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Research article

ENVIRONMENTAL WASTE MANAGEMENT IN RESIDENTIAL AREA OF SOUTHWESTERN NIGERIA: A CASE STUDY FROM THE AKURE SOLID WASTE MANAGEMENT AUTHORITY, ONDO STATE

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ABSTRACT

Over the years, concerted efforts have been made to adequately solve the problems created by improper waste management and disposal in Nigeria cities. This study, therefore appraises environmental waste n city management, a perspective from the Ondo state Waste Management Authority Akure (OSWMA). The broad objectives of this study are to identify types and sources of waste generated in relation to operational strategy adopted by OSWMA, describe the altitude and role of residents (household) toward solid waste management, and examine the possible constraints faced by Waste Management Agency of Akure in the discharge of their duties. A Purposive sampling method was employed for this study. There are two target groups, namely, the residents of Akure and staff of Ondo State Waste Management Authority. The study therefore draws its samples from the total number of staff and households served by the authority. A total number of 580 staff and 32,400 households was identified respectively. From these number, 9.1% of the Authority regular staff (38) and casual staff (15) amounting to 53 staff respondents altogether responded; and 1% (i.e. 324 of households) of 32,400 households in the study area was used for analysed. From the results of the study, majority (78.4%) of the staff respondents opined that solid waste is the waste managed by OSWMA. However, 54.5% of the staff of the authority opined that the mode of collecting solid waste is door to door collection. On the other hand, majority of the households' respondents (81.4%) expressed willingness to pay for service rendered by the authority. Findings also revealed that poor funding was the main constraints faced by the authority. The research recommends proper funding, provision of equipment and facilities needed for smooth running of the authority in order to ensure effective collection and management of waste in the study area.

KEYWORDS

Akure, Environmental management, Municipal, Ondo State waste management authority. Solid waste management.

1. INTRODUCTION

Municipal Solid Waste Management (MSWM) has continually been a major problem in many developing nations of the world. Solid waste management has thus gradually become a threat to the living environment of developing countries as they increasingly move towards industrialization (Awomeso, et al 2024). Waste is generated as a result of daily activities of man in his immediate environment and is a concomitant aspect of living; it cannot be totally evacuated but can only be managed (Okosun, et al 2023). In general, the generation of waste in human societies is a normal act of life and could be linked to economic activities in markets, restaurants, motor parks, homes, schools, offices, etc., leading to waste that nobody wanted. Solid waste is any material, which is not in liquid form, and has no value to the person who is responsible for it (Zurbrugg, 2003). In other words, Babatola (2008) described it as any material lacking direct value to the user and so must be disposed of. There are many problems that come as result of wastes which include: offensive odours during the rains and smoke, when the wastes are burnt uncontrollably, pollute the air and degrade the urban environment. They also constitute health hazards in themselves if they are not timely disposed as they become breeding places for vermin, worms and insects (Dosunmu and Ajayi, 2022). Several studies have pointed out that it is necessary to address the problems of solid waste in countries (Environmental Protection Agency, 1998; Dosunmu and Ajayi, 2022), to ensure a healthy and safe environment for future generations. It implies avoiding environmental degradation, which brings sustainable human settlement. According to Berettta (2012), environmental management is the fair treatment and meaningful involvement of all people regardless of status with respect to the development,

Governments in sub-Saharan Africa countries have grossly failed to adequately solve the problems of solid waste management and disposal in the urban areas. In advanced technologies, disposal is preceded by some engineering activities such as sorting and quantity reduction (White, Franke and Hindle, 1997). This is done in order to sort out materials that are still of some economic value. Several methods of waste disposal exist. The choice of any method depends on a number of factors. These factors according to Eerd (1997) include: characteristics of the solid waste to be disposed, cost consideration (i.e. how much is available and how much the method could cost), availability of disposal site (cost of land for example), and cost of labour and the technical implication of the methods.

Any community whether in the advanced or less developed countries is open to choose among the following options of solid waste disposal methods: converting/ recycling, sorting and salvaging, open dump, controlled tipping/sanitary and landfill/daily burying. Others include: composting, incinerating and disposal into sea (Oluwande, 1974; Rush and Pugh 1999). Over the years, concerted efforts have been made to adequately solve the problems created by improper waste management and disposal. However, management of solid waste has become a problem in Nigerian cities. Driving through the city, the accumulation of solid waste in drains, on the streets and highways has become an eyesore. Indiscriminate dumping of solid waste has become a common practice in Nigerian cities. Most of the waste dumps are located close to residential areas, markets, farms, roadside and water bodies. The composition of these solid waste dumps varies widely with many human activities located close to dump sites. Examples include domestic and industrial wastes, such as household waste, food waste, animal dungs, chemical, pesticides, paints, grease, inorganic material, oil sludge, among others.

