

Sewage Disposal Practices at Hausari Ward of Bama Local Government, Borno State

¹Lawan Alhaji Bukar,
²Tijjani Mallam Bukar
Gajibo & ³Abba Umar
Abullateef

¹Department of Education
Business, Umar Ibn Ibrahim El-
kanemi College of Education,
Science and Technology Bama,
Borno State.

²Department of Education,
Mohammed College Legal and
Islamic Maiduguri, Borno State.

³State Universal Basic Education
Board Damaturu, Yobe State

Article DOI:
10.48028/iiprds/ijsreth.v12.i2.01

Abstract

This study examines the effects of sewage disposal practice at Hausari ward of Bama, Local Government area of Borno State. The research method adopted descriptive survey method; questionnaire was developed, which consisted of 5-point Likert rating scale ranging from 1-5 in which respondents indicated the extent of their perception of listed variables. The results showed the sewage disposal practice. From the survey, it was observed that the only problem with on-site system is the contamination of water gotten from hand dug wells in the community owing to its proximity to onsite sanitary facilities and it is easier to maintain the onsite system than the centralized system. The research recommends that On-site system/septic tank should be encouraged with the design and construction supervised by an architect as well as located away from water source.

Keywords:

Sewage, Disposal,
Practices, Hausari
Ward

Corresponding Author:
Lawan Alhaji Bukar

Background of the Study

The waste disposal method in Hausari ward of Bama is the use of waste drum about two or three waste dust bins for fourteen families, with the waste disposal site close to the Rail line. In some cases due to unhygienic behaviours of people in this community some of them turn their backyards to a refuse site while others tend to keep their refuse in their houses for a long period before they dispose it, also with delay in collecting the wastes by the garbage collectors which results to the residents disposing their wastes on the floor of the waste disposal site, as a result of this insects, rodents and other animal use this dump site for habitation. This unmonitored domestic waste disposal practices can lead to poor environmental sanitation and there can be health implications to the people in this community. The growth of the world's population, increasing urbanization, rising standards of living, and rapid developments in technology have all contributed to an increase in both the amount and variety of solid wastes generated by industrial, domestic and other activities. African countries are now faced with huge amount of municipal solid waste which has direct effect on human health, safety, and environment (Muzenda, 2011). Nigeria, with population exceeding 170 million, is one of the largest producers of solid waste in African.

Despite a host of policies and regulations, solid waste management in the country is assuming alarming proportions with each passing day. Nigeria generates more than 32 million tons of solid waste annually, out of which only 20% -30% is collected. Reckless disposal of domestic waste has led to blockage of sewers and drainage networks, and choking of water bodies. Most of the wastes are generated by household, by local industries, artisans and traders which litters the immediate surroundings. Improper collection and disposal of municipal wastes is leading to an environmental catastrophe as the country currently lack adequate budgetary provisions for the implementation of integrated waste management programmes across the states (Bakare, 2016). Hausari community is located towards North-Western part of Bama and it comprises of Islamic Scholars and Businessmen who live there with their families. It's occupied by both educated and non-educated individuals, accompany by their various activities performed on daily basis which generate domestic wastes.

This study is therefore designed to determine the sewage disposal practice and health implications of poor domestic waste disposal in Hausari community with a view to encourage hygienic waste disposal practices based on environment sanitation and enlighten them on the health implications of improper waste disposal in the community. Sewage is the wastewater generated by a community, namely: a) domestic wastewater, from bathrooms, toilets, kitchens, etc., b) raw or treated industrial wastewater discharged in the sewerage system, and sometimes c) rain-water and urban runoff. Domestic wastewater is the main component of sewage, and it is often taken as a synonym. The sewage flow rate and composition vary considerably from place to place, depending on economic aspects, social behavior, type and number of industries in the area, climatic conditions, water consumption, type of sewers system, etc. The main pollutants in sewage are suspended solids, soluble organic compounds, and fecal pathogenic

