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Spatial Analysis of Solid Waste Management Within Tertiary Institutions in Owerri Municipality of Imo State

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Abstract- ***The term environment literary means surroundings, circumstances or influences. Different individual, groups with different technologies look at the same environment in diverse ways because of different interests.***

I. INTRODUCTION

A. Background to the Study

The term environment literary means surroundings, circumstances or influences. Different individual, groups with different technologies look at the same environment in diverse ways because of different interests.

Environment comprises of both living (Biotic) and non-living things, (Abiotic) and any change in the environment can affect the organisms. To geographer the term environment is defined in relation to man as a sum total of conditions which surrounds man at any point in time on the earth surface. These conditions can be physical, biotical, social and cultural.

Environment is the complex of physical, chemical and biotic factors that acts upon an organism. (Webster English Dictionary) (2025).

Naturally, the relationship between man and his environment is in-separable. The life of human cannot exist outside the environment which has such sustainable properties such as air, water and land, that is to say that, the environment exists for man and man's existence is of the environment.

Countries in the world suffer great deal of environmental pollution, as of solid waste origin. A good example was the case of Acid rain in Sweden, when lakes become acidic, fish can't survive, acid rain created thousands of "dead lakes" where fish no longer live. And another good example is the oil spills in April 2010, the deep water horizon oil reg exploded in the Gulf of Mexico, causing oil to gush from the ocean floor, in the following months, hundreds of millions of gallons of oil spewed into the gulf waters, the spill produced large plumes of oil under the sea and an oil slick on the surface as large as 24,000 square kilometers (9,100 square miles). The oil slick coated wetlands in the U.S states of Louisiana and Mississippi, killing marsh plants and aquatic organism such as crabs, fishes and birds such as pelicans. The same ugly phenomenon has been very acute in Nigeria, Owerri Municipalityl my case study.

Waste is any substance which is discarded after primary use, or is worthless, defective and of no use. Waste or wastes are unwanted or unusable materials.

According to Michael Agwuoke (2012), waste is residual materials which are as a result of human activities which cannot be reused or recovered as a resource, recycled into material production processes or thermally/biologically utilized for energy production.

Parker (2003) defined solid waste as non-liquid and non gaseous products of human activities, regarded as being useless. It could take the form of refuse, garbage and sludge.

Waste generated as part of daily activities not only damages natural resources but the potential negative impacts on the environment or human health cannot be excluded.

Solid waste generation in tertiary institutions has caused more negative effects to the students and staff of the schools. The academic performance of students can be affected due to the waste generation and poor management of the waste.

Today, solid waste is the major causes of pollution in the premises of teaching and learning in higher institution. This can be seen as a result of emission of smokes from restaurants, ashes from chimneys, illegal dumping on natural habitat, litter found on the roadside, sewage disposal, etc. All these affect the students and the staff in one way or the other and as a result making teaching and learning ineffective in Imo State University and Alvan Ikoku Federal University of Education, Owerri. This research work therefore investigate the spatial analysis of solid waste management in Imo State University and Alvan Ikoku Federal University of Education, Owerri, thereby proffer solution to the problems identified.

B. Statement of the Problem

The problem associated with environmental degradation due to improper waste management is continuously on the rise, this because of the alarming increase in human induced activities that affect the environment and most importantly the health of individual (International Journal of Scientific Research and Innovative Teaching 2015).

The problem of saving the environment is a serious one, hence it needs greater attention from government,

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individuals, non-governmental organizations, environmentalists and schools.

There is a very high rate of pollution due to improper solid waste management in our tertiary institutions. Students throw waste like paper, nylon, food stuff etc. indiscriminately in our campuses, which makes the environment to be filled with wastes that are not properly disposed, thereby leading to bad scene and also cause the students and lecturers to spend money on their health. These wastes if not carefully and properly checked could affect the students and the staff in one way or the other which may result to poor teaching and learning. Hence, the need for this study which is comparative analysis of solid waste management within tertiary institutions in Imo State University and Alvan Ikoku Federal University of Education, Owerri.

C. *Purpose of the Study*

The purpose of the study is to investigate on spatial analysis of solid waste management within tertiary institutions in Owerri Municipality of Imo State. The following specific objectives were used to achieve the purpose of the study.

1) To find out the causes of poor management of solid wastes in tertiary institutions within Owerri Municipality.
2) To determine the state of solid waste management in Imo State University and Alvan Ikoku Federal University of Education, Owerri.
3) To examine the methods of waste management in Imo State University and Alvan Ikoku Federal University of Education, Owerri.
4) To identify the effects of poor solid waste management on the schools/academic environment in Imo State University and Alvan Ikoku Federal University of Education, Owerri
5) To proffer achievable methods to managing solid wastes in Imo State University and Alvan Ikoku Federal University of Education, Owerri.

D. *Significance of the Study*

This study will lead to the improvement of heath status of the people especially students and staff and also improve the standard of living of the public. It is known that health is wealth and at the same time enhances learning in school.

For the students:

It will deal with issues on students' health, environmental education, as well as its effects on teaching and learning.

For the planners:

It will assist the curriculum planners to put in place policies that will address environmental issues and management and the inclusion of environmental education in the curriculum.

For the Educationists:

It will expose to the management and all tertiary institutions the dangers posed by environmental issues and how to protect it.

E. *Scope of the Study*

The scope of the study will cover on solid waste management in the two tertiary institutions within Owerri Municipality of Imo State. It will analyse the causes, effects and management of solid waste in these institutions with particular reference to Alvan Ikoku Federal University of Education and Imo State University.

F. *Research Questions*

In order to actualize the objective of the study, the following questions were put forward –

1) What are the causes of poor management of solid wastes in tertiary institutions within Owerri Municipality?
2) What are the state of solid waste management in Imo State University and Alvan Ikoku Federal University of Education, Owerri?
3) What are the methods of waste management in Imo State University and Alvan Ikoku Federal University of Education, Owerri?
4) What are the effects of poor solid waste management on the schools/academic environment in Imo State University and Alvan Ikoku Federal University of Education, Owerri?
5) What are the achievable methods of managing solid wastes in Imo State University and Alvan Ikoku Federal University of Education, Owerri?

II. LITERATURE REVIEW

In this chapter, the presentation is organized under four major aspects, which are;

1) Conceptual Framework
2) Theoretical Framework
3) Empirical Framework
4) Summary of Related Literature Review

In conceptual framework, the following subheadings were reviewed.

1) Concept of Environment
2) Waste
3) Categories of waste
4) Solid waste
5) Sources of solid waste on campus
6) Causes of poor solid waste management in the study area
7) Methods of solid waste management

8) Achievable method of managing solid waste on campus
9) Empirical Review of solid waste management
10) Summary of Related Literature Review

A. CONCEPTUAL FRAMEWORK

Concept of the Environment

Environment is a very broad concept and very necessary in terms of its various sub-systems. The Oxford Advance Learners English Dictionary (2025), defined environment as condition of circumstance affecting people's lives. Environment is the totality of the natural and human-mad surroundings in which living organisms, including humans interact. It includes all biotic (living) and abiotic (non-living) elements such as air, water, soil, climate, flora, fauna and human infrastructure. Environment is a dynamic system where human activities are affected by natural processes (Alexander Von Humboldt 1979-1859).

Okoroafor et al. (2006), to the geographer, the term environment is defined in relation to man as a sum total of condition which surround man at any point in time on the earth surface.

According to Enwereuzor and Umo (2019) environment has a variety of definitions as a concept which varies from one point of view to another. This according to European Commission defines environment as the combination of elements whose complex interrelationships make up the settings, the surrounding and the conditions of life of the individual and of society as they are felt.

Writing on the important of environment for healthy living in the country, Ume (2002) asserted that;

- Environment is the basic of all life and therefore deserves proper care and management.
- The environment is a part of our cultural heritages which should be handed down to posterity.
- There is need to enhance the sanitary and aesthetic quality of our environment in order to promote healthy living.
- The environment is part of nature and needs to be preserved for its general sake.
- Some of the resources of the environment are not easy replaceable and should be managed on a sustainable basis to prevent the extinction of certain component of the environment, such as plant and animals.

