan, 2014).

According to Tanaka (2006), the generation of solid waste is expected to increase steadily along with economic growth if a lifestyle of mass production, consumption and disposal is continued. The most visible implication of rapidly urbanizing is the increasing generation of municipal solid waste; a highly neglected problem with severe health and environmental implications. Governments at different levels are desperate to find highly effective, practical solutions for improving Solid Waste Management (SWM) with limited budgets. Moreover, the urban poor suffer disproportionately from bad environmental sanitation, particularly informal waste collectors and recyclers, resulting in illness caused by water - and vector-borne disease (Zewdu and Mohammedbirhan, 2014). Therefore, SWM has a vital role to play in achieving the Millennium Development Goals in health and environmental sustainability. Even though SWM infrastructure and services may be costly and complex issue, but its effective delivery is essential to improving the health, environment, and overall quality of life for all urban residents (Singha and Pandey, 2001, cited in Zewdu and Mohammedbirhan, 2014).

Inappropriate disposal of solid waste can be risky which often manifest by contamination of surface and ground water through leachate, soil contamination through direct waste

contact, air pollution by burning of wastes, spreading of diseases by different vectors like birds, insects and rodents, or uncontrolled release of methane by anaerobic decomposition of waste (Visvanathan and Glawe, 2006). Solid wastes disposed indiscriminately resulted also in aesthetic problems, constituting nuisance and pollution of land and water bodies of an area (Hammer, 2003). Therefore, proper handling of waste management by locating proper sites for its disposal and selecting appropriate landfill site far from residential areas, environmental resources and settlement is the main issue for the management of solid waste. One way to dispose solid waste is to place it in properly designed, constructed, and managed landfills, where it is safely contained. African nations (with the exception of South Africa which had the fewest engineered landfills), most nations practice open dumping for waste disposal. Several studies have indicated that slope less than 12% as appropriate site suitable for the prevention of contaminant runoff. This will reduce the amount of earth moving required during landfill construction, thereby reducing the overall costs (Ebistu and Minale, 2013).

Likewise, most studies suggested that the solid waste dumping site should be located within a 1 km buffer from the roads and other transportation facilities (Chang et al., 2008). Also, solid waste disposal sites should not be placed too far from the roads to decrease the cost of transportations. Solid waste disposal site should not be placed too close to settlement areas and recreation centers.

In a similar study, Awosusi, et al (2012) used Zero Waste City Concept to examine waste management and enterprise development in slum communities of Ado-Ekiti, Nigeria. According to the study, cities are over-consuming and per capita waste generation is relatively higher in high consuming cities compared to low-consuming cities. The concept of Zero Waste City includes a 100 per cent recycling rate and recovery of all resources from waste materials. According to them, cities attract people because of the socio-economic activities and quality of life offered to their inhabitants; hence, inadequate urban management often based on inaccurate perceptions and information, can turn opportunity into disaster (UNFPA, 2007). Cities are not only over-populated and over-consuming in nature but also deplete global finite natural resources at a high rate. There is a positive relationship between urbanization and poverty (UN-Habitat, 2008) and the relationship indicates that expanding cities in a sustainable manner is an important factor for global sustainability. How to redesign the existing systems, how to design new products for consumption systems and how to design new scenarios for quality of life are now major questions for planners and researchers (Vezzoli and Manzini, 2008; Awosusi, 2012).

3. Research Site, Materials and Methods

3.1. Research Site

Ado-Ekiti is the capital of Ekiti State, located within the North-western part of Benin-Owena River Basin Development Area. The city, since inception as the state capital on October 1st 1996 has assumed a new status as one of the most rapidly urbanizing cities in Nigeria. With her population put at 313,690 by the 2006 census on a density of 410 persons per square kilometer; 51.8% of the populations within the urban areas were male while 48.2% were female (NPC, 2006). Six slum communities were selected for this study which includes Oke-Ila, Odo-Ado, Ile-Ibiye, Atikankan, Irona and Isato as illustrated in figure 3. These areas are inhabited mostly by indigenous people of Ado-Ekiti. They are usually inaccessible to transportation because of bad roads; therefore waste carts/vehicles find it difficult to collect their wastes. Their housing structures are poor in nature; they are the low income earners. The area can generally be described as slum communities whose characteristics are similar to the definition and description of slum earlier made

