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Journal of Waste Management and Disposal

RESEARCH ARTICLE

ISSN: 2641-8827

Challenges and Prospects of Sustainable Waste Management in Jimeta Metropolis, Adamawa State, Nigeria

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Citation: Jahknwa JC, Buhari MK, Sindigawo Z (2019) Challenges and Prospects of Sustainable Waste Management in Jimeta Metropolis, Adamawa State, Nigeria. J Waste Manag Disposal 2: 302

Article history: Received: 06 August 2019, **Accepted:** 02 October 2019, **Published:** 04 October 2019

Abstract

This study assesses the challenge and prospect of solid waste management in Yola-North metropolis, Adamawa State in 2018. Still images of refuse dumpsites were taken from the selected neighborhoods under study and Key Informant Interview was used in this study to get information on waste disposal from the selected neighbourhoods. The study showed that there is no adequate waste disposal methods in Yola-North, no data on waste composition and daily total waste generated per neighbourhood. The Urban Planning unit has no waste disposal management framework that guides their operations. The study recommends adequate funding and strengthening of synergy with other relevant stakeholders at the private and public levels to implement a sustainable waste management policy in the metropolis and the state at large.

Keywords: Solid Waste; Dumpsites; Disposal; Still Images; Evacuation; Recycling; Regulations

Introduction

Waste generation and management is an intrinsic part of life forms on earth of which man is a part. It is a direct result of consumption behavior of living organism [1]. As such, the nature, type and quantity of waste generated varies with an organism's consumption behavior [2]. Every life form has developed its own unique management strategies for the wastes it generates to prevent the negative boomerang impacts on its health and survival of its habitat [2].

Man however, has a ubiquitous consumption behavior because of an insatiable appetite to consume every environmental resource on the surface of the earth, ceteris paribus (other things being equal) [1]. Accordingly, this level of waste generation has in all ramifications most often outpaced the management thereof [3]. Where there are no effective waste management strategies, environmental health risks of varying proportions manifest often threatening survival at the primary level [2,4]. Thus, many waste management strategies have and are being continuously developed, adopted and or adapted with evolving environmental challenges over time [5]. Yet, and quite often, these management strategies fail to meet up with the level of waste generation, making the subject matter to attract much attention of late.

Yes, population growth, urbanization, and industrialization have been the main stimuli of enormous wastes generation and disposal [3,6] making urban centers more amenable to the menace. Louis [7] pointed out that it was the recurrent epidemics associated with indiscriminate waste generation and disposal plus the belief in anti-contagionism (war against contagious agents) that led to the improvement in public health via construction of water treatment and sewerage works and what Aleluia and Ferrao [4] described as the thermal combustion of solid waste in the 19th century America, despite its capital intensiveness. Further improvement in the United States, Germany and other developed countries vide integrated and sustainable waste management system has now effectively reduced waste production to the barest minimum despite changes in consumption patterns [8].

This is however, not the case with low and middle-income countries of South America like Brazil and Argentina [9-13] or of Africa like Kenya and Nigeria [14-18] where solid waste generation has outpaced disposal, with no synergy between the formal and the informal waste sector due to absence of coordination and operational guidelines and the capital intensive nature of waste management that is slowing the adoption and adaption of integrated and sustainable techno-driven waste management practices. Some of these countries spend more than 50% of their budget in municipal solid waste management that are mostly biodegradable in nature [2]. What is further obtainable in the low and middle income countries according to Aparcana [4] and

Aleluia and Ferrao [2] is the existence of a formal waste management authority operating at a very low standard alongside the informal waste management sector consisting of individuals (variously called scavengers, recyclers, waste-pickers and so on) and micro-enterprises who are deemed illegal operators and therefore not allowed by the formal waste management authorities. It is the absence of synergy between the formal and informal waste management authorities that is perhaps one of the reasons of poor standards of operations and is making the sector to be affected by population growth, poor public participation and low income level [3]. Thus, most low and middle-income countries do not even know the total quantity of the waste they generate or the composition to enable them plan for effective disposal, and so only a fraction of waste generated is disposed-of countrywide albeit ineffectively and unsustainably [19]. This is the reason behind Aparcana [4] advocacy for the formalization of the informal waste management sector into municipal solid waste management systems in the low and middle-income countries by means of actors in the informal sector forming associations or cooperatives, or becoming community based organizations or being contracted as individual workers by the formal waste management authority.

