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# Constituents of Municipal Solid Waste Generated in Ado-Ekiti, Nigeria

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# Abstract

Continuously increasing quality of life and high rates of resource consumption have had an unintended and negative impact on the urban environment-by way of the generation of wastes far beyond the handling and treatment capacities of urban governments and agencies. Cities are now facing serious problems of high volumes of waste, characterized by inadequate disposal technologies/methodologies, rising costs of management, and the adverse impact of wastes on the environment. The generation of wastes and their management have attracted significant attention by local, national, sub-regional, regional, and international communities. This study attempts to examine the constituents of municipal solid waste generated in Ado-Ekiti, Nigeria. The study zone the major key area of the city into four zones and in each zone 75 questionnaire was randomly administered total 300 questionnaires administered to individual property Owners oroccupiersin the selected area, while 277 (92.3%) were retrieved and analysed. Findings shows that 100% of the respondents generatefood waste which is bio-degradable and at the same timegeneratenylon waste which is not bio-degradable but could be recycled, also the respondent deposited their refuse at road verge waiting for government refuse trucks to come and pick them while somerespondents disposed their refuse in nearby refuse dump sites. About 11.19% of the respondents adopted burning as a means of disposing refuse. The paper recommends enlightenment campaign, maintenance of waste dumpsite, re-introduction of Sanitary Inspectors (WoleWole), Recycling amongst others.

# **1. Introduction**

Solid wastes generated in Urban areas are classified into many ways according to sources which include domestic/household, municipal, commerce, agriculture and industry. As the cities grow the nature and volume of waste will be diverse and on the increase due to an accelerated industrialization, population growth and urbanization [1]. Solid wastes depending on the type could be garbage, rubbish, ashes bulky waste, street refuse, trash, dead animals, etc. Further worsened our environment [2], maintained that unmanaged solid waste is fast becoming a major pollutant in the environment because of the problem associated with the traditional methods of disposal. The current system of mere waste collection, transportation and dumping at a particular location has had such a great effect on the total environment such as, aesthetic problem, foul odour, contamination of underground water through leaching, contamination of surface-water

through run-off, accumulation of heavy metals in some fauna and flora species, human health and property values. Wastes are rubbish or materials that are not needed and are economically unusable without further processing [3]. They are also called refuse. Wastes as useless and discarded materials [4]. Solid wastes are unwanted, discarded, nonliquid materials emanating from various activities of man at home, markets, schools and workplace, which may be combustible [4]. Hazardous waste refers to any materials that may pose an unreasonable risk to health, safety, or property, especially those materials that are toxic, corrosive, reactive or ignitable [5]. Typology characteristics and future trends of solid waste was examined [6]. The major components of waste are degradable materials (food remnants, paper and rags) and non-biodegradable are plastics tins, metals, bottles, glass and bones. Food remnants 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. [7] maintained that improper disposal of solid waste poses serious danger to the handlers and the people living around the wastes as disposal sites carry along rodents, insects and other vermin, which could transmit diseases such as typhoid fever, dysentery, diarrhea, cholera, yaws, and other diseases.

As reported by [8] shows that the rate of change in domestic waste quantities and composition in developing and developed countries is unprecedented. It also made it known that generally, the greater the economic prosperity and the higher percentage of urban population, the greater the amount of solid waste generated. Waste disposal is one of the important aspects of urban management crises in Nigeria [9]. The study explain that management of solid waste generated within the urban centers has become one of the most intractable problems of development due to a phenomenal increase in the volume and range of waste generated in many developing countries of the world, Nigeria inclusive. This is a direct consequence of urbanization.

In most urban centers in Nigeria, wastes are disposed of by dumping in open areas, which produce health and pollution problems by encouraging the growth of organisms that can transmit diseases to people living around that vicinity. In order to reduce the volume of waste and conserve space, these wastes or refuse in open dumps are burnt with and in turn produce a form of air pollution. As countries become richer and more urbanized their waste composition changes. The substantial increase in the use of paper and paper packages is probably the most obvious change [10]. The effect of indiscriminate waste disposal on residential properties is plagued with numerous human activities in the society, and it's common in developing countries most especially the urban areas or environments. Many people have sought to attribute the provoking nature of waste disposal problem in the urban society to the ineffectiveness and inadequacy of environmental preservation and assessment order and policies, while others tend to wonder why the advancement in technology itself has not progressed to the extent of curbing this problem of waste disposal. The degree of environmental deterioration has grown to the extent of attracting a connection effort and determination of Government agencies and voluntary organizations in order to restoring the environmental order and sanity [11]. Against this background, it is therefore expedient to investigate into the constituents of municipal solid waste generated in Ado-Ekiti, Nigerian.