3.2. Materials and Methods of Data Collection

This study focuses on integrated approach to municipal solid waste in Ado-Ekiti with a view to suggest possible ways for sustainable management via small-scale business initiatives. Data used for this study were obtained from both primary and secondary sources with the aid of questionnaire administration, direct observation, interviews, photo-snaps and housing demographic survey. The study examined the perception of slum residents on waste management vis-à-vis business development. It also investigates the effectiveness of waste management service providers as well as types and volume of waste generated in the area. The study focused on six slum communities with a total number of 7862 housing units, out of which a sample size of 3.5% was taken for the purpose of data collection, totaling 275 houses. Using systematic random sampling, the respondents were selected at every 28th houses on street arrangement basis

4. Research Findings and Discussion

4.1. Types and Volume of Municipal Solid Waste Generated Within the Neighbourhoods

Wastes are generated from different sources in the

neighbourhoods. Types of solid wastes generated are shown in Figure 4, ranging from household waste (57.8%) to paper (20.7%), plastic (11.3%) and metals (10.2%). Just few (1.0%) of sampled respondents sort their waste before disposal while 99.0% do not border to separate theirs before they are disposed. This explains why waste management business is not embraced on a larger scale in the city, except for a very few that are involved in scavenging and those who work directly with the company in charge of street sweeping.

4.2. Methods of Waste Disposal

Table 1 revealed the some methods of waste disposal in the study area. As shown in the table, 32.0% of the respondents dispose their waste through the agency of waste management authority, 36.7% through wagon pushers, incinerating (3.6%), and dumping on vacant plots (27.7%). It can be deduced here that there is need to fortify strategy of waste disposal through public-private partnership so as to augment the effort of Waste Management Board in order to avoid indiscriminate waste disposal methods within the neighbourhoods. Plates 1 and 2 reveal typical examples of these unhygienic methods that are found rampant in the area.