It may be valid to think that the prevailing local socioeconomic and environmental conditions in low and middle-income countries will not easily permit the adaptation of western technology-driven intensive waste management strategies (Joshi, 2016). There could however, be other latent factors militating the effective management of waste that have not been identified yet especially in urban and suburban centers of countries such as Nigeria.

Indiscriminate waste disposal has always been a problem in Nigeria [14]. Evidence of such negative social behaviors manifest as eye sores in most urban and suburban areas across the country. Streets, low lying areas and drainages are often observed to be littered with all sorts of solid and liquid wastes, exposing the general population to environmental health risks daily [20-21]. Despite the local refuse evacuation and disposal mechanism in place, local authorities responsible for waste evacuation and waste management enforcement have not been able to meet up with the ever growing amount of wastes on daily basis generated in their areas of jurisdiction.

Consequently, we looked at the status of waste disposal from households in the study area with a view to identifying the challenges and prospects of waste management in Jimeta metropolis vis-à-vis the local peculiarities as a basic step to bringing to light the level of threat posed by the menace with a view to finding possible solutions.

Materials and methods

This study was conducted between December 2017 and January 2018. The study area is the Jimeta metropolis located in Yola-North North local government area of Adamawa State, northeast Nigeria (Figure 1). It lies on latitudes $9^{0}13``N$ and longitudes $12^{0}19``E$, with a land area of about $231.64km^{2}$ and an altitude of 85m above sea level.

The study is grounded on the pragmatic philosophy of the symbolic interactionism theory rooted in the works of Mead and Dewey [22]. This theory is based on the idea that social interaction shapes human thinking capacity through varying perceptions of meanings and symbols that influence behavior and as such is altered or modified based on contextual interpretation, which informs decisions on possible courses action that would yield maximum benefit. Accordingly, this study employs remotely sensed data (photographs) to interpret peoples pragmatic action with respect to waste disposal in their environment and how their actions portends a negative interactive boomerang effect from the environment.

The study area was classified into high-income, middle-income and low-income neighborhoods. The low-income neighborhood comprise Luggere, Nepa, Damilu, Jambutu, Demsawo, Nassarawo, Shinko, Clark-quarters neighborhoods; the middle-income consist of Bekaji, Karewa, Masakare, Gibson-Jalo, Old GRA neighborhoods; the high-income is the Dougirei neighborhood (Figure 2). This classification was based on level of income, level of planning and types of homes found in each of the neighborhoods. For instance the low-income neighborhoods are poorly planned with many slums, and streets that have cul-de-sacs with poor and/or inadequate drainages. Most households in the low-income neighborhoods are subsistent farmers and traders with no formal education, which are deemed to live below the poverty line. Similarly, the middle income neighborhoods are occupied mostly by civil servants who live in quartered houses in well planned neighborhoods that were developed by the government. The high income neighborhood is the elitist fully planned hilltop neighborhood with palatial mansions occupied by the rich and powerful in the study area.

The survey team comprised a male and two female who incidentally are the authors of this paper. The checklist in Tong, *et al.*, [23] guided data collection. Data for this study was collected vide observation using reconnaissance, Key Informant Interviews (KII) with household representatives and remote sensing using digital camera. The male member of the team took the photographs and female members did most of the interviews with the females in households to avoid cases of violating some religious tradition that does not allow male strangers access to some homes and the fact that in general respondents readily divulge requisite information to female interviewers than to their male counterparts. All respondents were informed of who the researchers were (academic staff of the Polytechnic in Yola-North-North), the nature and aim of this study and made to understand that the information they were going to give would be used for academic research purposes that could influence policy design by relevant authorities. All responses given were double checked with the respondents to agree that it was correctly recorded based on contextual meanings.