microorganisms, but sewage is not just made up of human excrement and water. A variety of chemicals like heavy metals, trace elements, detergents, solvents, pesticides, and other unusual compounds like pharmaceuticals, antibiotics, and hormones can also be detected in sewage. With urban runoff come potentially toxic compounds like oil from cars and pesticides that may reach the treatment plant and, eventually, a water body. In Borno State for instance, most of the population is concentrated in Bama and this is not unconnected with the fact that Bama is the state capital, as most of the infrastructural facilities are located in its confinement. Wastewater generation and its improper disposal then becomes one of such environmental problems in Bama, paving ways to distortion of its environment and posing health threats. The open disposal of wastewater provides convenient ground for breeding germs, disease vectors and an eye sore with offensive odour.

Statement of the Research Problem

The daily consumption activities of people relating to the food items discharged electronic items, yard trimmings, and household materials that are being used contribute to waste generation. Waste generations have been since human existence and the wastes generated are composed largely of refuse from home. Since waste generation cannot be stopped, the only solution is waste management and this is poorly implemented in developing countries especially in Nigeria. Due to poor waste management which can be attributed to the attitude of the people and the system of government in this country, this can affect human health and the environment. The waste disposal practices such as the way refuse is being dumped in the dump site and the measure taken to eradicate them can cause a detrimental effect in the state of health of the people. The domestic waste disposal practices are the determinant of the health implications of the people, for example; the scenario of a child being sent to the dump site bare footed and the parent's negligence about it, or an unhygienic behaviour e.g. not washing your hands after waste disposal, or being ignorant of the danger the child can encounter while playing around the dump site. Hence, in order to minimize these problems and promote a healthy environment through positive change in people's attitude, this study focused on domestic waste disposal practices and its health implication on Hausari Community in Bama local government area of Borno State.

Aim of the study

The main objective of this study is to determine the domestic waste disposal practices and its health implication on Hausari Community in Bama local government area of Borno State.

Objectives of the Research

The following specific objectives guided the study:

- i. To examine the domestic waste disposal practices of the people in the community.
- ii. To determine the relationship between domestic waste disposal practices of people in the community and its health implications.
- iii. To identify the factors that can promote the proper domestic waste disposal practices of the people in the community.

- iv. To establish the methods that can help in improving the waste disposal practices.

Research Questions

The following research questions were raised for the study.

- i Do the people have the knowledge of proper waste disposal practice in Hausari ward of Bama?
- ii Do the people know the health effect of improper waste disposal in Hausari ward of Bama?
- iii Do the people have the knowledge of waste pollution in Hausari ward of Bama?
- iv Will proximity to disposal site determine the proper use of the facility in Hausari ward of Bama?

Literature Review

Waste is a useless and unwanted products of human domestic and industrial activities released into the environment. (Ezechi et al, 2017). Waste can be gaseous, liquid or solid. Solid wastes include municipal waste, industrial waste and biomedical or hospital waste (Okpara, 2001). Furthermore, Moronkola and Okanlawon (2003) stressed that solid wastes are unwanted, discarded and nonliquid materials emanating from various activities of man at home, school, workplace, and so on, which may be combustible. Most human activities generate waste (Brunner and Rechberger, 2014). EU Framework Direction on Waste (91/156/EC) has been adopted. Despite that, the production of wastes remains a major source of concern as it has always been pre historic period (Chandler et al, 1997). In recent times, the rate and quantity of waste generation have been on the increase. As the volume of wastes increases, so also does the variety of the waste increases (Vergara and Tchobanoglous, 2012). A substantial increase in volume of wastes generation began in the sixteenth century when people began to move from rural areas to cities as a result of industrial revolution (Wilson, 2007). This migration of people to cities led to population explosion that in turn led to a surge in the volume and variety in composition of wastes generated in cities. It was then that materials such as metals and glass began to appear in large quantities in municipal waste stream (Williams, 2005). The large population of people in cities and communities gave rise to indiscriminate littering and open dumps. These dumps in turn formed breeding grounds for rats and other vermin, posing significant risks to public health. Most developed countries passed through a period when they were developing environmentally. Today, however, most of these countries have effectively addressed much of the health and environmental pollution issues associated with waste generation. In contrast, the increasing rate of urbanization and developments in emerging countries is now leading to a repeat of the same historical problems that developed countries have had to address in the past (Wilson,2007).