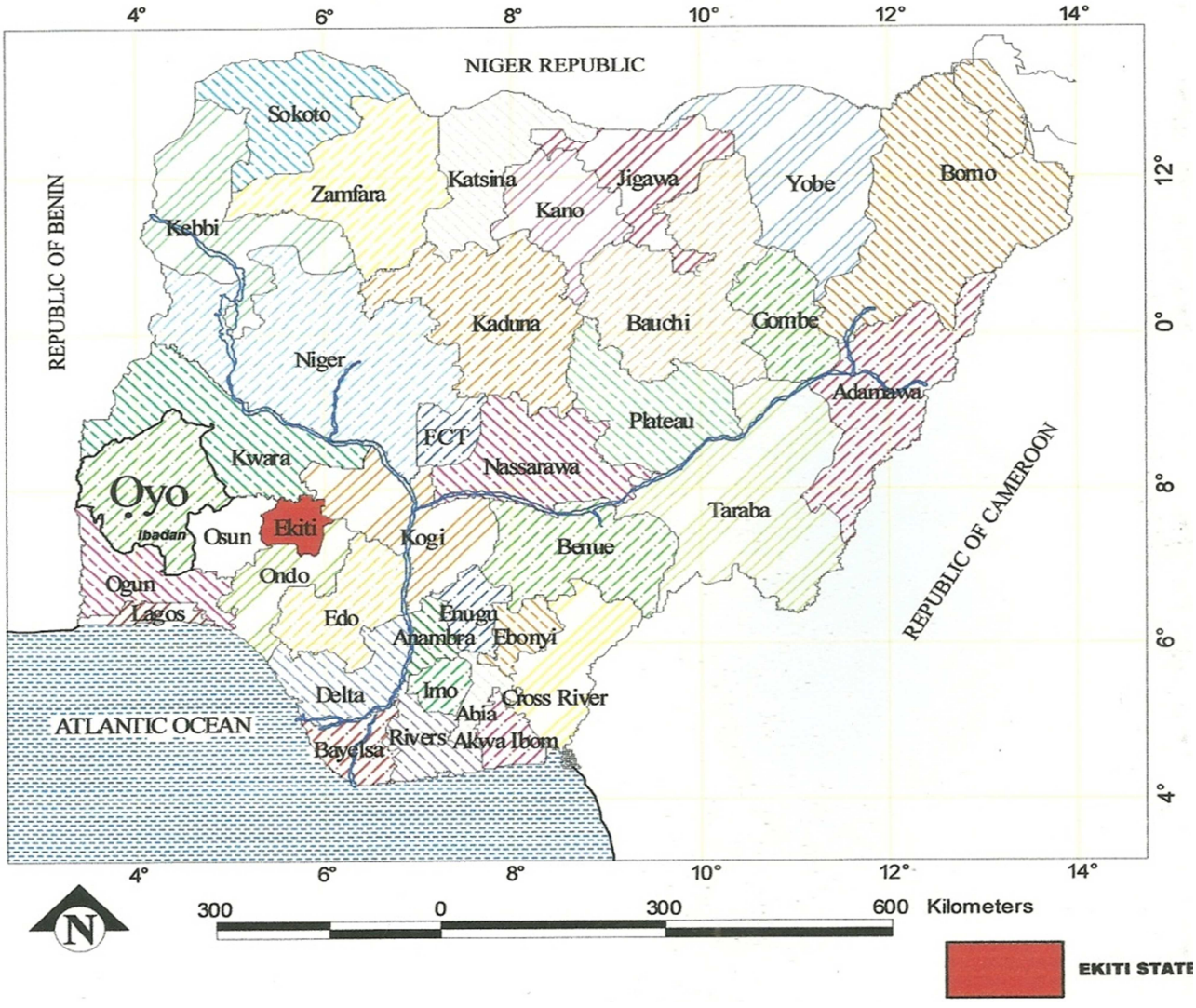

Figure 1. EKITI State in the National Setting.

Source: Ekiti State Ministry of Physical Planning, Ado-Ekiti (2014)