Human induced activities on the environment has caused and accelerated a lot of environmental problems such as improper disposal of solid wastes.

Waste (Solid Waste)

Generally, waste is anything that is not required again in the cause of activities such as manufacturing, cooking, residences, eating particle effluents etc. At times anything that is thrown away is either rubbish or waste.

Obasi (2004) observe that waste are such items which people are required to discarded, cars and television and garden waste etc. Thus all our daily activities can give rise to a large variety of different wastes rising from different surface. According to Ijeoma (2005), observed that waste is heap in commercial and industrial cities in Nigeria.

Waste is the product of pollution in any given environment, man can consumption, he will liter the waste and make the environment get filthy and dirty.

Pollution governance, especially in developing countries, is an essential issue of global concern (Fullet et al 2022; Landrigan et al 2018).This implies that improper solid waste management poses a great threat to the health conditions of the people and the environment. This results in consistent with the work carried out by Yhdego and Majura (1988); Stephen and Harpham (1992) and Songsore and MacGranaham (1993) who attributed the prevalence of diseases, morbidity and mortality in most African cities to poor sanitation and improper waste disposal practices. The findings, was further corroborated by the reports of environment Canada (2002), Olotuah and Fadairo (2005) and U.S.A.I.D (2008) which disclosed that flooding, climate change and environmental degradation were partly due to the effects of improper solid waste management systems in developing countries.

From the results, most people claimed being aware (88.4%) of the health and environmental impacts of improper solid waste disposal, yet wastes are dumped indiscriminately in and around of the city. The unsanitary health conditions could therefore not only be attributed to inadequate supply of equipment and manpower or lack of awareness but to peoples poor attitude to waste disposal and environmental hygiene and lack of legislation which depicts in manner people throw out wastes from moving vehicles, litter homes, institutions, markets and business premises with wastes, misuse public lavatories and deficate on road sides even in broad day light. It is common practice now especially around the municipality for landlords not to install toilet facilities in their homes, leaving their tenants with the options of either using nearly bushes or polytene bags which are thrown out along with other wastes, while waste water is channeled to the roads.

The objective of environmental sanitation is to create and maintain conditions that will promote health and prevent diseases (Lucas and Gilles 1990). Diseases associated with insanitary health conditions include cholera, dysentery, diarrhea, gastroenteritis, malaria, typhoid fever and various other air and water

related diseases (USAID, 2008, Waste Info Sheet 2009). These diseases if mishandled can lead to morbidity and death. Consequently, with delayed environment and loss of manpower, the people are unable to maximize benefits of developing the environment and exploiting the available resources to service the essential needs of the populace. This in turn affects the economic development of the city and achievement of sustainable development.

Categories of Waste

Hazardous waste can take different forms which are solid, liquid or gaseous and it can be emitted to land, water and air.

Solid waste: According to Ume (2002), who see solid waste as a waste generated from families, household, industries, product and agricultural activities which later cause harmful effect on the society.

Iwuchukwu (2002) observe that, the issue of solid waste is being cause as a result of population in our various cities today. Still in that vain, Ozioma (2005) defines solid waste as waste generated from industrial activities or related urban centers. He further explained that such wastes are acidic substance, caustic or inflammable from soap and detergent. From my own point of view, solid waste is seen as any garbage refuse, slidge that is generated from homes, industries, construction companies and agricultural products, that is harmful to the environment. Presently, in Owerri Municipal, solid waste is generated due to the existing population of the area.

According to Udofia and Asilaong (2005), waste could be biodegradable and non-biodegradable. The biodegradable waste are those domestic waste which include food remains, garbage, paper, etc. which can easily decomposed by microbes, while non-biodegradable waste are waste that cannot easily decomposed and are not combustible in nature. These are metals, glass, ceramics, stones, nails etc.

Sule (2001) asserted that most uncontrolled and poorly managed wasted are formed in fast growing capital cities of the world essentially in developing countries where population is always on the increase.

Sources of Solid Waste on Campus

Wastes are complex in nature depending on source of generation and the environmental status of the waste. Waste can be classified according to the origin or physical form or according to physical or chemical properties.

1) **Municipal Wastes:** Municipal waste consists of household waste construction and demolition debris, sanitation residue and waste from streets Nasrin (2008). With rising urbanization and change in lifestyle and food habits, the amount of municipal solid waste has been increasing rapidly in our institutions today. The rate solid waste generated has been so alarming that is has effect on the students' health. Oyinna (2005), stated that, when waste enters into bodies of water, it pollutes and renders the water unusable. Municipal waste can cause obstruction on the road if its been discarded on the roadside.
2) **Domestic Solid Wastes:** Domestic solid waste includes by-product of house keeping activities and construction. They include, food, residues wrapping leaves and paper, polythane, empty cans or containers, spoilt food and leftover food, crop peels etc.

Causes of Poor Solid Waste Management

In most cities today, waste is been generated on a daily basis which are;

1) **Industrialization:** Industrialization is one of the causes of solid waste. Nasrin (2008) said that industrial activities bring unprecedented wealth and unprecedented waste in environment. Obasi (2005) observed that since the emergence of industrialization, generation of solid waste has become enormous in the society. She emphasized on the population explosion as one of the major causes of solid waste generation.
2) **Population Increase:** The influx of rural population into the urban centers that put pressure on social services and other social activities and waste generation. Institutions of learning are now being over populated, especially the ones in Nigeria with consequent causes of infrastructure and rapid increase in waste accumulation, given the fact that the population of tertiary institution is dynamic, changing the period of academic activities and periods of holidays. The fact remains that, there are evidence of increase admission of students, its results will continue to be an increase in waste generation, no more no less. It is then accepted that urbanization and industrialization are the major factors that generated solid waste disposal.
3) **Food Items:** Food items is another causes of waste. It is one of the body requirement and is needed every day to enhance health. It has been observed that, it is one of the cause of waste that have been generated from our homes as a result of food preparation and consumption units. Food leftover, lack of giving and greediness, waste from food preparation item includes, tins, cans, plastic, wrappers, vegetable, etc.

Methods of Solid Waste Management

Waste management is the process of treating solid waste and offers variety of solution for recycling items that don't belong to trash.

Waste management is something that each and every household and business owner in the world need. There are methods by which solid wastes can be managed which are;

a) **Landfill:** This has to do with deposition of waste on a landfill, involves burying the waste. This remains a common practices in most countries. Landfills are often established in abandoned or unused quarries, mining voids or borrow pits. A property designed and well manage landfill can be a hygiene and relatively inexpensive method of disposing of waste materials. Other poorly designed or poorly manage landfill which are burn in regular bases can create adverse environment impact such as wind blow, liter attraction of vennim and generational of liquid leach e.t.c.

b) **Incineration/Combustion:** This is a type of disposal method in which municipal solid wastes are buried at high temperature so as to convert them into residue and gaseous product. This process is also known as thermal treatment where solid waste materials are converted by incinerator into heat, gas, steam and ash. This method would be suited in crowded cities where sites for land filling are not available.

c) **Recycling:** This is a resource recovery practice that refers to the collection of the reuse of waste in such as empty beverage container. The material from which the items are made can be reprocessed into new product. Materials for recycling may be converted separating from general waste using dedicated bins and collection. Vehicles are sorted differently from maxed waste streams known as kerb-side recycling. It requires the owner of the waste to separate it into different bins prior to its collection. The most common consumer product recycled include aluminum such as beverage can, copper as wise steel, food and aerosol cans, old steel furnishing equipment, perfume, bottles and jars, paper board, carton, newspapers, magazines and light papers and corrugated fitter board boxes. These type of materials accepted for recycling varies by cities and countries.

d) **Biological Processing:** Waste materials that are organic in nature, such as plant materials, food scraps and paper. Products can be recycled using biological composition and anaerobic digestion.