A reconnaissance survey was conducted to identify waste dump sites in the neighborhoods under study. Households for interviews were chosen based on their proximity to waste dumps selected for this study and their readiness to participate. Accordingly, five

houses were selected in Jambutu, three houses in Damilu, three houses in Bekaji and one house in Dougirei. Interview questions were of the open ended (unstructured) type to get the general perceived status on waste disposal in the study area, and information thereof scribed and validated during the interview sessions. For each neighborhood, Key Informant Interviews (KII) were conducted with representatives of household close to each dumpsite identified on how and where they dispose of their wastes, and access to waste disposal services be it private or public and how they are affected by the poor sanitary conditions. Consequently, neighborhoods with no access to disposal services were asked of the location of their central incinerators. A second observation visit was then carried out by the researchers to locate these incinerators which happen to be dump sites and take pictures by digital camera of some selected dumps in the study area. Selection of dumpsites was based on proximity to households.

A digital camera was used to take photographs of selected refuse dumps in all the neighborhoods under study. Key Informant Interview was conducted with a few staff of the department of urban planning on waste management.

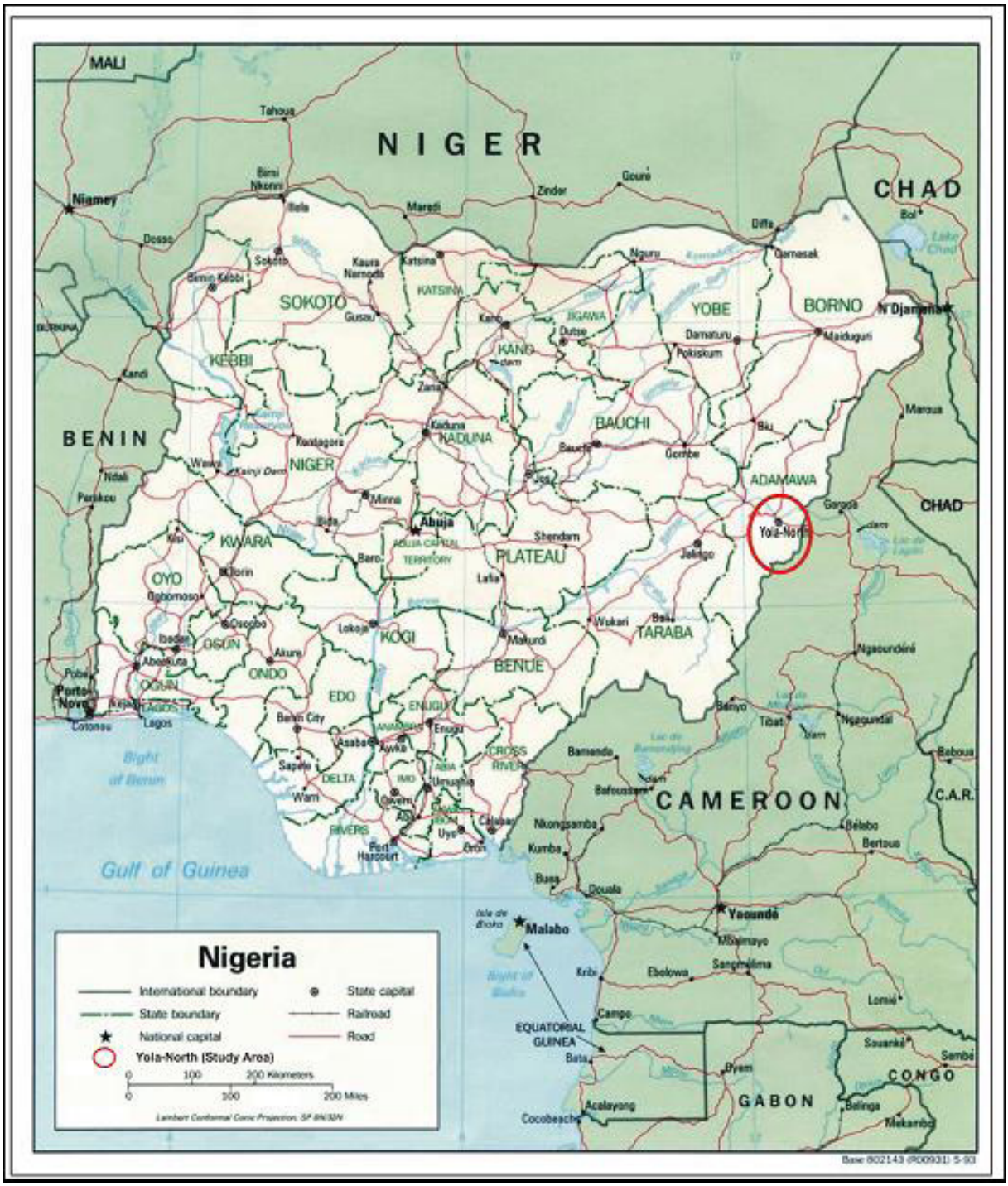

Figure 1: Nigeria showing Yola-North in the red circle

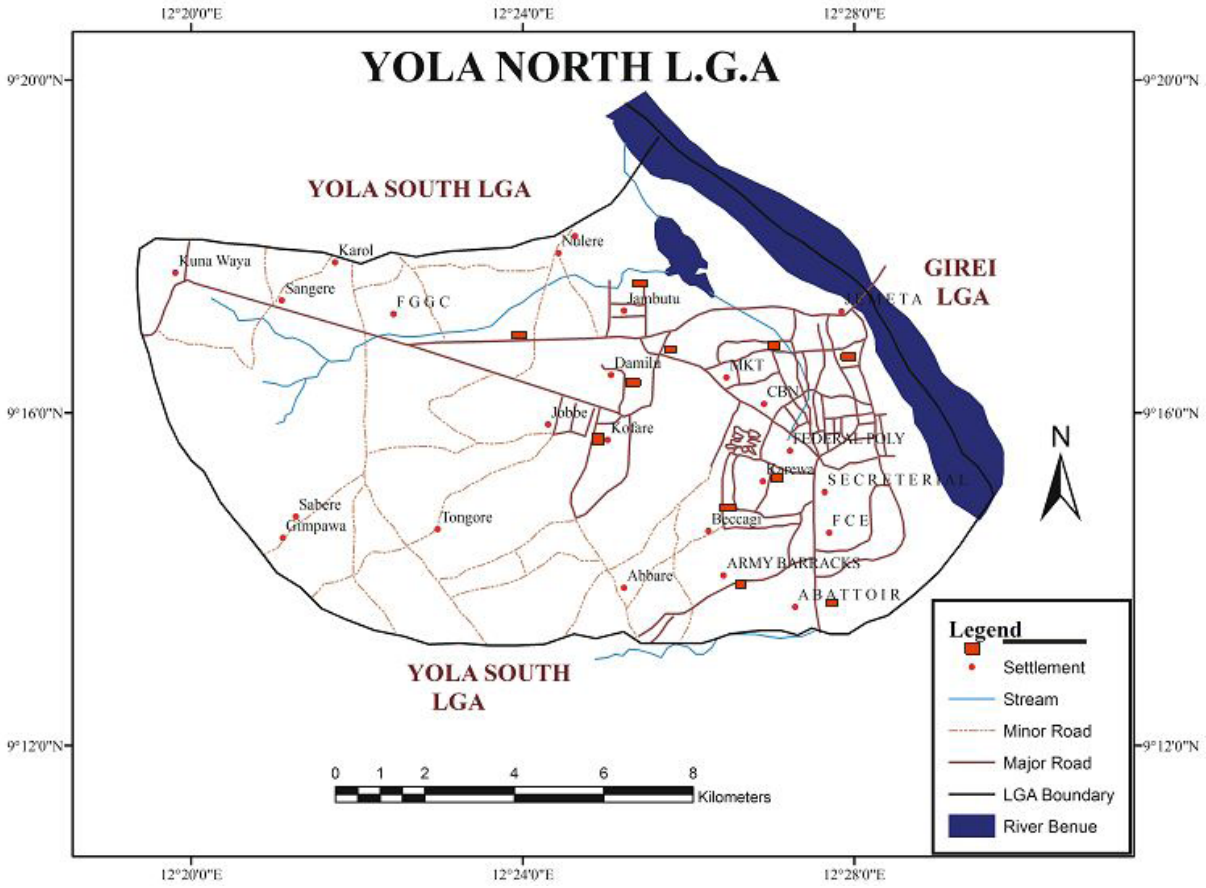

Figure 2: Map of Yola-North North

Result from digital photographs of waste dumps

