Comparative Study of the Problems of Solid Waste Management on Human and Environment in the Last Decade: Evidence from 2012 – 2022 Benin City, Edo State, Nigeria.

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Abstract

The problems of solid waste management in the last decade are alarming in Benin City. This is due to the increase in human population, urban growth and development. These problems range from inadequate human attitude, storage facilities, service providers, poor sanitary measures and environmental degradation. The problems of inadequate funding and infrastructure, inappropriate technology, ineffective implementation of government policies and behavioral patterns of the population and inadequate public awareness constitute the bulk of the challenge. The objective of the study examines the problems of waste generated in the study area in the last decade. The methods of content analysis and empirical analysis were used. Primary data were obtained from 25 selected wards and communities from 110 settlements that constitute the study area through a systematic sampling technique. In each of the selected streets, the 2nd, middle and 2nd to last households were administered with questionnaires. A total of 1,781 copies of questionnaires were administered in 768 pollen unit stations and 192,250 numbers of registered voters were used for this study. Results from the study revealed that the problems of waste management were more to poor human attitude, inadequate personnel and service provider, high billing system, inadequate finance, equipment, poor motivation and logistics. From the study, inadequate logistics represents 56.6%, inadequate finances represent 24.1%, inadequate equipment represents 12.1% and inadequate motivation represents 7.2% respectively. Given this, the study recommends that there should be a complete change in human attitudes and service operators. Waste collections are not satisfactory and evacuation should be done on a daily basis. The practice of selective collection by both accredited and non-accredited environmental waste managers should be monitored and sanctioned.

Keywords: Comparative Study, Problems, Solid Waste Management, Human Health, Environment, Last Decade, Benin City.

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1. INTRODUCTION

The challenge of solid waste management appears to be the most prominent issue globally in recent years. Living with solid waste littered around appears to be an acceptable way of life among person(s) in most towns and cities in Nigeria. Waste management has been a major problem since the inception of the history of waste generation.[1] At the global level, the problems are enormous and its threat differs from place to place and from one settlement classification to another. The problems range from inadequate funding, inadequate infrastructure, human attitudes, inappropriate technology, and ineffective implementation of government policies, behavioural patterns of the population and lack of public awareness.[2,3,4]

It has been observed that solid waste management in Nigeria is branded by inefficient collective methods, insufficient coverage and improper disposal system.[5] Furthermore, waste collection density has been on the increase, owing to the human population, urban growth and development which ranged from 280 to 370 kg/m3 while waste generation rates ranged from

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1 Agbebaku, 2018. An Analysis of Solid Waste Management and Environmental Quality in Benin Metropolis, Edo State, Nigeria: An Appraisal. Ambrose Alli University. *Journal of Annals of Environmental Studies* 2(1). Ekpoma

2 Agunwamba, 1998. *Solid Waste Management; Problems and Issues, Environmental Management*, 22(6), *849-856.* Retrieved 7th March 2017; http;//www.springerlink.com/conten

3 Abhijit and Thakareb, 2015. "Solid Waste Analysis and Proposed Management Plan, India", *International Journal of Research on Solid Waste Management*, 2(7), 40 www.rsisinternational.org/IJRSI.html

4 Agbebaku, Iduseri and Kama (2021). "Assessment of the Effects of Solid Waste Management on Environmental Quality in Benin City, Edo State, Nigeria". Federal University Wukari *Journal of Economics Management and Social Sciences*. 7(2), 148-161.

5 Agbebaku, 2021. "Perception of Residents on the Menace of Solid Waste on Environmental Quality in Benin City, Edo State, Nigeria, *Nigeria". Journal of Environmental Science and Technology.* University of Benin. Benin City. 5(2), 290-306. www.nijest.com

0.44 to 0.66 kg/capita/day. [6,7,8,9,10] observed that common constraints that faced environmental agencies include lack of institutional arrangement, insufficient financial resources, absence of by-laws and standards, inflexible work schedules, insufficient information on quantity and composition of waste and inappropriate technology. In addition, the inability of regulatory institutions to (a)inspect the practices of solid waste management, (b)create incentives for the minimization of solid waste (c)establish a hazardous waste management system for each of the economic zones, and (d)promote sanitation strategy and action plan by countries that will provide a clear basis for planning, control, funding, and implementing projects and activities in a more integrated way are some of the problems of solid waste management.[11,12,13] Given this, the combination of the problems of solid waste management in Nigeria, ranging from poor funding, inadequate facilities, inadequate human resources, unsanitary technology, low public enlightenment coverage and taxation observed that the problems of solid waste management are enormous and range from

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6 Okecha, 2000. "*Pollution, Protection and Conservation of Nigeria Environment"*, *Owerri, Afrique International Association*

7 Ezeah and Roberts, 2012. "*Emerging Trends in Informal Sector Recycling".* The State of Solid Waste Management in Nigeria

8 Egbenoma, 2016. "Solid Waste and Control in Some Residential Areas in Egor Local Government Area of Edo State". *B.Sc. Project Thesis Submitted to the Department of Environmental Science and Resource Management,* National Open University of Nigeria

9 Ogwueleka, 2009. "*Municipal Solid Waste Characteristics and Management in Nigeria". Journal of Environmental Health Science and Engineering, 6(3), 173-180*