Anaerobic digestion – Anaerobic digestion is a biological processes that decompose organic materials. It uses oxygen and bacterial free environment to decompose the waste materials. Biological composition is a waste dispose or treatment method which is the controlled aerobic decomposition of organic waste material by the action of the small invertebrate and microorganisms. The most common compositing techniques include static pole compositing, vermin compositing, window compositing and in-vessel compositing.

Economic Importance of Waste

According to Iwuchukwu (2003), he stated that, the main disposal route for hazardous waste is landfill, incarnation and physical or chemical treatment, but in other way round, waste can be recycling or burned as a fuel. Nasrin (2008) observed that part of the construction and demolition waste can be landfill. Also waste from electrical and electronic equipment (wee) are very important in term of recycling the waste. For instance no house that does not use refrigerator, television and telecommunication equipment, washing machine e.t.c. All these mentioned above can be recycled for future purpose. In addition, it can be buried to serve as manure for crops.

Effects of Poor Management of Solid Waste

Students are faced with numerous problems on campus which are traumatizing and frustrating. These problems can actually emanate from indiscriminating dumping by environmental pollution and degradation, which result into flooding as a result of blocked gutter or drainage channels.

Wastes disposal sites are breeding places for rodents and reptiles and even insects. Wastes pollute waste bodies, making them unsafe for usage.

Presence of water carries a lot of health hazard. Take for instance, when the wastes are dumped inside water bodies in and around the campus, they cause sicknesses like cholera which is a water borne diseases for the students and when they contact this ailment, the sort for treatment, thereby abstaining from classes.

If a waste disposal site is close to the classroom, the unpleasant odour which it will give out will disrupt both the lecturer and the students' attention, thereby making them uncomfortable and this will definitely affect the ongoing teaching and learning activities.

Intake of harmful gases from waste disposal site can cause stress. Stress leads to fatigue and a tired person cannot teach or learn effectively.

Flooding which can be caused by blockage of drainage channels, might cause water to gather in front of the classroom and even inside them and when this happens, neither the teacher nor the students will have access to the areas and teaching and learning would have been disturbed.

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Refuse from disposal sites, set ablaze will intoxicate the atmospheric air and might lead to the choking of individual, especially those who are asthmatic or epileptic, if this attack happens in a teaching and learning environment, the activities automatically will be stopped.

Wastes contaminate the portable water and render it not consumable by human and animals, but most people simply ignore the pollution and consume the water. Let's assume a sanitary landfill disposal system was carried out on a particular piece of land several years ago and some of the substances that were buried were toxic, this particular piece of land was used in borehole sinking at later times and it is very clear that the dissolved toxic substances on the ground will contaminate the water.

Achievable Methods of Managing Solid Waste on Campus

To ensure sustainable solid waste management on campus, the following will be put into practice.

1) Proper education and public enlightenment should be given to the students on the danger of the environment through improper disposal of solid wastes.
2) Students, academic staff and non-academic staff should avoid being wasteful, greedy and learn to give.
3) The school management should provide refuse bin at strategic points so as to reduce land pollution.
4) The school authorities should set up a group (monitoring team) that will be in charge of improper wastes disposal.
5) Non-challant attitude of the students towards improper wastes disposal should be reported the management.
6) The students, lecturers, non-academic staff and business owners should adopt the three Rs (3Rs) which means Reduce, Reuse and Recycle.

B. THEORETICAL FRAMEWORK

The Theory of Pollution Policy

The theory of pollution policy propounded by Helfland et al (2003) were used for this study. Physically, pollution occur because, it is virtually impossible to have a productive process that involve no waste. Economically, pollution occur because polluting is less expensive than operating cleanly.

This chapter explores the source and consequences of and remedies for pollution and associated environmental damages. If all goods has well-defined property right and could be traded in the markets environment, goods would be no different than other goods because property right cannot or do not exist and because of the non-exclusive non-rival nature of these goods, thus environmental goods provide dare classic case where government intervention can increase efficiency, achieving efficient levels of pollution based on damages cause by that unit.

In practice, this policy can be difficult to achieve, due to difficulties on measuring and differentiating damage by source, difficulties on monitoring and enforcing pollution, policies and the financial and political cost of pollution taxes.

This theory implies that, it is impossible to create no trash on the world we live on. Even if you buy things without packaging it is likely that, it was at some point package or that the materials traveled a far distance to get to you, thereby creating pollution which isn't waste on plastic, garbage but waste.

Its implication on the research work include that, wastes are been produced by students, academic and non-academic staff, hawkers, traders, and so on. In the school premises as result of the activities that goes on in the school, the wastes produce if not properly managed, it will affect school environment and the health of the students, which will hinder teaching and learning.

Students tend to value their education and they are willing to acquire knowledge, the environment in which teaching and learning take place should be valued and also be protected from any hazard for posterity because the school environment is a very important resource for learning. By this, it means that the environment should be studied with the view of ascertaining how it can be protected from unwanted destruction through pollution of all sorts by Anthropogenic and natural forces.

Theory of Reconstructionism

Another theoretical base of this research is that of reconstructionism. Reconstructionists like Tanner and Tanner (1975) which see a more direct ideology for building a better and sustainable society and the school is recognized as a very effective instrument of social reconstruction to national and global problems like environmental pollution, war, crime, poverty etc. all serve to give causes for social reconstruction.

Igboabuchi (2008), cited that the school must cooperate with other institutions in society to bring about the needed social change or reform, in so doing environmental pollution due to solid waste should be avoided.

The implication of this theory to this study which also constitutes the major views guiding the reconstructive as observed by Igboabuchi (2003) is as follows:

1) Education must lead to a complete change in the mind of men, making the technological power at

our disposal functionally useful rather than destructive. The task of education hence is to create new social order.

2) The child, school and education are all conditioned by social and cultural force of the society.
3) Education should make the individual an active member of the society, who must participate in social planning.

In conclusion, this shows that, for there to be effective teaching and learning, the environment must be free from any environmental problem such as wastes. For instance, where the university premises is filled with pollution problem such as solid waste disposal, it will hinder progress of teaching and learning experiences.

C. EMPIRICAL REVIEW

Nwosu, Orji, Nwachukwu, Oragba, Asoegwu and Awuchi (2021) evaluated the waste management practices at the Federal University of Technology, Owerri. The research utilized library, observations and sample survey technique, questionnaires based on formulated hypotheses were also employed. Data gathered were analyzed using textual, diagrams (charts and graphs) and tabular forms of data presentation. Percentages and figures were also used to clarify the relationship between variables. Consequently, the findings gotten from the field shows the kind of domestic solid wastes that is generated in the study area were majorly organic, papers, plastic, metal and textile wastes, about 72% of all the domestic solid waste that is generated at the eateries in the study area were mainly organic wastes. The domestic solid waste management strategies in place were burning, open dumping and burying. Open dumping was found to be the most common domestic solid management strategy practiced in the study area. The key players involved in the management of solid wastes were the school management and individual households. The study shows that the method of waste management adopted in the study area does not conform to sustainable waste management strategy which results in environmental degradation and health risks. It is implies that much attention has not been given to domestic solid waste management in the study area. The study therefore suggest that there is need to introduce solid waste management in the course work of all the department in the institution so that they could be informed on the need to maintain a clean and healthy environment and more attention should be given to waste disposal management through adequate funding by providing the students and residents with properly designed waste disposal points in order to protect the environment from pollution.

Duruobi (2023) examined the role of environmental education on solid waste management in Owerri West Local Government Area of Imo State. Simple random sampling technique was used and the sample size for the study was five hundred and two (502) taxable adult who were randomly selected from a population of seventy one thousand eight hundred and twenty-one (71,821)taxable aduit in all the communities in Owerri West Local Government Area of Imo State. Five research questions were raised, the instrument for data collection was a structured questionnaire developed by the researcher. The data were analyzed using simple percentage. The researcher recommends among others, the improper disposal of wastes should be abolished, refuse dumps should be regularly evacuated, public enlightenment should be carried out on waste management to the people of Owerri West Local Government Area, Environmental agencies should be integrated in the villages to checkmate the rate of environmental degradation due to inadequate solid waste management in the environment and enforce sanity. The government should provide adequate funding for agencies concerning with solid waste management and ensure that proper implementation of programs and policies and also the media should intensify their efforts at public enlightenment by presenting environmental information in the local languages to remove the language barrier.

