

## **Waste Management and Environmental Sustainability in Uyo Capital City, Akwa Ibom State, Nigeria**

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### **Abstract**

*The study focused on waste management and environmental sustainability in Uyo, the capital city of Akwa Ibom State. To achieve this objective, two hypotheses were formulated using waste recycling and waste landfill as variables of waste management. This study relied on Ecological Modernization Theory (EMT) as the theoretical framework. The survey research design was used and the study population was 1,457,020. 400 respondents were chosen as sample size using Taro Yamane's sample size determination technique. Data analysis was done using simple linear regression analysis. The findings revealed that waste management practices significantly influence environmental sustainability in Uyo Capital City. Specifically, the findings revealed that waste recycling and landfill practices have significant effect on environmental sustainability in Uyo Capital City. Based on the findings, it was recommended that Akwa Ibom State Government should ensure that waste recycling is incorporated into the Akwa Ibom State Environmental Protection and Waste Management Agency (AKSEPWMA) frameworks, with periodic reviews to support its adoption as part of sustainable development goal. Also, the environmental regulatory agencies such as Akwa Ibom State Environmental Protection and Waste Management Agency (AKSEPWMA) and the Akwa Ibom State Ministry of Environment should strengthen monitoring and enforcement mechanisms to ensure all waste landfill comply with national and international environmental standards.*

**Keywords:** Waste management, environmental sustainability, waste recycling, waste landfill and Environmental Protection.

## **Introduction**

The role of the government all over the world involves the protection and security of lives and properties, while also ensuring the equitable distribution of the government's resources for development. The process of protecting lives and properties, as well as the distribution of resources, cannot be attained without the creation of a safe and healthy environment, which is beneficial to individual citizens and the government, while working to ensure socio-economic stability within its clime (Amadi, 2020). Tuyahabwe et al. (2022) noted that one of these functions is waste management, which is particularly aimed at reducing the number of unusable materials by destroying, discarding, processing, recycling, and reusing to avert potential health and environmental hazards in the environment.

Waste management is necessary due to the increase in the global population, which has led to a geometric demand for food, water, clothing, and other resources, resulting in a greater volume of waste generated. The increase in the generation of waste has also increased the levels of waste disposed of, which, if not properly managed, could result in environmental hazards; thus, effective waste management systems become a necessity (Ogara, 2022). The population around the world is increasing; as such, protecting public health and the environment becomes a crucial problem (Berkun et al., 2011).

The relationship between sustainable waste management and socio-economic development is embedded in the manner in which the former leads to improvements in the indices of the latter, as it concerns individuals and the government. Sustainable waste management reduces waste and regulates its disposal, thereby preventing the health hazards such waste could pose to the environment through the spread of diseases like cholera, malaria, diarrhoea, etc. (Rajadurai et al., 2021). Igbinomwanhia (2011) posits that waste management means implementing a planned amalgamation of methodologies to efficiently transfer trash from its origin to its final disposal location. Waste management has been recognised as a global problem in numerous countries, especially in developing nations. A correlation exists between accelerated urbanisation, population increase, technological advancements, and the trash production rate in these nations' metropolitan areas (Narayana, 2019).

## **Statement of Problems**

A major environmental problem encountered in major cities is proper waste management. This issue appears much more pronounced in developing countries owing to their inability to formulate policy and the available resources to effectively manage waste. An increase in population coupled with rural-urban migration makes waste management even more difficult, resulting in nuisance and causing damage to the urban environment. The issue of improper waste management has become a global concern, leading to economic loss and environmental threats to health and human existence.

In Akwa Ibom State, formal waste management is conspicuous in the Uyo Capital City through the activities of the Akwa Ibom State Environmental Protection and Waste Management Agency (AKSEPWMA), which was reformed and revived in 2018 and charged with the responsibility of maintaining a clean and safe environment in the State. However, it is observed

that waste management in the metropolis takes the form of waste collection, transfer and disposal, with aspects of sustainable waste management like recycling, incineration and landfill, which basically involves collecting mixed materials and thereafter dumping them at dumpsites.