10 Agbebaku and Kama, 2022. "Comparative Analysis of Service Providers by Private and Government Agencies on Solid Waste Management in Benin City, Edo State, Nigeria". *Confluence Journal of Environmental Studies*. 15(1), 26-37

11 Mishra, 2008. "*Fundamental Concepts in Environmental Studies",* New Delhi, s. Chand and Company Ltd.

12 Shweta, 2013. "Application of Remote Sensing and GIS In Solid Waste Management, A Case Study of Surroundings of River Yamuda, India", *International Journal of Environmental Engineering and Management,* 4(6), 593-604

13 Kadam and Sarawande, 2016. Study and Analysis of Solid Waste Management Challenges and Options for Treatment, India, *IOSR Journal of Mechanical & Civil Engineering,* 15-22. www.iosrjournals.org

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human attitudes, techniques and tools of waste disposal, to private sector practitioners and government agencies.[14,15,16]

Furthermore, in a study on solid waste management in Benin City; an appraisal observed that the problems are due to an increase in human population and urban growth, poor techniques of waste disposal, dwindling financial resources, weak council institutions, the inability of the government to implement and monitor laws and policies and inadequate solid waste services.[17] In addition, a study also observed that in most cities of the world, solid waste materials are not only heaped in huge quantities in refuse dumps but thrown around to lie around in piles and heaps (a)on streets, (b)route junctions and (c)in a small illegal dump on a piece of unused land.[18] The situation is bad in most third-world countries like Nigeria with worst cases, unlike the industrialized countries which have (a)money, (b)technical know-how and (c)public attitudes to manage waste materials to some degree of sanity. In Nigeria, the problem of solid waste management has become a nightmare for the government and waste managers. The challenges of solid waste management result from a combination of variables, such as mal-administrative processes, inadequate finance, none stringent legal action, inadequate planning as well as physical handling of waste materials by concerned individuals, corporate bodies and government agencies.[10,19] Towns and Cities in Nigeria have witnessed

[14] Agunwamba, 1998. "*Analysis of Scavengers' Activities and Recycling in Some Cities of Nigeria"*. Environmental Management, 32(1), 116-127

[15] Agbebaku, Afolayan, Ojeifo, Okhae and Abu, 2022. "An Assessment of the Variability 10of Household Income on Volume of Waste Materials Generated in Benin City, Edo State, Nigeria". *Nigeria Journal of Environmental Science and Technology.* University of Benin. Benin City. 6(2), 506-518, www.nijest.com. https://doi.org/10.36263/nijest.2022.02.0356

[16] Osagie, 2011. *The Problems of Solid Waste Disposal; A Case Study of Ugbowo Municipal Council in Edo State,* A Project Submitted to the Department of Geography and Environmental Management, Ambrose Alli University, Ekpoma, Edo State, Nigeria

[17] Monday and Daniel, 2011. "Solid Waste Management in Benin City; An Appraisal", *The Nigerian Journal of Research and Production, 18(2)*

[18] Igbinomwanhia and Ohiwovoriole, 2011. A Study of the Solid Waste Chain in Benin Metropolis, Nigeria. *Journal of Applied Science and Environmental Management,* 15(4), 589-593. www.ajol.info and www.bioline.org.br/ja.

[19] Segynola and Ofuokwu, 2011. "Analysis of Patronage of Dump Sites in the Benin Metropolis, Edo State, Nigeria". *GRP Journal of Environmental Planning and Management, 4, 25-29.*

increasing indiscriminate solid waste disposal, especially in the last two decades in general and Benin City in particular. The factors leading to these threats are poor techniques of waste management, increased waste generation, increase urban growth and population, dwindling financial resources of urban council institutions, the inability of the government to implement laws and policies, inadequate solid waste services and human attitudes.[2,20,21] The situation with waste disposal in Benin City is such that waste materials are dumped anywhere and anyhow mostly in open spaces, in public facilities like schools and churches, along major and minor roads and junctions, abandoned projects, into streams and markets places.

Waste materials of different types and components are seen as heaps in places where its dumped and this has been a major concern for residents, researchers, government agencies and environmental stakeholders in recent times.[21,22,23] In Benin City, most urban areas and structures have been grappling with this problem of waste management over the years due to poor waste management. Waste management in Benin City is done by the tripartite bodies of environmental waste managers. The activities of these managers are coordinated by the apex body of the Edo State Waste Management Board the agencies of the (a)Local Government Councils (b)Private Sector Practitioners (PSP), and (c)Environmental Free-Lancers.[24] However, the management of solid waste in Benin City is still a challenge and threat to human health as these sets of waste managers were faced with a lot of challenges. The threat of solid wastes in Benin City is huge and needs stiff management because waste evacuation is poor and

[20] Babayemi and Dauda, 2009. "Evaluation of Solid Waste Generation, Categories and Disposal Options in Developing Countries. *A Case Study of Nigeria", Journal of Applied Environmental Management* 13(3), 83-88.

