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ANALYSIS OF SOLID WASTE COLLECTION AND DISPOSAL IN OVERSEA, NASARAWA TOWN, NASARAWA STATE.

by

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ABSTRACT

Collection and disposal of solid waste is a key element in evaluating of waste management and source of environmental problems in all urban areas of developed and developing World. However, tackling it is challenging in most urban areas of developing world. Good example of this is Oversea, Nasarawa Town, Nasarawa State, Nigeria. Probably due to absence of waste management facility aside unprecedented urban growth which is apparently evident by amount of waste produced by the inhabitants; changes in the volume of waste configuration and the management options. In an effort to rescue the ongoing and unabated degradation of environments in developing worlds like Nigeria, from perpetual and uninterrupted deterioration, several literatures related to this study were reviewed, but gap still subsist due government failure and limitations of private sectors partnership meant to bridge government inefficiency as established by various past studies. Therefore, the purpose of this paper is to analyse the present system of solid waste management in Oversea, Nasarawa Town, Nigeria with a view to identifying the source of waste management problem in the area and the way forward. To establish the types, volume, composition and methods of managing solid waste in the area, a field survey was carried out of which data were collected from various sources. Three randomly chosen homes in the residential neighborhood of overseas were used to estimate the amount of garbage. Subsequently, from the data retrieved from various stakeholders, a total of 168 sample were selected using systematic and stratified sampling techniques among the households as well as the staff of the Urban waste management agency. 143 questionnaires were returned, while 138 were used for the analysis yielding 80% and 75% return and response rate respectively. Descriptive statistics was used in this paper to compute data. The result of the analysis revealed that the major source of solid waste comes from households which is Domestic with 45.70 %, followed by Commercial with 27.50%, special waste 18.10%, Industrial 2.20%, while Others with 6.50% respectively. The result also revealed that method of solid waste disposal in the area range from drainage dumping 10.9%, open place dumping 66.6%, which the highest, followed by stream dumping 22.5%, due to the absence designated collection points and disposal sites in the area under study. Based on the results of this paper, the following were recommended among others; The government should provide the essential facilities, including designated collection points and dump sites, equipment, sufficient funding, and qualified staff to manage the various wastes produced. It should also raise public awareness through educational campaigns about the risks associated with the direct or indirect effects of indiscriminate waste dumping on human health. Additionally, in order to ensure environmental quality, proper legislation should be put in place to promote public engagement in the community.

Keywords; Waste Management Concepts, Sources and Types, Solid Waste Management options, Disposal Options in Oversea, Nasarawa Town

1.0 Introduction

Collection and disposal of solid wastes are critical elements in the equation of effective urban solid waste management. However, their provision is becoming an issue in the developing world as documented. Probably due to unprecedented urban growth that is capable of generating huge volume of solid waste (Oyinloye, 2013). Therefore, Solid waste can be seen as organic and inorganic discarded materials that contain both a diverse quantity of wastes (domestic) or continuous build-up of waste such as agricultural, industrial, mineral, special etc (Karsauliya, 2013). In contrast, the management of solid waste simply means "the control of generation, storage, collection, transfer

and transport vis-a-vis processing and final disposal which is in harmony with societal and economic needs simultaneously and accommodating environmental regulations (Rhea, 2003). Solid waste management is becoming an issue because not only as a result of the huge amount of waste generated, but also the absence waste management facilities (Murali, Lakshmana and Nooka, 2014). In other words, that the difficulties faced in locating systems of waste collection and disposal is a serious set-back to effective management of waste irrespective of its volume which is the focal point of this research. Thus, problem of collection and disposal of waste is becoming a recurring dismal in most cities of developing of the world, Nigeria inclusive. The management of solid waste is a key and indispensable services required to be rendered by governments in any Nation to make cities tidy (Idowu, Omirin, & Osagie, 2011). Waste collection and disposal, especially those generated in big and medium cities, are a major issue to resolve (Maity, 2014). Good example of this is Nasarawa town, Nasarawa state, Nigeria, where collection of wastes from homes are can only be afforded by the rich and some middle class individuals in the areas and dump in any available open space while the low income earners are left to struggle with the problem all by themselves. That is to say that, in the developing world, indiscriminate waste disposal has come to stay and is the birth place of environmental problems such as air, land and water pollution. In addition, disposing waste indiscriminately gives rise to the deterioration of beautiful of environments, leading to pollution of the air, water and land (Iro, Okorondu, Mbano & Duru, 2012).