The increasing global concern demands that waste be properly disposed in the most environmentally friendly and acceptable way. This is to minimize and where possible eliminate contact with humans and reduce its potential harm to humans, animal, and natural resources. There is an urgent need for an action to reduce the environmental impact caused by indiscriminate waste disposal (Safeguard, 2001). In Nigeria, in a bid to reduce solid waste problems, different agencies have come up with different waste management techniques. In spite of the functions of these agencies, heaps of refuse still abound in most Nigeria cities, Akure inclusive. It is in light of this, this research focus on environmental city management a perspective from the Ondo State waste management authority. The broad objectives are to identify types and sources of waste generated in relation to operational strategy in the study area; describe the attitude and role of residents (household) toward solid waste management; and examine the possible constraints faced by waste management agency in the discharge of their duties among others. It is a belief that a study of this nature will provide information that will enhance appropriate policies, programmes, finances, rethinking the way we build, manage, and live in communities.

2.0 LITERATURE REVIEW

According to Avinash et al., (2008), the term refuse or solid waste as inter changeable used means garbage, and other discharged materials including solid, liquid, semi-solid or contained gaseous materials resulting from various operation and from various community activities. Odochas (1994) defines solid waste as those materials which are generated as a result of normal operations over which we have control in terms of their production, disposal or discharge. Gilpin, (1976) observe solid waste as a material of solid or semi – solid character that possess no longer consider of important value to retain. WHO (2020) describes solid waste as being those useless, unwanted or discarded materials that arise from man's activities and are not free flowing. The Federal Ministry of Environment (2025) reported that SWM remains one of the most daunting environmental sanitation challenges facing Nigeria today. It has continually remained at its lowest despite huge investment in the sector (Sha'ato and Ikor, 2003; Okosun, et al, 2023).

Effects of solid waste on the environment

The effect of uncontrolled solid waste in an environmental continent is not limited to human life but its effect is significantly observed on property value and life span (WHO, 2010). Literature records that the Federal, State and Local tiers of Governments have roles to play in the process of environmental quality management (Stuti, 2001). They have to set goals, evolve appropriate policies, prepare programmes, provide finances, develop strategies and give legal lacking to mitigate the problems caused by lack of effective solid waste management. Okosun et al (2023) noted that, the greater the density of human population and its multiplication effects, the more the waste they will produce, that the effects and consequences of solid wastes in our environment has been

one of the greater concern to the citizen. Acks (1995) reports that environmental contamination such as solid waste constitutes hazard to human health and can lead to the destruction of natural (resources reduction of aesthetic, values and pleasures).

Appraisal of waste collection system

Wahab and Lawal, (2011) opined that periodic review of waste collection system should form part of the agency's policy to appraisal the effectiveness of the adopted waste collection systems to determine the cost benefit to the agency, government, people including the accompanying externalities on the environment. They further identified that the management of the waste collection system should be able to adjust the market price to affect opportunity cost in an economic cost exercise called shadow pricing. According to Abumere (1998), waste collection involves the cleaning of refuse from the dump or household for subsequent transfer to the final disposition sites. The methods of waste collection are determined by the storage, facilities provided by the relevant agencies and individuals themselves.

APPRAISAL OF SOME INSTITUTIONS MANAGING WASTE IN NIGERIA

Lagos state waste management authority, (LAWMA)

In April 1977 Lagos State Refuse Disposal Board was established. It was later changed to Lagos State Waste Disposal Board because of added responsibility of commercial, industrial waste collection and drain cleaning. Collection and disposal of derelict vehicles were added in 1981. The Lagos Waste Management Authority (LAWMA) is the government agency that is statutorily charged with Solid Waste management in Lagos State. Thus, it is saddled with the responsibility of collecting, transportation and general handling of all the solid waste generated from different sources within the Lagos environs such as: households, markets, industrial locations, offices, schools, highways, hazardous, medical and laboratory wastes, construction sites. Mission: to provide a professional, efficient and sustainable solid waste management service to the generality of Lagosians, corporate bodies and governments (local and state) in Lagos state. Vision: to make LAWMA an internationally accredited organisation and indeed a "case to be studied" in solid waste management in the African sub-region through the pioneering and championing of practicable and exceptionally efficient solid waste management services and products alongside the provision of a sustainable environment that will be conducive for the development of Lagos state and Lagosians.

Ibadan Waste Management Authority

In an attempt to supplement Federal Government effort to combat environmental hazard, the state government agencies were established. For instance Oyo state government enacted an edict establishing the Ibadan Waste Management Authority (Gazette No 8, vol, 22 of 16th May 1997). Although the functions of the Local Government Councils in the Ibadan urban area are to collect, transfer and dispose of solid waste. In other words, the function hitherto performed by the local councils under 1979 constitution has been delegated to the authority through this edict. Perhaps such hijack of the functions and the responsibilities of local councils have been attributed to the low technical capacity of the local councils to provide waste management services especially in large urban centres such as Ibadan city. However, it would have appeared that the edict tends to breed poor inter-governmental relations between the state and the Local Governments. Obviously, this enactment creates a duplication of effort, waste of resources and erosion of the local government' functions. The enactment also appears to have shifted the management of Ibadan city environment waste refuse on a single authority which admittedly could not cope with the volume of solid and liquid wastes produced in Ibadan. This bring us to examine the management of solid waste management in Ibadan the largest city in West Africa

(i) Management and operation of waste in Ibadan: Three government agencies are charged with the responsibilities of managing environment in Ibadan. They are: The Local Government Councils, the Ibadan Solid Wastes Management Authority; and the newly established Ministry of Environment and Water Resources.