Nwachukwu (2022) examined on solid waste generation and management in higher institutions in Imo State. The purpose of the study is to know how solid wastes are been generated in higher institutions, the types of waste generated, its effects if not properly taken care of and ways of managing waste in higher institutions. The population of the study comprises of the schools in A.I.F.C.E Owerri which is the study area. The research sampled the schools that make up the college which is the study area. Questionnaire was used as an instrument for data collection. After analysis, the result show that solid waste is greatly generated in higher institution through food package in nylons, foil, plastic bottles, cans etc. which are mostly consumed by the students and this waste has affected the students, lecturers and other staff negatively because of the poor management. Recommendations like; provisions of incinerator should be made available, recycling of waste rather than burning it, placing of waste bin at the side of the lecture halls and hostels and also at strategic places round the College environment should be employed, organizing a seminar or talk for the students on waste management and on environmental cleanliness should also be explored to help control waste and effect in higher institutions, workers should also be employed so as to ensure waste is not dumped randomly in the

school environment and to ensure clean environment for learning activities.

D. SUMMARY OF RELATED LITERATURE REVIEW

This chapter two review of related literature started with the conceptual framework of environmental pollution, which is centred on land pollution (solid wastes). This chapter discussed on the definition, types, causes, effects, methods of solid waste management and the achievable methods of managing solid wastes on campus as examined by Oxford Dictionary of Environment and Conservation (2019), Okoroafor et al (2016), Ume (2002), Markham (2005), Nathanson (2019), Iwuchukwu (2006), Obasi (2002), Ojimma (2005), Alexander Von Humboleto (1769-1859), Enwereuzor and Umo (2019) and others.

It also reviewed the theoretical framework, which include the theory of pollution policy and reconstructivism theory.

Solid waste is distinguished from liquid, gaseous and radioactive wastes materials produced by human activities. The concept include all materials, produces, and items discarded by the society which can no longer needed, or may be seen as useless, as well as organic substances from plants and animals, household and commercial activities such as tissue papers, pads and diapers, garbage including papers, wood waste, clothing materials, plastic or rubbers, straws, polyeneme, oil furniture, sweeping from buildings, food leftover, bottles, bones and broken glasses, etc.

In conclusion of this literature review, the empirical review of solid waste management were also examined by Duruobi (2023); Nwosu, Orji, Nwachukwu, Oragba, Asoegwu, Awuchi (2021) and Nwachukwu (2022).

III. RESEARCH METHODOLOGY

This chapter described the general methods the researcher employed in the investigation. It is presented under the following sub-heading:

1) Research design
2) Area of the study
3) Population of the study
4) Sample and sampling technique
5) Instrument for data collection
6) Validity of the instrument
7) Reliability of the instrument
8) Administration of the instrument
9) Method or technique for data analysis

A. Research Design

The study adopted the descriptive survey research design. Descriptive design studies are mainly concerned with describing events as they are without manipulation being observed.

Ali (2006), stated that descriptive survey design is used for studies which aim at collecting data and describing them in a systematic number. The characteristic/features/factors were about a given population.

B. Area of the Study

The study was carried out in Owerri Municipality of Imo state. Owerri Municipal Council is the most developed council located in the heart of the city of Owerri, which lies on the geographical co-ordinate of 5290N and 702E and an area of 58km. The area sits at the intersection of the road from Port Harcourt, Onitsha, Aba, Orlu, Okigwe, and Umuahia, and also share common boundaries with Egbu in the East, Mbaitoli (Nwaorieubi) in the North, Umuguma in the West and Nekede in the South. Owerri Municipal is made up of five villages; Umuororonjo, Amawom, Umuonyeche, Umuodo and Umuoyima; collectively known as Owerri Nchi Ise (See Appendices 2, 3 and 4). The main occupation of the area includes: trading, civil service, and education. The area is associated with tropical rainforest and tropical climate with average annual temperature 26.4 and average precipitation of 2219mm. The topography of the area is a lowland (plain) with different type of soil such as loamy, sandy, clay and silt soil.

C. Population of the Study

The population of this study comprised of all the students of Alvan Ikoku Federal University of Education, Owerri and Imo State University, Owerri, given a total of forty-four thousand, two hundred and twenty eight (44,228) students. Based on the data collected from both schools, the population of Alvan Ikoku Federal University of Education, is sixteen thousand and one hundred (16,100) students and that of Imo State University is twenty-eight thousand, one hundred and twenty-eight (28,128) students.

Source: Authors Field work (2025).

Table 1. Population of A.I.F.U.E., Regular Degree Students

S/No	Faculty	Number of Students
1.	Faculty of Arts	5,000
2.	Faculty of Science	4,500
3.	Faculty of Education	100
4.	Faculty of Social and Management Sciences	4000
5.	Faculty of Vocational and Technical Education	2500
	Total	**16,100**

Source: Admission Unit A.I.F.U.E. Owerri 2025.

Table 2. Population of Imo State University, Owerri Regular Degree students

S/No	Faculty	Number of Students
1.	Faculty of Administration	3120
2.	Faculty of Agriculture	1000
3.	Faculty of Arts	3621
4.	Faculty of Basic Medical Science	1500
5.	Faculty of Education	6104
6.	Faculty of Engineering	4083
7.	Faculty of Environment	2000
8.	Faculty of Law	1200
9.	Faculty of Medicine	500
10.	Faculty of Sciences	5000
11.	Faculty of Social Sciences	4000
	Total	**28,128**

Source: Admission Unit IMSU Owerri 2025.

D. Sample and Sampling Technique

The sampling technique for the study was stratified random sampling technique, which used to group the population into different strata, each stratum represents each faculty and was represented by a percentage.

The sample for this study consists of seven hundred and thirty one (731) students from both schools, in Owerri Municipal Council. The figure represents 2% of the population of the students.

This is in line with stipulation of Nwanna (1992) in Ekwe and Obinna (2006) which stated that in choosing a population sampling, if the population is few hundreds, a 40% or more will do, if many hundreds, a 20% sample will do, if a few thousands, a 10% sample will do and if several thousands or many thousands a 5% or less sample will do. Since the population of the study (44,228) run into several thousand, 2% sample will be considered appropriate for the study.

Table 3. Sample size of A.I.F.U.E, Owerri

S/N	Faculties	Number of Respondents	Percentage (%)
1.	Faculty of Arts	100	2%
2.	Faculty of Science	90	2%
3.	Faculty of Vocational and Technical Education	50	2%
4.	Faculty of Social and Management Sciences	80	2%
5.	Faculty of Education	2	2%
	Total	**232**	**2%**

Source: Author's Field work, 2025.

Table 4. Sample size of Imo State University, Owerri

S/No	Faculty	Number of Students	Percentage (%)
1.	Faculty of Administration	62.4	2%
2.	Faculty of Agriculture	20	2%
3.	Faculty of Arts	4.2	2%
4.	Faculty of Basic Medical Science	30	2%
5.	Faculty of Education	122.08	2%
6.	Faculty of Engineering	81.66	2%
7.	Faculty of Environment	40	2%
8.	Faculty of Law	24	2%
9.	Faculty of Medicine	10	2%
10.	Faculty of Sciences	100	2%
11.	Faculty of Social Sciences	80	2%
	Total	**1201**	**2%**

Source: Author's Field work, 2025.

E. Instrument for Data Collection

Two types of data were collected. The first was the primary data, which were collected through administration of questionnaire and observation. The questionnaires were structured in order to obtain valid information for answering the research questions. In addition, it facilitated easy coding, calculation, analysis and interpretation of data.

The second instrument was the secondary data which were collected from records, reports, internet, material, magazines, national dailies issued of the study.

F. Validity of the Instrument

The questionnaires were presented to the researcher's supervisor and he made all the necessary modifications. The instrument was taken to experts in measurement and evaluation for content and accurate validation.