Alhassan, (2012) opined that, Nigerian cities like that of other cities of most developing world are facing same problems in managing their waste as the increase in the generation of waste is directly proportional to the ever growing urban population. Consequently, this led to the loss of many lives each year due to diseases relating to environmental degradation like cholera, diarrhoea, malaria fever, typhoid fever, river blindness just to mention but a few (Idowu, Adagunodo, Esimai and Olapade, 2012). The author added that most of populace in third world countries live in dirty environments infested by rats, roaches as well as mosquitoes and this provide a favoured condition for the said environmental related diseases.

In Sub-Sahara Africa (SSA), the problem of management of solid waste is fast taking the wider space in the equation of social and environmental challenge as generation of waste in households as well as industries continue to rise simultaneously with population growth (Ezeah, 2010). That is to say the problem is multi-dimensional looking at the aspect of technologies used in developed world which is usually not applicable to developing world due to the nature of their roads network and waste components. Unplanned, poorly built, sprawling slums with narrow roads that are not accessible to collecting trucks define the cities of third-world countries (Gyuse, 2011).

From the background information given above, waste management system is a key component of the environmental management infrastructures in human settlements, particularly the aspect of waste collection and disposal.

The system encompasses all actions taken from the time waste is first generated until it is finally disposed of. Developed worlds have formed effective system for the elimination of solid waste from within their surroundings, though final disposal often poses problems in terms of monetary costs, environmental and water resources pollution.

While, in most towns of developing worlds is not conspicuous probably due to the nature of growth and development of their settlements. They face difficult task on all fronts capital resources management and public participation. Often the roles and responsibilities of individuals, households, corporations and the government are not well defined as regards waste management. As regards the indiscriminate, dumping is done on any portion of unoccupied land available as well as public open spaces and public rights of way.

Ideally, solid waste management should be sole responsibility of Local Authorities. However, based on the valuable finding of this research in Nasarawa Town, Nasarawa state, particularly Oversea is a mirage, which is apparently evident by the absence waste management facilities such as designated waste collection points and disposal site not to talk of waste bins or containers which form the basis of this research.

2. Literature

2.1 Solid Waste Management terms and concepts

2.1.1 Concept of Waste

Shaibu et al. (2016) averred that Man activities of all kinds produce volume of waste material otherwise known as refuse, garbage or trash desired to be disposed of. Hence, virtually every one in a society, regardless of his or her age, a child or an adult, at school, in the house or at work add to the pile up of waste ever- increasing in or around settlements all over the world. He added that, the sharp increase in urban populations of the developing worlds, growing commercial activities and consumerism are in fact worsening the situation. For instance, packaging materials of all kinds, Cardboard boxes, cans, bottles and plastics are increasingly claiming the largest proportion in the all solid waste generated along with discarded food materials. And then, there is the usual refuse from clothing materials, household goods, toys, building materials, industrial and agricultural waste.

Therefore, waste is a substance that has been rejected, laid off, or has little value to the owner and that owner intends to dispose (Christenson Thomas H, 2006). Nevertheless, the focus of this research is on solid waste which is pertinent to the study.

2.1.2 Solid Waste

Solid waste is anything discarded from human economic activity as being worthless or having no further use (Inglezakis & Moustakas, 2015). Material that cannot rapidly lift into the air or flow into a stream is undesirable. Factory, market, private, and restaurant trash disposal practices that were careless polluted the environment and endangered human health.