Results are shown using picture evidences of the three neighborhoods in Figures 1-3. Figure 1 shows picture evidences for the low-income neighborhoods, Figure 2 for the middle-income neighborhoods and Figure 3 for the high-income neighborhood.

Most of the solid wastes generated from homes in the study area are a combination of biodegradable and non-biodegradable materials comprising food wastes, foliage, paper-form wastes, polythene bags, plastics, glass, cans, metal scraps, animal carcasses, old rags, tyres, etc. This is why most refuse dumps in the study area are patronized by children who scavenge recyclable materials such as plastic bottles and metal scraps for money (Figures 1-3).

Low-Income Neighborhoods

The neighborhoods chosen to represent the low-income neighborhoods are Damilu and Jambutu. Investigations show that these neighborhoods have some minimal level of planning in terms of streets and drainages along major streets. However, most of the minor streets have no drainages constructed, such that fluid wastes are seen in front of compounds (Figure 1a). A total of nineteen waste dumps were found in the two neighborhoods with Damilu having eight and Jambutu having eleven dumpsites. Solid wastes in these neighborhoods are observed to be dumped either in front of homes with under 5 children seen playing with some of the waste materials (Figure 1b) or behind houses of residence where the wastes have accumulated over time to form mounds of wastes with adolescent children seen scavenging for recyclable waste materials in the form of plastics and metal scraps (Figure 1c). Figure 1d also reveals that major drains have also become dump sites littered with waste materials of sorts. More images on the state of waste disposal in the low income neighborhoods are shown in Appendix 1.