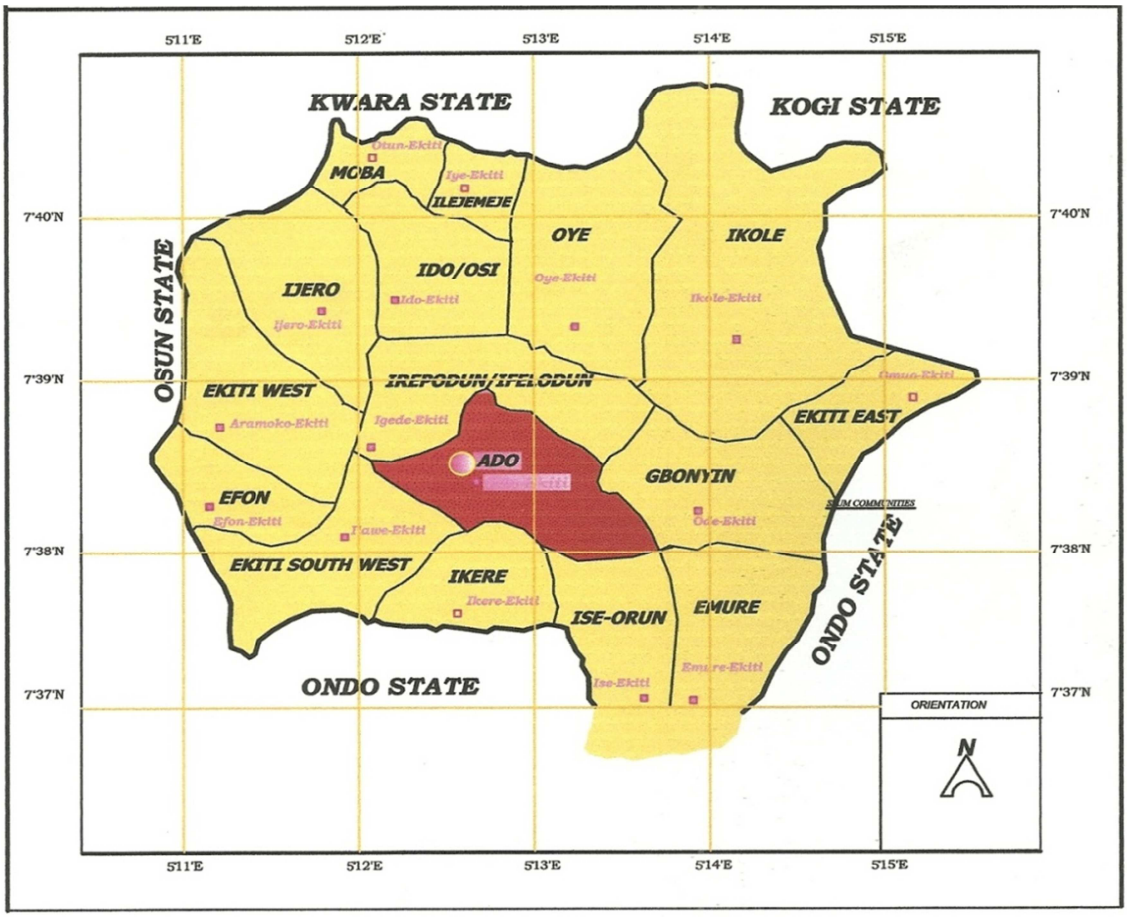

Figure 2. EKITI State showing Ado Local Govt. Area.

Source: Ekiti State Ministry of Physical Planning, Ado-Ekiti (2014)

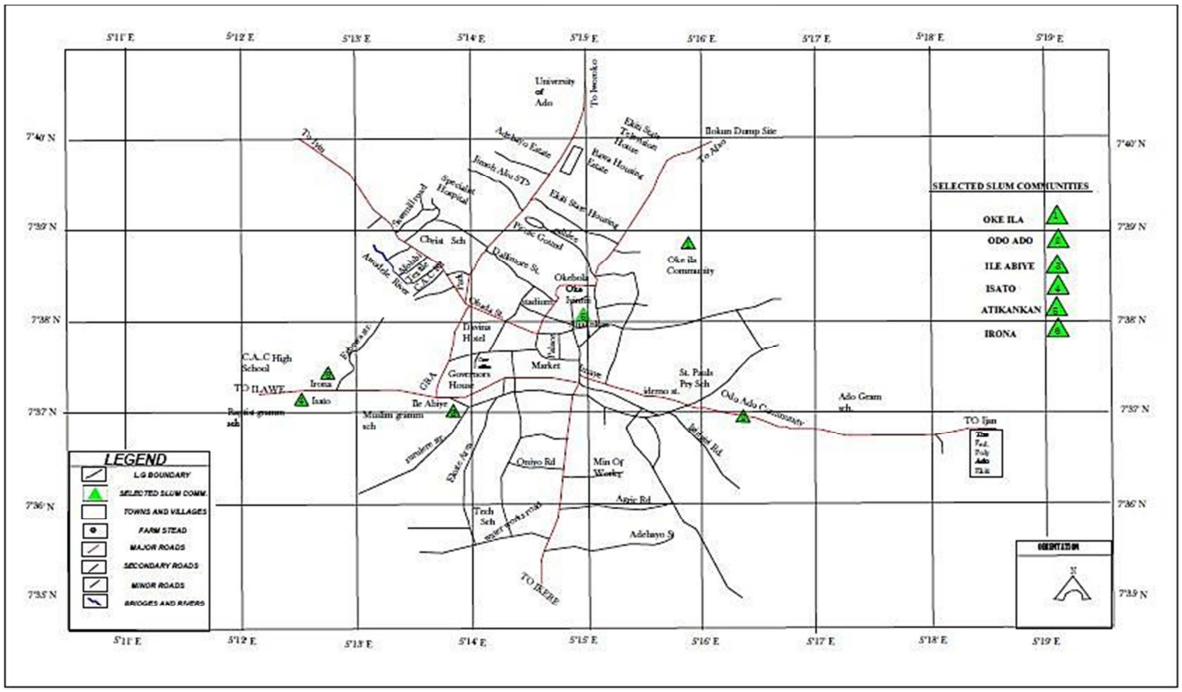

Figure 3. The Location of the Six Slum Communities selected for this Study.