Sadly, it is observed that in recent years, Uyo has witnessed environmental waste management problems due to increased emissions, indiscriminate exploration, and industrial pollution. If left unchecked, this could lead to environmental degradation, a lack of clean water, and poor environmental sanitation. It is assumed that Waste management in the Uyo Capital City has not attained its full potential due to a lack of transparency from government agencies in monitoring and regulating the level and rate of waste disposal, especially as measures of environmental sustainability. Therefore, this study is undertaken to examine the effect of waste management on environmental sustainability in Uyo, the capital city of Akwa Ibom State, Nigeria.

### **Research Objective**

The general objective of this study is waste management and environmental sustainability in Uyo Capital City, Akwa Ibom State.

The specific objectives of the study include:

- i. To investigate the relationship between recycling and environmental sustainability in Uyo Capital City, Akwa Ibom State
- ii. To examine the relationship between landfills and environmental sustainability in Uyo Capital City, Akwa Ibom State.

### **Research Hypothesis**

The following hypotheses were formulated to guide this study:

- i. **H<sub>01</sub>**: There is no significant relationship between recycling and environmental sustainability in Uyo Capital City, Akwa Ibom State
- ii. **H<sub>02</sub>**: There is no significant relationship between landfill and environmental sustainability in Uyo Capital City, Akwa Ibom State

### **Conceptual Explanation**

#### **Waste Management**

Waste management involves the collection, transportation, processing, recycling or disposal, and monitoring of waste materials (Ding, 2021). Waste management is intended to reduce the adverse effects of waste on human health, the environment, planetary resources and aesthetics (Gollakota et al., 2020). Waste management is an organised way of monitoring waste, energy, and other consumption that aims to transfer the tax burden on waste users as an incentive to increase further efficiency, green investments (Udo et al., 2025), and innovations in the consumption field (Todorovic, 2019). Waste management is based on the collection, transportation, disposal, handling, and monitoring of waste materials to facilitate the cleanliness of our environment (Spangenberg, 2015).

Adewole (2019) viewed waste management as the collection, keeping, treatment, disposal, and recycling of waste in such a way as to render it harmless to human, animal, and ecological life.

According to Udobia & Akpan (2023), waste management is generally viewed as the integrated process involving the collection, transportation, processing, recycling or disposal, managing, and monitoring of waste materials, to reduce the effect of such on the health of individuals, the environment or aesthetics, or for the recovery of essential resources. According to the United Nations Environmental Programme (2015), waste management is not only concerned with the collection, segregation, transportation and labelling, treatment, and disposal of wastes, but also the practical supervision of how wastes are produced through policies and regulations. Hence, waste management is the total supervision of waste production, handling, processing, storage, and transportation from its point of generation to its final acceptable disposal. However, this definition missed out on the benefit of waste management to man and the immediate environment. Consequently, a more acceptable definition is provided by the United Nations Statistics Division (2016). According to the unit, waste management is not only limited to the practical or operational processes of managing waste, but also the processes involving the promulgation, implementation, and supervision of waste-related laws/policies, as well as the technological and economic mechanisms which guide the waste management process.

### **Environmental Sustainability**

Environmental sustainability is the ability to maintain an ecological balance in our planet's natural environment and conserve natural resources to support the well-being of current and future generations (Ekins & Zenghelis, 2021). Environmental sustainability aims at reducing the negative impact of human industrial activities on the environment in order to safeguard the planet. Environmental sustainability is about ecological balance and stability in order to ensure quality of life for both humans, animals and plant species altogether (Muisyo et al., 2022). This is because for nearly two millennia, humans have carbonised the planet, which has contributed to global climate change.

Igbinomwanhia (2011) stated that it is undeniable that human actions have impacted the planet, resulting in the warming of the atmosphere, ocean, and land. Thus, the negative impacts of climate change require governments, organisations, and individuals to promote environmental sustainability and to protect our global ecosystems for the sake of future generations (Atakpa & Udoms, 2019). Environmental dimensions became a central point of the concept of sustainable development. People became more and more aware of environmental pollution around the 1960s and 1970s, which led to discussions of sustainability and sustainable development, including the natural and the human environment. Thus, the reduction of these negative impacts on the environment became the key basis of environmental sustainability (Ekins & Zenghelis, 2021).