Concept of Domestic Waste

The term “disposal” means the discharge, deposit, injection, dumping, spilling, leaking or placing of any solid or hazardous waste into or on any land or water so that such solid waste, hazardous waste, or any constituent thereof may enter the environment or be

emitted into the air or discharged into any waters, including ground water, from community activities (US Law-Solid Waste Act 2, 1990), while domestic wastes are waste generated every day in the residential environment. It is a waste type consisting of everyday items that are discarded by the public. Domestic solid waste is any unwanted solid materials from household activities that cause environmental, social, and health hazards (Imoukhuede, 2016). Garbage can also refer specially to food waste, as in a garbage disposal; the two are sometimes collected separately. They are simply as garbage or trash. Waste with similar characteristics may be generated in other economic activities and can thus be treated and disposed of together with household waste (Glossary of Environment Statistics, 1997). Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue, and waste from streets. This garbage is generated mainly from residential and commercial complexes (Parvathamma, 2014). Municipal solid waste can also be divided into recycled and non-recycled materials. Examples of recycled materials are discarded aluminum soft-drink cans melted down to create new cans, food and yard wastes composted and used to enhance soil fertility, and old newspapers and plastic bottles burned to produce electricity. The non-recycled portion of municipal solid waste consists of by-products that must generally be removed from the site lest they interfere with production and consumption by attracting vermin and flies, obstructing passage, clogging drains, emitting unpleasant odors, and so on. Whether or not materials are recycled depends on the nature and cost of available production, consumption, recycling, and disposed technologies, as well as on government regulations. These can vary widely across economic settings. In developing countries, municipal solid waste is often disposed of with ash; human waste-where sewage systems do not reach substantial portions of the population (Mensah and Whitney, 1991).

Concept of Waste Disposal Practices

Waste or garbage is any material generated by human activity that is considered to be useless, superfluous valueless or unwanted and is disposal of in the environment. After collection, this waste may be dumped into landfill sites or destined for composting, incineration or recycling. Solid waste generated in urban centers may contain both domestic and commercial wastes along with industrial waste, thus constituting a complex mixture of different substances, of which some are hazardous to health (Bernardinelli and Montomoli, 2000). Rinkesh (2017), listed some modern ways of solid waste disposal. The first is sanitary landfill, which is the most popular disposal method. Garbage is basically spread out in thin layers, compressed and covered with soil or plastic foam. Modern landfills are designed in such a way that the bottom of the landfill is covered with an impervious liner which is usually made of several layers of thick plastics and sand. This liner protects the ground water from being contaminated because of leaching or percolation. Landfilling of solid hazards waste pose direct threat to surface and ground water by leaching through soil thus, regulating such wastes in a sustainable manner (Pappu, Saxena, and Asoleka, 2007).

Waste Collection Process

The waste collection process contains the way from filling of containers to loading of the collection vehicle. Because of a variety of residential, commercial, and industrial development, it is impossible to collect waste with just one system. A variety of collection systems are used that respective municipal requirements to be used accordingly. Each collection method has compatible container systems and vehicles with dedicated loaders. The collection methods are:

Simple Emptying Method: The simple emptying method is used for the removal of household and small-scale commercial waste with mobile containers which are drained at the consumer. A lot of different standardized containers are used.

Exchange Method: At this method, full containers are exchanged with empty containers at their location. This method is suitable for highly sensitive waste, e.g. construction debris and sludge, as well as for low density waste from institutions or large hotels. Because of economy, these containers have minimum capacities of 4 m³.

One-Way Method: In the one-way method, waste is picked up in clear plastic or paper bags whose volume is limited to a maximum of 110 L. The bags are picked up by hand, so there are no emptied containers to be returned to the curb and the containers are not cleaned.

Non-systematic Collection: The non-systematic collection method is used for collecting bulky waste or extra-large particles, e.g. bulky goods.

