

## Solid and Hazardous Waste Management and Environmental Sustainability in Ado-Ekiti Metropolis in Ekiti State, Nigeria

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### Abstract

*There is a need for solid and hazardous waste management in Ado-Ekiti metropolis, as a result of effects of development and urbanisation, with the consequent increase in consumption patterns of urban dwellers. In other words, the growth of the city in recent times has shown in population increase and expansion in the area covered. These expansions have not in most cases, correspondent planning strategies. Hence, there is pressure on available infrastructure and social amenities in the metropolis. This has, therefore, given rise to the challenge of ensuring sustainable environment and maintain the health of the people. This is becoming more serious from the attendant numerous problems that are affecting the agencies responsible for waste disposal within and around the metropolis. Both primary and secondary data were sought while a simple statistical method of percentage was employed and applied in the analysis. Findings reveal, that the waste management problems emerging from the metropolis originate from inadequacy of infrastructural management, inadequate funding coupled with poor planning, the non-stream line of the activities of the institutions responsible for waste disposal as well as the attitude of the urban dwellers. This paper, therefore, advocates need for the government to find out thereal costs implications of the different arms of the metropolis' waste management system, the co-ordination of activities of hygiene as well as enlightening stakeholders in the metropolis on the issues of environmental education. In addition, the following waste disposal strategies are advanced: burning of solid waste, refusing, reducing, reusing and recycling.*

**Keywords:** Solid and Hazardous Waste, Environmental Sustainability, Waste Management, Metropolis.

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### 1. Introduction

Basically, waste is no 'waste' in as much as the wastes generated from one organism can translate to nutrients for others. Thus, recycling of nutrients produce huge amounts of waste that go unused and pollute the environment. Moreover, because of the law of conservation and matter and the nature of human life's styles, some waste will always be produced [1].

Solid waste belongs to the category of wastes which is any unwanted or discarded matter generated by society, that is neither liquid nor gas in nature. It represents pollution and unnecessary waste of resources. In other words, solid and hazardous wastes contribute to environmental pollution, natural capital degradation, health problem, and premature death [2;3]. Two types of solid waste are recognised

viz: Municipal Solid Waste (MSW) and Industrial Solid Waste (ISW). The Municipal Solid Waste (MSW) often called garbage of solid wastes produced at homes and work places in any municipal area. Examples are papers, cardboards, food wastes, cans, bottles, yard wastes, furniture, plastics, metals, glass, wood, etc.

According to [4], Industrial Solid Waste (ISW) is being generated by mines, agriculture and industries that supply people with goods and services. About 98.5 percent of all solid wastes generated in advanced countries especially in the United States is Industrial waste, 76 percent from mining, agriculture 13 percent and industry 9.5 percent, while the remaining 1.5 percent is from municipal waste.

In advanced countries, most municipal solid wastes are buried in landfills or in incinerators. This is in contrast to the experience in some developing countries where much of the wastes end up in open dumps for the less privileged to eke out a living, searching for items that can be sold for reuse or recycle.

Toxic waste is another important type of waste because it poses a threat to human health and the environment through its toxicity, chemical reactivity, corrosiveness, and combustibility. Some examples include incinerator ash, dry-cell batteries (which contain mercury and cadmium), industrial solvents, hospital waste, and car batteries (which contain hazardous lead and acids). [1] classify hazardous waste into two broad categories: inorganic compounds (such as various solvents, pesticides, PCBs, and dioxins) and organic heavy metals (such as lead, mercury, chromium, and arsenic).

According to a 2007 report by the Blackstone Institute, a U.S. environmental group, over 10 million people in eight countries, including Russia (three sites), China, India, Ukraine, Peru, the Dominican Republic, and Zambia, are at risk of exposure to harmful levels of pollution. Meanwhile, there are two major issues related to the volume of our solid and hazardous wastes. To begin, using up at least three-quarters of these resources is a waste of Earth's resources. Secondly, the products we use and then discard contribute significantly to air pollution, greenhouse gas emissions, water contamination, and soil erosion.

Consequently, upon the upsurge growth in the human population in this planet, substantive amount of food, water, raw materials and energy are consumed. In the process, good amount of pollution and wastes are produced. The challenge today is how to strike a balance between the growing population, especially in urban areas and environmental sustainability with special interest in solid hazardous waste disposal.

Sustainability is the ability of the earth's various natural systems, human cultural systems and economies to survive and adapt to changing environmental conditions indefinitely. Whereas, environmental sustainability according to [5] is the meeting of the current and future basic resource needs of people in a just and equitable manner without compromising the ability of future generations to meet their basic needs.