(ii) Operational management of solid wastes in Ibadan: Presently there are three institutions charged with the responsibility of overseeing the environment of Ibadan city. They are; (a) Ibadan Solid Waste Board, (b) The Local Government Councils, and (c) Ministry of Environment.

Stages in solid waste management

The various stages involved in waste management are:

i) Generation and storage:

The production and storage of waste represents the first points of physical contact and other routes of exposure between the waste and humans or the environment. The exposure and potential for adverse human health risks are particular concerns in the case of special or hazardous waste, especially during the production of industrial products with toxic by-products. while the risk is generally less in case of generation and storage of domestic solid waste , the inclusion of relatively small quantities of infectious and toxic waste, such as bottles containing hazardous types of pharmaceutical products, photographic material, batteries, infectious health care wastes and sharp (e.g. syringe needles and scalpels), excreta, and other such substances, can turn seemingly benign domestic waste into potentially dangerous waste, with attendant serious public health impacts (Oyeola, 2009). Storage of waste can also lead to adverse public health effects by: creating fertile ground for the breeding of household pests; animals feeding on the waste; and obstructing natural drainage channels, leading to the information of ponds that then serve as breeding grounds for insects and other carriers of human pathogens (Oyeola, 2009).

ii) Collection

This has to do with transportation of the solid waste from the point of storage to the point of disposal, two stages are involved in the collection stages; the direct collection, which makes use of only one means of transportation, the Solid waste is picked up from the point of storage in a truck that takes it to the disposal site, The second stage collection carries the solid waste from the storage facility to the Transfer station, at the transfer station, the waste is loaded into the secondary stage, to transport the refuse to the Disposal site. Waste collection is the collection of solid waste from point of production (residential, industrial commercial, institutional) to the point of treatment or disposal. Municipal solid waste is collected in several ways:

a. House-to-House: Waste collectors visit each individual house to collect garbage. The user generally pays a fee for this service.

b. Community Bins: Users bring their garbage to community bins that are placed at fixed points in a neighborhood or locality. MSW is picked up by the municipality, or its designate, according to a set schedule.

c. Curbside Pick-Up: Users leave their garbage directly outside their homes according to a garbage pick-up schedule set with the local authorities (secondary house-to house collectors not typical).

d. Self-Delivered: Generators deliver the waste directly to disposal sites or transfer stations, or hire third-party operators (or the municipality).

e. Contracted or Delegated Service: Businesses hire firms (or municipality with municipal facilities) who arrange collection schedules and charges with customers. Municipalities often license private operators and may designate collection areas to encourage collection efficiencies.

iii) Disposal

This is the final destination of solid waste, usually it is dumped on land at a tip, and this may be done in an engineered and hygienic way. The acceptable methods of refuse disposal are, namely (a) Composting. This is a widely used method particularly where large percentage of the waste is organic in nature; (b) Incineration. This entails thermal heating of waste; and (c) Sanitary land fill. This is a system whereby the site for keeping waste is identified. The choice of site is influence by a number of factors such as the population to be serviced, availability of sufficient land.

3.0 MATERIALS AND METHODS

Study area

Management of solid waste in Ondo State started with the establishment of Ondo State waste management authority. Ondo State Waste Management Authority was established in 1999 by Ondo State government, which made the agency to be responsible for the collection and disposal of municipal and industrial waste in the state capital with a view to spreading to other local government areas within the state in the nearest future. The basic functions of OSWMA included

a. Removal, collection and disposal of solid waste;

b. Cleaning and maintenance of public drains;

c. Cleaning of streets;

d. Ongoing planning requirements to establish and update master plan of waste collection and disposal; and

e. Regulatory requirements to approve and supervise all waste disposal systems.

The organizational structure of OSWMA consists of six departments namely: (i) Finance and administrative (ii) Engineering services (Maintain) (iii) Waste collection (iv) Customers client relation (v) Operational and landfill, and (vi) Finance and account and administrative department

Akure is a city in South-western Nigeria, it existed long before the advent of British colonial rule in Nigeria (Okosun et al., 2023). It lies approximately on latitude 7°15 North and longitude 5°15 East of the Greenwich Meridian. Akure is the capital of Ondo State and the headquarters of Akure South Local Government Area. Between 1976 and now, the city has experienced enormous growth (human and housing population growth). Akure is located between Latitudes 7º 15' and 7.17 North of the Equator and between Longitude 5º 14' and 5' 15' East of the Greenwich Meridian. Akure has a population of 403,000 persons as of the 2006 National population census (NPC), with a land area of 991km2 (Akinbode et al, 2023). The research was limited to households in the activity zones covered by Ondo State Waste Management Authority, which formed the focus of the study. Akure is centrally located, surrounded by a 48-kilometer radius, and the important towns of Akure North and Akure South Local Government are located in the city. It is bounded by Ondo and Idanre to the south, Owo to the east, Iju/Itaogbolu to the north, and Ile-Oluji to the west (Akinbode, et al, 2023). Akure is a medium-sized urban centre which became the provincial headquarters of Ondo province in 1939. Akure is situated within Akure North and Akure South Local Government Area of Ondo State. It became the capital city of Ondo State in 1976. Consequently, there was heterogeneous massing of people and households in the city, including the poor and non-poor households. (Aluko et al, 2024).

