ASSESSMENT OF WASTE MANAGEMENT PRACTICES ON LIVEABILITY IN IBADAN, NIGERIA

Adekemi OLUSA; Gbenga ENISAN and Ahmed ADEBISI

Department of Urban and Regional Planning, Federal University of Technology, Akure, Nigeria
aoolusa@futa.edu.ng; keminiyi14@gmail.com

ABSTRACT

One of the challenges of urbanisation is improper management of huge amounts of waste generated in most urban areas. This has led to various environmental challenges that threaten sustainable development. In view of the above, the study assessed waste management practices on city liveability in Ibadan, Nigeria. This was done by analysing the existing waste management practices in Ibadan through the public, private and informal sectors. Also, waste disposal and management techniques in Ibadan were examined. The methodology adopted involved the collection of waste data in Ibadan through secondary source and the data were used to forecast future waste generation and propose a resilient waste management system. The study found out that, collection of waste was the most challenging and most expensive aspect of waste disposal practice; it accounted for about80% of the total disposal cost. The challenges of waste management in Ibadan include: unamenable control of existing settlement patterns, poor staffing and inadequate technical know-how, poor funding, bad planning and poor legal framework. The study discovered that, methods of waste disposal in Ibadan were unhygienic and unsafe. Most of the wastes deposited were burnt to reduce the volume of waste generated. To ameliorate these environmental hazards, the study suggested that the government should embark on a habitual campaign on the dangers of haphazard waste disposal, provide good circulation in the core areas, ensure public participation in waste management, provide adequate funding for waste management, promote waste to wealth initiative and ensure constant enforcement for proper management that ensure liveability.

Keywords: Hazard, Management, Pollution, Urbanisation, Waste.

1.0 Introduction

Sporadic population drift across African settlements is responsible for its unabated urbanisation growth. This urbanisation trend is challenging rather than transformative. As people, regardless of age and sex, flock to the cities, the limited resources, infrastructure, and services of these cities become overstretched. However, owing to ignorance, poverty and poor management of resources, urbanisation in developing African countries is associated with environmental problems that endanger peoples' lives. With this alarming urbanisation rate, the volume of waste generated increases while space to dump waste legally decreases. The amount of waste generated in developing African countries is alarming and individual governments focus attention on approaches and methods to tackle the menace of municipal waste management (Popoola, Ayangbile and Adeleye, 2016).

Waste in itself is defined as leftovers, used products (both liquid and solid) that do not have economic value and must be disposed of(Bartone, 2000; Buckle and Smith, 2000; Oluwande, 2002; Olu-Olu and Omotosho, 2017). However, due to a paradigm shift in the concept of municipal waste management as highlighted by researchers such asShridar and Hammed (2014), waste is now perceived as a relevant leftover that can be systematically transformed to wealth through the major components of Sustainable Municipal Waste Management (SMWM): Reduce, Reuse and Recycle (The 3Rs' of SMWM).

The illegality of waste disposal in unauthorized spaces such as: open spaces/vacant lands, river courses and streamsarerampant, but risky practices, especially, in a developing nation like Nigeria. An estimated 80% of the waste generated in developing African countries are disposed

*Corresponding Author: Email: aoolusa@futa.edu.ng

of indiscriminately (Ogwueleka, 2009; Aziale and Asafo-Adjei, 2013). However, the situation is often exacerbated by poor or inadequate sustainable management strategies that plunge developing African countries into a myriad of environmental and health problems. Among these challenges, according to Rahman, Hossain, Rubaiyat, Mamun, Khan, Sayem and Hossain (2013)are: water and air pollution, food poisoning, biochemical pollutants among others. Many cities of developing countries are inundated with serious environmental degradation and health risks because of weakly established municipal waste management systems (Nguyen, 2014).

Quantitatively, the rate of waste generation in major African cities was estimated to an average of 0.78% (Achankeng, 2003), urban waste management per capital is expected to increase by 0.2kg per day because of relatively high Gross Domestic Product (GDP) and urban population rates. However, only a small proportion of the population is served; and the waste is not always collected in the serviced areas. Nigerian cities are striving to clear the mounting heaps of waste from their environments, just as the majority of the populace continues to haphazardly dispose of various types of waste generated. City officials have been incapacitated in stemming the tide, which is a negation of the clean air and health edicts of Nigerian sanitation regulations and standards (Napoleon, Dimuna and Dimuna, 2011).

Ibadan, being Africa's largest indigenous settlement, generates large quantities of waste yearly, beyond the capabilities of the public decision-makers. This resulted in the commercialisation of waste management, with a public-private partnership being saddled with the collection and disposal of waste within the city. Despite the involvement of private waste contractors in Ibadan city, inefficient waste management persists. Refuse bins fill up, spill over and decompose (Rahman et al, 2013). This poses a threat to the health of Ibadan residents and its biosphere. The World Health Organization and UNICEF joint report in August 2004 states that 2.4 billion people in fast-growing African and Asian cities will possibly face the risk of needless disease and death by 2015 because of bad sanitation (Uwaegbelum, 2004). This further revealed that bad sanitation (decaying or lack of sewage system and toilets) stimulates the spread of diseases like cholera, and diarrhoea, which kills a child every 21 seconds. Furthermore, the open dumpsite approach adopted by most Nigerian cities, Ibadan in particular, is health and ecologically unsafe, unscientific, obsolete and inefficient (Sankoh et al., 2013).