Environmental sustainability is the responsibility to conserve natural resources and protect global ecosystems to support health and wellbeing, now and in the future (Atairet & Mboho, 2019). Ekpenyong et al. (2020) define it as "meeting today's needs without compromising the ability of future generations to meet their needs". Environmental sustainability becomes important for the well-being of current and future generations as climate change presents a variety of complex environmental, social, and economic challenges for countries across the globe, ranging from rising

global temperatures and more extreme droughts to strengthening tropical storms, destructive wildfires, and devastating floods (United Nations 2015).

### **Waste Recycling**

Recycling is a resource recovery practice that refers to the collection and reuse of waste materials, such as empty beverage containers. These containers can be plastic or aluminium (Walker, 2018). However, this process involves breaking down and reusing materials that would otherwise be gotten rid of as waste or trash. Recycling is the process of separating secondary materials that can be reused. This process significantly reduces uncontrolled waste disposal and creates job opportunities (Fält & Gunnarsson, 2020). Waste recycling is the organised collection, classification, and treatment of waste materials (Peter et al., 2023). Waste recycling is the most environmentally friendly waste management method in Nigeria.

The recycling process converts and transforms waste and discarded materials into new objects and materials for further use. Hence, it becomes a good alternative to any “conventional” nature of disposal, and can help reduce emissions of greenhouse gases, as related to plastic production, for instance. The procedure in recycling can avoid the waste going to the landfill, which has the potential to be a useful product or material, and that reduces the fresh raw material consumption, thereby reducing further usage of energy, air pollution due to incineration, and air and water pollution. Hence, the Recycling process has become a crucial waste reduction component of the modern era and the third factor of the waste hierarchy, “Reduce, Reuse, and Recycle” (Aatamila et al., 2010).

### **Waste Landfill**

A landfill can be denoted as the physical facilities or places where solid waste and waste residuals are dumped, usually in a controlled and studied way (Zabaleta, 2018). Landfill is as old as mankind, and landfill seems to be the most common and popular waste management choice. It is the conventional waste disposal method that takes the centre-stage in waste management in many developed countries and is still popular in developing countries. This may be due to its relative ease of operation with fewer technicalities. In many respects, land filling has been highly criticised and is being regarded as the opposite of sustainability, apparently because of the health hazard and environmental burden it constitutes (Ettler et al., 2018).

A landfill occurs when a large area of land is specifically designed to receive waste. Landfill sites used to dispose of unwanted items also pollute the air, water, and land (Agbo, 2023). The appropriateness of the landfill's location, operational effectiveness, economic viability, environmental impact, future sustainability, and community acceptance are all important elements that affect its performance (Amadi, 2020).

### **Waste Recycling and Environmental Sustainability**

Waste recycling has a significant positive impact on environmental sustainability by conserving natural resources, reducing pollution, and mitigating climate change (Agbo, 2023). Recycling reduces the need for extracting virgin materials, lowers energy consumption in manufacturing, and

minimises waste sent to landfills, which helps to protect ecosystems, biodiversity, and human health. Recycling reduces the demand for raw materials like timber, minerals, and fossil fuels, which are often obtained through environmentally damaging processes like deforestation and mining. By reusing materials, we lessen the need for resource extraction, protecting ecosystems and reducing habitat destruction.

In some communities in recent times, the owner of the waste is required to separate the materials into different bins; such waste can include paper, plastics, metals, and other materials prior to its collection. In other communities, all recyclable materials are placed in a single bin for collection, and the sorting is handled later at a central facility (Ehugbo & Nnabuife, 2024). The latter method is known as "single-stream recycling. The most common consumer products recycled include aluminium, such as beverage cans, copper, such as wire, steel from food and aerosol cans, old steel furnishings or equipment, rubber tyres, polyethene and pet bottles, glass bottles and jars, paperboard cartons, newspapers, magazines and light paper, and corrugated fiberboard boxes (Vaverková, 2019).

However, Mol et al. (2014) noted that certain variation in acceptance is reflected in the resale value of the material once it is reprocessed. Some of the types of recycling include waste paper and cardboard, plastic recycling, metal recycling, electronic devices, wood recycling, glass recycling, cloth and textile and so many more. According to Kjeldsen et al. (2022) due to the relevance of recycling on the economy of a nation, in July 2017, the Chinese government announced an import ban of 24 categories of recyclables and solid waste, including plastic, textiles and mixed paper, placing a tremendous impact on developed countries globally, which exported directly or indirectly to China.