Methods

The survey research method was adopted for this study. Two sources of data were explored; (i) primary and (ii) secondary sources. Further relevant information was collected from in-situ observations, photographs, informal interviews and discussions with the respondents. For this research, Simple random sampling technique was used in selecting the streets in each neighbourhood where the questionnaires were administered while purposive random sampling technique was used in selecting the houses from each of the selected streets for the purpose of administering the copies of the questionnaire to households. The households in the activity zones covered by Ondo State Waste Management Authority in Akure formed the basic sampling frame and the sample falls within the core, transition and peripheral districts of Akure. Also the Staff of OSWMA and the Director in charge of waste management authority forms another sample frame, using the entire Akure municipal for questionnaire administration to clients of OSWMA would be a very tedious exercise. In administrating the questionnaire for the clients of OSWMA, hierarchical sampling was done in which Akure city was divide into three evolutionary districts or areas (core area, the transition area, and peripheral area) as shown in the Table 1.

There are two target groups, namely, the residents in the core, transition and peripheral districts of Akure and staff of Ondo State Waste Management Authority. Figure 1 shows the subdivision of Akure into zones served by OSWMA. Akure is the only town in the State where the work of OSWMA is pronounced. However, two neighbourhoods were selected randomly from each zone for the sampling due to the homogenous characteristics of the zones such as residential density and level of income. As shown in Table 2, Eru Oba and Erekesan were selected from the core area; Oke Aro and NEPA area were selected from the transition area and Orita Obele and Ijoka were selected from the peripheral area using the random sampling technique. The study therefore draws its samples from the total number of staff and households served by the authority in the four quarters mentioned above.

As shown in Table 3, a total number of 580 staff and 32,400 households was identified respectively. From these number, 9.1% are the Authority regular staff (38) and casual staff (15) amounting to 53 staff respondents' altogether; and 1% (324) of households was used. The reason for choosing 1% sample size for the households is based on the similarities in the characteristic of the households (cultural composition, socio-economic classifications and physical layout characteristics), their homogeneity in nature and in order to avoid repetition

(Eneyo, 2026). On the other hand, the 10% sample size of the staff was based on the homogeneous nature of the research case.

Table 1. Number of Households Served by the Authority Based on Zones.

Zones	Household Numbers
Core	10900
Transition	15550
Peripheral	6000
TOTAL	32400

Source: Ondo State Waste Management Authority, (2022)

Table 2. Major Residential Zone in Akure Served by the OSWMA

Core Area	Transition Area	Peripheral Area
Eruoba	Oke Arata	Aule road
Odo Ikoyi	Oke Padi	Gaga area
Igan	Oke Aro	Ijoka road
Odo Ijoka	Aiyedun	Ologede area
Imuagun	Nepa Area	Jegele
Isolo	Oke Isinkan, Ala	Igoba
Erekefa	Okuta Elerinla	Orita Obele
Erekesan		Ilesha road GRA
Oritagun		Shagari, Alagbaka, Ijapo

Source: Ondo State Waste Management Authority, (2022)

From Table 2, two neighbourhoods were selected randomly from each zone for the sampling due to the homogenous characteristics of the zones such as residential density and level of income. Eru Oba and Erekesan were selected from the core area; Oke Aro and NEPA area were selected from the transition area and Orita Obele and Ijoka road were selected from the peripheral area. Simple random sampling technique was used in selecting the streets in each neighbourhood where the questionnaires were administered while purposive random sampling technique was used in selecting the houses from each of the selected streets for the purpose of administering the copies of the questionnaire to households.

Table 3. Sample Size of the Clients Served by OSWMA Based on Neighborhood

S/N	Sample Neighborhood	Zones	Number of Client	Number of Questionnaire distributed (1%)
1	Eru Oba and Erekesan	Core Area	10900	109
2	Oke Aro and NEPA Area	Transition Area	15550	155
3	Orita Obele and Ijoka Road	Peripheral Area	6000	60
	Total		32400	324

Source: Author's field survey, (2022)

In Akure, 32400 clients were identified. While, the Authority had 380 regular staff and 150 casual staff amounting to 530 staff altogether as shown in Table 3 and 4. The reason for choosing 1% sample size is based on the similarities in the characteristics of the households, their homogeneity in nature and in order to avoid repetition. The similarities include the following: cultural composition, socio-economic classifications and physical layout characteristics of the residences.