Further to this, there are five primary categories of solid waste: commercial, home, hospital, industrial, and street sweeping (Ngiloi 1992). Business and institutional wastes are included in commercial solid waste (though hospitals and industries are excluded). Garbage or trash are household or domestic solid wastes. Biodegradable household wastes include things like leftover food, vegetables, rags, and paper, whereas non-biodegradable wastes include things like plastics, bottles, as well as glasses. Syringes, pads, dressings, and septic organic matter are among the potentially harmful items in hospital trash. Industrial waste is made up of abandoned raw materials and undesired byproducts from the manufacturing process, some of which may be hazardous pollutants. The article also said that wastes from street sweeping are combined and discharged into roads, streets, and waterways. Among others, they include dead carcasses, especially of wandering domestic animals, tree leaves, fallen trees or branches, sand, and others.

2.2 Solid Waste Management

Kumah (2007) referred the management of solid waste as the running of activities that provide for the collection, source separation, storage, transfer transportation, processing, treatment, and disposal of waste. Farirai study as cited in maidodo (2018) described solid waste management as an act regulating waste from stocking, transfer, transporting, as well as disposal of solid waste in accordance to environmental practices in public areas. Maidodo (2018) appeared to have a better appeal to the present research work and hence was adopted.

This research views waste management as an activity or exercise that necessitates keeping track of waste from its initial generation to its final transfer. This covers garbage collection, eradication, transportation, treatment, and disposal in addition to monitoring and regulation. It also covers the organizational and legal framework for waste management, including guidelines for source-to-sink separation, recycling, and other practices (Abila & Kantola, 2013). They also stand for a wide range of administrative, financial, and social concerns that need to be handled and clarified. However, this concentrate on the area's system of collection and disposal of solid waste.

2.2.1 Solid Waste Collection System

This has to do with house to house movement of waste truck at regular intervals gathering wastes from waste bins, conveying them either to central collection point from where the waste is processed for final dumping or lugged straight to final dump sites. This seems to be the best but expensive system because of the number of trucks and personnel required to operate effectively. It also

requires well planned city system with good roads aid vehicular access to various houses.

This framework where a common neighborhood dumps were established and considered a central collection point within the neighbourhood where each household within the neighbourhood dump his or her waste. The urban waste trucks evacuation is less expensive where it exists and effectively organized. However, this system suites third world like Nigeria situation where waste management is given place of pride and where accessibility to most houses is difficult, but less effective compared to the house—to—house collection system. It as well serves alternative where the collection system is not possible.

2.2.2 Solid Waste Disposal System

The final disposal system of solid waste determine how effective is the management system. After all, the choice of a disposal system is a function of level of technological advancement of the community in question, the available resources, the level of environmental quality standards required alongside quantity and nature of wastes collected. Numbers of disposal methods are been utilised by both private household and the public agencies. These methods include composting used in farm/gardens burning/incineration by individuals/relevant public institutions, others are the sanitary, land filling and the open dumping each with merits, demerits and characteristics. Barry and Horton (2001) enumerated various disposal methods such include;

i **Sanitary Landfilling**

This option comprises the section of waste to a smallest practicable volume with minimum dumping area. It is done by placing solid waste in ditch over a prepared area of land compressed and shielded each day with required amount of earth shield material.

ii. **Compositing:**

This incorporates decomposition of waste by the action of bacteria into humus like material similar to peat moss in form and tender.

iii. Incineration

Generally, there are two types of incineration, the central incineration and the on—site-- incineration. The central incineration is one which combustible refuse is reduced to ash by high temperature burning.

Iv Open Dumping

This method of waste disposal is still common in some parts of African countries and in Nigeria in particularly in the study area. Open dumping of waste in any available open space within residential neighbourhood is the only option because there is neither designated collection points non disposal site in the study area. Consequently, these gave birth to several public health and safety issues – diseases caused by pollution of water and air, mosquitoes etc. - therefore not recommended.

2.3 Solid Waste Management Experience in United States of American

A national Survey conducted in 1970 revealed that more than 50% of American cities with over 2,500 populations disposed most of their generated waste in open dump. It has also been revealed that agricultural wastes laid to be more in volumes than any other solid waste previously in solid waste planning, a general rules of thumb was 5 pound per capital per day has frequently been quoted and accepted as national average for solid waste production.