Source: Ekiti State Ministry of Physical Planning, Ado-Ekiti (Reproduced by Authors in Auto-CAD version, 2014)

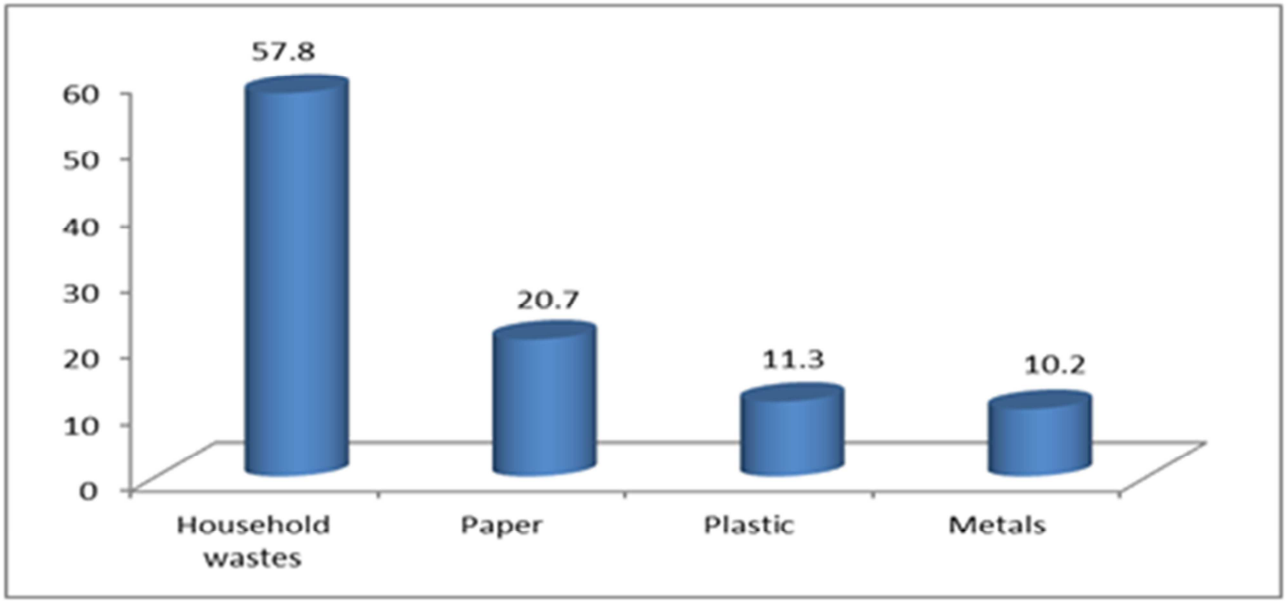

Figure 4. Types and Volume of Waste Generated in the Neighbourhoods.

Source: Field Survey (2014)

Table 1. Methods of Waste Disposal.

Methods of Waste Disposal	Frequency	Percentage
Waste Management Authority	88	32.0
Wagon Pushers	101	36.7
Incinerating	10	3.6
Deposit on Vacant plots	76	27.7
Total	275	100.0

Source: Field Survey (2014)

Plate 1a. Wastes Deposit at backyard of residential building.

Plate 1b. Wastes Deposit in Drainages in the Neighbourhoods.

Source: Field Survey (2014)

Plate 2a. Wastes dumped on Water Channel.

Plate 2b. Wastes dumped & burnt on vacant plot.

Source: Field Survey (2014)

4.3. Business Initiatives Via Municipal Solid Waste Scheme (MSWS)

Over the years, crude methods of waste disposal are warmly embraced in urban neighbourhoods as illustrated in literatures, which are noted not giving desirable result to environmental sustainability. As observed in this study, opportunities abound for business ventures in sustainable waste management initiatives. These opportunities are bound to serve dual purposes; it will enhance the aesthetic value of the environment and bring about economic sustainability.

Some viable ventures identified in the study area as shown in Table 2 include scavenging (21.5%), buying of sacks and bottles (20.6%), fertilizer making (9.1%) and conversion of sachet water to other useful products (21.5%). Other business identified is street sweeping which accounted for 16.4%. This was contracted out to a company by the state government. With this development, many still employ unacceptable methods for their refuse disposal. The resultant effect of these is emergence of dirty and unhygienic environment which could make the area prone to outbreak of diseases. Only about 12.7% of the respondents are not reached by the services of Waste Management Board thereby suggesting the need to coopt private firms to augment the responsibility under the supervision of State Waste Management Board. About 71.6% of the respondents believe collection of refuse would be effective and efficient if private firms are involved and they are willingness to patronize them.