One of the basic principles for sustainable living based on the words of [4], is to keep communities to care for their own environments such that it will ensure liveability of future generations. To conserve the earth's vitality and diversity, therefore, there is the need to prevent pollution, restore and maintain the integrity of the earth's ecosystems, conserve biological diversity and ensure that renewable resources are used to obtain sustainability [6; 7].

It is becoming increasingly clear that the ability of urban local governments in sub-Saharan Africa to collect, treat, and dispose of solid and hazardous waste in an environmentally sound manner is far outpaced by the rates at which these wastes are produced [4]. In fact, only 31% of the urban solid wastes generated in her cities each year are collected and disposed of [8]. Due to insufficient disposal of waste, littering is commonplace. Meanwhile, urban areas provide access to resources like jobs, entertainment, and healthcare at a lower cost and with greater efficiency than rural areas [9]. Our urban areas have expanded as a direct result of this. No one can say for sure how many people can live in urban areas, or how much of a toll that population density on the environment, other forms of life, and economies can take. As is the case in the world's leading democracies, we need clean, well-planned, and managed cities if we want to see steady growth. As [10] and [11] point out, most urban towns in Nigeria are outward manifestations of fifth, decay, slum, and unhygienic squatter neighborhoods that pose a health hazard and development problem.

However, argues that governments have ignored environmental problems like pollution of land, air, rivers, etc. in favor of focusing on improving citizens' quality of life [12]. In contrast, [13] argues that environmental management should have a philosophical orientation that includes the conception and planning for a liveable environment rather than simply being concerned with the control of nuisance. [14] research on waste disposal in Lagos identified two issues at the heart of the city's waste woes: poor worker morale and poor human relations. He draws the conclusion that the problem of disposing of waste in Lagos cannot be solved unless urbanization is managed. Hence, four major areas to be addressed are finance, service, maintenance and social order.

## 1.2 Statement of the Problem

The exponential growth in human population in Ado-Ekiti metropolis in the recent time has resulted into continuous exponential growth in human activities such as burning fossils, solid and hazardous waste disposal. Precisely, on the 21<sup>st</sup> and 23<sup>rd</sup> January, 2023, Ado-Ekiti environs were heavily littered, resulting from the first and second rains of the year. The rains exposed the dark side of the city waste management and sanitation practices (digging up plastics, nylons, and other waste materials inordinately dumped in open spaces and drainages). This has actually led to flooding, making the environment unhealthy, unhygienic, and very unkempt. This could facilitate proliferation of diseases such as malaria, cholera, diarrhoea and respiratory diseases affecting human life in numerous ways within and outside the metropolis. The attendant environmental, social and health issues arising from the unregulated solid and hazardous waste disposal in the city, therefore, call for concern and concerted efforts from all and sundry to address and advance mitigation measures if total elimination is not realistic and this has formed the thrust of this paper.

## 2. Methodology

In the determination of solid and hazardous waste management in environmental waste management and environmental sustainability in Ado-Ekiti metropolis, certain parameters and guidelines were followed. First, a well-designed questionnaire was utilized to solicit primary data on the types of refuse receptacle, mainly used by household(s) in the area; types of solid and hazardous waste disposal used by members of households; the composition of solid and hazardous waste in Ado-Ekiti metropolis; the collections frequency of solid and hazardous waste; and attendant problems faced with the indiscriminate solid and hazardous waste disposal in the metropolis. A simple statistical method of percentage is employed in the analysis of data collected.

## 3. Results

### 3.1 The Composition of solid and hazardous wastes of Ado-Ekiti metropolis

Composition of solid and hazardous wastes depends on the sources of the waste generation. About 70% of the solid and hazardous wastes generated in Ado-Ekiti metropolis are from households, commercial and market places, and this is a reflection that the metropolis is not an industrial city but a primary and tertiary based city. The MW can be classified under two broad categories – organic and inorganic matter. Organic matter constitutes about 70% of the metropolis solid and hazardous wastes generated within the metropolis, while the inorganic matter is just about 30%. Of organic matter, 26% is from food waste, 14% from plastics, rubber and leather, 13% from paper, 10% from textiles, 2% from garden trimming and 1% from cardboard. Also, from inorganic matter, 14% of the wastes is from dirt, ashes, bricks, etc., 6% from glass, 4% from aluminium, 3% from tin cans, and 3% from ferrous and non-ferrous metals (see Fig. 1)