G. Reliability of the Instrument

The reliability of the instrument were ascertained using test and retest method. A pre-test of the instrument were given to students outside the sampled population frame in two occasions. In each group of respondents, separation at interval of two weeks between the first and second correlates to establish its reliability. This shows that the instrument is reliable. It is expected that the instrument measured 0.75 to 0.87 reliability index.

H. Administration of Instrument

The questionnaires were administered to the respondents on a face to face basis to avoid bias. Seven hundred and thirty one (731) questionnaires were distributed to the students in both schools.

Questionnaires were collected immediately after their responses, so as to ensure high return rate of the questionnaire.

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I. Method of Data Analysis

The mean rating were used to analyze the data collected from the respondents. The formula is seen below.

$$\bar{X} = \frac{\sum Fx}{N}$$

Where $\sum$ = Summation symbol

Fx = Frequency of X likert point

N = Total number of respondents

In scoring, the four (4) likert will be used having its grade point as:

SA = 4 points

A = 3 points

D = 2 points

SD = 1 points

With a decision rule of 2.5, that is

$$\frac{4 + 3 + 2 + 1}{4} = \frac{10}{4} = 2.5$$

Where 2.5 served as the criterion mean. All scores of 2.5 and above were accepted while those with mean score below 2.5 were rejected.

IV. DATA PRESENTATION AND ANALYSIS

This chapter deals with analysis of data and presentation of results. The results on each table were interpreted below the table.

Research Question 1: What are the causes of poor solid waste management in tertiary institutions within Owerri Municipal Council?

Table 5. Causes of Poor Solid Waste Management in IMSU

S/No	Questionnaire Items	SA (4)	A (3)	D (2)	SD (1)	∑FX	X	Decision
1	Population causes poor solid waste management	96 (384)	100 (300)	5 (10)	100 100	1201 3494	2.9	Accept
2.	Students negative attitude is a contributory factor to indiscriminate waste disposal in tertiary institutions.	100 (400)	964 (2892)	100 (200)	37 (37)	1201 3529	2.9	Accept
3.	Non-challant attitude of hostel warden on students defacing of the campus environment contributes to poor management of solid waste.	72 (288)	81 (243)	608 (1216)	440 (440)	1201 2187	1.8	Reject
4.	Lack of adequate and appropriate orientation by university management on nurturing of the school environment is responsible for poor management of solid waste.	896 (3584)	100 (300)	100 200)	105 (105)	1201 (4189)	3.5	Accept
5.	Non-existence of eco-clubs among students on campus is responsible for poor management of solid waste.	300 (1200)	400 (1200)	400 (800)	101 (101)	1201 (3301)	2.7	Accept
6.	Non-existence of environmental ethics or rules is responsible for poor management of solid waste.	501 (2004)	300 (900)	100 (200)	300 (300)	1201 (3404)	2.8	Accept
	Grand mean						**2.8**	

Source: Author's Field Survey 2025.

In an effort to determine the causes of poor solid waste management in tertiary institutions, data generated from Imo State University (IMSU) respondents were presented in the table. The descriptive analysis using mean score showed that the six items variable fall within the acceptable range. The table showed that the high population causes poor solid waste management with mean score of 2.9, this was followed by students negative attitude is a contributing factor to indiscriminate waste disposal in tertiary institutions with a mean value of 2.9. Furthermore as shown in the table, lack of adequate and appropriate orientation by the university management on nurturing of the school environment is responsible for poor management of solid waste with a mean of 3.5 and lastly, non-existence of environmental athletic or rules is responsible for poor management of solid waste as reflected by mean score of 2.8, while the respondents in item 3 with a mean score of 1.8 rejected that non-challant attitude of hostel warden on students defacing of the campus environment contributes to poor management of solid waste. The respondents on item 5 with mean score of 2.7 accepted that non-existence of eco-clubs or green-clubs among students on campus is responsible for poor management of solid waste.

Table 6. Causes of Poor Solid Waste Management in A.I.F.U.E.

S/No	Questionnaire Items	SA (4)	A (3)	D (2)	SD (1)	∑FX	X	Decision
1	High population growth causes poor solid waste management	126 (504)	46 (138)	30 (60)	30 (30)	232 732	3.1	Accept
2.	Students negative attitude is a contributory factor to indiscriminate waste disposal in tertiary institutions.	100 (400)	113 (339)	12 (24)	7 (7)	232 770	3.3	Accept
3.	Non-challant attitude of hostel warden on students defacing of the campus environment contributes to poor management of solid waste.	83 (332)	84 (252)	35 (70)	30 (30)	239 682	2.9	Accept
4.	Lack of adequate and appropriate orientation by university management on nurturing of the school environment is responsible for poor management of solid waste.	60 (240)	113 (339)	35 (70)	24 (24)	232 673	2.9	Accept
5.	Non-existence of eco-clubs among students on campus is responsible for poor management of solid waste.	24 (96)	60 (180)	88 (176)	60 (60)	232 512	2.2	Reject
6.	Non-existence of environmental ethics or rules is responsible for poor management of solid waste.	35 (140)	72 (216)	95 (190)	30 (30)	232 576	2.4	Reject
	Grand mean						2.8	

Source: Author's Field Survey 2025.

The table showed that students negative attitude is a contributory factor to indiscriminate waste disposal in tertiary institutions with a mean of 3.3. This was followed by high population growth causes poor management of solid waste with a mean score of 3.1. Furthermore as shown on the table, non-challant attitude of hostel warden on students defacing of the campus environment contribute to poor management of solid waste in the institution with a mean of 2.9 and lastly lack of adequate appropriate orientation by university management on nurturing of the school environment is responsible for poor management of solid waste as reflected by mean score of 2.9 while the respondents in item 5 with the mean score of 2.2 rejected that non-existence of eco-clubs or green-clubs among students on campus is responsible for poor management of solid waste. The respondents in item 6 with a mean score of 2.4 rejected that non existence of environmental athletic or rules is responsible for poor management of solid waste.

The analysis from the causes of poor solid waste management in the two institutions, the main causes of solid waste on A.I.F.U.E are; high population growth, students negative attitude, non-challant attitude of hostel wardens on students and lack of adequate and appropriate orientation by university management, while in I.M.S.U. the main causes are; high population growth, students negative attitude, lack of adequate and appropriate orientation by university management, non-existence of environmental athletic or rules is responsible for poor management of solid waste.

Research Question 2: What is the state of solid waste management in tertiary institutions within Owerri Municipal Council?

Table 7. States of Solid Waste Management in IMSU

S/No	Questionnaire Items	SA (4)	A (3)	D (2)	SD (1)	∑FX	X	Decision
1	My school is always very clean and wastes are properly handled or managed.	101 (404)	400 (1200)	300 (600)	400 (400)	1201 2604	2.1	Reject
2.	Solid wastes are never seen defacing our school environment.	345 (1380)	106 (318)	400 (800)	350 (350)	1201 2848	2.4	Reject
3.	There are rules and regulations guiding students action on poor management of solid waste.	397 (1588)	353 (1059)	360 (720)	91 (91)	1201 3458	2.9	Accept
4.	Students/staff face disciplinary panel for littering the campus with refuse.	202 (808)	199 (597)	400 (800)	400 (400)	1201 2605	2.1	Reject
5.	There is a student volunteer group that works acidulously to keep the school environment clean.	190 (760)	170 (510)	410 (820)	431 (431)	1201 2521	2.1	Reject

S/No	Questionnaire Items	SA (4)	A (3)	D (2)	SD (1)	∑FX	X	Decision
6.	Environmentalists charged with the responsibility of maintaining the campus environment do not fail in their duties.	180 (720)	140 (420)	550 (1100)	331 (331)	1201 2571	2.1	Reject
	Grand mean						**2.3**	

Source: Author's Field Survey 2025.

In an effort to determine the state of waste management in tertiary institution within Owerri Municipal Council, data generated from IMSU respondents were presented in the table. The descriptive analysis using mean score showed that the six item variable were valid for the test but only one fail within the acceptance range.