Table 2. Business Initiatives in Solid Waste Management Scheme.

Business Initiatives	Frequency	Percentage
Scavenging	59	21.5
Buying and Selling of bottles and plastics	57	20.6
Fertilizer Making	25	9.1
Conversion of sachet water to resourceful products	59	21.5
Street Sweeping	45	16.4
No Idea/Not interested	35	12.7
Total	275	100.0

Source: Field Survey (2014)

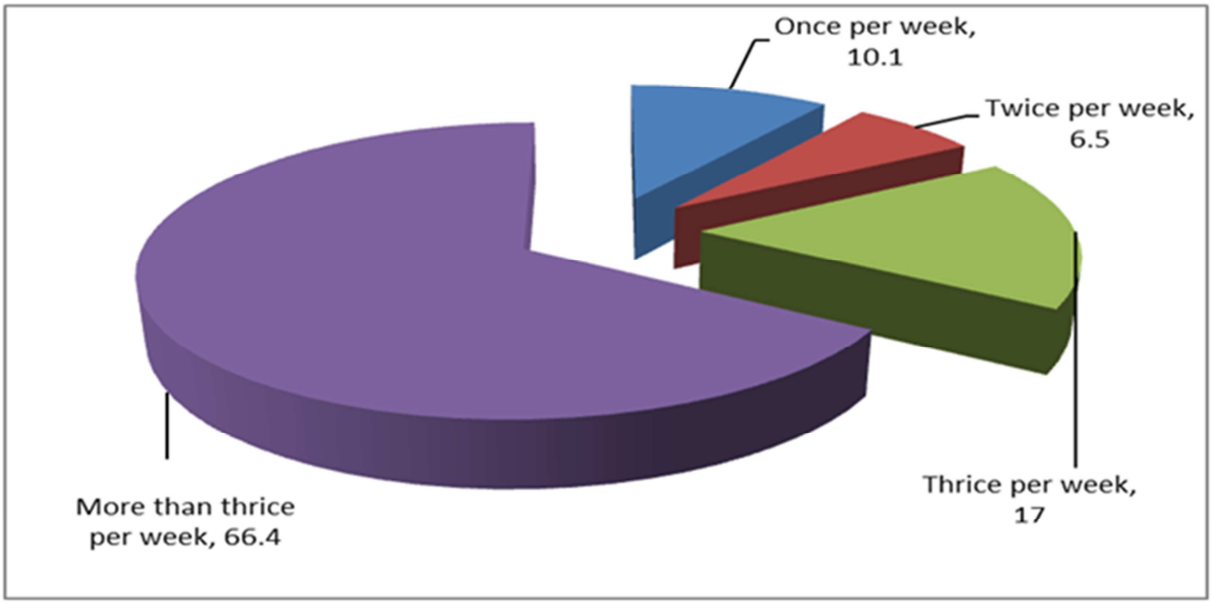

Figure 5. Frequency of Waste Collection.

Source: Field Survey (2014)

4.4. Frequency of Waste Collection

Figure 5 shows the frequency of waste collection by waste management agencies. About 10.1% of the respondents confirmed once in a week, 6.5% said theirs are collected twice a week, 17% said thrice while 66.4% confirm that theirs are collected more than three times a week. The variation might be due to difference in volume of waste generation at different parts of the city. Areas where collection of wastes are longer than necessary is prone to health challenge as those wastes are bounds to generate obnoxious odors that will attract flies and other health infested animals which may be dangerous to human lives. Based on this fact, there is need for the State Waste Management Board to put in place effective waste management strategy to ensure frequent waste collection in the study area and proper disposal in safer place.

4.5. Various Waste Management Initiatives Engaged by People in the Study Area

The study made further enquiries to know various waste business ventures people engaged in the study area. About 34.0% engaged in scavenging and cart pushing, 29.4% engaged in metals, cement sacks and bottles while 16.2% are involved in sweeping of roads. Other possible areas where

people can profitably engage include private waste collectors, recycling and compost making. However, table 3 shows the statistical data of residents' involvement in various waste management ventures in the area. Findings reveal that some of the people engage in more than one business. For instance, some of the male sweepers are sometimes engaged in transporting the waste to dump sites. Personal interactions with some of the residents show that some are not interested in waste business because of obnoxious odour it generates.