[21] Sridhar 2012. "*Waste Management Policy and Implementation in Nigeria",* Federal Ministry of Environment, edited by Ivbijaro and Akintola in Sustainable Environmental Management in Nigeria. 2, 253-259

[22] UNDP, 2004. *Municipal Solid Waste Management in Developing Countries: A Policy Framework*. Geneva. Technical Paper, 12, Geneva: UNDP

[23] LAWMA, 2022. Lagos Waste Management Authority, *Lagos* State. http//twitter.com/LAWMA

[24] ESWMB, 2022. Edo State Waste Management Board (ESWMB, 2022). Benin City

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weak.[8,10,17,25] In order to achieve this, the objective of this paper is to examine the problems of solid waste management and its implication on human health and the environment in the last decade. The choice of Benin City was pre-determined by a combination of factors with the incessant increase in (a)human population (b)urban growth and development (c)social and economic activities (d)volume of waste generation, and (e)poor service provider. However, the problems of solid waste management were examined from the perspective of service operators and institutions of government in Benin City.

2. CONCEPTUAL CLARIFICATION

Solid Waste Management

Solid waste management is the systematic process of waste generation, collection, storage, transportation, treatment, utilization and disposal of unused or waste items. This involves all the administrative processes, financial and legal implications and planning functions as well as the physical aspect of waste handling. Furthermore, solid waste management involves the activities and actions required to manage waste from inception to its final disposal.

This includes among other things waste generation, collection, storage, transportation, treatment and disposal.[5,26,27] In some studies, it was observed that over 1000 metric tons of solid waste materials are evacuated from indiscriminate dumps in public places every month in China, in England and the United States of America over 900 metric tons were

[25] Umunna, 2009. "Solid Waste Generation and Disposal in a Nigerian City"; An Empirical Analysis in Onitsha metropolis. *Journal of Environmental Management and Safety*, 2(1),181-191

[26] Gilpin, 1976. *Environmental Management* in Indian; New Delhi, CBS Publishers and Distributors.

[27] Ibrahim, 2016. Knowledge and Practice of Solid Waste Management among the Residents of Four Selected Wards in Ibadan North Local Government, Ibadan Oyo State. *A B.Sc. Project Thesis Submitted to the Department of Environmental Science and Resource Management,* Ibadan Study Center, National Open University of Nigeria

evacuated in public places every month while in South Africa and Sweden over 600 metric tons are evacuated in public places every month.[5,27,28,29] In Nigeria, over 200 metric tons of solid waste are evacuated from indiscriminate dumps in public places every month in Ibadan. This assertion was also corroborated [40, 41, 42, 43] in other varied studies in Lagos Island, Abuja and Benin Cities respectively where it was identified that the flow of 30, 25 and 20 metric tons of waste items was evacuated from residential places and in associate areas in every quarter of the metropolitan areas.[15303132] To this end, the situation varies in degree and is typical in most towns and cities in developed and developing countries. Furthermore, studies have shown that majorities of the dumpsites in urban areas in Nigeria are temporal in transits to permanent dumpsites unlike in the developed nations where the theory of locational model was considered before establishment if comparative studies are to be carried out. However, in most of these towns and city centers, urban growth, spread and development have engulfed such dumpsites as observed in major towns and cities in Lagos, Ibadan, Port Harcourt, Kaduna, Benin, Kano and Abeokuta.

For instance, in Benin City 3 out of the initial 5 permanent dumpsites at (a)Iguomo and (b) Otofure has been closed down due to a combination of factors such as (i)proximity, (ii)congestion, (iii)urban spread and

[28] Wright and Boorse, 2011. *Environmental Science*; Toward a Sustainable Future, New Jersey: Pearson Education Inc 11(10).

[29] Cunningham and Cunningham, 2015. *Environmental Science; A Global Concern*, Mc-Hill International Edition, 12(17), 123-134

[30] Ayo, 2015. Critical Issues in *Environmental Sustainability; Forward by Peter Okebukola, Unesco Consultant on the Environment*; Lagos, Ilverfoil Printing Press

[31] Imafidon, 2016. *An Assessment of Solid Waste Management in the Federal Capita City, Abuja,* A Seminar Paper Submitted to the Department of Geography and Environmental Management, Ambrose Alli University, Ekpoma, Edo State, Nigeria.

[32] Agbebaku, 2019. A Spatial Analysis of Solid Waste Management and Environmental Quality in Benin City, Edo State, Nigeria: *A Ph.D. Theses Submitted to the School of Postgraduate Studies*, Ambrose Alli University, Ekpoma.

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development and (iv)menace of waste generation to man and environment.[2,5,8,18,27,33]

Solid Waste Disposal

Disposal of waste items is done with allots of methods, equipment and storage facilities. Disposal of waste items is the ultimate desire for all types, compositions and classifications of waste items. The techniques of waste disposal at a global level are open burning, open dumping, sanitary landfills, incineration, composting, ploughing in fields, hog feeding, salvaging and grinding and discharging into sewers and these can be termed as (a) rudimentary, (b) semi-modern, and (c) modern methods. For instance, the methods of open dump and open burning technique under the rudimentary methods of waste management is where waste materials are dumped and burned anywhere and anyhow. This method is very much operational in Benin City and coupled with poor human altitude where waste materials are discarded anywhere and anyhow on streets, roadsides and junctions, open spaces and uncompleted buildings. However, this method happens to be the cheapest among other methods of waste management and these unapproved dumpsites have increased in the geometric form a crossed most towns and cities in Benin City.[10,15,27,32,34]

Problems of Solid Waste Management

The problems of solid waste at the global level are enormous and that its threat differs from place to place.[2,7,10,20,21] These problems range from inadequate funding, inadequate infrastructure, human attitudes, inappropriate technology, ineffective implementation of government policies, behavioural patterns of the population and lack of public awareness.[8] It has been revealed in the same study that (a); the inability of

[33] Igbinomwanhia, 2012. "Characterization of Commercial Solid Waste in Benin Metropolis", Nigeria *Journal of Engineering and Applied Science* 3(5), 834 - 838.

