Nigerian Journal of Technology (NIJOTECH)
Vol. 42, No. 2, June, 2023, pp.289 - 295
www.nijotech.com

Print ISSN: 0331-8443
Electronic ISSN: 2467-8821
https://doi.org/10.4314/njt.v42i2.18

ASSESSMENT OF SOLID WASTE MANAGEMENT IN OTA, OGUN STATE, NIGERIA

A. O. David[1,*], O. O. Odagbodo[2], O. T. Opafola[1], G. M. Amusan[1], A. A. Badejo[3], and O. S. Olaniyan[4]

[1]Department of Civil Engineering, Olabisi Onabanjo University, Ibogun Campus, Ogun State, Nigeria.
[2]Morgan Omonitan and Abe Limited, Lagos Island, Lagos, Nigeria.
[3]Department of Civil Engineering, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria.
[4]Department of Civil Engineering, Ladoke Akintola University, Ogbomoso, Oyo State, Nigeria.

*corresponding author (Email: adekunle.david@oouagoiwoye.edu.ng)

Article history: Received 12 January, 2023. Revised 30 June, 2023. Accepted 11 July, 2023. Published 31 July, 2023.

Abstract
The rapid rate of population growth and urbanization has impacted the management of municipal solid wastes (MSW) and is increasingly becoming a major concern in many cities in developing countries. Insufficient area coverage for wastes collection, processing system, and unsuitable disposal all appear to be the causal factors. This paper discussed the current situation of solid waste management in Ota municipality as well as the challenges and associated problems. Structured questionnaires, interviews and on-site observations were used for data generation, and subsequently analyzed using descriptive statistics. Results indicated that 28.6% of the respondents incinerate their wastes, while 27.6% of the respondents dispose theirs to public waste bins. About 11.4% deposit their wastes by the road side, while 6.4% dump their wastes in drainages and water bodies. Most respondents incinerate their wastes which would impact negatively on the ozone layer. Results also indicated that 54.3% of the respondents have their wastes disposed regularly, while 66% do not sort their wastes which make them difficult to manage. The city's single dump site was visited in order to have a better understanding of the existing solid waste management measures in place. Other illegal waste dumps in the town were also visited. In order to address the difficulties of solid waste management in the municipality, it is recommended that the state government engage additional Private Service Provider (PSP) operatives to assist with waste collection and transportation, provide suitable facilities, machinery, and equipment, and launch a public awareness campaign.

Keywords: Assessment, Solid waste, Management, Ota, Ogun State.

1.0 INTRODUCTION

The daily activities of man have always resulted in the production of wastes, which is an inevitable part of daily life, the waste produced must therefore be properly managed trough collection and disposal. Solid waste is generated from daily human activities and are considered not useful thereby should be disposed of [1]. Rapid urbanization, increase in industrial activities, the life style of the populace and the dominating commercial activities in an area can contribute to the rate at which their waste grows. Heaps of wastes piling up at different corners of a city than before is a sign that the city is experiencing growing urbanization [2, 3]. [4] Stated that with the annual population growth of 6.5% the quantity of waste generated in Nigeria grew to become 25 million tonnes per annum, this is a big issue. The current challenge of solid waste management in Nigeria is caused by the inability of the waste collectors to collect all the waste that is generated, the waste collectors are too few to cover the apportioned areas and the bad habit of the populace of dumping wastes indiscriminately [5].

The inadequacy of collecting, transporting and disposing waste have been identified numerous times

but the proposal for a lasting solution that would work in a country like Nigeria has been a major challenge [5]. Malaria and water borne diseases like cholera, dysentery and diarrhoea are the most reported diseases in most African countries and all these diseases are traceable to the poor waste disposal methods existing in these countries [6]. The uncollected waste that got into the drains have been the major cause of flooding events in Nigeria [7]. The main method of waste disposal adopted in Nigeria is open dumping, these dump sites is characterised by offensive odour, ever rising smoke and a breeding ground for pest and rodents [8].