## 2. Methodology

A reconnaissance survey was initially conducted in the city of Ado-Ekiti to know how to zone the major key area of the city; such areas include Ajilosun, Bashiri, Mathew, Ijigbo, Igbagba, IlaweRoad, Bank Road, Dalimor, State Hospital Road. The axis were zone into four and in each zone 75 questionnaire was randomly administered total 300 questionnaires administered to individual property owners or occupiers in the study area, while 277 (92.3%) were retrieved and analysed.

It is considered that, the population of study area is enormous to cover, then a good quality and adequate subset of the sample frame were served in doing this, a simple random sampling technique was adopted where the respondent are picked randomly, giving everybody within the study area an opportunity to be chosen in other to carefully select the sampling size whose opinion counts as regards the subject matter. An oral interview was also carried out randomly among some owners of some properties in the study area. The study area was categorized into four Axis, as follows: A = Ijigbo, Mugbagba, New Garage, Orereowu, Ajilosun, Ojumose; B = Atikankan, Irona, Ilawe Road, Irewolede: C = Adebayo, State Hospital, Housing, Oke-Ila, Afao Road: D = Secretariat/Bank Road, Iyin Road, Basiri.

#### 3. Study Area

#### 3.1. Historical Background of Ado-Ekiti

Ekiti State is one of the last six states created on 1<sup>st</sup> October 1996 by the then provisional ruling council and announced by the Head of State, late General SaniAbacha in a national broadcast to mark Nigeria's 36th independence anniversary. This makes Ekiti State one of the thirty-six states of the Federal Republic of Nigeria today. It was carved out of the former Ondo state, which itself came out of the old western state created in 1967. It is now made up of Ekiti Central, Ekiti north, Ekiti South and Ekiti West divisions. Before its creation, what is now Ekiti State comprised twelve Local Government areas but, at its creation, four more local government areas were created, bringing the number to sixteen with Ado-Ekiti as the capital? The population figure of the local government as revealed by the final result of 2006 census compiled by National Population is Three hundred and eight thousand three hundred and twenty one

(308, 321). Ado-Ekiti is predominantly on homogeneous society comprises mainly the Yoruba's. However, the cosmopolitan nature of the city allows for the convergence of people of divergence origin and culture. The dominant religions are Christianity, Islam while few percentages of the population are traditional religion worshipers.

Ado is the capital of Ekiti State of Nigeria and the seat of the state government. It lies between latitudes 7" and 80"5'N and between the longitudes 4"45' and 5"46'east. The state is found to the south of Kwara and Kogi states while it is bound by Osun state to the west. To the east of Ekiti state is found Edo state, while it is bounded in the south by Ondo state. Ekiti is a landlocked state, having no coastal boundary.

#### **3.2. Literature Review**

The purpose of this literature review is to evaluate the knowledge and links between open dumpsites, property value and its resultant adverse outcomes. The scope of this review is rapidly developing setting in urban areas, as a representation of the area of study.