### **Waste Landfill and Environmental Sustainability**

Kjeldsen et al. (2022) noted that Landfills, which are a common waste disposal method, significantly impact environmental sustainability by contributing to greenhouse gas emissions, water and soil contamination, and land degradation. Improperly managed landfills can lead to air and water pollution, impacting human health and ecosystems. Decomposing organic waste in landfills produces methane, a potent greenhouse gas that contributes to climate change. Landfill gas also contains carbon dioxide (Oyebode, 2024).

Solid waste landfilling is a significant source of greenhouse gas emissions, primarily methane (CH<sub>4</sub>) and carbon dioxide (CO<sub>2</sub>), which contribute to climate change. The anaerobic decomposition of organic matter in landfills produces methane, a potent greenhouse gas with a global warming potential (GWP) approximately 28-36 times that of CO<sub>2</sub> over 100 years (Agbo, 2023). According to the United States Environmental Protection Agency (EPA) (2022), landfills are the third-largest source of methane emissions in the United States, contributing about 15.1% of total methane emissions in 2020. The amount of methane generated by a landfill depends on several factors, including the quantity and composition of waste, the landfill design and management practices, and climatic conditions.

According to Osazee & Gupta (2021), landfills can be put to sustainable use by employing them to produce energy from waste whenever it is feasible, and it has the capacity to generate revenue. Furthermore, many advanced waste treatment technologies have been developed, which

received commendable attention in developed countries and are evolving in developing countries. Landfill gas-to-energy is viable economically and appropriate for the control of methane emissions and effective management of time, costs and quality with minimum risks to humans and the environment.

### **Theoretical Framework**

This study relied on Ecological Modernisation Theory (EMT). The Ecological Modernisation Theory (EMT) is not attributed to a single individual, but rather propounded by a group of scholars, notably Huber (1982), Mol & Spaargaren (1990). Ecological Modernisation Theory (EMT) posits that economic development and environmental sustainability are not mutually exclusive but can be mutually reinforced through the adoption of cleaner and more efficient technologies. Accordingly, Ecological Modernisation Theory (EMT) proposes that environmental problems can be addressed through economic growth, technological innovation, and institutional reforms, rather than solely through restrictions on economic activity or radical societal changes. It suggests that businesses and governments can work together to develop and implement environmentally friendly technologies and practices while maintaining economic prosperity (Mol et al., 2014).

The main concern of this theory is to make a good dwelling and working environment for people. Ecological modernisation is a school of thought that argues that both the government and the citizens can work together to protect the environment. It has gained increasing attention among scholars and policymakers internationally in the last several decades. It is an analytical approach as well as a policy strategy and environmental discourse. Ecological modernisation theory (EMT) represents the view that environmental problems can be solved through business innovation and government mandates aimed primarily at green technological improvements (Bullard, 1993).

As part of its relevance to the study, Ecological Modernisation Theory provides a strong theoretical lens for analysing the adoption of appropriate waste management methods as a modernisation strategy in achieving a sustainable environment. It supports the idea that investment in clean green house energy, emission control devices, and waste-to-energy facilities can transform waste management from a pollutant source to a sustainability solution. Ecological Modernisation Theory also encourages collaboration among stakeholders such as government, industry, and civil society in order to promote green technologies in their regions.

### **Empirical Review**

Umoh et al. (2024) investigated waste management agency practices in Uyo Metropolis. A total of 100 households from the (5) major roads in Uyo capital city were selected for the study using a purposive sampling procedure. Findings from the study revealed that common waste disposal practices in Uyo, the capital city, included drive-and-throw, burning, and littering, and that very few took their waste to public disposal facilities in their vicinity. Some of the respondents kept their personal waste bins in their homes/shops in the study area, but it took them a week or more to dispose of the refuse, despite the volume. It was recommended that officers of the Akwa Ibom State Environmental Protection and Waste Agency (AKEPWMA) which is responsible for waste collection and evacuation in Uyo, should make it mandatory for every household in Uyo capital

city to have at least one waste bin or basket in their houses as a way of preventing littering of wastes that could block drainages which may likely lead to flooding in the city.