[34] Enahoro, 2016. "*Evaluating Current Women Participation in Household Solid Waste Management in Oredo Local Government Area"*, A Project Submitted to the Department of Geography and Environmental Management, Ambrose Alli University, Ekpoma, Edo State, Nigeria

regulatory institutions to inspect the practices of solid waste management (b); to create incentives for the minimization of solid waste, and (c); to establish hazardous waste management system for each of the economic zones are some of the problems of solid waste management.[13] Furthermore, there is a need to promote sanitation strategies and action plans in countries that will provide a clear basis for planning, controlling, funding, and implementing projects and activities in a more integrated way. The threat of solid waste in the Benin metropolis is huge and needs stiff management and urgent attention. He added that the problem ranges from individual attitudes and corporate bodies and mainly from the inability of the government to provide the essentials and enforced laws and policies, and the failure of Local Government authorities to administer the needful procedures for effective waste management. It was further submitted that the lack of coherent policies and in-coherent implementation of existing policies of waste management results in poor handling, collection and disposal.[8] He ascertained further that there is a constitutional lapse in ensuring clear duties and responsibilities between the State and Local Government agencies, lack of manpower planning and inadequate technical training, poor funding and lack of accountability prevail among authorities involved in waste management and these are major reasons for the appalling state of waste management in Benin City.

Impact of Waste Disposal on Human Health

Human health to a great extent is a function of how clean and best we manage our wastes, water, air, land, food and hygienic environment. The fitness and healthy state of man is a function of the quality of food intake and the state of the environment we live.[32] This is in terms of clean water, air, land and a hygienic environment. However, in the study area, the prevalence of outbreaks of epidemics and diseases such as cholera, malaria, fever, typhoid and Lassa fever are relatively moderate and low in the low and high brawl areas in each of the 3 Local Government areas. For instance, the communities of Ologbo, Idogbo, Aduwawa and Obayantor in Ikpoba-Okha Local Government areas with high and compact density populations. Given this, residents in this Local Government area are having more health challenges owing to the poor hygienic environment of their areas if

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compared with some of the communities in Oredo and Egor Local Government Areas. In addition, the level of enlightenment for effective waste management to foster clean water, air, land, eat good food and a hygienic environment is low in Ikpoba-Okha than in Oredo and Egor Local Government Areas.[4,10,32]

Impact of Waste Disposal on the Environment

The *environment* is mixed with the threats of (a) smoke (b) fumes (c) sooth (d) carbon monoxide (e) sulphur dioxide (f) methane gas (g) lead (h) toxic chemicals, and (i) particle matters caused by the disposition and burning of waste materials. These actions may cause disease and other health problems. Studies have revealed that a filthy environment repels environmental quality and that any damage done to the environment, run-down capital and that this harm will sooner or later reduce the value of its re-current services. In view of these, there is a need for the environment to be free from mixed pollutants and the threats of smoke, fumes, soot, carbon monoxide, sulphur dioxide, methane gas, lead, toxic chemicals and other particle matters. The impact of waste on the environment is the unbearable and unforeseen incidence of poor aesthetics, unpleasant scene, overflows of temporal dumpsites mainly in markets and hospitals; refuse litter on the streets, road junctions, open spaces and water channels. In addition, there were cases of unbearable and uncountable numbers of heap counts in all the wards, communities and Local Government areas at strategic, common and unusual places.[35]

However, these ill indices led to severe environmental menace such as (a)offensive smells, (b)poor aesthetics and sanitary condition and, (c)environmental ill-quality of clean air, water and land throughout the period of the ban of service operatives from the management of waste materials from August 2018 to March 2019 in the study area. Given this, the environment of Ikpoba-Okha Local Government area is more subjected to poor waste management than the duo of Oredo and Egor Local Government Areas. This is due to the factors of (a)proximity to Idokpa dumpsite (b)low brawl areas (c)more marketplace (d)huge volume of waste

[35] Ministry of Environment and Sustainability of Edo State (MoES, 2022). Benin City, Nigeria

generation (e)population growth (f)urban spread, and (g)poor waste management if compared to most of the communities of Oredo and Egor Local Government Areas. [4,10,32]

3. MATERIALS AND METHODS

Study Area

Benin City is administered mainly by 3 Local Government areas of Oredo, Egor and Ikpoba-Okha and parts of Ovia South-West, Uhunwonde and Orhionmwon Local Government areas. Benin City lies within Latitude $6^0$20' and $6^0$58' North of the Equator and Longitude $5^0$35' and $5^0$44' East of the Greenwich Meridian. These 3 Local Government Areas are made up of several settlements some of which were used for this study. The population of these Local Government areas was put at 1,085,676. Based on a percent of 5.5 growth rate for urban centres, with the 2006 population census figure projected to 2016, the population of Benin City is 1,344,962.[36] To get primary data, wards and settlements of the study area were used as the frame. The study area is constituted of the 3 Local Government Areas of Oredo, Egor and Ikpoba-Okha respectively and these Local Government areas constitute the Benin metropolis. Each of these Local Government areas is made up of political wards, the wards are made up of settlements.