The health of the people is at risk when drainage networks are blocked with litters. More importantly, it leads to the breeding of vectors causing microorganisms and floods. According to WHO, Nigeria is part of the leading countries that recorded the highest number of infections and death to waterborne disease and respiratory diseases as a result of poor sanitation. This is not unconnected to the high number of air and water pollutants (surface and groundwater pollutants) and other agents causing organisms that grow from the incomplete combustion and unsafe waste decomposition techniques. According to Gwatkin and Guillot (1999), the two major causes of death in the poorest 20% countries of the world disaggregated by national GDP per capital are respiratory infections and diarrhoea diseases. These kinds of endemic diseases have been ascribed to areas with poor and improper waste collection and disposal methods.

The poorest population, therefore, brace the odds by disposing of their waste into available lands, designated spots at backyard and frontage, sidewalks, drainage, streams, road median, and roadways. More than 70% of refuse produced in the city is disposed of in these noxious manners. Heaps of refuse are potential contaminants of water systems and the human environment as a whole (Olayiwola, Abdulawal and Adewuyi, 2017). The study assessed the effects of improper waste management on the health of the people in Ibadan city and

recommended sustainable waste management policies for environmental regeneration while highlighting the adverse implications on human health.

2.0 Waste Disposal and Management in Ibadan City

With a land cover of 103.8km^2, Ibadan is the largest city in West Africa (Areola, 1994). The city experienced population growth from 1,228,663 residents to 4,700,000 residents from 1991 to 2000, respectively, with a present projection of over 3 million people in the city (Mabogunje, 1962; Mabogunje, 1968). However, the rapid population growth of the city, with its innumerable environmental problems, is reshaping the image and form of the city. For instance, some of the city's indigenous areas, in particular, lack sewage systems, adequate water supply, and waste disposal systems. The inhabitants of these areas rely on the streams and river flowing through their communities for waste disposal (refuse and sewage) most especially in the rainy season, and shift with natural processes to open defecation and burning of refuse. This has been happening unabated for decades in Ibadan. Consequently, when such polluted water bodies are consumed for domestic use, untold diseases strike and threaten the lives of the residents. This supports the claim that settlements characterized by intense poverty, poor housing condition, poor sanitation, lack of potable and palatable water and high illiteracy are the most vulnerable to environmental hazards. However, despite the recent private-sector involvements in the collection and disposal of waste in the city, Ibadan city still faces acute sanitation challenges that endanger the health of the majority (Sankoh, et al, 2013).