Figure 1a: Fluid waste in Damilu, December 2018

Figure 1b: Solid waste dumps in front of homes in Jambutu, December 2018

Figure 1c: Mounds of solid waste behind homes in Damilu, December 2018

Figure 1d: Major drains littered with solid waste in Jambutu, December 2018

Middle-Income Neighborhoods

Figure 2a: Solid waste dumps in front of homes in Bekaji, January 2019

The neighborhood chosen to represent the middle-income neighborhoods is the Bekaji Housing Estate. Investigations show that this neighborhood is fully planned with houses numbered according to streets that are tarred. A total of four waste dumps were

found in Bekaji housing estate. All dumpsites in this neighbourhood are located in open spaces in front of homes. Figure 2a shows a boy scavenging for recyclable waste. Figure 2b shows a waste dump composed of polythene bags and other solid wastes located along one of the streets in Bekaji housing estate with waste collection container that is out of use.

High income neighborhood

The Dougirei neighbourhood (Figure 3a-d) represents a high-income neighbourhood in the study area. The neighbourhood is well planned and has a network of asphalt roads with palatial homes (Figure 3a). A total of eleven (11) waste dumps were sighted in the Dougirei neighbourhood. Waste sites are generally small in size when compared with those identified in middle and low income neighbourhoods, but are located across the street as seen in Figure 3b, in front of homes (Figure 3c) and on undeveloped plots in between homes as seen in Figure 3d.