Table 4. Sample size of staff

Staff categories	Total Number of staff	Total No. of Questionnaires) 10% Percent of staff
Regular	380	38
Casual	150	15
TOTAL	530	53

Source: Author's field survey, (2022)

10% sample size for the staff and 1% sample size for the citizen is considered adequate, based on the homogenous nature of research case which justifies the sample size arrived at. These proportions are ideal and reasonable since no fixed percentage is ideal; rather, sample size is determined by the circumstances surrounding the study situation (Okosun et al, 2025). The collected data were subjected to analyses using the simple statistical analytical techniques. The processing of data was subsequently analysed employing Statistical Package for Social Sciences (SPSS) version 21. The analysis of data was discussed objective by objective using frequency count; distribution and such information were presented through the use of tables, percentages and charts.

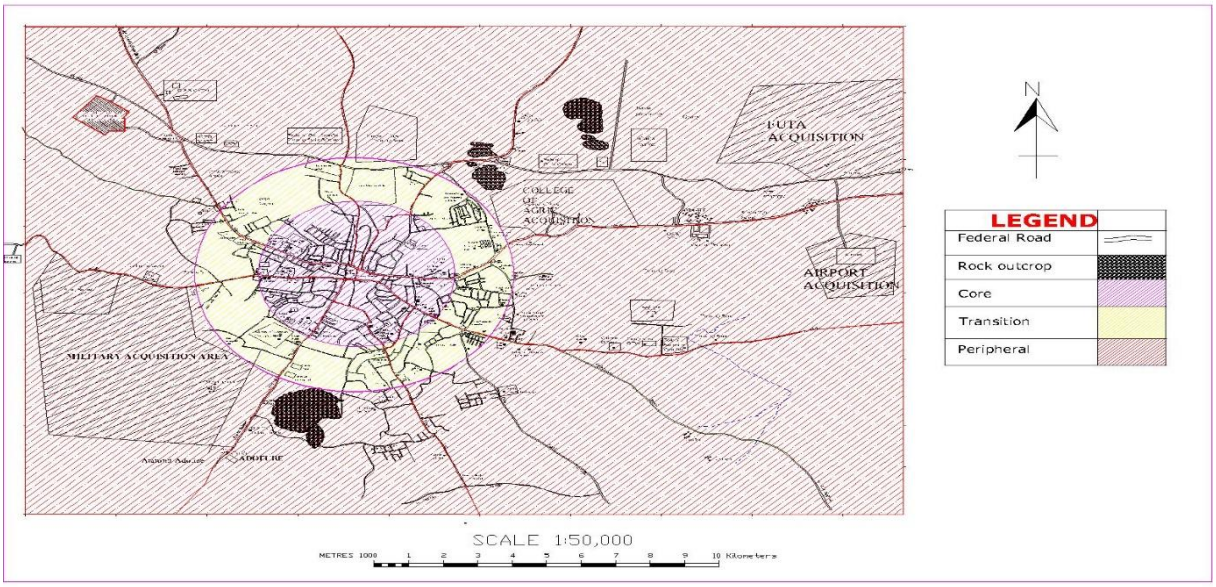

Figure 1. Street guide of Akure town showing subdivision of Akure in zones.

Source: Ondo State Waste Management Authority, 2024. Digitized by the author's

Objective 1: identify the types of solid waste managed by OSWMA in the study environment in relation to operational strategy in the study area. This will be identified by separation of the solid wastes into categories as found from the various sources in the area.

Objective 2: highlight and describe the attitude and role of residents (household) toward solid waste management in the study area, in relation to operational strategy in the study area.

Objective 3: examine the possible constraints faced by waste management agency in the discharge of their duties in relation to operational strategy in the study area

4.0 RESULTS AND DISCUSSION

4.1 Assessment of Strategies Used by Ondo State Waste Management Authority

4.1.1 Types and source of waste managed by OSWMA on daily basis

Table 5 reveals that 81.1% of the types of waste managed by OSWMA are solid waste only, while 18.9 % of the respondents were of the view that the wastes managed are both solid and liquid waste. It is deduced from this analysis that a higher percentage (81.1%) of OSWMA staff opined that the waste been manage by the authority is solid waste. The types of solid waste managed by OSWMA in the study environment includes trash and garbage from household, institutional and market, while the liquid waste managed by OSWMA is household sewage (i.e.) waste from septic tanks.

Table 5. Types and source of waste managed by OSWMA

Types of waste managed	Frequency	Percent
Solid waste only	43	81.1
Solid and liquid waste	10	18.9
Total	53	100.0

4.1.2 Operational strategy adopted by OSWMA

The analysis on Table 6 indicates that majority of the staff of OSWMA (54.7%) opined that the mode of collecting solid waste is door to door collection method while 26.4% opined the mode of solid waste collection is collecting from designated dumping site and only 18.9% of the respondents opined anywhere such as drainages, streams and road sides. Even though, wastes are also collected at the designated point at the commercial centres in the city. The mode of collection use for majorly used by residents is door to door.