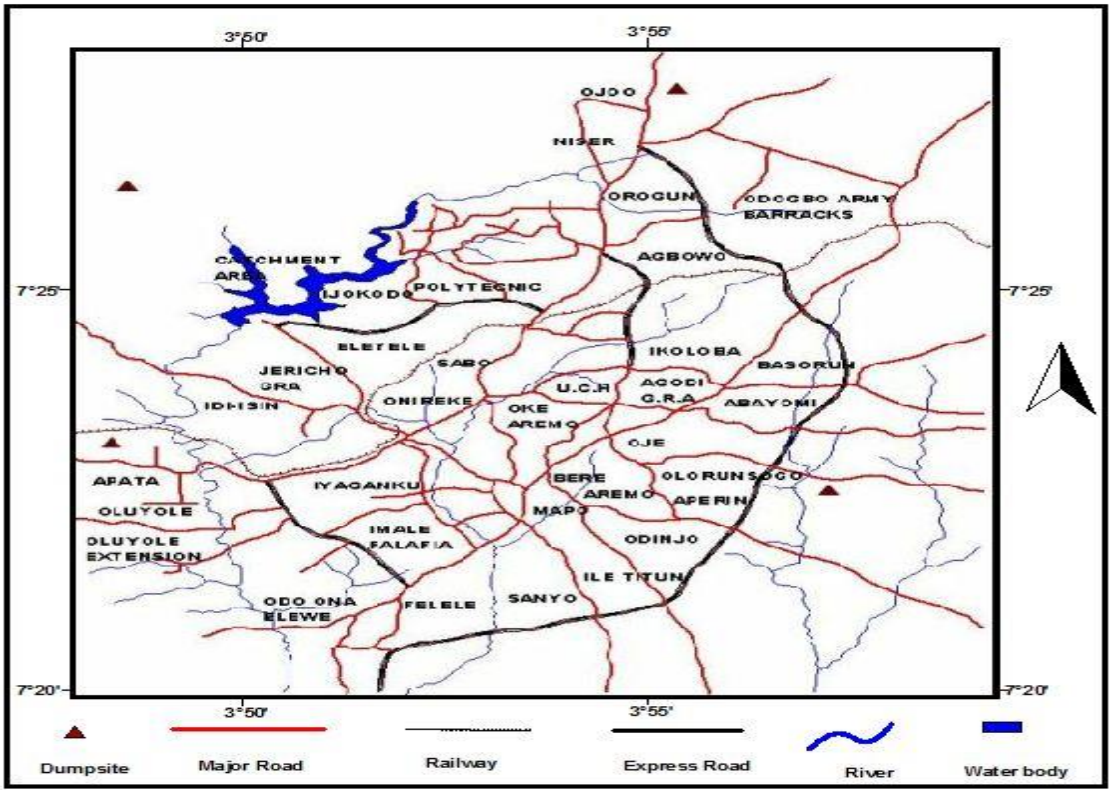

Figure 1: Spatial Patterns of Ibadan
Source: Ujile, Omo-Irabor and Ogonna, 2012

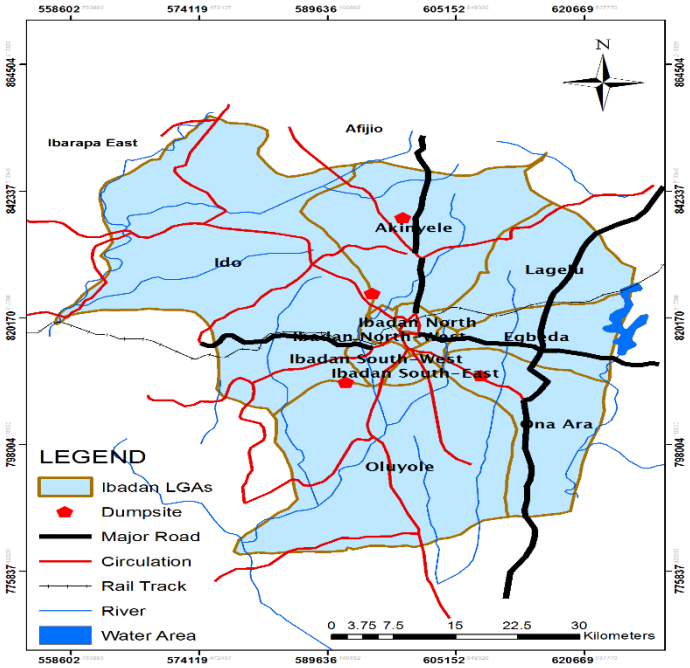

Figure 2: Location of the Dump Sites in Ibadan
Source: Ogungbuyi, 2013

2.1 Socio-Demography and Administration in Ibadan

Ibadan metropolis comprises of 11 local government areas. These Local Government Areas (LGAs) are spatially zoned into two, namely: the inner city (urban) and the suburbs (semi-urban/rural) of the metropolis (Ogungbuyi, 2013; World Bank Group, 2017). While the former comprises of Ibadan North, Ibadan North-East, Ibadan North-West, Ibadan South-West and Ibadan South-East, the LGAs which make up the suburbs are Akinyele, Egbeda, Ido, Lagelu, Oluyole, and Ona Ara LGAs (Figure 2). The 2006 National Population Census put the total population at 2,550,593, while the number of households stood at 616,103 households. According to Olowe (2013), within a period of 15 years (1996 – 2012) the urban density of Ibadan increased by 9.4%, while the rural areas increased by 100% (with a total household of 671,168). He further observed that, as a result of rapidurbanisation and industrialization of the core area, population drift is skewed towards the secondary city, where industrial developments are viable as a result of the availability of land in large quantities and accessibility, due to the dualization of major roads like Ibadan/Ife and Mokola/Ojoowhich increased access to the rural areas.

2.2 Legal and Institutional Framework of Ibadan Waste Management

In recent times, wastes are managed in Ibadan through a Public-Private Partnership (PPP). Oyo State Waste Management Authority (OYOWMA) is the public institution in the city that is saddled with the task of waste management, but the quest by the city managers to improve the efficiency of waste collection and disposal in Ibadan resulted in the PPP initiative. This is a policy that encourages private sector involvement in the collection and disposal of wastes. However, the activities of the two partners are managed and monitored by the state government. The legal framework that established waste management, which is part of Nigeria's laws and regulations in the city are the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act of 2007 and the National Environment Regulations(Sanitation and Wastes Control) of 2009. These legislations are focused on the protection and development of the environment. They also provide general environmental guidelines on the management of

solid waste, including a requirement that the waste is handled by a person licensed to transport and dispose of solid waste in a designated waste management facility. Furthermore, the Federal Ministry of the Environment set out the roles and responsibilities of the three tiers of government in waste management in the Solid Waste Management Policy Guidelines of 2005. Solid waste management options in the document include: management by local government/municipal agencies, private companies on contract with the LGA/municipality, private companies on contract with home owners and by Public-Private Partnership (PPP).

2.3 Waste Generation and Collection Estimates in Ibadan

According to Ogungbuyi (2013) and World-Bank-Group (2017), waste generated in Ibadan can be categorised into four major groups: domestic waste, commercial waste, industrial waste, and public/institutional waste. Besides, as indicated by Babayemi and Dauda (2009), waste streams, agrarian waste, and waste generated from educational developments are part of the aforementioned waste categories in Ibadan metropolis. Adewumi (2005) estimated that of the total waste generated in Ibadan, domestic waste accounted for the highest proportion (60%), followed by industrial waste with 12%, commercial waste with 20%, while only 2% was recorded as agricultural waste. The average per capita volume of waste generated in indigenous settlements and newly developed areas, according to Maclauren (1970), estimates were 0.37 - 0.5 kg/day and 0.53kg respectively.

The Ibadan Master plan study of 1970 by Maclauren International also estimated the waste generation rate in Ibadan based on land use-based classification of waste; waste can also be classified based on the nature of the waste generated. Therefore, waste can be sub-divided into solid waste (refuse) and waste water (sewage). However, in Nigeria, the latter is more challenging to the people and the city managers. Causal factors for this are: the strategic storage of storm water during the rainy season to compensate for water shortage in the dry season, the treatment of industrial water waste before discharge into the water system, the discharge of grey and black water into sewers, and the channelization of some settlements for easy flow of storm water. Unlike water wastes, solid wastes like nylon take years to decompose. Even paper waste takes months to decay if left uncollected and unprocessed. Meanwhile, the discharge of untreated waste water into waterways, siting of latrine close to the water well, open defecation coupled with the indiscriminate discharge of untreated grey and black water into water system and subsoil, in some indigenous locations like Bere, Foko, Oke-Mapo, Idi-Arere, and Oke-Ado in Ibadan, is harmful to the ecosphere of the city. Furthermore, as espoused by researchers (Ogungbuyi, 2013; Okoko, 2014), poor management of storm water is a contributing factor to flood hazard when the waterways are blocked with solid waste. Therefore, owing to the data gap in the volume of water waste produced in Ibadan and the menace of solid waste management in Nigeria, this study focuses on solid waste management in Ibadan metropolis, and the health implications of improper waste management in the city.