Figure 3a: Dougirei Neighbourhood well planned with paved road network

Figure 3b: Roadside solid waste dumps across the street in Dougirei, January 2019

Figure 3c: Roadside solid waste dumps in by homes in Dougirei, January 2019

Figure 3d: Roadside solid waste dumps located on undeveloped plots and in front of a palatial house in Dougirei, January 2019

Result from Interviews conducted with Key informants

Key informant interviews in low income neigbourhoods was carried out on how and where they dispose of their wastes, and access to waste disposal services be it private or public and how they are affected by the poor sanitary conditions. Consequently, neighborhoods with no access to disposal services were asked of the location of their central incinerators.

With regard to the how wastes are disposed of in the low-income neighbourhood of Jambutu, we found out that children are sent to dispose of wastes in nearby dumps in general and for households with economic means, waste collectors who are primarily children between the ages of 12 and 14 years do the work at the cost of between N10 and N20 per waste bin.

A Key Informant Interview (KII) held with a female resident in Jambutu revealed the following:

> *I am the mother, we send the eldest of our children to take away the waste to the nearest dump site. We dump wastes here because the central dumpsite for the neighbourhood has not been evacuated for the more than five years. Some people came some three years ago informing us that they were private waste collectors and that we need to pay a token of N3500 per month for our solid waste to be disposed of, but we cannot afford such an outrageous charge because my husband is a trader in the market. However, the stench from the waste dump near our house and the cockroaches and mosquitos are a problem making us to spend more on insecticides (KII, 2019).*

Another Key Informant Interview (KII) held with a male resident in Damilu revealed the following:

> *I am the husband; I have two wives and eight children. I am a farmer and a trader in the Jambutu motor park. I earn N500 daily on the average. I personally take the solid waste out to deposit on the dump in front of our house, because according to our Muslim injunction, I as the husband is in charge of all affairs outside the house. I only engage the services of the almajiris (the young male disciples from quranic schools aged 5-13 years who carry out waste disposal for N10). I do not allow my children to carry out waste disposal. The services of the government waste evacuators has not been felt to the best of my knowledge for the past 10 years in this neighbourhood. We don't have a central drop point for now, everybody does his thing on waste disposal in this neighbourhood, which is why even the streets are littered with polythene and paper wastes (KII, 2019).*

The foregoing interview excerpt shows that wastes are dumped indiscriminately in the study site with no iota of thought or act for recycling. Furthermore, there has not been any government action on waste evacuation or management in the neighbourhood for the past ten years.

In respect of waste disposal in middle income neighbourhood of Bekaji housing estate, it was generally gathered that most respondents engage the services of private waste management company in the state called Gabyto. However, few households in the middle income neighbourhood dump their wastes indiscriminately. A Key Informant Interview (KII) held with a male resident that is closest to a dumpsite in Bekaji revealed the following:

> *I am the husband, with one wife and two children. I am a civil servant with the Ministry of water resources. I used to allows the waste from my bin to be disposed of by the almajiris for N40 daily, however, when a private company engaged in waste disposal came to me to do evacuate my waste responsibly for N2500 monthly in 2012, I engaged them immediately. This is because the department of urban plan we know who used to evacuate our waste no longer do that. I do not know if there is any formal recycling process in place by either the government or the private sector. But I believe, there is no recycling of the type of waste that come from my home, majorly polythene. Sorry to say that most of my neighbours dump their refuse indiscriminately that is why you see litters of wastes everywhere (KII, 2019).*

For the high income neighbourhood, the case is different. Most of the residents decline interview. The few we were able to connect with have only the local guards at home during our visit. We were informed that the owners only come on visits and the wastes are disposed of by the guards. We were however successful to conduct an interview with one of the sons of the owner of such homes who was on a visit from Abuja, who disclosed the following:

> *I am 24 years of age and the third son of my father who is abroad. I am here on holidays from Lagos, Nigeria. To the best of my knowledge, we used to engage private collectors for N50,000 annually. But whenever they do not show up, our guard used to just dump the waste outside the house. The private collectors are not efficient because there is no one to supervise their activities. So, we are just patient, having to do with what is at our disposal. I think the story is the same for the rest of the residents in this neighbourhood. I also know that the state government and indeed Nigeria is not ready to undertake waste management as a serious business (KII, 2019).*

With regards to officials of the Urban Planning and Development Authority saddled with the responsibility of waste management in Jimeta metropolis of Yola North, we found that they have not engaged in waste evacuation since 2015 due to lack of funding from the central government. Furthermore, we were informed of the decline by the government to engage a private company for waste recycling due to political interest. Excerpt from the interview with one of the respondents in the department is as follows:

I am the senior officer in charge of sanitation; one of my duties is to regularly ensure that wastes are evacuated from neighbourhoods at least once a week. In time past, we used to make sure that waste collection containers are dropped at strategic points in each of the neighbourhoods within Yola North for evacuation using our trucks. But with time, due to inadequate funding, we stopped the evacuation, and such waste containers became filled up such that residents went on to continue to deposit their wastes on the ground at the drop points till they all became hills of waste dumps. It is only when the local media carries "poor waste disposal" as a news item that the government initiates urgent evacuation to counter such news using their cronies as private contractors who hardly get the job done. It's all politics at play. We as a department used to have a centralized system of waste collection where we allocate an evacuation truck to each neighbourhood to carry out waste disposal. We dump the wastes anywhere in the outskirts far from the city center because we have no designated dump site for sorting of wastes for recycling or total incineration. A private contractor from the southeast Nigeria once approached the governor in 2016 with a plan for a public private partnership in waste recycling that would be a win-win for parties, but it did not see the light of the day. Even the few small private company's around who go to neighbourhoods to charge them between N2000 and N5000 monthly for waste disposal are doing it illegally because we have not licensed them to do it. At present, we have been mandated to ensure the cleaning of the major tarred roads linking the airport and the government house weekly. So, as you can see, we have a problem (KII, 2019).

Discussion

We discovered that irrespective of the social stratification, all of the neighbourhoods studied have more than four waste dumps of varying sizes littered haphazardly. The wastes are composed mostly of polythene bags, leftover food, cans and other metal scraps, paper and clothe materials, etc. For example, the Damilu neighbourhood has small dumpsite that number up to seven and only 7% in the neighbourhood patronize individual waste collectors who are children of the almajiri stock. Bekaji quarters has four big dumpsites that have become breeding grounds for vectors such as flies and cockroaches and foul the air with unpleasant odor; this is despite the fact that there are private waste collectors been patronized by about 14% of residents in the neighborhood. It is pertinent to note that all the dumps observed are located sandwiched amongst houses of residents, making residents vulnerable to all kinds of communicable diseases. Large drains in Nasarawo, Wurokuturo and Runde have been turned into refuse dump sites thus silting up the drains. It was also discovered that public waste management authority responsible for evacuation of wastes have not been able to carry out their functions for quite a while now due to poor funding. It is the children involved in scavenging and waste collection for a token fee that are playing significant roles in waste disposal in the study area. The foregoing findings agree with that of Aparcana [4] who opined that it is the low standard of operation of formal waste authorities that brought the need for alternative ways of waste disposal and thus the emergence of the informal waste sector in the low and middle income countries leading to significant contributions in recycling rates. It also agrees with the conclusion that the informal sector is associated with poverty, bad working conditions, child labour and lack of education because of the non-formalization of the informal sector.