Special Collection Systems: Vacuum extraction and hydraulic flushing are two kinds of special collection systems. Both the pneumatic vacuum transport systems and the hydraulic flushing method combine collection and transport processes, but they have low importance. (Bilitewski, 1997)

The Concept of Waste Collection Systems and Storage Method

Waste storage and collection form a very crucial stage of waste management. Proper waste storage makes for ease of collection. Waste storage has both environmental and health implication. It was observed that waste bins are usually located within the house and provide harborage for disease vectors. Over time, these bins become heavily contaminated, depositing germs at the slightest contact. Most municipal waste management authorities encourage bagging of waste by providing polythene bags to households. Bagging makes waste collection less messy. From previous researches it was seen that plastic bins followed by polythene bags are the most common waste storage containers. Other unconventional waste bins include paper bags, used drums and sacks. Choice of bin is usually based on the nature of waste to be stored, conveyance, durability and affordability. Storage and collection form the final link between waste generators and waste managers and thus can be used as control. It is easier to sort waste at source than after collection (Charles, 2013).

Factors influencing the development and design of waste collection and storage systems A lot of factors influencing the development and design of waste collection and storage systems. A few of them are: Size of collection area, Economic structure of the area, Residential lifestyle.

Container Systems/Storage

Storage means the holding of waste for a temporary period of time. There are different storage systems in use. In the following, a few of them will be described. To ensure efficient and mechanized waste collection, the number and size of containers must be standardized. Today, wheeled containers with capacities of 110 to 1.000 L, partly as much as 5.000 L, are used for household waste collection.

Garbage Cans and Trash Barrels/Eurobin

The smallest, standardized garbage cans are round with capacities of 35 to 50 L. They are made of galvanized sheet metal or plastic. The next in size standardized cans are made exclusively of plastic, with capacities up to 120 L capacities. Furthermore, cans with up to 360 L capacity already exists. Finally, small amounts of garbage are collected in a variety of trash barrels and dumpsters.

Large-sized Containers

Due to the rising quantities of waste, large sheet metal and plastic containers with wheels were developed. The transport by the consumer and handling by the collection crew is effortless with these containers. This container is appropriated for locations where large quantities of waste are generated. These are for example markets, sporting events or businesses. Just as the other large containers (120-5.000 L), these Large-sized Containers are also serviced using the simple emptying method.

The Concept of Solid Waste Management

Waste management (or waste disposal) is the activities and actions required to manage waste from its inception to its final disposal. This includes the collection, transport, treatment, and disposal of waste, together with the regulation of the waste management process. (United Nations Statistics Division Environment, 2017).

Factors Affecting Waste Disposal Practices

Culture, Education, and Microeconomics: Oftentimes when systems are breaking down and problems are escalating, people look to societal factors to fix the issue. This has often been the case when dealing with the mismanagement of solid waste in the developing world.

The Attitude and Behavior Gap: Waste can mean many things to different people (Moore, 2012). Some people such as the trash pickers of Ghana see “waste” as a resource or a way to make an income in an otherwise limited job market. On the other hand, you have a majority of people living in the developing world that see waste as a burden and a problem that needs to be addressed.

Lack of Education and Awareness: Another major constraint seen throughout the developing world is the lack of education and awareness of effective waste-management practices. One study in Gaborone, Botswana, found that even though citizens were aware of recycling and other sustainable waste-management techniques, this does not necessarily translate into participation in pro-environmental activities such as recycling initiatives. The lack of interest in the environment creates a culture of nonparticipation of communities in decision-making processes. That stance enhances lack of responsibility for pollution and waste issues.

Choice versus Response: Another problem is that many people feel that they have no impact on the decision-making process, and as a result do not bother to register complaints with the authorities. Some researchers argue that people of lower socio-economic groups tend to have less regard for environmental issues on the basis that employment and housing are their main priorities (as cited in Périou, 2012).

The Health Problems Relating to Domestic Waste Disposal

Poor management of waste led to contamination of water, soil, and atmosphere and to a major impact on public health. In medieval times, epidemics associated with water contaminated with pathogens decimated the population of Europe and even more recently (19 century), cholera was a common occurrence.