Etah & Ipuole (2024) studied the effects of waste recycling in preserving the environment. This research provided an overview of the effects of recycling on the environment. Recycling eliminates the need to build an equivalent of one large landfill in the city or rural location, thus avoiding environmental concerns such as land, air and water pollution. In conclusion, therefore, the government should not only conceive waste management as a means of delivery service but as a war against poverty, poor living in the environment and bio-electricity generation (clean energy). It was also recommended that solid waste activity in the informal sector should be transformed into a more formal sector, which will bring about better organisation of the sector, hence making it more attractive, thus paving the way for job opportunities for both skilled and unskilled workers, amongst others.

Ehugbo & Nnabuife (2024) investigated the impact of waste management on corporate sustainability: a case study of Nigerian Breweries Plc. The study focused on waste management's effect on Nigerian Breweries Plc's corporate sustainability in Enugu State, Nigeria. Specifically, the study examined the impact of waste recycling and landfills on economic sustainability. The study adopted a survey research design. The population comprised the top management cadre (176) and the human resource department (22). Stratified and convenience sampling techniques and Taro Yamane's formula were used to determine the sample size at 132. With the aid of SPSS IBM version 25, multiple regression was used to test the hypotheses. Results obtained from the test of the formulated hypotheses revealed that waste recycling positively affected the economic sustainability of Nigerian Breweries Plc ( $P < 0.05$ ;  $t = 3.198$ ). The study's findings also showed that landfills positively impacted the economic sustainability of Nigerian Breweries Plc. ( $P < 0.05$ ;  $t = 3.851$ ). The study concluded that organic and inorganic waste management is strategically necessary for corporate sustainability. Waste recycling was recommended to ensure corporate sustainability, thereby reducing production costs and improving profitability.

Vaverková (2019) conducted a study on the impact assessment of the municipal solid landfill on the environment. The main purpose of the study was to analyse the influence of landfills on the environment. The research was focused on the assessment of the toxicity of leachates and soils in the managed municipal solid waste landfill in Těmice (the Czech Republic). Research results showed the soil collected from the active landfill body exhibited higher toxicity as compared with the samples taken from the outside of waste storage activities. Leachates from the landfill exhibited phytotoxic effects, and that is why they had to be considered and handled as wastewater.

Odunze & Nwikpo (2019) assessed the impact of recycling in Obio-Akpor Local Government Area. Through literature review and participant observation, a qualitative approach was used in data collection and stratified random sampling was used to select respondents. Random sampling was used to administer 203 questionnaires to the masses; descriptive statistic was used to analyse the impact and benefit of recycling. The result indicated that recycling has a significant impact on environmental sustainability in Obio-Akpor in Rivers State; therefore, there is an urgent need to educate the masses about mitigation strategies for sustainable development, such as waste

recycling, reducing, and reusing materials to ensure that the environment is cleaner, healthier and a greener place to live. These strategies will help to guarantee a sustainable future where the economy can thrive, and good health is fostered across every border.

### **Methods of Waste Management in Uyo Capital City, Akwa Ibom State, Nigeria**

Akwa Ibom State, which is one of the Niger Delta States in Nigeria, has emerged as the cleanest state in Nigeria for five (5) consecutive years from 2018-2022. This has been attributed to the activities of the Akwa Ibom State Environmental Protection and Waste Management Agency (AKSEPWMA), which was reformed and revitalised in 2018 under the leadership of its current Chairman, Dr Prince Ikim (Udonquak, 2021). Before the reformation of the agency in 2018, which led to the acquisition of new equipment such as compacting trucks and galvanising receptacles, waste management in the Uyo metropolis was particularly bedevilled by dilapidated waste management equipment and the lackadaisical nature of waste workers. However, since 2018, the reform of the AKSEPWMA changed the trajectory of waste management in the state, which produces over 15,000 tonnes of municipal household waste daily (Udonquak, 2021). This was, however, achieved through the institution of waste management programmes such as the Greater Akwa Ibom Clean-Up Campaign, which was aimed at intensifying public awareness/sensitization towards proper waste management through environmental sanitation and the distribution of over 13,000 waste baskets and receptacles in the state. These practices reduced the exposure of residents to health hazards, eased business activities among SMEs, and attracted tourism as well as infrastructural development in the metropolis. Basically, the Akwa Ibom State Environmental Protection and Waste Management Agency (AKSEPWMA) adopts recycling, landfill and incineration as a method of managing waste in Uyo City. This study limits its scope to only recycling and landfill Methods.