Local governments have traditionally shouldered primary responsibilities to solid wastes, collection, processing disposed, not until 1965, with solid waste disposal act did the American government assumed a major role under the act, the central government became duty research training illustration of new skill, practical aid and endowments for state and local government authority solid waste planning programme. Legislation focused attention on studies to ensure national resources by reducing waste and unsalvageable materials and solid waste recovery.

2.4 Wastes Management Experiences in Nigerian States Generally

In Nigeria, the prevailing situation as regards to waste management is still quite unsatisfactory. In many urban centers, out-dated methods are still being employed in collecting and disposing wastes. In thousands of Nigeria communities, the most primitive and unsanitary means of waste disposal, the open dumping is still receiving the

approval of our people. Streets are frequently littered with garbages, due to the inability of township authorities to organize regular collection and disposal. Household waste collection is also inefficiently organized at present in most Nigerian houses not to talk of towns and cities at large. Most of the households do not have waste bins and even in the case of those who have, due to irregular collection by the authorities concerned, their waste bins frequently become over filled thereby constituting a nuisance making the whole environment unfriendly and hazardous to health. Public waste bins are not common and where they exist, they are neglected. The above explained situation has been existing for years and has worsen with the increasing development of the urban growth. The management of waste has been left in the hands individuals because local authorities have failed in different instances. This statement can be backed by the 1979 Nigerian constitution, where local government councils were charged with the responsibility of provision and maintenance of public conveniences and waste management. With this, the state government made provision for the establishment of sanitation board and ministries that were supposed to deal with the refuse problems hand–inhand with local government. However, from the present situation of our cities, it is glaringly clear that the sanitation boards and the local government have proved to be incapable of handling the waste problems. The reasons given by these local governments for failure to keep the cities clean are lack of funds, equipment and manpower and as illustrated in Figure 1 below.

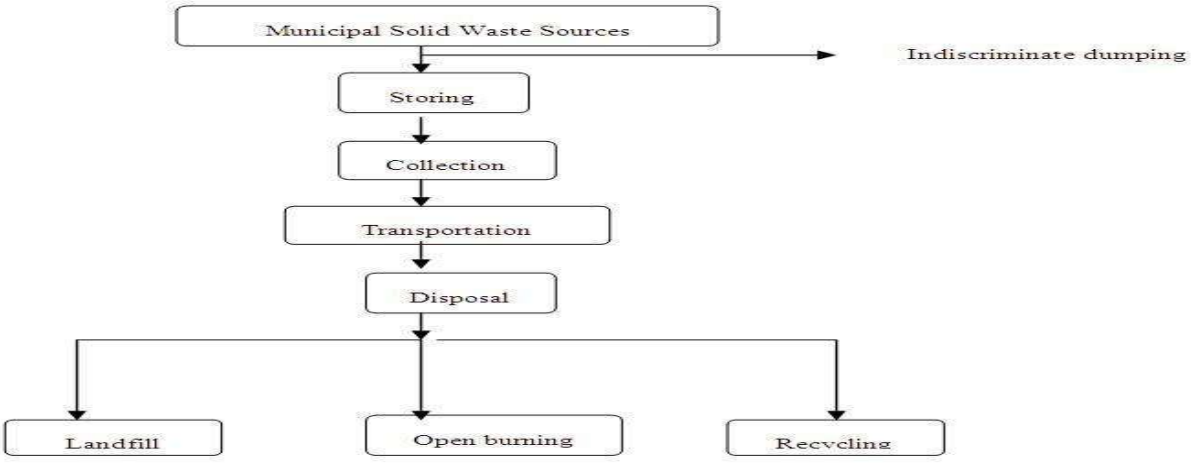


Figure 1.1 Nigeria Existing Urban Solid Waste Management Process Flowchart

Source: Abila and Kantola cited in Maidodo (2018)

Narrations from Figure 2.3 described the pattern of solid waste disposal in Nigeria. Idowu et al., (2011) stated that conventionally, collection and disposal of waste has been established by law to be the duty of the local authorities, but, delivering it has been become an issue in Nigeria, particularly, oversea, Nasarawa Town. Furthermore, this given rise to the prolong challenges of the management of solid waste in the area (Okot-Okumu, 2012).