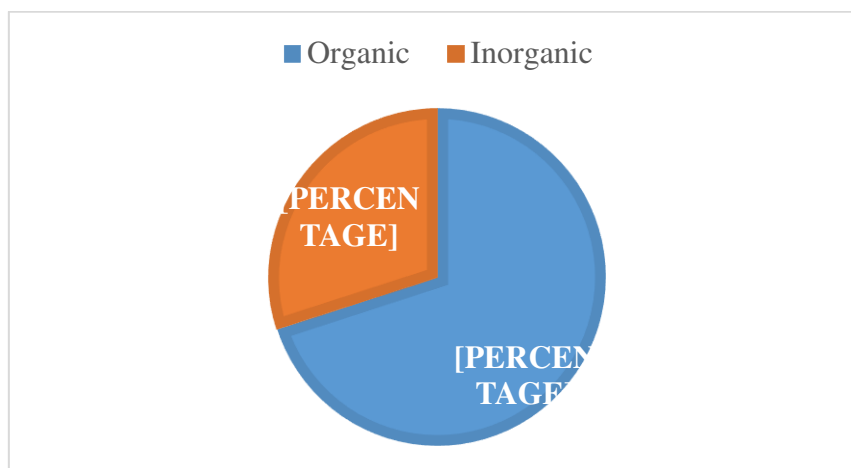


Fig. 1. Compositions of solid and hazardous wastes of Ado-Ekiti metropolis

Table 1. Types of refuse receptacle mainly used by households in the metropolis

S/n	Type	Frequency	Percentage
1	Covered standard waste bin	08	4%
2	Uncovered standard waste bin	14	7%
3	Covered container	15	7.5%
4	Covered/Uncovered baskets	25	12.5%
5	Uncovered container	30	15%
6	Sacks	45	22.5%
7	Polythene bag, etc.	63	31.5%
	Total	200	100%

Source: Field work 2023

Table 1 reveals, that refuse receptacle mostly employed by households, individuals and corporate bodies in the metropolis are Polythene bags with about 31.5%, followed by Sacks which made up to 22.5%. 15% from Uncovered Containers, 12.5% from Covered and Uncovered Baskets, 7.5% from Covered Containers, 7% and 4% from Uncovered Covered Standard Containers respectively. This is an indication that most disposals are done without using standard bin across the metropolis. No wonder, spillages of wastes are rampant at the collection sites. To worse it off, there is no specific area for the collection of the wastes in some parts of the city. In most cases, the barricade between dual-carriages along major roads are found littered with refuse receptacles, especially when there is delay in the final collection. Usually, much of the wastes are found scattered and littered on the roads by winds, whenever there is rain. This is very uncivilised and does not dignify a capital city of its kind.

Table 2. The collections frequency of solid and hazardous wastes in Ado-Ekiti metropolis

S/n	Types of Locality	No of frequency
1	High populated areas (residential)	Twice daily
2	Moderate populated areas (residential)	Once daily
3	Low populated areas (residential)	Once in two days
4	High income areas (GRA & Estates)	Once daily
5	Market areas	Twice daily
6	Commercial areas (Banks, Hotels, etc.)	Twice daily
7	School environment	Once daily

Source: Field work 2023

Table 2 shows that the collected wastes in the metropolis is mostly carried out from each locality based on the volume of the wastes generated. Usually, as it applies to the metropolis, areas of high population density, market areas, and commercial areas, the collection of wastes is carried out twice in a day; high income areas such as Government Residential Areas (GRAs) and both public and private Estates as well as Moderate populated areas are visited once daily for wastes collection; while areas of low population density and schools' environment (public and private) are attended to once in two days. This is based on the context of the population and volume of waste generated in each of the localities.

### **3.2 People's response to solid and hazardous waste management of Ado-Ekiti metropolis**

For collection and disposal of wastes to be thorough, the whole metropolis is divided into four distinct areas namely Area One, Area Two, Area Three, and Area Four. Area one falls within Water-works, Ekute, and Ilawe road axis (all areas along the left side of the road while facing Ilawe-ekiti); Area Two covers all households around Noval, Basiri, Olorunda etc. axis; Area Three covers all households, schools, event centers, etc. around Okeila, Housing Estates, Tinuola and Adebayo axis; and Area Four is made up of Odo-Ado, Agric. Olope, Mofere, The Federal Polytechnic road and Ureje. Areas one, two and four are detailed to Government functionary (Ekiti State Waste Management Board) to take charge of the collection and disposal, while Area three is contracted out to private agencies in partnership with the state government. The private agents involved are Waste Master, William Neat and Mr. Passer. The first two agents are currently active while the third is inactive due to low response from people to waste disposal bills in the area allotted to her. The experience here confirms the claim of [15] as he ascertains that privatisation of waste disposal does not usually work well: in small or sparsely populated areas, since there is usually insufficient earning potential due to low waste volumes; when the government entity with justification is too small or too politically weak to be able to manage the contrasting processes effectively; and when poorly designed. For instance, when there is little or no follow-up and adherence to contract's agreements.