2.4 Estimate of Solid Waste in Ibadan

According to Maclauren (1970) the estimation of waste generated in Ibadan is based on the land use map and population distribution within the city; the inner core areas generated the highest volume of solid waste as shown in Table 1. He further assumed a street refuse generation rate of 15% and subsequently derived 0.55kg/capital/day as the waste generation rate in Ibadan (Table 1 and 2).

Table 1: Landuse-based waste generation estimate in Ibadan from 1995 to 2000

Location	Waste generation (1000 tonnes)	
	1995	2000
Inner core	360	420
Other high-density areas	170	196
Medium and low-density areas	135	156
Commercial areas	15	15
Industrial areas	35	35
Public and institutional areas	10	10

Source: Oyo State Urban Rehabilitation Project II; Solid Wastes Composition, 1988; Ogungbuyi, 2013

Table 2: Waste generation rate in Ibadan

Waste	Rate in kg per capita per day
Domestic Waste	0.46
Street Refuse	0.09
Total	**0.55**

Source: Maclauren 1970; Ogungbuyi, 2013

Several other studies conducted in Ibadan, like the study for the CPE (Centre for People and Environment) for Methane-To-Markets Program, put the average daily generation rate at 0.3 to 0.51 kg per capita per day. According to OYOWMA statistics, the average amount of waste collected per month in 2015 (both public (OYOWMA and LGAs) was 38,250 tonnes. Assuming that the population of Ibadan city was 3.5 million, this estimate correlates to roughly 0.35kg/person/day collected. The rate is about 35% if 0.7kg/person/day of waste generated is assumed (Adewumi, 2005). This corresponds with Ogungbuyi's (2013) estimate of 40%.

Approximately, 40% of the total waste collected was carried out by private contractors, an increase of 10% unlike the 30% collected in 2014. While over 50% of the waste collected was done by OYOWMA, about 5% were collected by the LGAs (Figure 3). However, as the responsibility of waste collection returned to the LGAs, the share of waste collected by the LGAs became higher than OYOWMA's (World Bank Group, 2017).

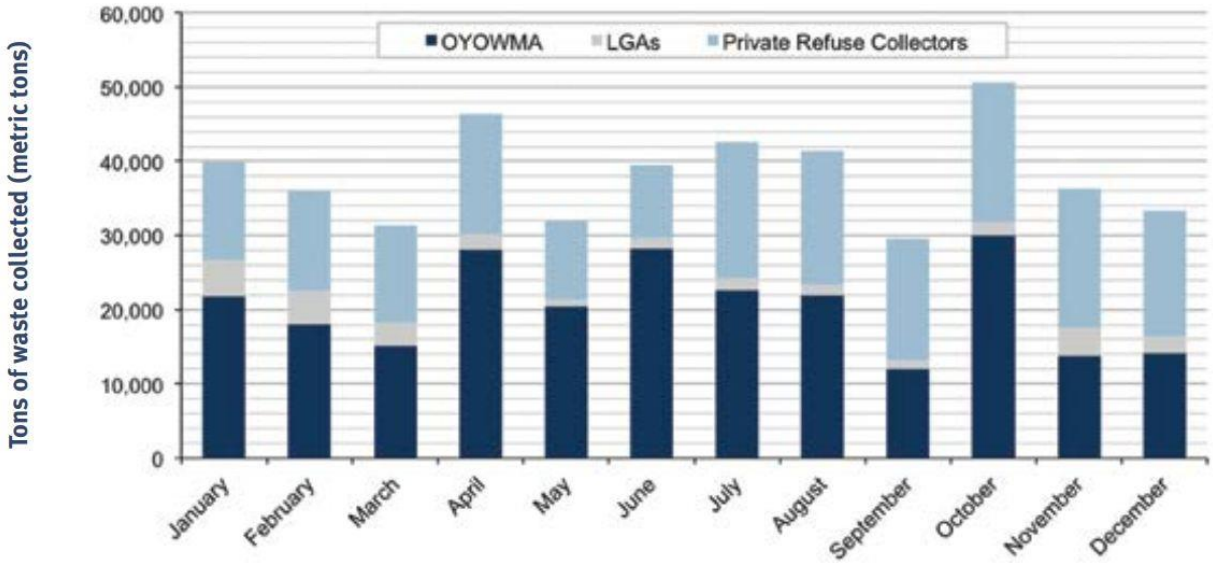

Figure 3: Quantity of waste collected in 2015
Source: OYOWMA; World Bank Group Report, 2017

2.5 Population and volume of waste generated for 2006 and 2018 in LGAs of Ibadan.

The dominance of informal activity like street hawking and on-street trading in Ibadan motivated the researcher to adopt the Maclauren estimate of 0.55kg per capita per day, for it takes into consideration street sweeping. Therefore, the application of this value to the 2006 population figures, Ogungbuyi's estimates of 2013, and projected figuresfor 2018 resulted in the annual quantities of waste generated in Ibadan as shown in Table 3.