Ota has been one of the fastest growing city in Ogun State and this is due to its proximity to Lagos State which is a commercial city and the presence of many manufacturing companies within the city [9]. The increasing population has given rise to increased waste generation beyond what the existing structure of the Ogun State waste management authority can handle. The Ogun State government in October 2019 established Ogun State waste management authority (OGWAMA) for replacement of the already existing Ogun State environmental protection agency (OGEPA) with the aim of providing more quality and extensive service to the state residents. OGWAMA has been in operation for more than two years now yet the impact of their operations have not been so much noticed by the city occupants as the standard of services rendered by the authority has not been different from what the previous agency rendered, the lack of proper education of the city's occupants could be a cause of these too. It has become the general habit of the populace to dump their refuse indiscriminately. Refuse are dumped along the road side kerb as shown in Figures 1a and 1b and in the drains thereby polluting the environment, posing health risk and flood risk.

Figure 1: Indiscriminate dumping of refuse in drainages and along the road sides

The growth rate in indiscriminate refuse dumping in Ota even after the replacement of the waste management agency has called for a great concern. This study investigated the existing solid waste management measures in the town under the administration of OGWAMA, the state of their dump sites, the challenges of solid waste management faced, the consequences associated with the current approaches to solid waste management and offers suggestion towards overcoming the challenges of waste management in the state.

2.0 MATERIALS AND METHODS

2.1 Study Area

Ota which is the seat of Ado-odo/Ota local government is ranked as the third city in Nigeria that contains the largest number of industry [10]. It is the administrative centre of the Ado-Odo/Ota local government region, which spans an area of 878 square kilometres between latitudes 6°41′N and 6°68′N and longitudes 3°41′E and 3°68′E. The LGA has a population of 527,242 people (male 261,523 and female 265,719). [11], Ado-Odo, Agbara, Igbesa, Iju-Ota, Itele, Kooko Ebiye City, Owode, Sango Ota, and others are among the towns and cities. Ado-Odo/Ota is a true industrial Local Government, with the largest industrial area and the greatest number of industries in the state. As a result, the Local Government generates the highest internally generated revenue (IGR) in the State of Ogun. Covenant University, Bells University of Technology, Crowford University and Gateway Polytechnic at Igbesa are the operational private universities. The region is a hive of commercial activity. Veepee Company, Coca-Cola Nigeria Ltd, May and Baker Nigeria Plc, Glaxo-SmithKline Plc, and others are among the companies that operate there [12]. Figure 2 shows the map of Ota town.

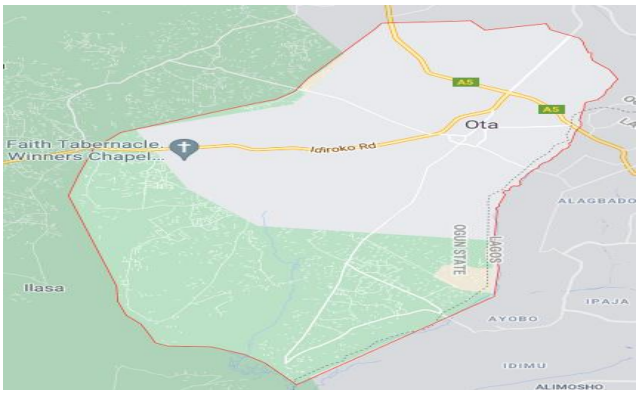

Figure 2: Map of Ota Town [Source: Googlemap]

2.2 Field Work

The data for this study is collected through;

I. Personal observations, field trip and interviews;
II. Questionnaire administration.

Prior to beginning the actual fieldwork, pre-tested checklists were used for data gathering. The majority of the information produced for this study was qualitative. Structured field observation, a questionnaire, interview guidelines, was employed to gather information and data for the study. For the chosen participants, a standardized questionnaire was used on a household's knowledge of their sources of energy use, living arrangements, on-site solid waste management, and solid procedures for disposing of garbage, among other things. In addition, a checklist was provided so that the OGWAMA could learn more about how solid waste is now managed. For several days, data on solid waste management and the importance of community involvement was gathered from the examined families. Two professional collectors completed the collection. During field observations, the researchers employed tools including a digital camera and a GPS to take pictures of and ground control locations. Open dumping grounds, market places where it is anticipated that handling waste will be challenging, and waste collection sites with containers were also specifically utilized as sample units to gather qualitative data. Combining information from secondary sources, qualitative research, and quantitative survey, the results were examined.