Table 6. Operational strategy adopted by OSWMA

Operational strategy	Frequency	Percent
Door to door	29	54.7
Designated dumping site	14	26.4
Anywhere	10	18.9
Total	53	100.0

4.1.3 Opinion on the Performance of OSWMA

Table 7 reveals the household respondents opinion on the general performance of OSWMA. It was discovered that, out of the total household respondents, 50.0% opined that OSWMA performance is not satisfactory, 18.9 % claimed that the performance is fairly satisfactory, while 20.0% affirmed their performance are satisfactory and 11.1% ascertained very satisfactory. The resident perception concerning OSWMA is not satisfactory because wastes are not cleared when it supposed to be cleared.

Table 7. Opinion on the Performance of OSWMA

Opinion on the Performance of OSWMA	Frequency	Percent
Not satisfactory	162	50.0
Fairly Satisfactory	61	18.9
Satisfactory	65	20.0
Very satisfactory	36	11.1
Total	324	100.0

4.2 Attitudes and Role of the Residents toward the Solid Waste Management

4.2.1 Waste Disposal Habits

Table 8 reveals the respondent's habit towards waste disposal. 47.5% of the respondents in the study area dispose their waste through burying and burning in pits. Use of pits is the common method of waste disposal in the study area. However, some of the respondents (16.9%) dispose their waste by throwing along the road side in residential areas. While the remaining percentage of 35.5% dispose there waste through the waste management Authority.

Table 8. Waste disposal habits

Habits	Frequency	Percent
Waste management Authority	115	35.5
Burning	94	29.0
Burying in pits	60	18.5
Roadside dumping	55	17.0
Total	324	100.0

4.2.2 Willingness to Pay for the Service Rendered

When asked if the respondents are willing to pay for the service rendered by the authority in the study area. Table 9 reveals that majority standing at 78.4 percent of the respondent were of the view that they are willing to pay for the services rendered by the authority and this buttress the findings on the effectiveness of strategies used by the authority which the respondent reveals that the strategies were fair, while only 21.6 percent of the respondents opined no.

Table 9. Willingness to pay for the service rendered

Willingness	Frequency	Percent
Yes	254	78.4
No	70	21.6
Total	324	100.0

4.2.3 Residents' role in solid waste management

As shown in Figure 2 is a multiple response item, majority of the respondents (75%) indicated that they were supposed to keep their immediate surrounding (homes) clean. (55%) of the respondents thought that they were supposed to keep their homes and working environments clean and not any other public place. Only a few of the respondents (22.5%) were of the view that they were supposed to keep their immediate environment and public places clean. Payment for waste collection was cited by most respondents (62.5%) as part of their roles to keep their communities clean. Concerning source reduction of waste through waste sorting, (5.0%) thought it was part of their roles to reduce waste lying about in undesignated places through sorting. Residents had little knowledge on the role they were supposed to play to reduce the problem of accumulating waste in public places in the area. Environmental education is very much needed in the study area to inform households about source reduction of waste, tasks and responsibilities of residents, place to deliver waste and waste recycling (Okosun, 2023).

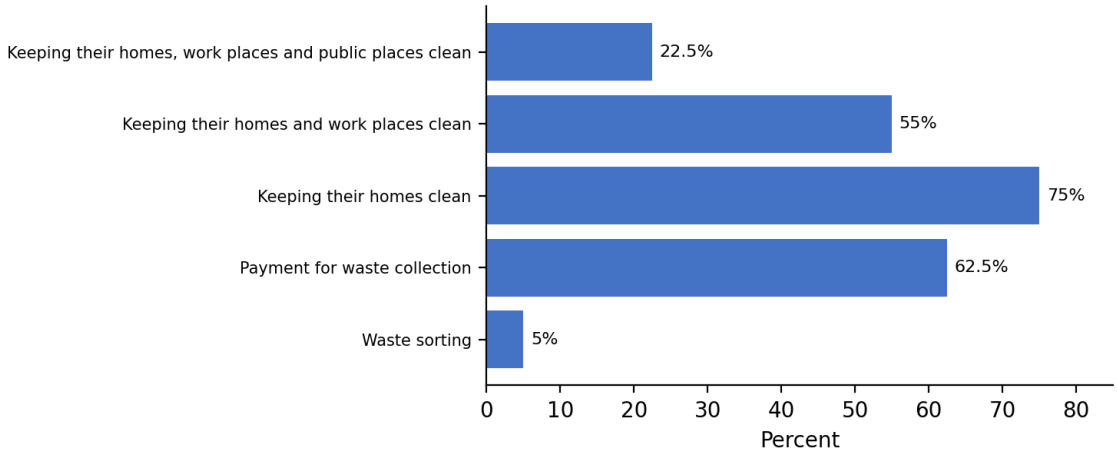

Figure 2. Views regarding residents' role in SWM

4.3 Constraints faced by waste management agencies in the discharge of their duties

4.3.1 Sufficiency/adequacy of equipment and vehicle

Vehicle and equipment are essential components for waste management authority to carry out their duties. Figure 3 shows that 72% of the respondent were of the view that the equipment are not enough while 28% opined that equipment are enough. From the findings, there is need for provision of more equipment in order to increase the level of their performances and increase their coverage area. Also the staff of the authority opined that equipment used by the authority is inadequate to meet the need of the growing population of the study area.