The agency uses recycling as a method of managing waste. Recycling is the collection and reuse of everyday waste materials such as empty beverage containers, papers, plastics, metals, cloths, foods, and bottles. The preparatory stages of recycling are usually carried out by the agency. After the wastes have been collected by the different receptacles spread across the city, the waste trucks evacuate those receptacles and move them to the dumping site. The dumpsite is situated at Uyo village road near the government house, where all wastes in Uyo are dumped. Afterwards, the process of recycling begins.

First, the process of differentiation is carried out. This process involves the segregation of all wastes differently from one another, that is, plastic to plastic, paper to paper, metals to metals, bottles to bottles, etc. (see Appendix 1). After the sorting process is completed, trucks then move the sorted waste to different recycling plants within the city (AKSEPWMA, 2023). However, the recycling of waste in the Uyo metropolis has not received wide attention, as it is coordinated by the informal sector with little or no organisation and regulation from the government. Hence, the informal and uncoordinated way it is executed in the metropolis makes it difficult to determine its contributions to socio-economic development. Though the concentration on waste collection and disposal, and the awareness created has augured well for the metropolis in terms of reducing exposure to health hazards, attracting tourism, and boosting business operations amongst SMEs,

these do not cover what sustainable waste management entails, hence, reducing its contributions to socio-economic development. Aspects of sustainable waste management like recycling, reuse and recovery would result in the preservation of natural resources for future generations, reduction in climate change, and environmental degradation, which are the core of sustainable development (Ekeuwei et al., 2022).

The agency also uses landfills as a method of managing waste in Uyo City. Landfilling has been a dominant waste disposal method, which stems from the comparatively high cost of alternative treatment or disposal alternatives. It refers to the process of dumping solid waste on a site reserved for such purposes. A landfill is the most popular solid waste disposal method used today. Garbage is basically spread out in thin layers, compressed and covered with soil or plastic foam. When the landfill is full, it is covered with layers of sand, clay, topsoil and gravel to prevent seepage of water. The process of incineration is usually carried out by the agency from different locations where the receptacles are positioned across the city. The waste trucks transport these wastes to the dumpsites located on Uyo Village Road after the process of selection has been completed. The unimportant wastes are then landfilled (AKSEPWMA, 2023). In the method of waste management, waste is collected from street-level bins using compactors and trucks, transported, and dumped into designated sites where it is compacted by heavy machinery (Idemokon, 2021). The dumpsite is located at the end of Wellington Bassey Street, near the old stadium, or behind the University of Uyo ( see Appendix 2).

### **Materials and Method**

The research employed a descriptive survey and correlation design. This design enables the researcher to obtain data from the population marked for the study. The main instrument used for this research in collecting data was a well-designed questionnaire. Data for this research were collected from two sources: primary and secondary sources. In analysing the formulated hypotheses, the simple linear regression analyses were used. The population of this study was 1,457,020. This figure represents the urban agglomeration, which includes Uyo capital city, and its surrounding suburban areas (projected population) (National Bureau of Statistics, 2025). The sample size was 400. The sample size was determined using Bill William Godden's (2004) formula for an infinite population.

## Data Presentation and Analysis

The data collected from the respondents were presented and analysed using tables and percentages.

**Table 1: Analysis of Questionnaire Administered**

Number of questionnaires sent out	Questionnaire returned	Questionnaire not returned	Percentage returned	Percentage unreturned
400	251	149	63	37
400	251	149	63	37

**Source:** Field Survey, 2024

Table 1 shows that a total of 400 copies of the questionnaire were administered to respondents in Uyo, Capital City, Akwa Ibom State. From this number, 251 copies were completed properly and returned. The duly completed copies of the 251 copies of the questionnaire represented about 63% response rate, while 149 copies of the questionnaire, representing 37%, were not returned. Therefore, there was 63% compliance. Hence, this analysis will be based on the returned questionnaire.