A total of 200 questionnaires was administered out of which only One Hundred and Forty (140) questionnaires were retrieved from the households within the study area containing their demographic characteristic, types of solid waste generated, place of disposal, availability of bins for storing waste, mode of collection and payment for collection, distances covered to dispose of waste, waste separation practices and the risk of improper waste management etc. Field surveys and oral interviews with Ogun State Waste Management Authority (OGWAMA) representative, three waste dump sites were visited in the study area. The 2016 population of Ota was 526,565. Assuming four persons per household, Ota is supposed to have 131,641 houses. Sample population (n) is given as;

$$n = \frac{N}{1-N(e^2)} \quad (1)$$

Where; n = sample size, N = sample frame and e = margin of error with 7.5% confidence level. n = 178.

3.0 RESULTS AND DISCUSSION

3.1 Demographic Characteristic of the Respondents

A total of 200 questionnaires were distributed while 140 were retrieved as shown in Table 1. The study area has predominantly youth population with age range between 18 and 45 representing 84% of the respondents. Majority of the respondents are either self-employed (35%) or working in a private establishment (44%) while the minority (21%) of respondents are civil servants, corper and unemployed. The study area is occupied and characterised by low income earners (85% earning 50,000 or less montly) which suggested the reason for majority having a small household size. A scientific study revealed that income stratification is a key determinant of the respondent's socioeconomic status [13]. The distribution of the respondents' location is presented in Figure 3 with Abbebi having the highest (28%) respondents while Joju has the least respondents distribution of 7% within the municipality which is not far-fetched because it is a bus stop in Ota with less residential facilities as compared to other areas.

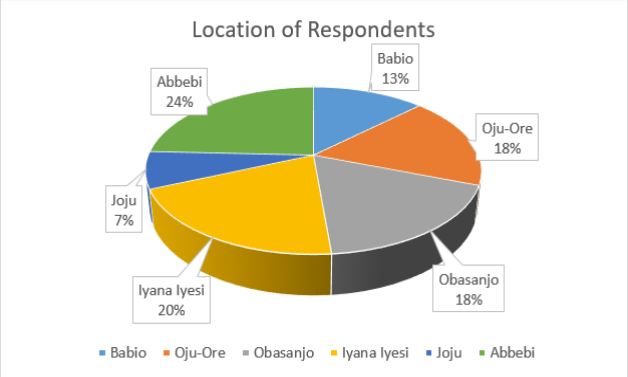

Figure 3: Location of Respondents

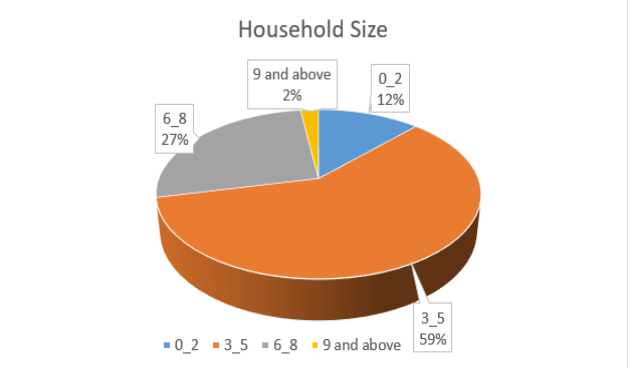

Figure 4: Respondent's Household Size

The household size of the respondents shows low to medium range as shown in Figure 4 with three to five members recording fifty-nine percent while a large

household is only two percent. The occupation of the respondents range from public service to private sector as shown in Figure 5 with private employee having the most distribution of 44 percent.