[36] NPC, 2016. National Population Commission (NPC, 2016). Benin City, Edo State

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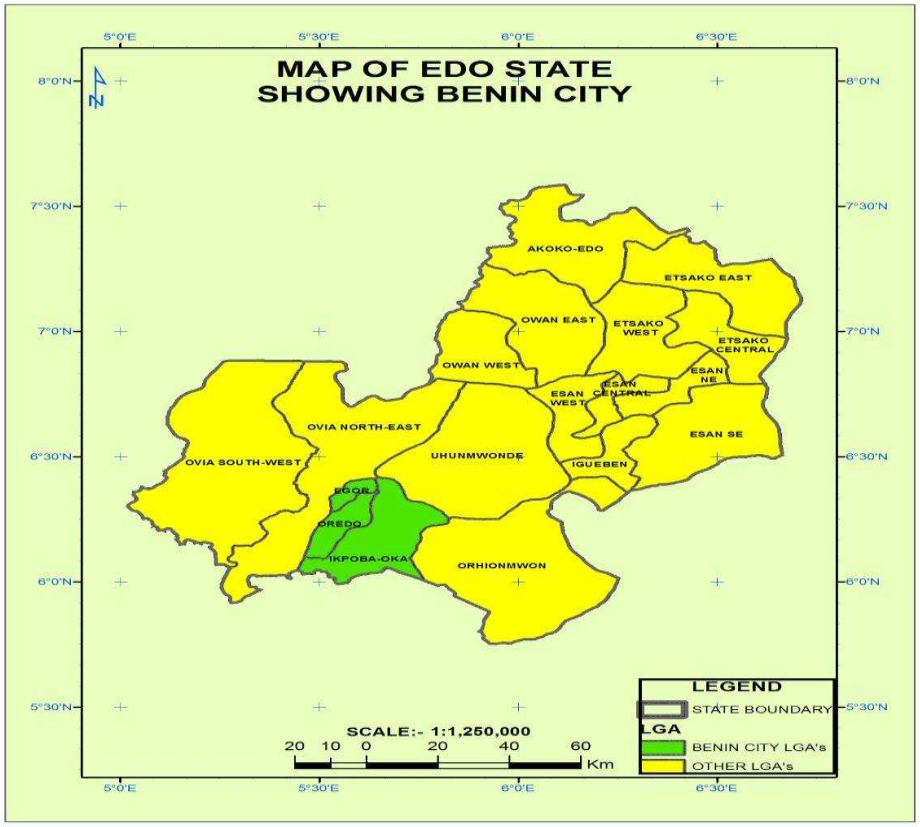

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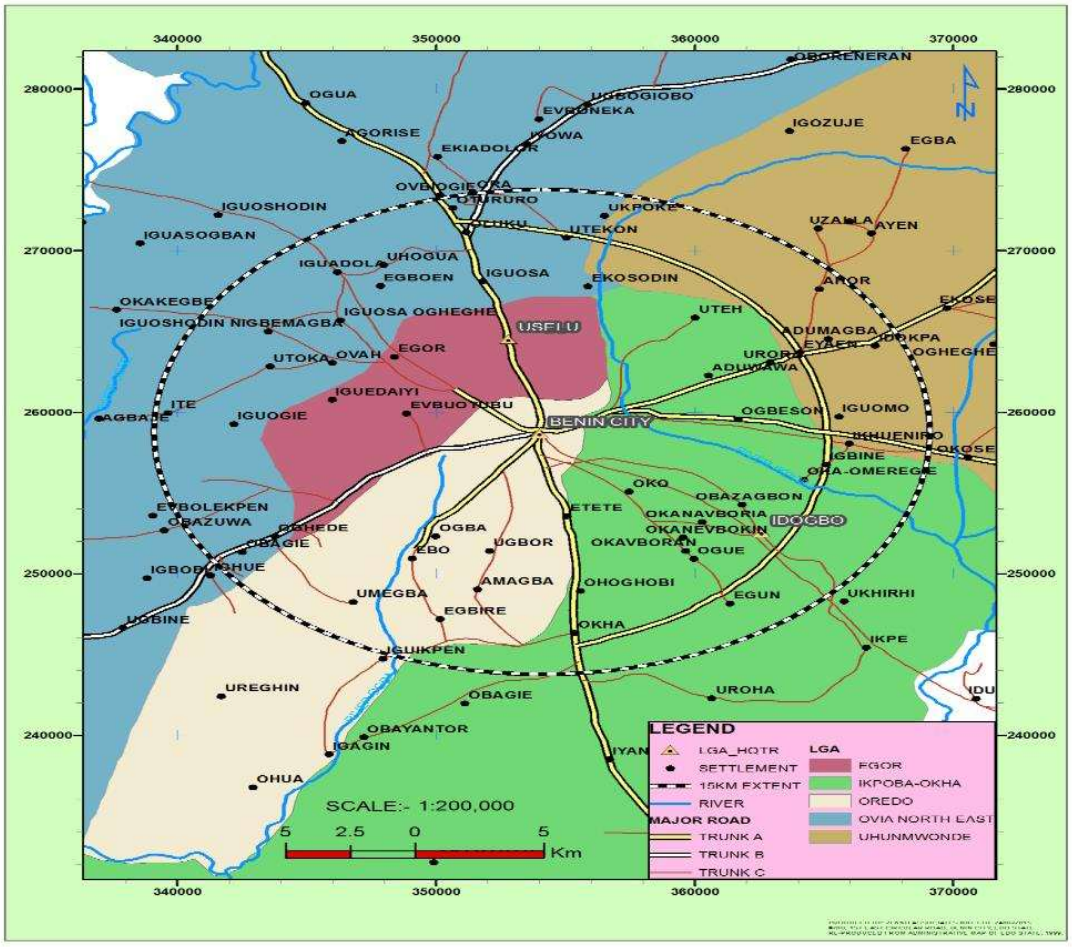