Table 3. Number of Persons Engaged in Waste Management Business in the Study Area.

Sampled Slum Communities	Various Waste Management Business Activities Involved in the Study Area						
	Scavenging	Cart Pushing	Selling of Recyclables	Waste Recycling	Making Compost	Street Sweeping	Transport to Dump Sites
Odo-Ado	2	11	8	-	-		
Oke-Ila	4	14	7	-	-		
Irona	3	13	4	-	-	Five sweepers per km	3
Isato	3	13	9	-	-		
Atikankan	4	11	6	-	-		
Ile-Abiye	2	10	7	-	-		
Total	18	72	41	-	-	700	3

Source: Adopted from Awosusi, et al (2012)

4.6. Feasible Benefits of Business Development in Waste Management

Benefits of business development in waste management as discover from the study is shown in table 4. 22.8% identified employment opportunities as a benefit, 40.6% said it is a viable source of income, while 12.2% see the benefits in terms of a cleaner and healthier environment, meanwhile, a section of the population sampled covering 11.7% identified the combination of all benefits already mentioned above.

Table 4. Benefits of Business Development in Waste Management.

The Benefits	Frequency	Percentage
Employment	63	22.9
Source of income	112	40.7
Cleaner & Healthy Environment	33	12.1
All the above	32	11.6
Do not know	35	12.7
Total	275	100.0

Source: Field Survey, 2014

5. Summary of Findings and Policy Recommendations

The study has unveiled the situation of municipal solid waste generation in Ado-Ekiti and the prospects of business initiatives as integral approach to its effective management in Ado-Ekiti. It also revealed reasons why people do not embrace business in waste management despite the possible profits that can be accrued from it, ranging from employment generation to profitable source of income, provision of low cost raw materials for housing development such as metallic solid wastes are converted to iron rods for housing construction, and aesthetic environment as it will ensure a cleaner and healthier environment. It is therefore believed that more business initiatives can be established in waste management enterprise such as recycling industries like one converting scrap metals to lanterns and wetting cans, nylons and plastics to plates and PVC.

To ensure effective waste management strategy, it has become imperative for this study to put up some recommendations for both the residents and policy makers. In the first place, government should see it as an important and worthwhile duty to embark on public enlightenment programmes in order to educate people on the values in waste separation, the viability of waste management businesses and other opportunities that can be of benefit for the people in waste management venture. Secondly, the State Waste Management Board should be an advocate for public participation by compensating individual households for separating the waste generated from their homes, thereby encouraging Zero Waste Cities which will foster a clean environment at all times. To further ensure a cleaner environment; thirdly, government should make provision for more waste bins and to be positioned nearer to residential areas for easy collection by the Waste Management Board and private companies that might be involved. More trucks should be deployed to slum communities that are farther away from the reach of metal bins distributed as against two metal bins that are presently located in each of the six communities examined. Also, adequate personnel are to be employed to ensure more hands are engaged in the collection of wastes generated in the area. This will guide against long duration of waste collection in some of the communities. Engineering landfill device of waste disposal system should be employed to discourage open dumping method that is rampant in most urban centres in Nigeria. This is much more appropriate and suitable for the prevention of contaminant runoff.

Fourthly, private firms and individuals who are interested in waste management businesses should be encouraged by the government. The encouragement could be in form of short-

term loans given out to individuals to start up enterprises in whichever aspect of waste management business anyone may desire. It could also be in the form of training the public on how to develop businesses through waste management. This will help to take care of the inadequacies of operation of the State Waste Management Board in the city since more hands would be involved in managing wastes generated in various parts of the town. Lastly, environmental law and edits should be promulgated to avoid indiscriminate dumping of refuse. This should be sustained by the establishment of monitoring group to punish defaulters. Although effective and enforceable environmental policies are difficult to develop and implement in many sub-Saharan countries including Nigeria, but this appear to be a viable solution if a country must be environmentally secured. For this to be effective, old sanitary inspectors should be re-introduced as a sustainable strategy for any environmental law that would be introduced to be efficiently implemented in the area.

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