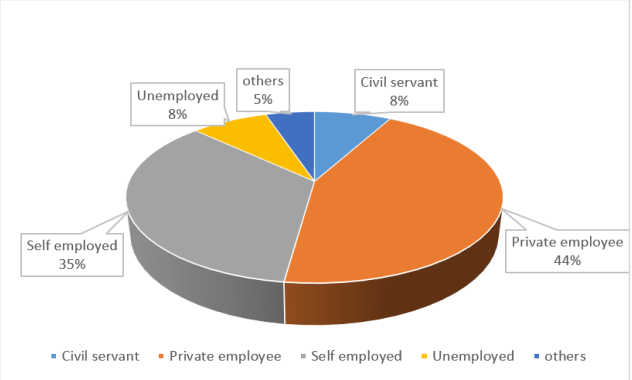

Figure 5: Occupation of Respondents

Table 1: Demographic Characteristics of the Respondent

RESPONDENT CLASSIFICATION	DESCRIPTION	DISTRIBUTION (%)
Genger	Male	46
	Female	54
Age Range	18 – 25	30
	26 – 35	34
	36 – 45	19
	46 – 60	14
	61 - above	2
Household Size	1 – 2	12
	3 – 5	59
	6 – 8	26
	More than 8	2
Formal Education	Secondary School	27
	Higher Education	64
Work	Civil Servant	8
	Private Employee	44
	Self Employed	35
	Corper	5
	Unemployed	8
Income per Month	₦0 – ₦2,000	42
	₦20,000 – ₦50,000	43
	₦50,000 – ₦100,000	9
	Above ₦100,000	6
Location	Abebi	24
	Babio	13
	Oju-Ore	18
	Obasanjo	18
	Iyana Iyesi	20
	Joju	7

3.2 Method of Solid Waste Collection and Disposal

Formal waste collectors are referred to involvement of State Government and its partnership with private companies in Public-Private Participation (PPP). However, the activities of private vehicles, cart pushers and scavengers are regarded as informal waste collectors [14]. The mode of waste management within Ota municipality includes the use of public waste bins, scavengers, cart pushers, burning, burying of waste and indiscriminate dumping of waste in open space (Figure 9), roadsides (Figure 11) and drainages (Figure 10).

Figure 6 shows that only 27.8 percent of generated wastes are collected by officials from designated public waste containers to government approved dump sites, 14.3% are handled by informal collectors, 6.4% disposed their waste into drainages, 10.7% use open waste dumping and 11.4% disposed their waste by the roadside. The huge participation of informal and illegal waste disposal technique might be attributed to the collection containers placed far away from the residents and inaccessibility of some areas due to poor planning and road network.

Burning is the major waste disposal technique adopted by residents within the municipality representing 28.6% while burying of generated wastes is the least adopted technique representing 0.7%. The open burning of wastes is common practice mainly as a waste and odour reduction measure. However, it is a major source of dioxin/furans emission which serves as a non-point source of various pollutants and direct emission into the breathing zone of the atmosphere which affects health adversely [15, 16, 17].

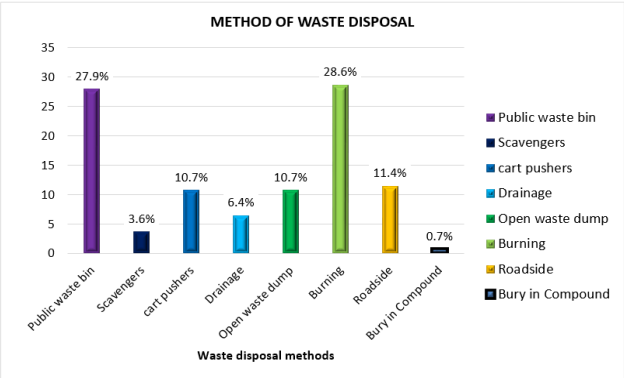

Figure 6: Method of waste disposal adopted

Figure 7: Kurata Dump Site

Sixty-four (64) of the sampled population do not have regular waste collection in their area of residence while 76 of the respondents claimed to have regular waste collection in the area of residence. Twenty-seven (27) of the respondents that have regular waste collection in their area of residents do not use this facility while 49 of the respondents within the area where there is proper waste collection use this facility. 65 of the respondents do not pay for regular waste collection while 75 of the respondents pay for the regular waste collection in their area of residence. 48 of the sample population separate their waste before disposal while 92 of the respondents do not separate their waste before disposal. 96 of the respondents have a prior knowledge of reuse, recycle and reduce while 44 of the respondents do not have a prior knowledge of reuse, recycle and reduce. Twenty-four (24) of the respondents that have a prior knowledge of reuse, recycle and reduce claim to reuse their waste in minimizing the amount of waste disposed, 27 of the respondents claim to recycle their waste, 14 of the respondents reduce their waste before disposal while 31 do not use any of these methods in minimizing the amount of waste disposed.