Figure. 2: Benin City**:** The Benin Metropolis.
Source: Ministry of Land and Survey, Benin City, Edo State (2022)

Research Methods

This paper is purely an empirical study and a combination of content analysis of articles from literature and empirical study. Benin City is administered mainly by 3 Local Government areas of Oredo, Egor and Ikpoba-Okha and parts of Ovia South-West, Uhunwonde and Orhionmwon Local Government areas. Benin City lies within Latitude 6^0 20' and 6^0 58' North of the Equator and Longitude $5^0$35' and $5^0$44' East of the Greenwich Meridian. Figure 1 shows the 3 Local Government areas used for the study while Figure 2 shows the Benin City metropolitan area respectively. The study area is the 3 Local Government areas of Oredo, Egor and Ikpoba-Okha Local Government in Benin City. These 3 Local Government Areas

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are made up of several settlements some of which were used for this study. Each of these Local Government areas is made up of political wards and the wards are made up of settlements. To get primary data, wards and settlements of the study area were used as the frame. For the purpose of this study, 60% of the wards of each Local Government area were randomly selected for the study. In doing this, 12 wards were selected in Oredo, 03 wards in Egor and also 10 wards in Ikpoba-Okha Local Government areas respectively. The selection of settlements was based on the number of Polling Units.

Therefore, settlements with Polling Units of 20 and above were selected for questionnaire administration. For the purpose of determining the population size for primary data collection, the number of registered voters in the Polling Units of each settlement was used. Voter registrations of 250 were used per polling unit. The use of the number of registered voters is predicated upon the unavailability of the 2006 Population Census figure for settlements. For Oredo Local Government area, the number of registered voters from the selected polling units was 89, 250 while in Egor and Ikpoba-Okha, they are 15, 750 and 87,250 respectively. In all 192,250 populations were registered. Distributions of the questionnaire were administered in each ward of the Local Government areas. To this end, wards with 20 and above polling unit stations (PUS) were selected in each of the three Local Government areas. That is, in Oredo Local Government area with 28 communities, which constitutes 12 wards; all the communities in the 12 wards were used for questionnaire administration going by the benchmark of 20 and above polling unit stations used for this study.

4. RESULTS AND DISCUSSION

Results from the study revealed that all the different sectors of waste managers in the study area were understaffed mainly the accredited waste managers. This is against the required global standard in line with the increasing human population in Benin City. From responses on staffing from environmental waste managers; the staff of Edo State Waste Management Board (ESWMB) have 20 personnel deficits from the required recommended number. This is followed by staff from the Department of Environmental Health Officers; for instance, Oredo Local Government area

had 13 staff deficits from the required number. Findings from the Private Sector Practitioners in Egor Local Government area; showed that 9 staffs were deficits from the required number while for Environmental Free-Lancer (waste vendors); 8 staffs were deficits from the required number to manage a given cell or bits according to global practice.

In addition, the study revealed also that the majority of staff from the Private Sector Practitioners were not trained on the job unlike those from ESWMB and Local Government councils. However, staff from Local Government areas admitted that ill-service training on-the-job was part of the major challenges they encountered on the job; as training and re-training programmes on waste management were not regular and adequate. The study revealed that the practice of ill-service training of Environmental Waste Managers had not changed from 2012 to 2022. Though, it was revealed that staff of ESWMB and Local Government authorities have better academic qualifications and are more qualified on-the-job than those from the private sector. More so, qualifications for staff intake from the public sector cut crossed all the 3 cadres of senior, intermediate and lower categories. At the Senior cadre, we have those with postgraduate qualifications; at the Intermediate cadre there are those with 1st, 2nd and NCE degrees and qualifications while at the Junior cadre, there are those with OND and SSCE qualifications.

The situation is not so with the private sector, as the Managing Directors are those with either B.Sc, NCE and OND qualifications only and with other supporting staff. Having Secondary and First School Leaving Certificates. The Environmental Free-Lancers (one-man business venture), does not have or need academic qualifications or undergo training programs to operate. However, responses from the 3 Local Government areas revealed that Oredo has the highest number of private sector practitioners and environmental health officers than the other 2 council areas with Egor and Ikpoba-Okha Local Government areas in that order.