Environmental Implication of Poor Domestic Waste Disposal

Environment is the sum of all social, biological, physical, and chemical factors which compose the surroundings of human beings (Rahman M, Haque K and Hasan M, 2003). Health depends on our ability to understand and manage the interaction between human activities and the physical and biological environment. The maintenance and improvement of health should be at the center of concern about the environment.

The Importance of Waste Management

Recycling and Recovery: Recycling is reprocessing the recovered rubbish to be converted into something new and useful. Recycling is specially included in the idea of this practice. Recycling products would only require a small amount of energy. The product produced by recycling can be a renewable source of energy and it is Eco-friendly. Collecting of used trash like plastic, paper and so on is called Recovery.

Composting: This is the process of decomposing waste products that are organic such as leaves, scraps of fruits and vegetables and turning them into a very rich soil also known as the Black Gold. In addition to that, waste gas is produced during this process and is used for the production of electricity.

Waste Minimization: This is practiced by limiting the amount of waste that is generated by helping to eliminate the production of hazardous and harmful wastes effectively. It supports efforts to promoting a more sustainable society. In this method of waste management, you can start producing products that are more complex rather than

disposable ones, using second hand items. Purchasing products that can be reused and repairing products that you have at home and prolong its use and purpose.

Landfills: The importance of this is that Methane and Carbondioxide are produced by rotting food waste then oozes up to the air.

Plasma Gasification: Converting organic matter into synthetic gas using plasma. The process of this is done and conducted in sealed vessels with high pressure in it. This disposal process is self-sustaining, environmental friendly and converts garbage into electricity and energy. Residues are left behind, it's known as „char“, and it's being used to produce more usable items.

Incineration or Combustion: this is a waste treatment technology that reduces the amount of waste, from 95%, to be thrown in landfills. It is used to convert waste materials in the gas, ash, steam, and heat. At the end of the process of incineration, which includes combustion of waste, the produced products are later being used for generating electricity (Karen, 2019).

Causes of Indiscriminate Disposal of Solid Waste

Ugwunwa (2005) identified the causes of indiscriminate disposal of solid waste as carefree attitude, lack of environmental awareness, absence of disposal site and population explosion. In Sub-Saharan Africa (SSA) in particular, the combined influence of poverty, population growth and rapid urbanization has tended to worsen the situation (Walling et al, 2004).

Methodology

The Study Area

The study was carried out in Bama LGA which is one of the 27 LGAs of Borno State located in the North eastern corner of Nigeria. It is located in latitude 12010" and 14000" North and longitude 11030" and 13016" East. Bama LGA has an area of 6,176 square kilometers with two distinct climatic zones (Sudan Savannah and Sahel) with mean temperature of 300c, and mean annual rainfall of 500mm. These climatic conditions are favorable for the cultivation of the local cowpea varieties, hence, majority of the populace of the study area who are predominantly small-scale farmers produce the crop. Bama is a community in Borno State, Nigeria and the center of a Local Government Area of the same name about 30 km to the southeast of Maiduguri, situated on the north bank of the Ngadda River. The population of the Bama Local Government Area is about 17,400. It is one of the sixteen LGAs that constitute the Borno Emirate, a traditional state located in Borno State, Nigeria. The primary languages are Shuwa Arabic, Yerwa Kanuri Maffa and Wandala / Malgwa. Bama town doubles as the Local Government Area headquarters, amongst other towns and wards of the area are Andara, Ajiri, Wulba, Buduwa, Bula Chirabe, Dipchari, Jere, Dar-Jamal, Kotembe, Gulumba, Bankki Jukkuri, Batra and others.

Research Design

The descriptive survey research design was used for this study. This is considered appropriate because it enables a researcher to carefully describe, interpret and explain factual and detailed information about the variables of interest. This design is selected as the most suitable since the study is intended to examine the sewage disposal practices on Hausari ward of Bama.