## Test of Hypotheses

### Hypothesis 1

**H<sub>01</sub>:** There is no significant relationship between recycling and environmental sustainability in Uyo Capital City, Akwa Ibom State

**Table 2:** Regression analysis result on the relationship between recycling and environmental sustainability in Uyo Capital City, Akwa Ibom State

Model	R	R square	Adjusted R-squared	Std. Error of the Estimate
1	.712 <sup>a</sup>	.507	.456	8.27125

  

Goodness of Fit <sup>a</sup>						
Model	Sum of squares	Df	Means Square	F	Sig.	
Regression	2536.224	1	3144.033	12.275	.010 <sup>b</sup>	
Residual	3811.026	249	152.326			
Total	6347.25	250				

  

Coefficients <sup>a</sup>						
Model	Unstandardized Coefficients		Standardized Coefficients		T	Sig.
	B	Std. Error	Beta			
1 (Constant)	1.426	.831			3.032	.104
Waste Recycling	.315	.101	.403		3.119	.001

a. Dependent Variable: Environmental Sustainability

Table 2 presents the results of regression analysis on the relationship between recycling and environmental sustainability in Uyo Capital City, Akwa Ibom State. The generalised model summary showed a  $R^2=0.456$ , which implies that 45.6% of the changes in waste recycling practice influences 45.6% of the sustainable environment in Uyo Capital City. The model also showed a goodness of fit at 95 per cent ( $p$ -value  $< 0.05$ ). Waste recycling practice effect on the environment in Uyo Capital City showed a statistically significant relationship at 95% (also  $p$ -value  $< 0.05$ ).

When considering this result, the null hypothesis, which states that there is no significant relationship between recycling and environmental sustainability in Uyo Capital City, Akwa Ibom State, is rejected. Hence, it can be concluded that waste recycling practices have a significant

relationship on sustainable environment in Uyo Capital City. The implication of this is that waste recycling practices can determine a sustainable environment in Uyo Capital City, Akwa Ibom State.

**H<sub>0</sub>2:** There is no significant relationship between waste landfill and environmental sustainability in Uyo Capital City, Akwa Ibom State

**Table 3:** Regression analysis result on the significant relationship between waste landfill and environmental sustainability in Uyo Capital City, Akwa Ibom State

Model	R	R square	Adjusted R-squared	Std. Error of the Estimate
1	.817 <sup>a</sup>	.667	.664	7.36053

  

Goodness of Fit <sup>a</sup>						
Model	Sum of squares	Df	Means Square	F	Sig.	
Regression	2431.026	1	5337.113	9.635	.000 <sup>b</sup>	
Residual	3801.212	249	138.003			
Total	6232.238	250				

  

Coefficients <sup>a</sup>						
Model	Unstandardized Coefficients		Standardized Coefficients		T	Sig.
	B	Std. Error	Beta			
1 (Constant)	1.307	.236			3.015	.001
Waste Re-use	.471	.209	.488		2.254	.000

a. Dependent Variable: Sustainable Environment

Table 3 shows the result of regression analysis on the significant relationship between waste landfill and environmental sustainability in Uyo Capital City, Akwa Ibom State. The generalised model summary showed an  $R^2$  of 0.664, which implies that 66.4% of waste landfill practice in the state influences 66.4% of the sustainable environment in Uyo Capital City. The model also showed a goodness of fit at 95 per cent ( $p$ -value  $< 0.05$ ). The relationship on the sustainable environment of Uyo Capital City, Akwa Ibom State, showed a statistically significant relationship at 95% (also  $p$ -value  $< 0.05$ ).

In line with this result, the null hypothesis, which stated that there is no significant relationship between landfill and environmental sustainability in Uyo Capital City, Akwa Ibom State, was thus rejected. It can therefore be concluded that the waste landfill practice of Uyo Capital City has a significant relationship on sustainable environment. The implication of this is that waste landfill practices can be used in predicting a sustainable environment in Uyo Capital City, Akwa Ibom State.

### **Discussion of Findings**

This study was conducted to establish the relationship between waste management practice and environmental sustainability in Uyo, the capital city of Akwa Ibom State. Findings of the study indicated two issues of waste management for environmental sustainability, namely, waste recycling practice and waste landfill. The results of the analysis imply that waste management practice effectively influences environmental sustainability in Uyo Capital City, Akwa Ibom State.

Findings from hypothesis one revealed that there exist significance relationship between recycling and environmental sustainability in Uyo Capital City, Akwa Ibom State. This is in agreement with the result from Agwu (2022). He stated that waste recycling has a significant and positive impact on environmental sustainability by conserving natural resources, reducing pollution, and mitigating climate change. Recycling reduces the need for extracting virgin materials, lowers energy consumption in manufacturing, and minimises waste sent to landfills, which helps to protect ecosystems, biodiversity, and human health. Similarly, Odunze & Nwiko's (2019) result indicated that recycling had a significant impact on environmental sustainability in Obio-Akpor in Rivers State.