### **3.3 Segregation of wastes**

Segregation is the act of separating the waste based on the types – organic and inorganic. The organic matter can further be separated into food waste, plastic, rubber, woods, garden trimming, textiles, etc.; while the inorganic matter is glass, aluminium, tin, can, ferrous and non-ferrous metals, etc. Pathogenic waste generated by hospitals and clinics can be regarded as important wastes to be collected in different categories according to the manner they are to be processed at later stages. Based on the assertion of [16], about 85% of all the wastes generated in hospitals and clinics can be grouped as regular domestic wastes, whereas 10% is regarded as being infectious (needle, scalpels, etc.), while only 5% is considered being non-infectious but hazardous wastes. Hence, the call for the separation of the generated waste from such places where they are generated, in as much as both non-infectious and non-hazardous wastes could be treated and handled like mere household wastes.

In contrast to the above, no segregation of solid and hazardous waste is carried out at the sources of generation within the metropolis. The only place where separation of waste is done is at Ilokun dump site where an integrated (recycling) plant is situated by the state government. Operation here is only limited to crushing and this involves sorting out plastics and rubbers for recycling. The absence of separation of the wastes from source has actually complicated the effective collection, storage, and disposal of waste in the metropolis.

### **3.4 Collection type (vehicle involved)**

Collection of wastes is usually classified based on the style of operation, the equipment employed, and types of waste collected. Classification based on the mode of operation system and vehicle used are hauled container system and stationary container system. The hauled Container System (HCS) involves movement of the container to the dump site. There are two types, namely - conventional mode and exchange container mode. Haul Container System (HCS) is useful when the rate of waste generation is high and the container is large. It also helps in eliminating spillage associated with multiple smaller

containers. However, should a low generation of waste be recorded in an area, such that the container is not filled up in time, this could lead to low utilisation rate.

The Stationary Container System (SCS) exists where a container remains at the site (resident, industrial, commercial, etc.). It may either be manually or mechanically loaded. Its major advantage is that vehicles do not travel to dump site until it is filled up. This enhances higher rates of utilization. However, there is flexibility enough in the system such that bulky goods are easily picked up.

Disappointedly, with the exception of the haul container system which is partially used for the collection of wastes in the metropolis, none of the two standard systems described above could have been in optimal use. Finding reveals that solid and hazardous waste collection are carried out with the aids of three vehicles namely Compactor, Dino truck and Mitsubishi canter. For the whole metropolis which extends more than 293km<sup>2</sup> and with an estimated population of 241,200, the waste generation of 0.71kg/per/day as well as waste generation of 9.518ton per months [17; 19], only three Compactors, one Dino truck, and one Mitsubishi canter are available for the exercise. This is grossly inadequate, considering the teeming population cum volume of solid and hazardous waste generated within the metropolis. No wonder, therefore, that some minor and major streets are usually littered with wastes as well as the emergence of many unapproved dump sites within the metropolis.

### 3.5 Dump Sites

Basically, there are three approved dump sites identified around the metropolis. These are Ilokun dump site, located off Ado – Iworoko road; Emirin dump site, located off Ado –Federal Polytechnic road; and Shashadump site behind Shasha in Ikere-Ekiti. The first two dump sites (Ilokun and Emirin) are currently very active, while the dump site behind Shasha in Ikere-Ekiti is inactive due to pressures from Ikere-Ekiti indigenes on land ownership. This results from government taking over such land without payment of adequate compensations to the acclaimed land owners.

However, it is highly disgusting, seeing fleets of unapproved dump hills within and around the metropolis. Streams, drainages, bushes and many parts of the streets have now been turned to dump sites. This is very uncivilised and highly inimical to the health of the inhabitants. In other words, contamination of water resources and air pollution emanating from the uncontrolled dumps without proper management of refuse (solid and hazardous waste) are great risks to the health of the people living nearby.