Table 3: Population Distribution and Waste Quantities for 2006 and 2018

S/N	LGA	Population		Waste Quantity (Tonne/Yr)	
		2006	2018	2006	2018
	Ibadan Urban				
1	Ibadan North	306,795	461442.90	61,757.83	92888.46
2	Ibadan North East	330,399	496945.10	72,555.62	100035.05
3	Ibadan North West	152,834	229873.90	33,562.35	46273.62
4	Ibadan South East	266,046	400153.32	58,423.70	80550.86
5	Ibadan South West	282,585	425029.23	62,055.67	85558.38
	Ibadan Semi-urban				
6	Akinyele	211,359	317899.93	46,414.44	63993.26
7	Egbeda	281,573	423507.10	61,833.43	85251.98
8	Ido	103,261	155312.36	22,676.12	31264.38
9	Lagelu	147,957	222538.53	32,491.36	44797.01
10	Oluyole	202,725	304913.74	44,518.41	61379.14
11	Ona Ara	265,059	398668.80	58,206.96	80252.03
	TOTAL		**3836284.90**		**772244.15**

*Projected 3.46% Annual Oyo State population growth rate from UNFPA statistics

Source: National Population Commission 2006 Census; Ogunjobi, 2013; Author's Computation, 2019

2.6 Waste Characterisation in Ibadan

Omole and Alakinde (2013) observed that the eating habit of the people and other socio-demographic attributes such as: level of education, income and settlement pattern were major factors which influenced waste generation. The dominant waste generated in Ibadan metropolis was organic like leaves. This is supported by the study of Ogungbuyi (2013) and a report by World-Bank-Group (2017). However, owing to the cost-effectiveness of polythene, it is a perfect substitute for leaves in the city, especially in the CBDs where informal activities are dominant. In his study of waste characteristics in Ibadan, a small proportion of the waste generated was discharged paper and carbon waste (Omole and Alakinde, 2013). Meanwhile, the preponderance of the informal economy in Ibadan centres has resulted in the generation of more carbon and synthetic materials like paper and plastic respectively. This underscores the fact that the socio-economic characteristics of the people which include: income, education attainment, occupation, and building types were factors that determined the type and quantity of waste generated in Nigeria generally, and Ibadan in particular (Oluwande, 1974; Omole et al, 2013). Thus, indicating that owing to the high percentage of garbage waste in Ibadan, the density of waste generated in Ibadan is very high especially in areas where people with indigenous food habits reside (Oluwande, 1974; CPHERI, 1970).

2.7 Waste Collection in Ibadan

Collection of waste is the most challenging and most expensive aspect of waste disposal practice; it costs up to 80% of the total disposal cost. This includes storage or collection in containers at producing locations and transportation to disposal sites. House to house refuse collection is not prominent in many developing countries. This results in the use of all sorts of receptacles as dustbins. Baskets are used in many southwestern statesin Nigeria. Unlike the developed countries where all houses have proper access roads for easy accessibility by waste trucks, refuse collection in developing countries is challenging because the majority of the

houses have no access roads. Household or domestic refuse has to be carried by the inhabitants themselves to strategically located collection depots. These collecting depots, according to Oluwande (1974),come in different forms. It could be an ordinary open space where the refuse may be left permanently to decay or burnt periodically. It may also be a container with or without wheels, or in the form of built structures, at ground level or elevated, roofed or without a roof. This supports the study of Omole et al, (2013) in Ibadan which discovered that most of the residents of Ibadan walked long distance before gaining access to waste collection depots due to the nature of traditional core areas in Ibadan and the backwash effects of poor urban planning of the past years, that have been carried over to recent times. He characterized Ibadan core settlement as a slum, inaccessible settlements with a deplorable environmental condition that discourage the location of the public waste container in a central area for public easy access and also impedes the mobility of waste collectors. Consequently, the quest by the people to dispose of their waste against all odds, result in haphazard waste disposal in Ibadan metropolis.

2.8 Existing Waste Management Practices in Ibadan

2.8.1 Public Sector

OYOWMA as a public waste institution collects refuse day and night. They collect waste between 9pm and 6am because of high vehicular and pedestrian traffic during the daytime. According to EGIPE Snarl (2015), OYOWMA collects 68% of Ibadan waste. Owing to the heterogeneous pattern of Ibadan districts and the deplorable condition of road networks, the use of packer trucks is problematic. Presently, the waste collection method adopted in heavily reliant on accessibility by vehicles. The prevalent forms of waste collection methods in Ibadan include: house-to-house, communal depots, block system and shop-to-shop (Ogungbuyi, 2013). A study by Oguntayo and Obayelu identified 5 collection methods in Ibadan which are: government/dumpsite waste collection point, private drum container, landfilling/burning, dumping into river/drainage, and dumping by the roadside. According to the study, 10% of waste producers used the private refuse contractors and paid an average monthly charge of ₦2,000, while 41% used government waste services and paid an average monthly charge of ₦500. According to Ogungbuyi (2013), house-to-house waste collection usually required financial commitment in areas with accessibility. He further estimated that roughly 16% of the households disposed of their waste at approved public dumpsites. However, the majority of the poor residents of Ibadan haphazardly dump their wastes in undesignated locations (Ogungbuyi, 2013). This results in human-induced hazards like a flood when there is blockage of waterways and drainage systems in particular. It is a major causal factor of health hazards when such contaminated/polluted water comes in contact with the household.