2.4.1 Solid Waste Management Practices in Oversea, Nasarawa Town

The challenge of SWM in Nigeria towns is multi-dimensional as the disposal facilities have not been in agreement with the quantity of wastes being produced (Debishree and Samadder 2013). SWM differs from one place to another in Nigeria and employed management method based on available

functional tools and skilled personnel (Ajadike, 2007). The management of solid waste in oversea, Nasarawa Town was addressed as follows:

2.4.2 Available collection points and Dump Sites in Nasarawa

Dumps sites are large, usually metal trash containers designed to be lifted up from collection point by a truck so as to be transferred to specific waste dump sites. Presently in the study, absence of collection points and dump site was noticed in present study. Therefore, the inhabitants dispose their waste in any available open place, streams while the rest use the drainage as illustrated in Plate 1,2,and 3.

Figure 1: Indiscriminate Refuse Dumping in an Open Space at Back of House in Oversea, Nasarawa Town

Figure 2: Sea filled up with both Eroded and Dumped Waste in Oversea, Nasarawa Town

Figure 3: Drainage Filled up with Waste in oversea Nasarawa Town Nasarawa

3.0 Methodology

3.1 Study Area

Nasarawa State, in the north central region of Nigeria, is home to Nasarawa Town. The Okwa River, a branch of the Benue River, forks where the Town is located. Umaru Makama Dogo, a dissident official from the adjacent town of Keffi who was originally from Ruma in Katsina State, established Nasarawa as the capital of the new emirate of Nasarawa about 1838 in the Afo (Afao) tribe region. By capturing adjacent lands, Umaru Makama Dogo grew his empire and annexed Nasarawa as a vassal state of Zaria (175 miles [282 km] north). One of his successors, Muhammadu Danwaji, who ruled from 1878 to 1922, expanded the emirate via a number of conquests and was among the first emirs to formally swear allegiance to Great Britain in 1900. Nasarawa Town joined Plateau State in 1976 but moved to Nasarawa State in 1996. McDonald, 2009. During the military rule led by General Abacha, the Local Government Area of Nasarawa was created in the state of Nasarawa in 1996.

3.1.1 Location

Nasarawa Town is located within the crystalline hydro geological province of the North Central Nigeria bounded by latitudes 8^0 30' N to $8^0$40' N and longitudes 7^0 34' E to 7^0 45' E, and the total area coverage is 370.7 km see figure 1,2,3, and 4. The postal code of area is 962 from the Ministry of Land and Survey, Lafia (2005).

Figure 1.1: Map of Nigeria Showing Nasarawa State.

Source: NAGIS, 2021.