The results revealed that there were deficiencies in infrastructural facilities and services virtually in all the 3 Local Government areas. These basic infrastructures, facilities, services and equipment, needs to be provided by

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the concerned persons(waste generators) and agencies such as; (a)residents (b)private sector practitioners, and (c)government agencies. This is to enhance quality services and effective and efficient service providers. Basic facilities for waste management include operational structure, office space, personnel and materials, permanent dumpsites, vehicles/trucks, car park, road network, operational cells or bits, personal protection equipment and code of conduct. From the study, these amenities and facilities were inadequate in all the 3 Local Government areas. Adequate services for effective waste management connote the provision of essential amenities to waste generators, waste managers and government agencies. Each of these persons and groups needs to do the needful and provides the minimum basic services and altitudes expected of them. For instance, waste generators need to ensure the provision of adequate storage facilities such as; sack bags, nylon and plastic containers in their respective domains on one hand and on the other, these facilities should be well utilized and managed.

The trio of waste collectors should provide the men and materials, ensure prompt logistics and qualitative service providers. In addition, they should avoid selective services and ensures adequate coverage of their areas of operations. Results from the study revealed that evacuation of waste materials in the study area was relatively poor and inadequate in all the 3 Local Government areas except some selected high brawl areas per LG. Virtually, all the communities were faced with these anomalies and inadequacies of storage facilities. For instance, government agencies are supposed to provide the operational structures for effective service management in each of the wards, community and Local Government areas. Government services through the Ministry of Environment, Waste Management Board, Departments and Local Government agencies should coordinate activities of waste management. These service agencies should take charge of; appointments, and regulations, and monitor, implement and sanction defaulters on waste matters in their given areas. These agencies should collaborate with service operators for effective waste management in their respective Local Government areas. Furthermore, government agencies should exercise full control and responsibilities of managerial functions such as adequate planning, controlling, coordinating, monitoring,

laws, policy, enforcement and sanctions for waste management to be effective.

The results revealed that the presence of database records is very significant for the management of waste materials. For instance, the response from those that indicate the presence of database records represents 60.2%, while those with the absence of data represent 39.8%. The study further revealed the need for records keeping for the daily, weekly, monthly and yearly volume of waste materials collected. The same can be kept for the volume of waste generated, movement and number of vehicles on daily, weekly, monthly and yearly bases of vehicles entering the varied dumpsites. in the study area. However, it was revealed that the public sector management had better records of their operations than those from the private sector because the practice of keeping database records is of utmost importance in the planning and designs of any environmental system. It was observed that the act of record keeping was not in line with the model of database management and standard of international practice in the study area. However, the comparative analysis revealed that responses from Oredo L.G (41%) have more database records than those from the other 2 council areas. This is followed by responses from Egor (36%) and Ikpoba-Okha (23%) Local Government areas respectively. Furthermore, the study revealed that clients pay monthly bills for waste materials directly to operatives of waste managers for waste collection. Payments were made on daily, monthly, quarterly and yearly bases and subject to the condition of service and terms of the agreement.

It was revealed that each service operator generates and distributes bills in their areas of coverage while the computed amount was based on the volume of waste materials collected, composition and the number of persons per household. The monthly charge ranges from a minimum of #2,000.00 to #8,000.00 per household in all the 3 Local Government areas, while those that generate more and heavy waste items from industrials, medicals and hazardous wastes were highly levied; this was owned to composition, hazardous and infectious of such waste items. Results from the study revealed that the problem of high monthly charges formed part of the major challenges in the study area as 95.0% of the residents' complained

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of high billing charges. Which does not commensurate with the volume of waste materials generated. Furthermore, the study revealed that private service operators pay yearly taxes to the government on revenue collected from residents and corporate establishments. These taxes are paid to the government through the state waste management board. The study revealed that the amount (tax) paid by an individual operator per year ranges from #1,000.000.00 to #10,000,000.00 depending on the area and nature of service delivery. This compared the operators to increase their daily, monthly and yearly charges to clients. Furthermore, the study revealed that renewal of appointment and continuity of service delivery with the Board is a function of not defaulting on tax payment instead of service delivery and aesthetics of the environment.

In addition, the study revealed that the majority of responses indicate a fair perception of the effectiveness of waste evacuation. Response of fair perception represents 37.5%. This is followed by those with good perception and this represents 25.3%. The perception of very good represents 20.1% and poor perception represents 17.1% respectively. Furthermore, it was revealed that fair perception could be due to irregularities in the service provider. These anomalies could be part of the reasons for poor waste management as observed in Okhuoro and Aduwawa and other public places like the popular Oba and Uselu markets as well as in the New-Benin motor park. In addition, the study revealed that the mandatory functions of government to provide sanitary services as stated in the 1999 Constitution 'Fourth Scheduled' were maladministered and poorly implemented in the study area. The comparative analysis of responses of residents on the effectiveness of waste management was a bit good and fair services in Oredo and this is followed by responses from Egor and Ikpoba-Okha Local Government areas respectively. The reason for this was the effectiveness and efficiencies of the service operators in Oredo, in-between in Egor and poor in Ikpoba-Okha respectively. Furthermore, the study revealed that the greatest challenges faced by environmental waste managers were the constraints of inadequate logistics to equate the demand for waste evacuation and this represents 56.6%. This is followed by the challenge of inadequate finances and this represents 24.1%. The challenge of inadequate equipment represents 12.1% while the challenge of

inadequate motivation represents 7.2% respectively. Furthermore, the challenge of inadequate logistics needs to be improved by service operatives. However, these constraints were faced by both private and public sectors in the study area.