Figure 8: Road to Kurata Dump site

3.3 Personal Observation of the Disposal Sites

There is only one government-approved disposal site in Ota, which is located behind the High Court on Idiroko Road. Kurata is the name of the dump site. The coordinates of Kurata dumpsite are N 6º 41′ 26″ and E 3º 12′ 00″ where all trash collected inside Ota township is to be dumped. Figure 7 shows the dump site's current state. The government has done little or nothing to improve the dump site's condition. The roads leading to the site are in poor condition as seen in Figure 8; the site itself emits an odour that is inconvenient to the local residents; there is no waste treatment. Waste is continuously burned on the site; and the government has no waste selection plan; scavengers visit the site to scavenge for reusable and recyclable materials. It is crucial for different states to increase the effectiveness of their garbage collection, investigate highly effective waste conversion technologies, combine supply from neighbouring cities, or take into account a variety of renewable energy sources for large-scale power generation [18].

Figures 9 (Osi Itele) and 10 shows the situation of Itele road dump sites, which are illegal dump sites that have been in operation for a long time, and where PSP vehicles continue to deposit garbage, as shown in Figure 9. This site is located between coordinates N6º40′ 54″ and E3º13'47" 3º13′ 47″ in Ota, and is a gully that transports flood water. Waste is poured into the gully in the hopes that the flood water will carry it away. This has caused frequent flooding within the area during the rainy season. Sango bridge is progressively becoming a dump site; during the research, it was discovered that the bridge is surrounded by waste. Sango bridge is located at coordinates N 6º 42′ 25″ and E 3º 14′ 33″ in the state, and the waste generated in the market is dumped beside the bridge, with OGWAMA vehicles coming around to park them.

Figure 9: Osi (Itele road) Dump site

Figure 10: Itele road Dump site

The amount of waste generated in the market exceeds the capacity of the designated truck therefore the

remaining waste find its way into the drains, this has caused flooding countless times within the area and if nothing is done to alleviate the situation, flooding will continue. According to Uwadiegwu and Chukwu [19], in order to accomplish successful waste management, locals must be motivated through sensitization and environmental education, which would change people's attitudes toward improving and sustaining neighborhood quality while providing a sense of belonging.

Figure 11: Sango Bridge Dump site

4.0 CONCLUSION

Ota municipality waste management systems have not been effective throughout the years because a significant portion of the town's citizens do not receive regular waste collection in their neighbourhood and so discard their waste carelessly. It is practical to develop the frequency of collection and route design for collecting vehicles in order to make collection from all generation places simple. Strict regulations should be in place to make it easier and the public should be made aware of the locations where waste may be disposed of. A program on waste minimization and waste sorting should be run among the inhabitants to increase public understanding of solid waste management (SWM) in the municipality.

To lessen environmental pollution, it is advised that the government put in place a waste-to-energy treatment system, repair the access roads to the city's dump site, and turn the city of Ota's current open dumping system into a sanitary landfill with the necessary environmental protection measures. It is critical to emphasize that resources for waste management must be harnessed, and that storage, separation/sorting, collection, and transport to the appropriate processing unit must all be addressed before final disposal. Because of human activity, waste creation is unavoidable. As long as the population's need for products rises, waste will rise with it. As a result, good waste management and reduction should always be a priority. For ease of collection from all generation points, the frequency of collection and route design for collecting vehicles should be developed. The public should be made aware of where waste may be disposed of, and strict policies should be in place to make it easier. To raise public awareness and comprehension of solid waste management (SWM) in the municipality, public education initiatives should be designed to encourage public engagement in sustainable waste management behavior.