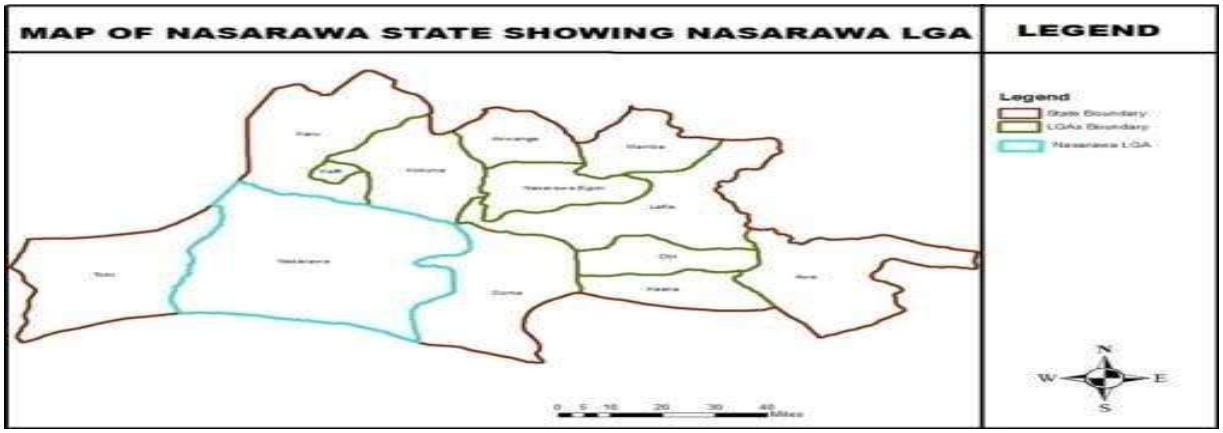
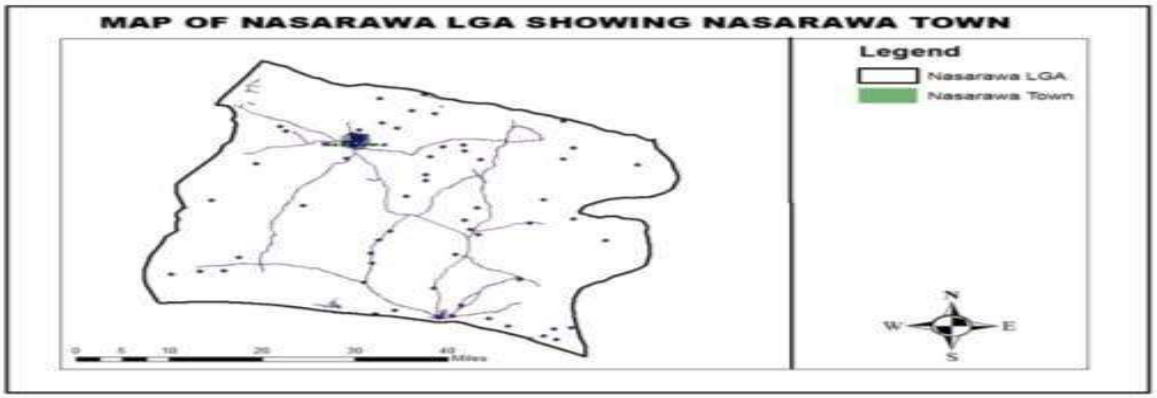


Figure 1.2: Map of Nasarawa LGA in the context of Nasarawa State. Source:

NAGIS, 2021.



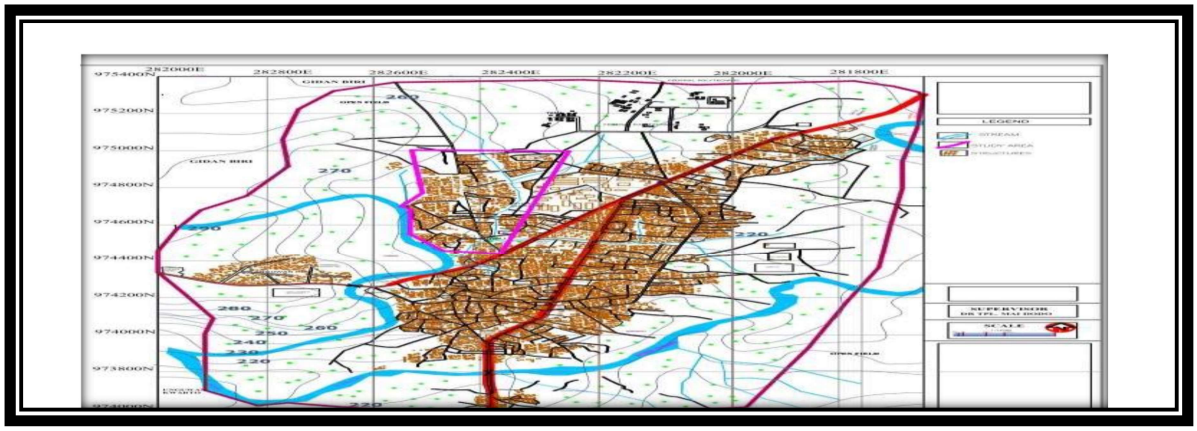


Figure 1.3: Map of Nasarawa Town showing the study area

Source: NAGIS, 2020.