An interview with the chief of sanitation of the local department of Urban Planning saddled with waste management in the area also revealed that there is no decentralized system of waste evacuation in the study area. What they have is a centralized system designed to evacuate wastes from dumpsites in each of the neighbourhoods whenever funds are available. However, the total lack of funding with respect to waste evacuation is the main cause of the problem, which goes contrary to the findings of Aleluia and Ferrao [2] in the low and middle income countries of Asia where half of the budget of local governments goes into waste management.

We also found that there is the non-inclusion of the private sector in waste management in the form of "Public Private Partnership" by the government for sheer lack of will, which if done would have helped. There is no waste management plan in place and no waste evacuation and disposal infrastructure in place that would have taken care of not just evacuation of waste but also recycling component of waste management. The formal waste management authority in the study area only engage in minimal activity of organizing monthly environmental sanitation, when a few selected refuse dumps are cleared only to be re-dumped on farms or open fields on the outskirts of the city without sorting or incineration. They also carry out some form of direct labour cleaning of the tarred roads that networks the metropolis. Accordingly, the department has not been able to design and implement a comprehensive plan for an effective waste evacuation and disposal and there is no central incineration dumpsite in the area. Consequently, there is no data on the total volume of waste generated and the composition by ratio and none on total volume collected on daily basis that would inform policy design and decision making on waste management in the study area. Furthermore, it is found that the role being played by informal waste disposal sector comprising small companies and individual operators is quite significant because they are readily accessible, though not affordable in low income neighbourhoods; with no law or regulation guiding their operations. This finding is similar to what Njoroge, et al., [18] found in Kenya where private companies and community based organizations operate in an uncoordinated fashion because there is no regulation to guide their operations. It further agrees with the assertion by Aparcana (2016) [4] of the non-formalization of the informal waste sector in low and middle income countries.

Identified Challenges:

1. No specific program designed for waste management;
2. Lack of operational guidelines and laws to guide waste collection and disposal especially for the informal waste disposal agents;
3. No enlightenment on sanitation and proper domestic waste disposal methods;
4. Absence of household health inspection by relevant departments for enforcement of public sanitation regulations;
5. Poor funding and absence of a comprehensive and integrated system geared towards waste disposal, recycling and management;
6. Undue politicization of waste management and the non-recognition and collaboration with private waste disposal companies and agents in the state.

Consequently, we advocate that a deliberate move be initiated by the state government towards forming a taskforce with terms of reference that would include the design of a decentralized waste management system for the urban and suburban parts of Yola North as a requisite first step. A waste management model that would involve the community/neighbourhood in a participatory process should accordingly be developed that would involve the integration of waste disposal methods in terms of source reduction via public enlightenment, waste sorting for recycling and composting, thermal treatment via combustion/incineration/pyrolysis and the use of landfills. Furthermore, regulations should make to take care of the formalization and operational guidelines of the private waste disposal companies and agents in the study area. The government should adopt some form of public-private-partnership with private companies in waste management.

Conclusion

The growing population and human activities in Jimeta metropolis of Yola North has brought about the generation of several tons of various types of biodegradable and non-biodegradable wastes on daily basis, which are disposed of in the environmental in an unsustainable manner and without regards to the level of pollution that may be taking place in the soil, groundwater system and in the air. The local government, the industrialists/private sector and residents have not come to terms with the governance problem affecting the municipal waste management sector, which is perhaps why they seem not to bother about the menace affecting their locality. And yet, as the population keeps growing, economic activities multiplies, and more wastes generated, environmental health risks are compounding, killing the poor in a silent manner such that one day may explode into an epidemic proportion to affect all and sundry.

The major challenge to effective waste management is the lack of government's commitment to this sector. With adequate funding, purchase of waste evacuate equipment and training of staff on contemporary waste management planning and disposal, dumpsite will disappear from the metropolis, and residents will enjoy a clean environment with a breath of clean air. As such, collaboration with the academia, private waste managers and the public on a durable solution to waste management would go a long way at curbing the indiscriminate waste disposal menace in the study area and thus rid the society of related infectious diseases.

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