REFERENCES

[1] Ojo, O. O., and Adejugbagbe, J. A. "Solid Waste Disposal Attitude in Sango Ota, Ogun State: Implication for Sustainable City Development in Nigeria", *Journal of Environment and Waste Management* 4(3); 2017, 253-260.

[2] Agunwamba, J. C. "Solid Waste Management in Nigeria: Problems and Issues", *Environmental Management*. Volume 22 (6); 1998, 849-856.

[3] Agunwamba, J. C. "Environmental Assessme-nt: Analysis of Scavengers' Activities and Recycling in Some Cities of Nigeria", *Environmental Management*. Volume 32 (1); 2003, 116-127.

[4] Olukanni, D. O., and Mnenga, M. U. "Municipal Solid Waste Generation and Characterization: A Case Study of Ota, Nigeria", *Int. J. Environ. Sci. Toxic. Res*. Vol. 3(1); 2015, 1-8.

[5] Ogwueleka, T C. "Municipal Solid Waste Characteristics and Management in Nigeria", *Iran. J. Environ. Health. Sci. Eng.*, Vol. 6 (3); 2009, 173-180.

[6] McMicheal, A. J. "The urban environment and health in a world of increasing globalization: issues for developing countries", *Bulletin of the World Health Organisation*, 78 (9); 2001.

[7] Folorunso, R. and Awosika, L. "Flood mitigation in Lagos, Nigeria through the wise management of solid waste: the case of Ikoyi and Victoria Islands", *Managing Conflicts over Resources and Values*. Results of a workshop on 'Wise practices for coastal conflict prevention and resolution', Maputo, Mozambique, 19-23, November 2001.

[8] Onwughara, I. N. Nnorom, I. C. and Kanno, O.C. 2010. "Issues of Roadside Disposal Habit of Municipal Solid Waste, Environmental

Impacts and Implementation of Sound Management Practices in Developing Country – Nigeria", *International Journal of Environmental Science and Development*. 1 (5); 2010, 409 – 418.

[9] Olukanni, D. O., and Akinyinka, M. O. "Environment, Health and Wealth: Towards an Analysis of Municipal Solid Waste Management in Ota, Ogun State, Nigeria". Proc. ICCEM; 2012, pp. 138 – 145.

[10] Salako R. A. "Ota: The Biography of the Foremost Awori Town", *Penink and Co*.; 1999, pp. 85-87.

[11] Nigeria Population Census; 2006.

[12] Olukanni, D. O. and Mnenga, M. U. "Municipal Solid Waste Generation and Characterization: A Case Study of Ota, Nigeria", *Int. J. Environ. Sci. Toxic. Res*. Vol. 3(1); 2015, 1-8.

[13] Miezah, K., Obiri-Danso, K., Kádár, Z., Fei-Baffoe, B., and Mensah, M. Y. "Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana", *Waste management*, 46; 2015, 15-27.

[14] Ike, C. C., Ezeibe, C. C., Anijiofor, S. C., and Daud, N. N. "Solid waste management in Nigeria: problems, prospects, and policies", *The Journal of Solid Waste Technology and Management*, *44*(2); 2018, 163-172.

[15] Daffi, R. E., Chaimang, A. N., and Alfa, M. I. "Environmental impact of open burning of municipal solid wastes dumps in parts of Jos Metropolis, Nigeria", *Journal of Engineering Research and Reports*, 12(3); 2020, 30-43.

[16] Kumari, K., Kumar, S., Rajagopal, V., Khare, A., and Kumar, R. "Emission from open burning of municipal solid waste in India", *Environmental Technology*. 2017, 1–14. doi:10.1080/09593330.2017.1351489

[17] US Environmental Protection Agency. "PCBs in the United States: Industrial Use and Environmental Distribution", 1976, EPA 560/6-76-005.

[18] Somorin, T. O., Adesola, S., and Kolawole, A. "State-level assessment of the waste-to-energy potential (via incineration) of municipal solid wastes in Nigeria", *Journal of Cleaner Production*, 164; 2017, 804-815.

[19] Uwadiegwu, B. O., and Chukwu, K. E., (2013). "Strategies for Effective Urban Solid Waste Management in Nigeria", *European Scientific Journal* 9(8); 2013, 296-309.