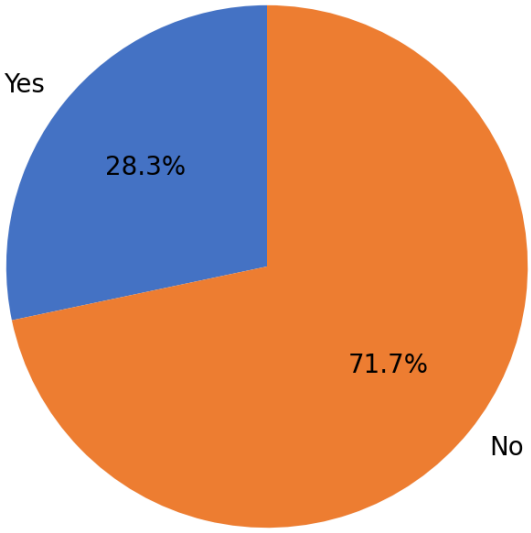

Figure 3. Sufficiency /adequacy of equipment and vehicle

4.3.2 Finance

Table 10 shows that majority of the respondents (83.0%) of the staff of the authority opined that, the authority bottleneck is inadequate finance. There is need for the authority to adopt some concepts of waste management such as waste to wealth and polluter pays principle. This will help to provide additional source of finance to the authority asides the annual allocation from the government. The sector needs more money to handle waste. When good and proper services are being rendered, the people are more willing to pay for a good environment. However, MSW management is the responsibility of every inhabitant and waste is an unavoidable product from human activities. So if people need a good environment and healthy life they are willing to pay for SWM.

Table 10. Finance

Inadequate finance	Frequency	Percent
Yes	44	83.0
No	09	17.0
Total	53	100.0

5.0 CONCLUSION AND RECOMMENDATIONS

Having identified the nature and extents of the problems confronting the performance of OSWMA in Akure, Ondo State. It is therefore indispensable to impose feasible solutions towards improving the performance of the operation of OSWMA, at least to a level of ensuring a clean and sanitized environmental quality. Study demands that if adequate funds are made available for waste management, lives of people would be improved. Sufficient fund should be provided to local government to repair dilapidated waste equipment and improve working condition of OSWMA and also improve the welfare of the staff. However, environmental education is very much needed to inform households about source reduction of waste, tasks and responsibilities of residents, place to deliver waste and waste recycling. The following recommendations include:

1. Environmental Education: Environmental education is very much needed to inform households about source reduction of waste, tasks and responsibilities of residents, place to deliver waste and waste recycling.

2. Effective Collection of Waste: In the study area waste must be sanitarily stored in air tight container right from where they are generated and during transportation to disposal sites. Effective street waste collection must be embraced; Dino bin must be adequately provided for frequent collection of waste communal or municipal collection should be planned and properly embraced. Proper collection and disposal should be durable.

3. Rehabilitation of the disposal site: It is important to ensure the hygiene of the environment. The landfill site should be rehabilitated to the work in accordance with the initial design which is sanitary landfill so as not to degrade the environment due to burning of waste which pollutes the environment and ensure sustainability in waste management.

4. Funding: Funds should be provided to local government to repair dilapidated waste equipment and improve working condition of OSWMA and also improve the welfare of the staff. This is because the study demands that if adequate funds are made available for waste management, lives of people would be improved. Lack of inadequate funding, facilities will continue to prevent the progress of solid waste management if not properly tackled. Government of Ondo State should made sufficient funds available to OSWMA to assist in procuring some of the materials needed. This will enable them carry out their duties effectively.

5. Increase Performance: Government should help to increase the performance of the operations of OSWMA in the study area by employing trained and qualified staff.

DECLARATIONS

Informed consent: Not applicable

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Data availability: The data supporting the findings of this study are available from the corresponding author upon reasonable request

REFERENCES

Abumere, S. I. (1998). Solid management in Nigerian cities; An Agenda for Reforms'' A paper Presented at a National stakeholders consultancy workshop organized by the urban development Bank of Nigeria Plc Abuja, in collaboration with the Afri-projects consortium.

Acks, K. (1995). Valuation of Environmental Damages to real estate in Adewusi A. O. and Onifade, F. A. (2006). The effects of urban solid waste on physical environment and poverty transactions in Surulere LGA. Journal of land use and development studies, 2(1) 65-72.

Akinbode T, Okosun S.E & Adeyemo, A (2023): Safety regulations compliance by sawmill operators and the perception of regulators and residents in Akure, Ondo state, Nigeria. Journal of

Akinwumi, C. (1999). Spotlight on the Lagos state waste disposal board and solid waste

Aluko, E.A. Okosun, S.E and Aladelokun A.O (2024): Assessment of IJAPO housing estate akure facilities for transition into a smart city. African Research Journal of the Environment (AREJOEN), Faculty of Environmental Science, Enugu State University of Science and Technology, Nigeria. 7(1), Pp 5-15

Avinash, P., Manoj, K., and Eonkar, J. (2008). Solid waste management in Jalandhar City and its impact on community health. Indian Journal of Occupational and Environmental Medicine. 12(2): Pp. 76–81.