The research observed that formal waste recycling is minimal, and that instead, limited recycling is undertaken by an informal sector of waste pickers at the main dumpsite. The primary location where recyclable materials are recovered is the main municipal solid waste landfill, historically situated along Uyo-Village Road and now at Ntak Inyang. This indicates a potential for establishing an integrated waste management system focused on composting, recycling, and land reclamation. Also, it was revealed that in Uyo, the capital city of Akwa Ibom State, recycling of municipal solid waste (MSW) is not currently a formalised or well-established practice. While some waste is collected and temporarily stored, there's a lack of an organised framework for recycling and reuse. Some individuals, like scavengers, sort through waste for recyclable materials. This has been a common practice in the metropolis. Waste recycling significantly contributes to a more sustainable environment by reducing landfill waste, conserving natural

resources, and minimising pollution. Recycling also offers socio-economic benefits like job creation and reduced costs associated with waste disposal.

Findings from the second objective revealed that in Uyo, waste is primarily landfilled at a central dumpsite located at Uyo Village Road, a government-reserved area remote from residences. The site is managed by the Akwa Ibom State Environmental Protection and Waste Management Agency (AKSEPWMA). This finding aligns with the result of Ehugbo & Nnabuife (2024), whose study's findings also showed that landfills positively impact the economic sustainability of Nigerian Breweries Plc. Also, Vaverková (2019) conducted a study which showed that a properly managed Landfill significantly influence environmental sustainability.

From our study, the landfill is in operation from 6 AM to 6 PM daily. On a typical business day, the disposal facility closes to waste delivery trucks at 5 PM, and the next hour is used for site-tidying activities. These generated wastes are dumped in publicly provided receptacles. For collection, various types of vehicles such as compactors, tipper trucks, and utility vehicles are used. Specifically, compactors collect waste from the roadside, which is mainly around residential areas, whereas trucks collect waste from the market areas, and utility vehicles, also referred to as “house-to-house”, collect waste from individual homes. In Uyo, a properly designed and managed landfill provides a designated area for waste disposal, preventing indiscriminate dumping in streets, waterways, and open spaces. This minimises the pollution of land, water, and air, which are common consequences of uncontrolled waste disposal. Modern landfills incorporate measures to control leachate (contaminated liquid that drains from the waste) and landfill gas (primarily methane, a potent greenhouse gas). This prevents these pollutants from contaminating soil and water resources and impacting air quality.

## **Conclusion**

The main aim of the study was to examine the effect of waste management on environmental sustainability in Uyo Capital City, Akwa Ibom State. The research was guided by two research objectives and hypotheses. From the research findings, this study reveals that waste management has a significant relationship with environmental sustainability in Uyo Capital City, Akwa Ibom State. The study establishes that waste recycling and waste landfill play a vital role in promoting environmental sustainability. By effectively reducing hazardous waste volumes and minimising environmental pollution. Waste management supports cleaner ecosystems and contributes to safer living conditions for local communities. The findings highlight the need for greater investment in modern waste management systems, along with strict regulatory oversight, to ensure optimal performance and compliance with environmental standards. Incorporating a broader waste management strategy in the city can significantly enhance environmental outcomes and support sustainable development goals.

## **Recommendations**

As a result of the various findings from the study, the following recommendations are made:

1. That Akwa Ibom State Government should incorporate waste recycling into the Akwa Ibom State Environmental Protection and Waste Management Agency (AKSEPWMA)

frameworks, with periodic reviews to support its adoption as part of sustainable development goal.

2. Environmental regulatory agencies such as Akwa Ibom State Environmental Protection and Waste Management Agency (AKSEPWMA) and the Akwa Ibom State Ministry of Environment should strengthen monitoring and enforcement mechanisms to ensure all waste landfills comply with national and international environmental standards.

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## **APPENDIX 1**

Appendix 1: Scavengers sorting out waste materials for recycling at Uyo Village Road dumpsite



**Source:** Field survey, 2026

## **APPENDIX 2**

Appendix 2: Trucks and utility vehicles used for landfill at Uyo Village Road dumpsite



**Source:** Field survey, 2026