Data Analysis and Discussion

Table 1: Distribution of Respondents by Age

Age	Frequency	Percentage (%)
< 21years	81	40.5
21-30 years	36	18
31-40 years	25	12.5
41 - 50 years	42	21.0
51- 60 years	16	8.0
Total	200	100

Table 1 shows that out of 200 respondents, 40.5% of them are within the age bracket less than 21years, the age bracket of 21-30 years accounted for 18%., the age bracket of 31-40 years accounted for 12.5%, the age bracket 41-50 years accounted for 21% while the age bracket 51-60 years accounted for 8%. This implies that majority of the respondents are within the age bracket less than 21years.

Table 2: Distribution of Respondents by Gender

Gender	Frequency	Percentage (%)
Male	77	38.5
Female	123	61.5
Total	200	100

Table 2 shows that out of 200 respondents, 61.5% of them are female while 38.5% of them are male. This implies that majority of the respondents are female.

Table 3: Distribution of Respondents by Religion

Religion	Frequency	Percentage (%)
Islam	181	90.5
Christian	19	9.5
Traditional	0	0
Total	200	100

Table 3 shows 200 respondents, 90.5% of the respondents are Muslim while 9.5% are Christian and no respondents is practicing traditional or any other religion. This implies majority of the respondents are Muslim.

Table 4: Distribution of Respondents by Ethnic group

Ethnic group	Frequency	Percentage (%)
Kanuri	103	51.5
Babur	66	33.0
Others	31	15.5
Total	200	100

Table 4 shows 200 respondents, 51.5% are Kanuri, 33% are Babur, while another ethnic group are 15.5%. This implies that majority of the respondents are Kanuri.

Table 5: Distribution of Respondents by Marital Status

Marital Status	Frequency	Percentage (%)
Single	114	57
Married	86	43
Total	200	100

Table 5 shows that the respondents who are single are 57% while the respondents who are married are 43%. Meanwhile, there are no respondents who are separated, divorce and widowed. This implies majority of the respondents are single.

Table 6: Distribution of Respondents by Educational Qualification

Educational qualification	Frequency	Percentage (%)
Non-formal education	19	9.5
O' level	81	40.5
Grade II	6	3.0
NCE	22	11.0
Diploma	14	7.0
HND/BSC	46	23.0
Master's degree	12	6.0
Total	200	100

Table 6 shows 200 respondents, 9.5% for those with non-formal education qualification, 40.5% for those with O'level education qualification, 3.0% for those with Grade II education qualification, 11.0% for those with NCE education qualification, 7.0% for those with Diploma education qualification, 23.0% for those HND/BSC qualification while

6.0% for those with Master's degree qualification. This implies that majority of the respondents have an O' level educational qualification.

The Waste Disposal Method Used in your Community One

Waste Disposal Method	TICK
Pit in the backyard	13 (6.5%)
Dump site	23 (11.5%)
Refuse bins / drums	193 (96.5%)
Plastic bags disposal	23 (11.5%)
No storage	1 (0.5%)

The result of this study shows that respondents have the largest proportion of refuse bins/ drums with the frequency of 193 which accounted for 96.5% out of 100%, dump site have the frequency of 23 which accounted for 11.5% out of 100%, plastic bags disposal have the frequency of 23 which accounted for 11.5% out of 100% and pit in the backyard have the frequency 13 which accounted for 6.5% out of 100%. While, one (1) respondent ticked no storage which accounted for 0.5% out of 100%.