2.8.2 Private Sector

The private waste collectors collect waste from residential, commercial and industrial areas that are ready to pay for their services (OYOWMA, 2016). About 40% of the waste that gets to the dumpsites are collected by private waste collectors. According to the World Bank Group Report (2017), industrial wastes are collected every day, while commercial waste is collected 3 times a week (up to 4 complete loadings of one truck in a day), household wastes are collected once a month (one or two complete loads for one truck in a day). Unlike OYOWMA, private contractors do not collect waste at night because dumpsites are closed at night, and due to safety concerns.

2.8.3 The Informal Sector

The informal sector is not unconnected to disposal mechanisms in Ibadan. The scavengers in the core areas, according to Fadamiro, Olujimi, and Okedele (2014), are involved in the reduction of waste quantity and the provision of secondary resources for manufacturing whichis too important to overlook. However, owing to the myopic nature of their services, there is no record on the quantities of solid waste collected at open spaces, along the roads, gutters, and open drains among others.

2.9 Waste Disposal in Ibadan

It is obvious from various researches that the vast majority of Ibadan residents dispose of their waste indiscriminately, but waste collected by OYOWMA and the private collectors are disposed of at strategically located dumpsites in the city. They are located in the North, East, West and South wings of the city for easy access to refuse trucks. From the beginning, the locations for dumpsite were devoid of human settlement, but, due to poor urban planning, developments have sprung up in these locations – a contending evil to peoples' health (EGIPE Sarl, 2015). However, the land coverage of the sites ranges from 10.7 to 20.1 (Table 4). Wood waste is the dominant waste composition in Ajakanga and Abaeku sites, there is a preponderance of food waste in Awotan dump site (Table 4). The socio-economic characteristics of settlements proximal to each location are the determinants of the type of wastes deposited in each dump site.

Table 4: Overview of Existing Dumpsites and Households Served

Dump Site	In service year	LGA	Approximate size in hectare	No of Households in 2006	No of Households in 2018	Issues
Lapite	1998	Akinyele	9.3	49,883	67638.28	Opened, Uncontrolled and haphazard dumping of waste
Awotan	1998	Ido	20.3	24,745	33045.18	Open disposal approach
Ajakanga	1997	Oluyole	10.7	44,200	64875.26	Dominance of Industrial waste
Aba Eku	1994	Ona Ara	10.7	59,097	84823.15	Open disposal approach
TOTAL				**177,925**	**250,381.87**	

*Projected 3.46% annual Oyo State population growth rate from United Nations Population Fund statistics. The average number of persons per household – 4.7 based on Sridhar et al. 2011 Ibadan Household survey results
Source:(Ogungbuyi, 2013); (World-Bank-Group, 2017); Author's Computation, 2019

As indicated by the World Bank Group Report, none of the dumpsites complied with established environmental and safety standards. Access roads to the dumpsites were in very bad shape and resulted in the wear and tear of the trucks. After the waste is tipped off the track, they are burnt to reduce the quantity of deposited waste. This form of disposal (burning) is an incomplete waste disposal method. The smoke released polluted housing developments nearby and as the residues decay, it gives a pungent odour with psychological effects on developments in close proximity. A description of dumpsites in Ibadan city is hereby presented in Table 5.

Table 5: Waste Composition of Selected Dumpsites in Ibadan

Composition	Average Weight in Percentage		
	Awotan	Ajakanga	Aba Eku
Paper and Textile	21.99	23.14	19.46
Garden, Park or non-food waste	15.64	26.65	25.47
Food waste	36.67	21.80	26.51
Wood/Straw	25.70	28.40	28.57
Total	**100.0**	**99.99**	**100.0**

Source: Centre for People and Environment (CPE) for Methan-To-Markets Program USEPA on Landfill Recovery and Use in Nigeria, 2010; Ogungbuyi, 2013.

The researcher estimated that with about 3.8 million population, Ibadan city generated roughly 772, 244.15 tonnes of solid waste in 2018 (Table 3). This shows an 83.8% increase compared with the volume generated in 2006. However, while the land coverage of existing dumpsites remained constant, the average for household services increased from 177,925 in 2006 to 250,382 in 2018 (Table 4). Thus, it can be concluded that given the unsustainability of management techniques such as open dump site approach, the quantity of waste generated in Ibadan has exceeded the capacity of existing dumpsites and as a result, some residents have resorted to methods like indiscriminate burning of refuse, dumping into drains and waterway channels. Consequently, this impairs the human environment and threatens the lives of the people.

3.0 Challenges of Waste Management in Ibadan

3.1 Nature of Existing Settlement Patterns

The nature of existing physical developments and building structures in the core of most Nigerian settlements are not easily amenable to control. The vast majority of inhabitants in the core areas are indigenes and illiterates who often resisted any form of control on their landed properties. A typical example isFoko, Ibadan where sanitation is less prioritized. Also, the deplorable state of the roads hinders the performance of waste management services in Ibadan. For instance, Oke- Foko residents cannot enjoy the services of private waste collectors because it lacked accessibility to waste trucks. This probably explains why OYOWMA is in charge of waste collection in the core areas.

3.2 Poor Staffing and Meager Technical Know-how

The staffing situation of the existing planning structure in the state is grossly inadequate qualitatively, quantitatively and technically. The understaffing of planning officials in both the public and private sectors could result in improper monitoring and control of waste in most settlements. Besides, the available staff is not conversant with contemporary monitoring systems like ArcGIS, QGis and Golden Surfer.

3.3 Poor Funding

Capital is a crucial aspect of waste management. The various planning agencies in the country are poorly funded. The facilities needed for monitoring are not provided for in the public sector. The private sector is also inadequately funded and are constraints to borrow from institutions owing to stringent borrowing conditions like high interest rates and limited payback period. This limits the capacity of waste managers to effectively render waste management services. For instance, owing to lack of funds, most of the private collectors used open-cabin tippers which are poorly designed for waste collection. More often than not, as the vehicles pass by, waste with offensive odour drop on roads thereby resulting in an unpleasant and disturbing environment.