Generally, various legislations in several jurisdictions: have attempted to describe, define and delimit what waste is. Waste is materials that have no economic value of use, concentration of which would be economically undesirable [12]. Waste has been defined - as something that is not or no longer useful and is to be thrown away or disposed of. (Oxford Advanced Learner's Dictionary, 4th Ed.), also defined waste as any material lacking direct value to the producer and so must be disposed. Municipal or urban solid waste is a refuse that includes predominantly household wastes with sometimes the addition of commercial waste collected by a municipality within a given area [13]. They are in solid or semisolid form and generally exclude industrial hazardous wastes. Municipal SolidWaste is useless or unwanted material discharged as a result of human or animal activities. It comprises of garbage or food wastes: rubbish, including glass, tin cans, and paper, and fresh / garden wastes- which include larger items like tree limbs, old appliances etc. Most commonly, it is solids, semi solids or liquids in containers thrown out of houses, commercial or industrial premises [14]. In the European Community, Waste Management Licensing Regulations 1999 came into force to implement the Framework Directive on Waste. The Regulations also implement all of the remaining section of part II of the UK Environmental Protection Act (EPA) 1990, which defined waste as (a) any substance which constitutes a scrap material or an effluent or other unwanted surplus substance from the application of any process, (b) any substance or article which requires to be disposed of as being broken, worn-out, contaminated or otherwise spoiled [5]. Waste is considered to be something which poses a significantly different threat to human health or environment, partly because of the manner in which it may be disposed of and partly because the holder no longer has the same sense of obligation in relation to it [15].

Pollution is the release of waste substances or energy into the environment through human activities in amount which are harmful to man and properties [16]. Waste materials which are often thrown into the environment such as sewage refuse and industrial waste may cause harm and reduce the quality of the environment. He latter classified it into various type of pollutionnamed according to the part of the environment polluted and type of sustainers be named according to the polluting agent such as noise, radioactivity or heat, so he classified pollution into land pollution, which is below; Waste therefore, is something which falls out of the normal commercial circle or utility. The Circular suggests four broad categories which may be considered - deciding the question whether an object is a waste:

(a) Worn but functioning substances or objects which are still usable (albeit, after repair) for the purpose for which they were made are not to be considered waste,

(b) Substances or objects which can be put to immediate use otherwise than by a specialized waste recovery operation or undertaking are likewise not to be considered waste,

(c) Degenerated substances or objects which can be put to use only by establishments or undertaking specializing. Substances which the holder does not want and which he has to pay to be taken away are waste, where the holder intends that the objects are to be discarded.

Waste is usually classified according to (a) its source (b) its harmful effect on humans and the environment, (c) the ontrol which are appropriate to deal with it [17]. With regards to the source classification, it either comes out of the shop (market) or office -commercial waste or, out of the factory- industrial waste, or out of the home -household or domestic waste. Domestic waste includes that from domestic premises, caravan sites residential homes, educational establishments (schools) and nursing homes (and probably hospitals) [18]. It can be organic or non-organic. Organic waste can decay. Waste food from the household can be composted and returned to the soil. Domestic waste such as tin cans and plastic and bottles is inorganic and cannot be treated in the same way.

Domestic waste can pollute the environment and be indirectly dangerous to humans. It can enter the atmosphere or water supplies causing damage to plants and animals. Some items of domestic waste may in themselves be harmless; e.g. packaging waste is not poisonous if touched ' and does not enter the atmosphere or water supply. Yet the sight is unattractive and may in time produce nauseating and rancid odour and may attract rats if it contains food waste thus constituting a hazard to human health. Some may acquire dangerous properties; such items may react with other substances, thus becoming dangerous. Domestic waste may be corrosive, that is, it may eat away and destroy solid materials. These distinctions are important in determining the management strategies which are appropriate to deal with it.

In a larger view, waste can be described as anything by which the owner cannot find any particular use in it. Wastes as materials that have no economic value of use, concentration of which would be economically undesirable [19]. Waste as useless, unused unwanted or discarded materials. It can be seen that waste are materials of value, which result from man's daily activities, and if not properly taken care of, it can result to environmental health problem [20]. The waste could be in three forms which are: Liquid, solid and gaseous. The discussion shall be based on solid.

In Nigeria, the urban environment is characterized by a proliferation of squatter settlements, a breakdown of waste disposal, air pollution, water pollution, inadequate water and power supply and squalid condition of environmental sanitation.