Summary, Conclusion and Recommendations

Holistically, chapter one narrated pre-historic development of waste, and that waste are substances or objects, which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national laws but the major type of waste for this study is domestic waste, which is defined as a waste that is generated as a result of day-to-day use of domestic premise. Domestic waste disposal is an issue that is important to the management of urban areas. Therefore, the importance of waste collection, transfer, and disposal cannot be over-emphasized because many health impacts such as transmission of infections such as cholera, typhoid fever, gastroenteritis, dysentery, soil transmitted helminthes infection, and Lassa fever on rare cases, and all these depend on the type of exposure, nature of the waste, disposal site proximity etc. This chapter indicated five objectives of the study which can be mitigate to be; examining their waste practices, obtaining the relationship the dependent variable and independent variable, identification of the factors can promote and method that can help in improving the waste disposal practice in Hausari ward. Also, chapter two elaborated the previous researchers' work done on this study which are factors affecting waste disposal practices, factors influencing the development and design of waste collection and storage systems. Also, environmental implementation of poor domestic waste disposal was discussed and points explained is that urban solid waste management is considered to be one of the most immediate and serious environmental problems confronting urban governments in developing countries. In addition, the concept of solid waste management was explained and it was indicated in the study that there is a difference between waste management of developed and developing countries. This study also indicated that a health educator is needed for proper management and recycling of solid waste in Nigeria. In chapter three, the research design used for this study was descriptive survey, the population of the study comprised of the residents of Hausari ward, Bama and it comprised of two

hundred respondents. The research instrument used was self-developed structured questionnaire and the instrument had .734 Cronbach Alpha values, which showed that the instrument is acceptably reliable. In chapter four, the details on results and discussion of findings are based on socio-demographic characteristic of the respondents, analysis on the research questions and hypothesis. The research questions were analyzed with frequency counts, percentages.

Conclusion

Based on the findings in this study, it is concluded that the people in Hausari ward have low knowledge on the effect of improper domestic waste disposal practice in relation to its health implication. It is equally concluded that proximity to waste facility among the residents in Hausari ward promote disease occurrences. It is also concluded that since there is an indirect and significant relationship between knowledge on domestic waste disposal practices and waste pollution among the people in Hausari ward, improving knowledge on domestic waste disposal will decrease the practice on waste pollution such as burning of waste in Hausari ward.

Recommendations

Adequate skip containers should be provided in communities to encourage frequent disposal of waste. Adequate skip containers will decrease improper waste disposal method like waste burning, the metropolitan waste management bylaws should be strictly enforced to punish anyone who disposes waste at unapproved areas, Recycling of waste should be encouraged by the government. The government should encourage private sector waste management to enhance recycling of waste, Households should be educated on effects of indiscriminate waste disposal, Issues concerning technical, economic and social constrain hindering proper waste management should be addressed, The media should also show and enlighten the public the aftermath effect of this improper waste disposal method through all means of communication, Every household should obtain waste disposal baskets for refuse collection and dump inside strategically placed waste disposal containers provided by the government that would be emptied regularly, There should be adequate provision of refuse vans and heavy machines for transportation of wastes for land filling purposes, There should be effective public health education campaigns in the community on how to keep the environment free from indiscriminate disposal of refuse and its effects, Policies aimed at keeping the environment clean should be formulated and enforced by appropriate authorities, State and local government authorities should use environmental health officers and sanitary inspectorate division of ministry of environment to supervise refuse disposal in the community, Awareness campaigns on the health implication of environmental risk-factors should be intensified to educate the masses.