The comparative analysis of the response to the greatest challenges faced by environmental waste managers indicated that residents from Egor were faced with the greatest challenges of inadequate logistics. This is followed by responses from Oredo and Ikpoba-Okha Local Government areas respectively. Response to inadequate finance was higher in Ikpoba-Okha than in the other 2 council areas. This is followed by responses from Egor and Oredo. The challenge of inadequate equipment is much lower in Oredo and higher in Ikpoba-Okha Local Government area. The constraint of inadequate motivation is very low in Oredo and none in Egor and Ikpoba-Okha Local Governments respectively. Responses to awareness of laws and policies regulating the activities of Environmental Waste Managers were high in the 3 Local Government areas. The study revealed that 95.2% indicates the presence of sanitary laws and government policy on waste matters while 4.8% indicates absence or none awareness.

The study observed that those that indicate the absence or no awareness of environmental laws and policies were ignorant of the existence of such laws and policies as these set of persons need to be enlightened. Furthermore, these categories of persons have poor human attitudes and indulged in the practice of indiscriminate dumps of refuse materials anywhere and anyhow in the study area. The comparative analysis of responses from waste managers on residents on adherence to laws and policies revealed that only 4 out of the responses from Ikpoba-Okha indicate the absence of laws and policies and this could be the reason for poor waste management and practice of indiscriminate dumps of refuse anywhere and anyhow observed in most of the communities in the Local Government area than from the other 2 council areas.

The study revealed that the impact of waste on the environment in the study area is becoming unbearable and unforeseen incidents in recent times and have led to poor aesthetics, unpleasant scene, heap count, and overflows of

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temporal dumpsites mainly in market and hospital places. On daily bases, refuse materials are littered on the streets, road junctions, open spaces and water channels. Cases of unbearable and uncountable numbers of heap counts were recorded in all the wards, communities and Local Government areas, at strategic common and unusual places. These ill indices led to severe environmental menace, offensive smells and poor sanitary conditions throughout the period of the ban of service operatives during the period of August 2018 – March 2019. This was the first of its kind in the last decade in the history of the study area. Furthermore, the study revealed remedies to the problems of waste management in Benin City. Response from the remedy of the prompt service provider was the major problem and this represents 21.9%. This is followed by remedy of recycling measures and this represents 17.3%. 13.3% indicate remedy of the provision of waste disposal materials. 12.7% indicate the remedy of engagement of more service operators. 10.4% indicate the remedy of public education and sensitization. 7.6% indicate the need for adequate enforcement. 6.6% indicate the need for better sanitary measures. 5.3% indicate the use of degradable materials while 4.9% indicate the need for staff motivation respectively. Where all these measures are well annexed and implemented, there will be some possible changes in the threat from poor waste management in the study area and this will enhance the environmental quality of clean land, waste and air.

However, the comparative study from residents of the 3 Local Government areas revealed sizeable numbers of remedies to problems of waste management in the study area. For instance, responses from Oredo recommend the remedy of recycling measures more than the other 2 council area. This is followed by responses from Egor and Ikpoba-Okha respectively. Remedies of prompt service providers and provision of waste disposal materials were also high in Oredo, in-between in Egor and low in Ikpoba-Okha respectively. This may be due to the level of awareness and exposure of residents from Oredo and Egor more than residents from Ikpoba-Okha Local Government area. From the study, other remedies to the problems of waste management in order of priorities were those for the better service provider, public education, adequate enforcement, better sanitary measure, use of degradable materials and staff motivation.

However, all these variables were adequately high in Oredo, moderate in Egor and relatively low in Ikpoba-Okha Local Government area respectively.

5. CONCLUSION AND RECOMMENDATIONS

The problems of waste management were common in all the wards, communities and Local Government areas of the study. Residents should be cautious of waste disposition. Living with solid waste littered around appears to be an acceptable way of life among person(s) in most towns and cities in Nigeria. The problems of solid waste management in Benin City ranges from inadequate funding and infrastructure, human attitude, inappropriate technology, ineffective implementation of government policies, and behavioral pattern of the population and lack of public awareness. Furthermore, the problem includes inefficient collective methods, insufficient coverage of the collective system and improper disposal system. In addition, there is a lack of coherent policies and in-coherent implementation of existing policies of waste management resulting in poor handling, collection and disposal. The study recommends that there should be a drastic change in human altitudes. Secondly, waste generators should ensure the provision of adequate storage facilities. Thirdly, operators of environmental waste materials from the tripartite bodies should evacuate waste materials daily and weekly if need be. Fourthly, there should be strict legislation for offenders irrespective of the degree of the offense. Lastly, the practice of the concept of environmental quality of the environment should be highly embraced and adopted, this is one of the key measures to mitigate the menace of waste materials globally.

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