The table showed that there are rules and regulations guiding students action on poor management of solid waste with a mean of 2.9 while the respondents on item 1 with mean score of 2.1 rejected that my school is always very clean and waste are properly handled or managed. The respondents in item 2 with a mean of 2.4 rejected that students/staff face disciplinary panel for littering the campus with refuse. The respondents in item 5 with a mean score of 2.1 rejected that there is a student volunteer group that works acidulously to keep the school environment clean. The respondents in item 6 with a mean score of 2.1 rejected that environmentalists charged with the campus environment do not fail in their duties.

Table 8. States of Solid Waste Management in A.I.F.U.E

S/No	Questionnaire Items	SA (4)	A (3)	D (2)	SD (1)	∑FX	X	Decision
1	My school is always very clean and wastes are properly handled or managed.	12 (48)	60 (180)	72 (144)	88 (88)	232 460	2.0	Reject
2.	Solid waste are never seen defacing our school environment.	30 (120)	42 (126)	107 (214)	53 (53)	232 513	2.2	Reject
3.	There are rules and regulations guiding students action on poor management of solid waste.	36 (144)	125 (375)	18 (36)	53 (53)	232 608	2.6	Accept
4.	Students/staff face disciplinary panel for littering the campus with refuse.	24 (96)	30 (90)	125 (250)	53 (53)	232 489	2.1	Reject
5.	There is a student volunteer group that works acidulously to keep the school environment clean.	42 (168)	102 (306)	30 (60)	58 (58)	232 592	2.5	Accept
6.	Environmentalists charged with the responsibility of maintaining the campus environment do not fail in their duties.	60 (290)	90 (270)	65 (130)	17 (17)	232 707	3.0	Accept
	Grand mean						**2.4**	

Source: Author's Field Survey 2025.

Data generated from A.I.F.U.E. respondents were presented in the table. The table showed that, there are rules and regulations guiding students action on poor management of solid waste with a mean of 2.6. This was followed by environmentalists charged with responsibility of maintaining the campus environment, do not fail in their duties with a mean score of 3.0. Furthermore, shown in the table, there is a student volunteer group that works acidulously to keep the school environment clean with a mean of 2.5, which was accepted while the respondents in item 1 with a mean score of 2.0 rejected that my school is always very clean and waste are properly handled or managed. Also the respondents in item 2 with a mean score of 2.2 rejected that solid waste are never seen defacing our school environment. The respondents in item 3 with a mean score of 2.6 accepted that students/staff face disciplinary panel for littering the campus with refuse.

The analysis from the state of solid waste management in the two institutions, the state of solid waste management in IMSU is that there are rules and regulations guiding students action on poor management of solid waste, there is a student volunteer group that work acidulously to keep the school environment clean; and the school have environmentalist that are in charge with the responsibility of maintaining the campus environment.

Research Question 3: What are the methods of solid waste management in tertiary institutions within Owerri Municipal Council?

Table 9. Methods of Solid Waste Management in IMSU

S/No	Questionnaire Items	SA (4)	A (3)	D (2)	SD (1)	∑FX	X	Decision
1	My school has dumping site within the school environment	380 (1520)	340 (1020)	190 (380)	291 (291)	1201 3211	2.7	Accept
2.	My school has incineration within the school environment	101 (404)	200 (600)	500 (1000)	400 (400)	1201 2404	2.0	Reject
3.	My school has people, who are incharge of collection and sorting of waste for recycling.	193 (772)	108 (324)	300 (600)	600 (600)	1201 2296	1.9	Reject
4.	Establishment of a recycling center in our school environment will solve the problem of solid waste management.	420 (1680)	330 (990)	190 (380)	261 (261)	1201 3311	2.7	Accept
5.	My school does not have enough dumping site for solid waste.	450 (1800)	280 (840)	261 (502)	190 (190)	1201 3352	2.8	Accept
6.	There are no steady dumping site, instead solid waste are deposited indiscriminately.	350 (1400)	380 (1140)	270 (540)	201 (201)	1201 3281	2.7	Accept
	Grand mean						**2.5**	

Source: Author's Field Survey 2025.

In an attempt to identify the various method of management of solid waste within Owerri Municipal, a data generation from IMSU respondents were presented. In the above the descriptive analysis using mean score shown that the six items variable were valid for the test but only four items fall within the acceptable range.

The table shown that my school has no dumping site within the school environment with a mean of 2.7. This was followed by the mean 2.8 which stated that my school does not have enough dumping site for solid waste. Thirdly, there are no steady dumping site, instead solid wastes are disposed indiscriminately and however, the least mean score value of 2.7 was associated with a view that establishment of a recycling center in our school environment will solve the problem of solid waste management while the respondents in item 2 with a mean score of 2.0 rejected that my school has incinerator within the school environment. And also the respondents in item 3 with a mean score of 1.9 rejected that my school has people, who are in-charge of collection and sorting of waste for recycling.

Table 10. Methods of Solid Waste Management in A.I.F.U.E

S/No	Questionnaire Items	SA (4)	A (3)	D (2)	SD (1)	∑FX	X	Decision
1	My school has dumping site within the school environment	66 (264)	90 (270)	47 (94)	29 (29)	232 657	2.8	Accept
2.	My school has incinerator within the school environment	21 (84)	69 (207)	107 (214)	36 (36)	232 434	1.9	Reject
3.	My school has people, who are in-charge of collection and sorting of waste for recycling.	11 (44)	60 (180)	36 (72)	125 (125)	232 421	1.8	Reject
4.	Establishment of a recycling center in our school environment will solve the problem of solid waste management.	72 (288)	120 (360)	35 (70)	5 (5)	232 718	3.1	Accept
5.	My school does not have enough dumping site for solid waste.	60 (240)	108 (324)	48 (96)	16 (16)	232 676	2.9	Accept
6.	There are no steady dumping site, instead solid waste are deposited indiscriminately.	27 (108)	49 (17)	90 (180)	66 (66)	232 371	1.6	Reject
	Grand mean						**2.4**	

Source: Author's Field Survey 2025.

The table shows that, establishment of waste recycling centres in our school environment will solve the problem of waste management is supported with a very high mean score of 3.1. This was followed by a mean score of 2.8 where the respondents admitted that my school has dumping site within the school environment. Furthermore as shown in table that my school does not have enough dumping site for solid waste within a mean score of 2.9 rejected that my school has incinerator within the school environment and also the respondents in item 3 with a mean score of 1.8 rejected that my school has people in charge of collection and sorting of waste for recycling. The

respondents in item 6 with a mean score of 1.6 rejected that there are no steady dumping site, instead solid waste are deposited indiscriminately.

The analysis from the method of waste management on the two tertiary institution, IMSU has a dumping site within the school environment, which is not enough and there is no steady dumping site, instead solid waste are deposited indiscriminately, but the establishment of recycling center will help to solve the problem of solid waste management, while in A.I.F.U.E, there is a dumping site within the school environment which is not enough and the establishment of a recycling center in the school environment will help to solve the problem of solid waste management.

Research Question 4: What are the effects of poor management of land pollution (solid waste) on the students and academic environment?

Table 11. Effects of Poor Management of land pollution (solid waste) on the students and academic environment in IMSU

S/No	Questionnaire Items	SA (4)	A (3)	D (2)	SD (1)	∑FX	X	Decision
1	Poor management of waste affects the learning environment.	312 (1248)	420 (1260)	300 (600)	169 (169)	1201 3277	2.7	Accept
2.	Poor management of waste affects the health of the students.	328 (1321)	500 (1500)	200 (400)	169 (169)	1201 3390	2.8	Accept
3.	Poor management of waste can lead to mortality of students as a result of contact with unhygienic substance.	400 (1600)	300 (900)	400 (800)	101 (101)	1201 3401	2.8	Accept
4.	Poor management of solid waste hinders teaching and learning because of the offensive odour coming from such.	800 (2000)	400 (1200)	199 (398)	102 (102)	1201 3700	3.1	Accept
5.	Poor management of solid waste defaces our school environment.	380 (1520)	490 (1470)	300 (600)	31 (31)	1201 3621	3.0	Accept
6.	Poor management of solid waste in our institution will lower the image of the school.	490 (1960)	500 (1500)	200 (400)	11 (11)	1201 3871	3.2	Accept
	Grand mean						**3.0**	

Source: Author's Field Survey 2025.