Awomeso, J. A., Taiwo, A. M., Gbadebo, A. M. and Arimoro, A. O. (2024). Waste disposal and pollution Management in Urban areas. A workable remedy for the environment in developing countries. Journal of Environmental Science, 6(6): Pp 26-32.

Babatola, J. O. (2008). Hospital Waste Generation and Management Practices in Akure, Nigeria. African Research Review, 2(3): Pp. 292-305.

Beede, D. N. and Bloom, D. E. (1995). 'Economics of municipal solid waste" World Bank

Beretta, I (2012): Some Highlights on the Concept of Environmental Justice and its Use, E Cadernos CES. Available at http:// eces.revues.org/1135; DOI: 10.4000/eces.1135

Dosunmu. O. O. and Ajayi, A. B. (2022). Problems and management of saw mill waste in Lagos. Proceedings of International Symposium on Environmental Pollution Control and Waste Management, (7)10: 271-278.

Eerd, M. V. (1997). The occupational health aspect of waste collection and recycling: An

Eneyo, V.B (2026): Where the City Eats: Spatial Clustering, Distance-Decay and Patronage, Rhythms of Eateries in Calaber, Nigeria. Journal of Environmental Sciences and Built Environment Research (JESBER) 1 (1) Pp. 1-13

Federal Ministry of Environment (2025): Report on solid waste management. Environmental protection agency (1998), Final guidance for incorporating environmental justice concerns in EPA's NEPA Compliance Analyses. Washington DC:US EPA.

Geography and Planning Sciences, 4 (1) 1-15. Department of Geography and Planning Sciences, Adekunle Ajasin University, Ondo State, Nigeria.

Gilpin, A. (1976). Dictionary of environmental terms and Kegan Paul LTD, London

Inventory study in India. UMEP Working document. No 4, part ll waste guide, The Netherlands.

Inventory. Publish by Black Science ltd, a Blackwell publishing company, USA.

Management in Lagos. Daily Times April 20, 1999.

Odocha, J. N. K. (1994). Waste Generation and Management in a depressed Economy. A lecture delivered to student of the law and environmental faculties, UNEC, University of Lagos.

Ojo T (1980). Solid Waste Management and Environmental Sanitation in Nigeria. In Odusanya, (2001). 2(2) Pp. 87-93.

Okosun S.E, Akuba S, and Ajayi, I.S (2023): Solid waste management in traditional African Cities – A perspective from the Benin City waste management board, Edo State, Nigeria. Ethiopian Journal of Environmental Studies & Management, 16 (6): Pp 786 – 801.

Okosun, S. E., Olatunji, S. A., Daniel, A., Zakka, D.S., Adeowu, B.M., David, O. J, Iji, S.O., Athenkosi S (2025): Appraisal of motorists' behavioral patterns and physical factors influencing vehicular parking in Nigerian. Journal of the Nigerian Institute of Town Planners (JNITP) 30(2), Pp 1-23.

Oluwande, P. A. (1974). Investigation into certain characteristic of refuse from western state of Nigeria. Journal of Waste Management, 3(1) 22-32.

Oyelola, O. T. (2009). Health implications of solid waste disposal. Case study of Olusosun dumpsite, Lagos, Nigeria . International Journal of Pure and Applied Sciences 3(2): 89-95

Research Observer 133-150.

Rush, B. and Pugh, M. (1999). Solid Waste Landfills in Middle and Low Income Countries. A technical guide to planning, design, and operation.

Safeguard, (2001). Lagos State Waste Management Problem, cited in the Eko media, News Watch 19 June 2001

Sha'ato, R. and Ikor, P. C. (2003). Documentation of Available Information on the Solid Waste Situation in Nigeria: A Case Study of Benue and Enugu States. DFID-SLGP Consultants Report Number 59(6) 141-156.

Simon, R. A. (2002). Estimating Proximate Property Damage from P C B Contamination in Rural Market, In Adewusi and Onifade (2006). The effects of urban solid waste on physical environment and poverty transaction in surulere. Journal of Land Use and Development Studies, 2: 77.

Stuti, K. (2001). Fiscal Federalism and Service Delivery in Nigeria: The Role of States and Local Governments. Fiscal fed Report, 1-16.

Tchobanglous, G. (1997). Integrate Solid Waste Management, Engineering Principle and Waste Management issues (3).

Tchobanglous, G. (2002). Solid Waste Engineering, Principles and Management issues: 2nd Edition, New York McGraw- Hill book Companies, Inc.

Wahab, A. B and Lawal, A. F. (2011). An evaluation of waste control measures in construction industry in Nigeria. African Journal of Environmental Science and Technology, 5(3): 246-254.

White, P., Franke, M., Hindle, P. (1997). Integrated solid waste management: a lifecycle

WHO (2025). Global water supply and sanitation assessment. Available at:http://www.who.int/docstore/water_sanitation_health/Globassessment/GlobalTOC.htm

Zurbrugg, C. (2003). Solid waste management in Developing Countries. Presented to the Scientific Committee on Problems of the Environment, Urban Solid Waste Management Review Session, Durban