### 4. Conclusion

The need to investigate the activities of solid and hazardous waste management in Ado-Ekiti metropolis arose resulting from the effects of development and urbanisation which has eventually led to increase in consumption patterns of the inhabitants. Ado-Ekiti the state capital of Ekiti State, has witnessed growth and development in both her population and spatial size without corresponding provision of infrastructure and social amenities. This has attracted noticeable pressures on the available amenities. This in turn has, therefore, given rise to the challenge of how to maintain a justifiable environmental sustainability and equilibrium development for both the present and generations to come. It is highly despairing to observe that the efforts of the state government by the establishment of Ekiti State Waste Management Board (EKSWMB) to guarantee a clean and sustainable environment in the metropolis is seriously threatened as the exact number of people the urban area can support and the actual amount of wastes that are generated within the metropolis are not known. Hence, the challenge of determining the actual cost of solid and hazardous waste management (waste collection and disposal). This actually confirms the claim of [11], that many cities do not know the actual costs of their solid wastes management services. Therefore, they find it difficult to estimate target cost recovery.

It is equally discovered that the clean-up of major roads is usually given more attention at the expense of existing but most minor roads, especially in new areas, resulting from the shortage of staff (street sweepers, scavengers, collection crew staff, etc.). Finding also reveals, that there is grossly inadequate equipment/facilities for the effectiveness of the exercise. In other words, utility and waste



management vehicles are not readily available, while the few available collectors are often faced with the challenge of spare parts which are not only locally scarce but are too costly to maintain.

Poor network and bad condition of roads within the metropolis is yet another serious predicament facing waste management. Most areas are inaccessible especially during the raining season. Some of the roads are too narrow and slippery to facilitate or allow easy movement of big and heavy vehicles like the types that are used to convey the wastes from the collection points to the dump sites.

Wastes management has still not received the interest of the inhabitants especially when financial commitment is involved. Hence, unguided dumping of wastes is still the most common practice in the metropolis. Contamination of the resources (land, water, and air) of such disposal sites are on the increase. Consequently, the health risks of people living closely to the sites is imminent and of great concern.

Land ownership is another attitudinal challenge facing waste disposal in the metropolis. No one wants to part with his/her land without receiving due compensation for it, and the government has failed in this aspect. The failure of the Ekiti State Government to pay compensation to the land owners has resulted to the reclaim of such lands which has earlier been assigned as dump sites. This is the situation at the Shasha dump site in Ikere-Ekiti.

Segregation of wastes is not done at generation sources. This has further compounded the challenges facing waste disposal system in the metropolis.

## 5. Recommendations

Having been duly informed about the imminent dangers of indiscriminate disposal of solid and hazardous waste in the metropolis of Ado-Ekiti, the State and Local Governments, Corporate bodies, as well as individuals should as a matter of urgency feel compelled to intervene and involve in remedial actions. The following mitigation actions are hereby advanced:

Since the current situation is seriously not satisfactory, to improve on and adequately manage solid and hazardous waste services, therefore, real effective cost implications of the metropolis' waste management scheme should be determined. This will enable the concerned agencies to make necessary but decisive decisions and identify opportunities as well as make plans for sustainable environment.

There is also the need to extend the coverage and effectiveness of solid waste services by giving consideration to community-based partnership and private sector with the government agencies.

Uncontrolled waste dumping should be discouraged, while upgrading of existing approved dump sites should be a matter of great concern and of priority attention. When carried out, this will enhance clean and sustainable environment, minimise health risks of the inhabitants and as well prolong the utility of the dump sites. A possible measure to upgrade an open dump is the reuse of decomposed wastes (landfill mining). This is the case in Deonar, a waste disposal site in Mumbai, India [16]. At the site, the decomposed materials are manually extracted, bagged and sold by the scavengers. This system according to [19] has potentiality of resource recovery and enhances upgrading to a better standard, the excavated area for their reuse as disposal.

To guarantee an appropriate service delivery, a legal and regulatory framework should be established by the government. In addition, efficient control of the system of performance and monitoring should be put in place.

Indiscriminate disposal is accelerating in the metropolis as the inhabitants still showing little interest to waste management, due to a low level of environmental knowledge. Consequently, it is unequivocally recommended that efforts should be geared towards ensuring, that there is effective communication and public enlightenment on benefits attached to a friendly and sustainable environment. The public enlightenment should include knowledge on separation of wastes, functional storage, and efficient wastes management.

A sustainable market for products recovered or extracted from metropolis solid and hazardous waste should be instituted. This will motivate the establishment of small-scale organic waste recycling and as well boost the performance of existing informal recycling system.

Government should establish a legal and regulatory framework (by-laws and regulations) and appropriate systems of performance control and monitoring to ensure appropriate service delivery. Also, as an alternative to government responsibility, a private firm should be hired to ensure compliance by other private firms that are in partnership, with environmental regulations.

Lastly, in addition to making fund available to the agencies in charge, on the job personnel training on technical issues is required to ensure a compliance and a satisfactory operation of an efficient waste management.

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