Waste disposal is one of the important aspects of urban management crises in Nigeria. It has been noticed that management of solid waste generated within the urban centers has become one of the most intractable problems of development. In the last two decades, there has been a phenomenal increase in the volume and range of waste generation in many developing countries of the world, Nigeria inclusive. The rapidly growing metropolis in developing countries has been identified as one of the major factor responsible for waste problems [21]. Poverty is the main cause of waste [22]. They focused on the investigation of the effect of poverty as an urban problem on solid waste in terms of volume and composition of solid waste generation, storage and disposal strategies. There exist urban resident with diverse, social, economic and cultural attribute and they occupy different residential social economic attributes of residents in the area of socio-economic attributes of residents in the area of study revealed that more of the wardslocated in the core show a higher level of poverty than areas that are located at the outskirt. The volume and composition of solid waste generation in areas studies show that areas that exhibit higher poverty level potentials are known to generate higher volume of waste than those where poverty levels indicators are low.

## 4. Data Presentation and Analysis

This aspect focuses on data presentation, the data collected were analyzed using percentile, SPSS, and regression analysis thereafter the results were discussed for better understanding.

#### 4.1. Response Rate of Respondence

This section gives the breakdown of the distribution of questionnaire and the general background information about (Tenants and Landlords) respondents. This is important to show how the data for the study were gathered and the reliability of information provided by the respondents.

Table 1. Distributed Questionnaire and the Number Retrieved.

No of QuestionnaireAdministered	No of QuestionnaireRetrieved	Percentage (%) rate of Respondence
382	277	72.51

Source: Field Survey, 2017

Table 2. Preliminary	Survey	detail of	distribution	of R	lespondents
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SEX	Frequency	Percentage (%)
Male	127	45.85
Female	150	54.15
Total	277	100
AGE (years)		
Below 20	36	12.99
20-29	50	18.06
30.39	63	22.74
40-49	86	31.05
50 and above	42	15.16
Total	277	100
QUALIFICATION		
Primary	28	10.11
SSCE	61	22.02
ND/NCE	72	25.99
BSc/HND	77	27.80
MSC above	39	14.08
Total	277	100
MARITALSTATUS		
Single	77	27.80
Married	157	56.68
Divorced	25	9.03
Widow	10	3.61
Widower	8	2.88
Total	277	100

Source: Field Survey 2017

Table 2 shows the sex distribution of the respondents. There were 45.85% male and 54.15% female that responded. This indicates that, there are more female in the study area as at the time of administering questionnaire which indicates that men goes out in search of their family needs. the table also shows the age of the respondents who are residents of the sampled area. 53.79% of the residents are between the ages of 30 and 49 years while 31.05% of the residents are less than 30 years of age. 15.16% of the residents are above 50 years. Educational qualification of the respondents show that 53.79% of the respondents are holders of ND, NCE, BSc/HND certificates while 32.13% of the residents are either Primary School Certificates or Senior Secondary School Certificates holders. 14.08% of the residents are post graduate degrees holders. In Table 2, it is evident that the respondents are knowledgeable enough to provide information on the subject matter. Thus one can rely on the information provided. Table finally shows the marital status of the respondents where there is 27.80% single, 56.68 married, 3.61% widow, 2.88% widower. This reveals that there are more married people in the sampled study. Thus information provided comes from mature people which are more reliable.

#### 4.2. Types of Accommodation Occupied by Respondents

Туре	Frequency	Percentage
Tenement	101	36.46
Blocks of flats (3 bedrooms)	81	29.24
Bungalows	54	19.49
Detach House	25	9.03
Self-Contain	16	5.78
Total	277	100

Table 3. Types of Residential Accommodation occupied by the Respondents.

Source: Field Survey, 2017

Table 3 shows the type of residential accommodation occupied by respondents. 36.46% of the respondents occupied tenement buildings, 29.24% of the respondents occupied blocks of flats, 19.49% of the respondent occupied bungalows, 9.03% of the respondents occupied Detach house while 5.78 of the respondents occupied self-Contain. The table above revealed that the summation of respondents occupying block of flats (3 bedrooms) and Bungalow houses are higher than those occupying tenement houses.

Table 4. Year of respondents living in the area.

Year	No of Respondents	Percentage%	
0-3	20	7.22	
3 -6	80	28.88	
6-9	77	27.80	
9-12	40	14.44	
12-15	32	11.55	
15 above	28	10.11	
Total	277	100	

Source: Field Survey 2017

In examining the distribution of years of the respondents living in the study area, it was revealed that 7.22% claimed that they just spent between 0-3 years while the highest respondents 80 claimed that they just spent between 3-6 years representing 28.88%

# 4.3. Characteristics of Waste Generated in the Study Area

The following discussions show the characteristics of the various types of wastes generated and dumped by the respondents.