From the above, the descriptive assessment of data using mean score revealed that poor management of waste affect the learning environment with a mean score 2.7. This was followed by poor management of waste affect the health of the students as indicated by a mean score 2.8. Furthermore, as indicated in the table, the poor management of solid waste in our institution will lower the image of the school with a mean of 3.2. The fourth method as shown on the table is poor management of waste can lead to mortality of student as a result of contact with bacteria and vectors from unhygienic substance with a mean score 2.8, mean score of 3.1 was associated with a view that poor management of solid waste hinder teaching and learning, because of the offensive odour coming from such. This descriptive analysis using mean score reveals that the six item variable were valid for the study and was accepted by the respondents.

Table 12. Effects of Poor Management of land pollution (solid waste) on the students and academic environment in A.I.F.U.E

S/No	Questionnaire Items	SA (4)	A (3)	D (2)	SD (1)	∑FX	X	Decision
1	Poor management of waste affects the learning environment.	114 (456)	66 (198)	28 (56)	24 (24)	232 734	3.2	Accept
2.	Poor management of waste affects the health of the students.	132 (528)	29 (87)	41 (82)	30 (30)	232 730	3.1	Accept
3.	Poor management of waste can lead to mortality of students as a result of contact with unhygienic substance.	71 (284)	102 (360)	53 (106)	6 (6)	232 763	3.3	Accept
4.	Poor management of solid waste hinders teaching and learning because of the offensive odour coming from such.	72 (288)	96 (288)	61 (122)	3 (3)	232 700	3.0	Accept
5.	Poor management of solid waste deface our school environment.	42 (168)	95 (285)	65 (130)	30 (30)	232 673	2.9	Accept
6.	Poor management of solid waste in our institution will lower the image of the school.	266 (264)	95 (285)	63 (106)	18 (18)	232 673	2.9	Accept
	Grand mean						**3.1**	

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Source: Author's Field Survey 2025.

From the above, the descriptive assessment of the data reveals that poor management of waste can lead to mortality of students as a result of contact with bacteria and vectors from unhygienic substance with a mean score of 3.3 followed by poor management of waste affect the health of students with a mean score of 3.1. Furthermore as indicated in the above table, the poor management of solid waste hinder teaching and learning, because of the offensive odour coming from such with a mean score of 3.0, the fifth effect as shown on the table is poor management of the solid waste hinder teaching and learning, because of the offensive odour coming from such with a mean score of 3.2. The least mean score is 2.9 which is associated with a view that poor management of solid waste in our institutions will lower the image of the school.

Based on the table, the responses to research question 4 show that; poor management of solid waste affects the learning environment.

The health of the students can lead to mortality of students as a result of contact with bacteria and vectors from unhygienic substance, hinder teaching and learning deface our school environment and also lower the image of the school.

Research Question 5: What are the achievable methods of managing solid waste in tertiary institutions in Owerri Municipality?

Table 13. Achievable methods of managing solid waste in IMSU

S/No	Questionnaire Items	SA (4)	A (3)	D (2)	SD (1)	∑FX	X	Decision
1	Public enlightenment in the danger of improper disposal of solid waste will encourage clean environment.	380 (1520)	420 (1260)	2o1 (402)	200 (200)	1201 3382	2.8	Accept
2.	Provision of refuse bins at strategic points will reduce improper solid waste disposal.	430 (1720)	500 (1500)	100 (200)	171 (171)	1201 3591	3.0	Accept
3.	Activities of student sanitation officer will help check students against improper solid waste.	600 (2400)	300 (900)	200 (400)	101 (101)	1201 3801	3.2	Accept
4.	Holding/organizing of environmental friendless talks, twice in a session will help re-orient students poor waste management, both at department level and at college level.	700 (2800)	400 (1200)	101 (202)	0 0	1201 4201	3.5	Accept
5.	A motivation award to school/facilities with the neatest environment will improve management of wastes in school.	600 (2400)	300 (900)	200 (400)	101 101	1201 3801	3.2	Accept
6.	There should be a very strong institution regulation against improper management of wastes among students with a penalty attached for defaulters will help solve the problem of poor management of solid waste.	400 (1600)	500 (1500)	300 (600)	1 (1)	1201 3701	3.1	Accept
	Grand mean						**3.1**	

Source: Author's Field Survey 2025.

From the table, it was observed that items 1-6 had a unity high mean score that ranges between 2.8-3.5 respectively, which gave a grand mean (x) of 3.1, which is greater than the acceptable mean. As shown on the table, the descriptive assessment revealed that public enlightenment on the danger of improper disposal of solid waste will encourage clean environment with a mean score of 2.8 and also a motivation award to school facilities with the neatest environment will improve management of waste in school with a mean score of 3.2. This was followed by activities of student sanitation officer will help check students against improper solid waste disposal with a mean score of 3.2 and there should be a very strong institution regulation against improper management of wastes among students with a penalty attached for defaulters will help solve the problem of poor management of solid waste with a mean score of 3.1. This was followed by provision of refuse bins of strategic points will reduce improper solid waste disposal with a mean score of 3.0. The mean score 3.5

which is associated with a view that holding/organizing of environment friendless talk twice on a session will help re-orient students for poor waste management both a department level, faculty level/ school level and at the college level.

Table 14. Table showing mean rating of respondents on achievable methods of managing solid waste in A.I.F.U.E

S/No	Questionnaire Items	SA (4)	A (3)	D (2)	SD (1)	∑FX	X	Decision
1	Public enlightenment in the danger of improper disposal of solid waste will encourage clean environment.	125 (500)	65 (195)	30 (30)	12 (12)	232 737	3.2	Accept
2.	Provision of refuse bins at strategic points will reduce improper solid waste disposal.	143 (572)	65 (195)	18 (36)	6 (6)	232 809	3.5	Accept
3.	Activities of students sanitation officer will help check students against improper solid waste.	65 (260)	107 (321)	42 (84)	18 (18)	232 683	2.9	Accept
4.	Holding/organizing of environmental friendless talks, twice in a session will help re-orient students poor waste management, both at department level and at college level.	59 (236)	125 (375)	24 (48)	24 (24)	232 683	2.9	Accept
5.	A motivation award to school/faculties with the neatest environment will improve management of wastes in school.	65 (260)	95 (285)	30 (60)	42 (42)	232 647	2.8	Accept
6.	There should be a very strong institution regulation against improper management of wastes among students with a penalty attached for defaulters will help solve the problem of poor management of solid waste.	65 (260)	125 (375)	30 (60)	12 (12)	232 707	3.0	Accept
	Grand mean						**3.1**	

Source: Author's Field Survey 2025.

From the table, it is observed that items 1-6 had mean score range from 2.8 to 3.5 respectively which is greater than acceptable mean of 2.5. As shown on the table, the descriptive assessment reveals that provision of refuse bins at strategic points will reduced improper solid waste disposal with a mean score of 3.5. This was followed by public enlightenment on the dangers of improper disposal of solid waste will encourage clean environment with a mean of 3.2. Furthermore, as indicated on the table that activities of student sanitation officer will help check students against improper solid waste disposal. Holding/organizing of environment friendless talk, twice in a session will help re-orient students poor solid waste management both at department level, faculty level and at the university level with a mean of 2.9. This was followed by there should be a very strong institution regulation against improper management of solid waste among students with a penalty attached for defaulters will help solve the problem of poor management of solid waste with a mean 3.0, the least mean is 2.8 which is associated with a view of a motivation award to faculties with the neatest environment will improve management of wastes in school.