3.4 Bad Planning

Bad planning owing to lack of reliable planning data for projections, poor governance, discontinuity in planning policies and poor location of dumpsites, is too critical to overlook. In addition to this, planning policies must be taken into consideration the socio-economic status of the majority. However, this study revealed that the vast majority of the people, especially in the core areas of Ibadan, could not afford the services of waste collectors. Thus, they dispose of their waste illegally and indiscriminately.

3.5 The Legislation

Existing legal frameworks guiding waste management in particular and spatial development generally need to be reviewed**.** They are no more effective in contemporary spatial planning. For instance, the issue of penalties for pollution needs to be reviewed. The polluter pay principle is no more effective especially with water pollution like oil spillage, as people prefer to pay the penalty rather than take proactive measures. In addition to this is the issue of penalties for contravention in the Urban and Regional Planning Law, Decree No 88 of 1992 which needs to be reviewed. People prefer to pay the stipend fine in the provision of the law than complying with the law.

3.6 Ignorance

A significant proportion of the population of Ibadan residents that dispose of their waste on open land and in drains are ignorant and uneducated. They are of the shallow opinion that waste collection is a public service that should be done for free. Furthermore, most of them are ignorant of sanitation ethics and the consequences of indiscriminate waste disposal. Psychological housing poverty is another causal factor of this. In this instance, they are satisfied with the state of their environment and socio-economic wellbeing owing to a lack of exposure.

3.7 Lack of Blueprint

Another inhibitor of waste management in Ibadan is the lack of a master plan to guide land use development. Although the city is one of the pioneers of planning education in Nigeria,with the first Urban and Regional Planning Institution in Nigeria, it has been left for decades to chaotically develop without a master plan. Even now, the people await theimplementation of the Ibadan city master plan that kicked off 3 years ago. Dumpsites are poorly located and waste management operations are not well defined. For instance, Aba-Eku dumpsite was designed for sanitary landfilling, but is now been used as an open dumpsite which makes waste management problematic on the site.

4.0 Implications of Improper Waste Management on the Health of Residents of Ibadan

Oke, Atinsola and Aina, (2012) described the locational pattern of household facilities particularly in tenement houses in Ibadan. Facilities like the kitchen, toilets, and bathrooms are located very close to each other. Due to the inadequacy of space, water storage is located proximal to the toilet (latrine). Most of their bathrooms are located close to the water well and are mostly made up of zinc sheets (a toxic material in solution) or wood. Water systems are therefore polluted because of the close location of toilets and water supply systems. Other implications include: bad odour, food contamination, breeding of mosquitoes, cockroaches, and flies (the major carrier of e-colli causing cholera). Malaris is endemic in the dirty areas of Ibadan. Spots earmarked by most of the households for the disposal of their household waste breed vectors responsible for malaria. Meanwhile, settlements located close to the four designated dumpsites in Ibadan are not immune to disease epidemics.

Untreated waste waters, especially industrial waste water, that are discharged into water systems are toxic to benthic organisms like fishes and other aquatic animals. Such contaminants in solution, like mercury, affects the food chain of the extraterrestrial habitats. Fishes bred in such waters have mercury deposits in their system, and when such fishes are consumed by humans, it causes mercury poisoning. To buttress this point, it is estimated that the vast majority of Nigerians are living in abject poverty, which reflects in their eating habits. Most of Nigerian generally, and Ibadan in particular, consume fish because of its low price in tandem with their meager incomes. A fish can be gotten for as low as 70 naira in Ibadan and can sustain a not too large family for a single meal. This implies that of all the cohorts in human society that consume fish, the poor are more vulnerable to mercury toxicity, as they lack the capacities to respond and recover from such health hazards unlike the rich. The discharge of untreated water waste into rivers and seas also increases the population of algae. Consequently, the chemical oxygen demand in water is limited.

5.0 Policy Recommendations

Given the health implications of improper waste management in Ibadan, waste management services in the city need to be improved and affordable to the inhabitants. To achieve this, the following recommendations are crucial:

5.1 Habitual campaign on the dangers of haphazard waste disposal

The residents need to be sensitized on the health implications of improper waste disposal. This should be a collaborative effort on the part ofthe government, NGOs, and CBOs through a series of seminars, public lectures, and conferences. Ultimately, this will change the wrong perceptions of the residents on haphazard disposal of waste and in no small measure ensure good environmental sanitation in their settlements.

5.2 Provision of good circulation in the core areas

The core areas of Ibadan like Foko, Bere, Oke-Ado, and Idi-Arere require infrastructural upgrading. These settlements need a good road network for ease of accessibility by the waste collectors. The financial assistance of organisations like UNHABITAT and the Word Bank should be sought in this regard.

5.3 Public Participation

Waste management in Ibadan has a top-down, rather than a participatory or inclusive approach. The opinion of the people is important for any planning policy to be sustainable. For instance, the willingness of the people to pay for waste management services is pertinent in an indigenous city like Ibadan. This will provide a window of opportunity for the people and the city mangers to reach a concession regarding waste management policies. It will also provide reliable information to the managers, concerning existing problems. Also, the role of the informal recyclers called scavengers must be considered. Therefore, there should be a synergy between the private firms and the informal street waste collectors (scavengers) to collect domestic wastes in inaccessible areas and bring them for onward collection at the depots. This form of collaboration will complement the services of the private firms particularly in the core areas.