References

- Biliteski, S. (1997). *Waste management*, Springer Verlag Berlin Heidelberg retrieved from http://esl.jrc.it/envind/sip/wm/Sip_wm_03_24th_of_Oct_2019.
- Brunner, P., & Rechberger, H. (2014). Waste to energy-key element for sustainable waste management from <http://doi.org/10.1016/j.wasman.2014.02.003> from, *Journal of Management and Sustainability*, retrieved 1st of Oct, 2019.
- Chandler, A., Eighmy, T., Hjelm, O., Kosson, D., Sawell, S., Vehlou, J., & Sloot, H. (1997). *Municipal Solid Waste Incinerator Residues*, from *Journal of Management and Sustainability* retrieved from www.jms.ccsenet.org retrieved 1st of Oct, 2019.
- Charles, C. N. (2013). *Status of municipal solid waste generation and disposal in Nigeria*, Department of Civil Engineering, University of Nigeria, Nsukka, Nigeria, retrieved from <http://www.researchgate.net> retrieved 16th of Nov, 2019.
- Ezechi, E., Nwabuko, C., Enyinnaya, O., & Babington, C. (2017). Municipal solid waste management in Aba, Nigeria; Challenge and prospects, *Environ Eng Res* 22, 231-236 from www.imedpub.com retrieved 14th of Oct., 2019.
- Glossary of Environment Statistics, studies in Methods, Series F, (1997). *From a stats*.
- Hardin, G. (1968). *The tragedy of the commons Science*, 162(3859), 1243-1248 from <http://www.sciencemag.org/content/162/3859/1243.full> retrieved 24th of Oct, 2019.
- Imoukhuede, O. B. (2016). *Investigation into solid waste disposal and management; A case study of Owo, Ondo State Nigeria*, retrieved from <http://www.ijettjournal.com> retrieved 4th of Nov., 2019.
- Karen, M. (2019). *The importance of waste management*, from [www.karen's maid.com](http://www.karen'smaid.com) retrieved 25th of Jan, 2020. Karshima SN., [2016] from *Journal of Veterinary Science* Vol. 11, 2016:142-148 on Public Health Implications of Poor Municipal Management in Nigeria retrieved in 20th of August, 2019.
- Moore, S. (2012). Garbage matters: Concepts in new geographies of waste, *Progress in Human Geography*, 36(6), 780-799 retrieved from <http://digitalcommons.usu.edu/gradreports> retrieved 24th of Oct, 2019.
- Moronkola, O. A., & Okanlawon, F. A. (2003). *A textbook on Fundamentals of Public and community Health Education from Nigeria School Health Journal* 25 (2), Ibadan; Royal People (Nigeria) Ltd

- Okpara, E. E. (2001). *Environmental awareness training manual (EATM)*, Friedrich Ebert Foundation, retrieved from <http://www.researchgate.net> retrieved 17th of Nov, 2019.
- Pappu, A., Saxena, M., & Asolekar, S. R. (2007) Solid waste generation in India and their recycling potential in building materials, *Building and Environment*, 42(6) 2311-2320 retrieved from www.worldscientificnews.com.
- Parvathamma, G. (2014). *Journal of Environmental Science: Toxicology and Food Technology – An analytical study on problems and policies of solid waste management in India*, retrieved from <http://www.researchgate.net>
- Rahman, M., Haque, K., & Hassan, M. (2003). *A study on solid waste disposal system of Sylhet City Corporation*, Proceeding of the IIT-Bombay National Conference on Advances in Environmental Science and Engineering retrieved from <http://www.researchgate.net>.
- Rinkesh, J. (2017). *Solid waste management*, from *Nigeria School Health Journal* 29, retrieved from [www.conserveenergyfuture](http://www.conserveenergyfuture.com) 17th of Nov, 2019.
- Ugwunwa, F. A. (2005). *Indiscriminate disposal of solid waste in urban environment: Cause and consequences: A Case of Onitsha metropolis*, An unpublished BURP Degree Dissertation of Department of Urban and Regional Planning. University of Nigeria, Enugu Campus retrieved from <http://www.researchgate.com>.
- United Nations Statistics Division – Environment Statistics (2017). retrieved from unstats.un.org.
- US Law-Solid Waste Act 2 (1990). *Definition of solid waste for RCRA subtitle C hazardous waste from Nigeria School Journal* 25(2), (2013) retrieved from <http://www.epa.gov/.osw/hazard/dswl>
- Vergara, S., & Tchobanoglous, G. (2012). Municipal solid waste and the environment: A Vincent, I. O., (2000). *Waste management in Benin City Environment and Urbanization*, 12(2) from *Nigeria School Health Journal*. 29, retrieved from <http://www.researchgate.net>
- Williams, P. (2005). *Waste treatment and disposal*, London, New York: John Wiley and Sons. <https://doi.org/10.1002/0470012668> retrieved from *Journal of Management and Sustainability*.
- Wilson, D. (2007). *Development drivers for waste management*. *Waste Management and Research the Journal of the International Solid Wastes and Public Cleansing Association Iswa*, 25(3), 198-207. retrieved from <https://doi.org/10.1177/073424X07079149> from *Journal of Management and Sustainability* retrieved.