Based on the table, the responses to reach question five (5) showed that public enlightenment on the danger of improper disposal of solid waste will encourage clean environment. Provision of refuse bins at strategic points will reduce improper solid waste disposal, activities of student sanitation officer will help check students against improper solid waste disposal. Holding/organizing of environmental friendless talks, twice on a session will help re-orient students poor waste management, both at department level, faculty/school level and at the college level, and also a motivation award to school faculties with the neatest environment will improve management of waste in school and lastly there should be a very strong institution regulation against improper management of waste among students with a penalty attached for defaulters will help solve the problem of poor management of solid waste.

V. DISCUSSION, CONCLUSION, RECOMMENDATIONS AND SUMMARY

In this chapter, the following heading are covered; discussion of the results, conclusion, recommendations and summary. The result presented in chapter four are presented and discussed.

A. DISCUSSION OF FINDINGS

The discussion of the results were presented in line with the research questions.

Research question one was to evaluate the causes of poor management of solid waste in tertiary institutions within Owerri Municipal Council are high population growth, students negative attitude, non challant attitude of the hostel warden on students, lack of adequate and appropriate orientation by university management, non-existence of environmental athletic and rulers are the causes of poor management of solid wastes. Therefore, these factors have led to the numerous problems on campus which are traumatizing and frustrating the students in general.

This finding is contrary to the view of Nathanson (2019) who see pollution as the deposition of solid or liquid waste materials on land or underground in a manner that can contaminate the solid and ground water, threaten public health and causes of insight conditions and nuisances.

In assessing the state of waste management in tertiary institution based on research question two, it was observed that most students respond to these concepts negatively: that the school environment is not in away very clean and wastes are not properly handled or managed, waste are seen defacing the school environment, students, staff do not face disciplinary panel for littering the campus, and also environmentalists charged with the responsibility of maintaining the campus environment fail on their duties. This is due to lack of orientation and awareness on poor management of solid waste by the school authorities.

Research question three sought to find out the methods of waste management in tertiary institution within Owerri Municipal. The result of the finding on the table with the mean score of 2.5 and 2.4 reveals that, there is a dumping site within the school environment, which is not enough but the establishment of a recycling center in the school environment will solve the problem of solid waste management. Recycling is a resource recovery practice that deal with collection of refuse of waste such as empty beverage container. The material from which the items were made can be reprocessed into new product. Materials for recycling may be collected separately from general waste using dedicated bins and collection.

Research question four provide basis to determine how poor management of solid waste have affected the students and school environment. From the table, the result of the finding has a mean of 3.0 and 3.1 which revealed that poor management of solid waste has affected the students and he school environment in different ways; such as affecting the environment, the health of the students, lead to mortality of students as a result of contact with unhygienic substance, hindering teaching and learning, the deface of the school environment and lower the image of the school.

This finding is contrary to the view of Enwereuzor (2019) who stated the general effects of solid waste on the environment, such as health effects, aesthetic effects, flooding and population.

Research question five focused on the achievable methods of managing solid wastes to entrance the sanitary and aesthetic quality of our environment. In order to promote healthy living and these workable methods, includes public enlightenment on the danger of improper disposal of solid wastes, provision of refuse bins at strategic points, activities of students sanitation officer will help check students against improper waste disposal, holding and organizing of environmental friendliness talks, twice in a session, a motivational award to university faculties with the neatest environment and also a very strong institution regulation against improper management of waste among students with a penalty attached for defaulters will help solve the problem of poor management of solid waste.

The environment is a very important resource for learning, by this, it means that the environment should be studied with the view of ascertaining how it can be protected from unwanted destruction through pollution of all sorts by anthropogenic and natural forces. In this way, man can learn on how to preserve and protect the environment for posterity, this is in line with Ume (2002) who asserted that;

- Environment is the basis of all life and therefore deserves proper care and management.
- The environment is a part of our cultural heritages which should be handed down to posterity.
- There is need to enhance the sanitary and aesthetic quality of our environment in order to promote healthy living.

B. CONCLUSION

Based on the finding, the following conclusions were drawn.

1) The main causes of poor management of solid waste on tertiary institutions within Owerri Municipal Council are; high population growth, students negative attitudes, lack of adequate and appropriate orientation by university management on nurturing of the school environment, non-existence of environment athletic or rules etc.
2) The state of solid waste management on our tertiary institution is very poor due to solid waste are seen defacing our school environment, waste are not properly handled or managed, students/staff do not face disciplinary panel for

littering the campus with refuse, contractors charged with the responsibility of maintaining the campus environment sometimes fail on their duties.

3) The methods of solid waste management on our tertiary institution is very poor due to the dumping site provided is not enough, there is no steady dumping site, instead solid waste are disposed indiscriminately, the school do have people who are in-charge of collection and sorting of solid waste for recycling but do not take their duties serious, there is no incinerator within the school environment.
4) Poor management of solid waste affect the learning environment, health of the students, hinder teaching and learning, deface the university environment and lower the image of the school, sometime lead to mortality of students as a result of contact with unhygienic substances.
5) Achievable methods of managing land pollution (solid waste) in our institutions are; public enlightenment on the danger of improper disposal of solid wastes, provision of refuse bin at strategic points, activities of student sanitation officer will help check students against improper solid waste disposal, holding/organizing of environmental friendliness talks twice on a session, a motivational awards to school faculties with the neatest environment, there should be a very strong institution regulation against improper management of waste among students with a penalty attached for defaulters.

C. RECOMMENDATIONS

Having examined the improper solid waste management in tertiary institutions within Owerri Municipal Council, the researcher deemed it necessary to make certain recommendations based on his findings which are considered worthwhile and relevant for improvement.

1) School authorities should set rules and regulations against improper management of solid waste among students and staff.
2) School authorities should hold and organize environmental friendliness talks, twice in a session; it will help re-orient students poor solid waste management.
3) There should be enlightenment on the danger of improper disposal of solid waste, this will encourage clean environment.
4) The school authorities should provide refuse bins at strategic points, this will help reduce improper solid wastes disposal.
5) The school authority should give award to school/faculty with the neatest environment, it will improve management of solid wastes on the school.
6) Students and staff should face disciplinary panel for littering the campus with refuse.

D. EDUCATIONAL IMPLICATIONS

Based on the findings of this study, the following educational implications were deduced.

1) The need and importance of the environment should be a part of school curriculum at all level in order for students to know the general effects of environment.
2) Improving a healthy environment for conducive teaching and learning, it is important to know that, the environment is an important resource for learning.
3) "Cleanliness is next to Godliness" which refers to the idea that people have a moral duty to keep themselves and their home clean. The same is applicable to the environment, that everyone have a moral duty in keeping the environment clean.

E. LIMITATION OF THE STUDY

The following limitation can be attributed to the study.

1) Lack of finance which would have helped the researcher to have further acquisition of qualitative pieces of information for the work.
2) Difficulty in getting the attention of the respondents to fill the questionnaire due to their tight schedules.

F. SUGGESTION FOR FURTHER STUDIES

The researcher suggests that research should be carried out in all the local government area to ensure proper management of the environment.

G. SUMMARY OF THE STUDY

The main aim of this study was to compare the solid waste management in tertiary institutions within Owerri Municipal Council. The researcher started by giving a brief introduction about the environment and how it can be affected. After chapter one, chapter two dealt with the literature review of related works. Here, definitions of different authors of some concepts were identified, the causes, effects and methods of solid waste management was also discussed. Different theories were used such as theory of pollution policy, and theory of reconstruction were used on explaining improper solid waste management within Owerri Municipality.

Chapter three was based on research methodology. The research methodology showed sampling technique was used as the sample technique, questionnaire were administered to students both in AIFUE and IMSU as the instrument for data collection

and was validated by project supervisor and the researcher adopted the mean score as the method of data analysis.

In chapter four, from the analysis and interpretation, a lot of findings were made in the course of the research which include the causes of poor solid waste management in tertiary institutions within Owerri Municipal, methods of managing solid waste in the institutions, the effects of poor management of land pollution (solid waste) and achievable methods of managing solid waste on tertiary institutions within Owerri Municipal Council. Improper solid waste management remains a major issue on the environment because it poses threat on the school environment and the health of the students and staff. Thus the school authorities should look into the possible solution for a healthy environment.

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