5.4 Adequate Funding

It is known to all that sustainable waste management in any region requires huge capital. The private sector involvement in waste management in Ibadan has not been effective in terms of providing an adequate fund to procure high-quality trucks, employ more staff and buy other

equipment used for the collection, transportation, disposal and management of waste in the city. Because of this, there should be financial support through reduced interest rates and support from the state government.

5.5 Waste to Wealth Initiative

The study ascertained that Ibadan residents produced 772,244 tonnes of waste in 2018 (Ogunjobi, 2013; UNESA, 2018). This suggests that this huge volume of waste can be transformed into wealth, that will not only alleviate abject poverty in core areas of Ibadan, but also provide revenue for the government to provide the basic needs of the indigenous settlements. This concept of waste to wealth is practised in a state like Kano, where solid wastes are bought from homes for recycling and reuse.

5.6 Constant Enforcement

This study ascertained that there are legislations guiding waste management in Ibadan, but these are not fully enforced by the regulators owing to socio-economic and political factors such as: poor funding, nepotism, and corruption. For example, due to political interferences by some individuals in the establishment, the issue of waste management has not been given adequate priority.

6.0 Conclusion

This study concludes that indiscriminate disposal of waste in Ibadan is a threat to the wellbeing of the residents of the city. In the purview of urban and regional planning, unsystematic waste disposal methods impair city morphology. It reduces land value and discourages economic development in the city. With respect to coastal planning and biodiversity, haphazard waste disposal increases the ecological footprint and contribute to coastal hazards like flooding. Although, flood occurred on terrain above sea level rise like Ibadan owing to anthropogenic forces like blockage of waterways with refuse, unconnected drains, and others. In the circle of medical science and public health, indiscriminate discharge of waste is deadly to human life. It is detrimental to the lives of people, especially the vulnerable that live in inhabitable environments. It is estimated that thousands of Nigerians unnecessarily as a result of poor sanitation every year. These deaths could have been averted if the necessary proactive measures are put in place by the people and the decision-makers in such instances.

REFERENCES

Adewumi. (2005). Planning organic fertilizer industries for municipal solid waste management. *Journal of Applied Science Research*.

Babayemi, J.O., and Dauda, K.T. (2009). Evaluation of solid waste generation, categories and disposal options in developing countries: A case study of Nigeria. *Journal of Applied Science and Environmental Management (JASEM), 13*(3), 83-88.

Bartone, C. (2000). *Strategies for improving municipal solid waste management: Lesson from a decade of World Bank landing.* Cairo, World Bank, Washington, D.C: Regional Conference Partnership in Municipal Solid Waste Management.

Buckle and Smith. (2000). *Solid waste handling in metropolitan.* Washington, DC: United States Public Health Service (USPHS) publication.

Fadamiro, J.A., Olujimi, J.A.B., and Okedele, O. (2014). Urban environmental sustainability: Liveable cities. In S. Ayarinde, and J. Olujimi, *Urban management: The role of private firms in waste management in Ibadan, Nigeria* (pp. 101-128). Akure: Urban Design Research Team (UDRT), Department of Architecture, School of Environmental Technology, Federal University of Technology, Akure, Nigeria.

Napoleon, S.M., Dimuna, K.O., and Dimuna, J.E. (2011). Mitigating the impact of solid wastes in urban centres in Nigeria. *Journal of Human Ecology, 34*(2), 125-133.

Ogungbuyi, K. (2013). *Ibadan urban flooding management project.* Ibadan: Baseline report on solid wastes management components - Environmental harmony.

Ogwueleka, T. (2009). Municipal solid waste characteristics and management in Nigeria. *Iran. J. Environ. Health. Sci. Eng, 6*(3), 173-180.

Olayiwola, H.A., AbduLawal, L., and Adewuyi, G.K. (2017). Effects of indiscriminate solid waste disposal and environmental issues in Ibadan South West Local Government, Oyo State, Nigeria. *Journal of Natural Sciences Research, 7*(10), 87-97.

Olufayo, Olu-Olu, and., Omotosho, B.J. (2017). Waste disposal and waste management in Ado-Ekiti, Nigeria. *The Social Sciences, 2*(2), 111-115.

Oluwande, P. (2002). *An overview of urban solid waste management in Nigeria.* Ibadan: A paper presented at the Workshop on Waste Disposal. Environmental Pollution and Community Health, Industrial unit and Technology. University of Ibadan.

Omole, F.K., and Alakinde, M.K. (2013). Managing the unwanted materials: The agony of solid waste management in Ibadan metropolis, Nigeria. *International Journal of Education and Research, 1*(4), 1-12.

Popoole, A.A., Ayangbile, O.A., and Adeleye, B.M. (2016). Assessment of solid waste management systems in Ibadan North, Oyo State using geo-spatial techniques. *Ethiopian Journal of Environmental Studies and Management, 9*(6), 666-679.

Shridar, M.K.C., and Hammed, T.B. (2014). Turning waste to wealth in Nigeria: An overview. *Journal of Human Ecology, 46*(2), 195-203.

Ujile, A.A., Omo-Irabor, O.O., and Ogonna, J. (2012). Groundwater contamination at waste disposal sites at Ibadan, Nigeria. *Journal of Solid Waste Technology and Management*, 149-156.

World-Bank-Group. (2017). *Private sector participation in solid waste management activities in Ibadan.* Washington DC: International Bank for Reconstruction and Development / The World Bank.