3.2 Data collection and analysis

Systematic and stratified sampling method was used to select a total 168 samples from households and staff of the Urban waste management agency. 143 questionnaires were returned, while 138 were used for the analysis yielding 80% and 75% return and response rate respectively.

Descriptive statistical tool such as frequency table and percentage was used to the analyse the data

collected from respondents in order to know the effectiveness of solid waste management. That is, the effectiveness of waste collection and disposal by Nasarawa urban development board (NUDB) being one of the integral part of sanitary facility to the community. They are of fundamental to the community especially where they are adequately provided at a strategic location and effectively managed. The mathematical formulae adopted to calculate the simple percentage and frequency figures of respondents as was obtained from Owuama lam (2012).

4.0 Result and Discussion

4.1 Adequacy of Waste Collection

The result on effective of waste collection shows that 20.2 % not adequate and 12.3% adequate, while 67% indicates not applicable because there is no any collection point in the area so question adequacy should not arise as indicated in Table 4.1. Hence, consideration needs to be given to the provision of the collection point.

4.2 Adequacy of Waste Disposal

The result on adequacy of waste disposal indicates that, 66.6% of the population dispose their waste in any available open place, 22.5% use streams, while the rest 10.9% use drainage narrated in Table 4.2 below. Given this, a high percentage of the inhabitants use open spaces as dumping site in the study area, meaning that the area most have be littered with waste due to the absent collection points not to talk of waste bins and designated disposal site in the study area which is the focus of this research.

Table 4.2: Alternative Dumping Site

Site	No	Percentage (%)
Tipping in the stream	31	22.5%
Tipping in the drain	15	10.9%
Tipping in the open place	92	66.6%
Total	138	100%

Source: Field Survey 2022.

4.3 Agency Responsible for Waste Collection and Disposal

Result on agency responsible for collection and disposal reveals that 76.8% of the population are of the opinion that Nasarawa urban development board are responsible for waste collection and disposal in the study area, while private and ministry of work with 13% and 10.2%. Therefore, for effective waste management community need to be involved being the donor of the waste. Traditionally, Local Authority is solely responsible for waste collection and disposal going by environmental protection law. However, they have failed in different instances and so community should take responsibility of what they are generating if they most have descent environment.

4.4 Summary

In order to achieve the stated aim and objectives a comprehensive study of the existing waste collection and disposal system was carried out. It was observed that several problems affect waste collection and disposal systems in the study area. These problems do not allow for effective waste management. These problems are summarized as follows:

The management of waste is very poor in Oversea due to the absence of waste collection and disposal facilities in the area. The result of analysis shows that 116 out of 138 sampled population lacked storage facilities for the waste generated. Moreover, what further worsen the problem in oversea was there is no designated disposal site in the area. The whole environment is littered with waste of all kind, waste is becoming major land marks in the area and no one care about it, since the majority of the people in the area are illiterates as revealed by the valuable findings of this research.

5.0 Findings and Recommendation

5.1 Findings

From the results of the analysis the study found that the only available method of waste management in the area is indiscriminate dumping of waste in the alternative dump site such as any available open spaces, streams and drainages. This was due to absence official designated collection points and dump site in the area leading to flooding, water borne diseases of

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all kind and environmental pollution. The result also revealed that there are Inadequate Waste Truck and Equipment.

Lastly, the findings of this research indicated that, end of month environmental sanitation in the whole Nasarawa town is a camouflage, because after assemble people to sweep or gather waste in front of their houses and leave them there due to absence of official designated collection points and even if they use any means to convey these wastes the end up in any available open space, stream or drainage as a result of the absence of official designated dump site.

5.2 Recommendation

Based on the valuable findings of this research the followings were recommended:

i. Government should provide basic facilities such as designated collection points and dump site.
ii. There is dire need for Equipment/Trucks provision.
iii. There is need to improve budgetary allocation waste management funds, in a bid to ensuring healthy sanitary and aesthetically pleasing environment.
iv. Community should take responsibility of what they are generating if they most have descent environment since government have failed in different instance.

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