Table 5. Types of Solid Waste Generated.

Types of waste	Frequency	Percentage	
Food waste	277	100	
Nylon	277	100	
Tin	233	84.12	
Old appliances	185	66.78	
Carton	176	63.54	
Glass	160	57.76	
Paper	140	50.54	
Plastic	140	50.54	
Plank	102	36.82	

Source: Field Survey, 2017.

Table 5: shows the type of solid waste generated by respondents. 100% of the respondents confirmed that they generate food waste and nylon, 84.12% of the respondents generates tin as wastes, 66.78% of the respondents generates old appliances as wastes while 63.54% of the respondents generates carton as waste. 50.54% of the respondents generates paper and plastic as wastes, 36.82% of the respondents generates planks as wastes. It is clear that in Ado-Ekiti 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.

Table 6. Method of Waste Disposal.

Methods	Frequency	Percentage
Road verge	90	32.49
Nearby refuse dump site	81	29.24
Itinerant vehicle of PSP	75	27.08
Burning	31	11.19
Total	277	100.00

Source: Field Survey, 2017

Table 6 shows the various mean of waste disposal method employed by respondents. 32.49% of the respondents confirmed disposing their refuse in road verge, 29.24% of the respondents confirmed they normally dispose their refuse in any refuse dump site close to their residence, 27.08% of respondents confirmed the disposal of their refuse via Itinerant vehicle of PSP while 11.19% of the respondents confirms that they normally dispose their refuse by burning them.

#### 5. Conclusion

It has be ascertained that every household generate waste of different types on daily basis which has negative impact on residential properties and people living in the environment, it result to various health issues on the resident and pollution of the environment. However, the study revealed that 100% of the respondents generate food waste which is biodegradable and at the same time generate nylon waste which is not bio-degradable but could be recycled. It is clear that in Ado-Ekiti 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 and that is why our environment is daily filled with all this garbage disposedhaphazardly on the street and corners and around the houses. This was confirmed by this study which revealed that 32.49% of the respondents deposited their refuse at road verge waiting for government refuse trucks to come and pick them while 29.24% of the respondents disposed their refuse in nearby refuse dump sites. About 11.19% of the respondents adopted burning as a means of disposing refuse.

Therefore, Government should ensure hygienic environment is attained, the sanitary landfill should be

properly maintained and Government should also make provision for basic amenities that make life conducive for people of the State.

#### Recommendation

Based on the findings in this research work, it has become imperative to put up some recommendation that are necessary to improve the living condition of the urban residents, their environment together with their health condition.

- 1) Enlightenment Campaign: Government should embarks on continuous enlightenment on the waste management strategies and cleanliness which is next to Godliness.
- 2) Ensure Hygienic Environment: Government should ensure hygienic environment, within the cities particularly in the core area of the urban centres to avoid pollution.
- 3) Adequate Funding: More attention should be given to waste disposal management through adequate funding.
- 4) Provision of Basic Amenities: Government should take up responsibilities of making provision for basic amenities that will enable families and individuals to have access and to maintain good and healthy environment
- 5) Eradication of Pollution: Government should provide a better means discarding and perhaps the proper management of pollutants in cities which could be by providing enabling environment for Public Private Partnership (PPP) to curtail the menace.
- 6) Recycling: Government should partners with private individuals on how to recycle some of the wastes generated in our households. It is obvious that no household can do without generating waste on daily basis. This will create employment opportunities to some of our graduate who are yet to be employed hence, make our environment worth living.
- 7) Awareness and orientation: There is need for environment and public health education on the danger posed by waste dumpsite in the area. Also, hygienic studies from primary education to the tertiary level should be introduced.
- 8) Re Introduction of Sanitary Inspectors (WoleWole): There was a time government introduce sanitary inspectors to enforce cleanliness and to regulate waste disposal system, then it was a huge success. If government can re-introduced them and empower them for enforcement of high-genic environments.

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