AN EVALUATION OF THE EFFECTIVENESS OF DOMESTIC WASTE WATER MANAGEMENT IN BUILDING IN AUCHI, EDO STATE

BY

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CERTIFICATION

This is to certify that this project tittle An Evaluation of The Effectiveness of Domestic Waste Water Management in Building in Auchi, Edo State was carried out by **OFEOSHI FRANKLINE IMOKHALE** with **MAT NO: ENV/203190087**

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DEDICATION

I dedicate this project work to Almighty God whom as given me the opportunity to complete this project and my family of High Chief Joseph Ofeoshi who as support me physical and spiritually.

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I am indeed grateful to God Almighty the creator of the universe and who has made this journey a success.

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__ABSTRACT__

This project work is aim at assessing effectiveness of domestic waste water management in building in auchi, Edo state. 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 estates owing to its proximity to onsite sanitary facilities and it is easier to maintain the on-site system than the centralized system. In the centralized system when there is blockage of the sewerage, the sewage flows out into people's compounds and environment thereby polluting the water source (underground wells, which is common in the study area) and environment.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

According to Michael (2012), wastes are residual materials which are as a result of human activities which cannot be reused or recovered as a resource, recycled into material production processes thermally/biologically utilized for energy production. Waste streams vary from country to country and may be aggregated as solid, liquid and gaseous wastes; hazardous and nonhazardous wastes or as industrial, commercial, residential or institutional waste streams (Maclaren 2000, UNEP 2005). Today, institutions around the world are producing both toxic and nontoxic waste at unprecedented rate. For instance, in 2012 the municipal solid waste generation levels were 1.3 billion tonnes per year and are expected to rise to approximately 2.2 billion tonnes per annum in 2025, which represents a significant increase in per capita waste generation rates from 1.2kg to 1.42kg per person per day (World Bank, 2012). Hence, it is inevitable that this waste is prudently managed. Traditionally, waste management has been the responsibility of local governments. However, with the increasing rate of solid waste generation, and awareness and regulations (for recycling and recovery, management and source reduction by intervening at production and consumption level), various institutions have got involved into one or more aspects of solid waste management chain.

Waste management is a global environmental challenging issue that is severe especially in developing countries where increased urbanization, poor planning and lack of adequate resources contribute to the poor state of Municipal Solid waste management (Mwanthi et al., 1997). Proper management of solid waste has been established to be critical to the health and well-being of urban residents (World Bank, 2001).

Aliyu (2010) classified wastes into three basic types; solid, liquid and gaseous which could be biodegradable, semi biodegradable and non-biodegradable. The Federal Ministry of Environment (2012), divided urban solid wastes into three main categories; Municipal solid wastes which comprise domestic waste, trade and commercial refuse (from schools, hospitals and clinics) and street cleansing waste; industrial wastes, consisting of refuse generated from industrial operations and by solidification of liquid and gaseous effluents and building construction wastes, which are mainly inert from demolition, excavation and construction activities. Waste management, according to Wokekoro, (2007) as cited by Uchegbu, (1998), in all its ramifications, is a planned system of effectively controlling the production, storage, collection, transportation, processing and disposal or utilization of wastes, in a sanitary, aesthetically acceptable and economical manner. It includes all administrative, financial, legal and planning functions as well as the physical aspects of waste handling. Folz (2004) indicates that the type of service which various institutional waste managers provide may be categorised into two broad areas: direct waste management related services and support services. The direct waste management related services primarily deal with the provision of services for different stages of waste management chain i.e. collection, transportation, pre-treatment, recycling/recovery and disposal. The support service category deals with the provision of services which indirectly enhance the effectiveness and efficiency of waste management and include and include awareness creation, provision of information, technical expertise as well as financing.

1.2 Statement of the Problem

In most cities in Nigeria, waste management issues have become a glaring challenge. In recent years, there has been a phenomenal increase in the volume of wastes generated daily in the country (Olanrewaju & Ilemobade, 2009). This is due to the huge volume of waste generated in the cities on a daily basis which calls for proper handling in order to protect the environment and the population. Hoornweg (2019) emphasized that waste is inseparable from life because as long as man is alive, he stores up, uses, and disposes off materials and the complexity of waste which modern civilization produced is directly related to the living standard, socio-economic and cultural attributes of that particular environment. Over the years, concerted efforts have been made to adequately solve the problems created by the emanation of wastes. Akaninyere and Atser (2001) examined the typology, characteristics and future trends of solid waste and asserted that the major components of waste are degradable materials (food remnants, paper, and rags) and non-biodegradable plastics, tins, metals, bottles, glass, and bones.

Inadequate management of domestic waste resents in health issues hazards which are better prevented then suffered. These hazards can reach water and food and pollute the ambient environment and also may bring about chemical intoxication.

Health hazards multiply through the agency of flies, rats and mosquitos and such chemicals as lead mercury and other heavy metals. All these result from wastes that are not well-conserved. The threat of vermin infestation and chemical intoxication resulting from poor domestic waste management can be more in rural areas. It is therefore imperative for the researcher to carry this study to uncover the effectiveness of sewage disposal system in buildings in Auchi Edo state.

The problem of waste management in Nigeria is due to the absence of public policy, enabling legislation and an environmentally stimulated and enlightened public. Appropriate policy and institutional mechanism for implementation of waste management strategies are critical for sustainable waste management. Where the policy is poor or the public is not properly sensitized or there are no proper enforcement of laws and regulations, waste management is a problem or challenge. Urban waste management in Nigeria is constitutionally the responsibility of the third tiers of government, that is, the local government council. Financial, material and human resources that have been committed to waste management by this tier of government have not matched this responsibility.

1.3 Aim and objectives

The aim of the study is to examine the risks/hazards and challenges caused by the domestic waste management in building, Auchi, Edo State. The specific objectives are;

i. Identify the waste disposal methods commonly used in Auchi, Edo State.

ii. To examine the environmental and health implications of domestic waste management in residential environment.

iii. To examine the effectiveness of domestic waste management in Auchi, Edo State.

iv. To determine wastewater management strategies in the study area.

1.4 Research Questions

i. What is the waste disposal methods commonly used in Auchi, Edo State?

ii. What are the environmental and health implications of domestic waste management in residential environment

iii. How effectiveness involved is domestic waste management in Auchi, Edo State.

iv. What are the domestic waste management strategies employed in Auchi, Edo State

1.5 Statement of Hypothesis

Hypothesis One

H_o: There is are no effective waste disposal methods commonly used in Auchi, Edo State

Hypothesis Two

H_o: Environmental and health has no significant implications on domestic waste management in Auchi, Edo State

Hypothesis Three

H_o: There is no significant effectiveness involved in domestic waste management in Auchi, Edo State

Hypothesis Four

H_o: There are no waste management strategies in Auchi, Edo State

1.6 Significance of The Study

This study will very significant to students, ministry of environment and the general public. Safe and acceptable solid waste management practices are serious concern for the public health point of view. The concern comes from both poor polices and solutions proposed by all associated authorities of the government for the management of domestics waste and a perception that waste management facilities use poor operating procedures. The study will suggest solutions to waste management, and how it can be control in Auchi, Edo State.

1.7 Scope of the Study

The scope of the project covered only domestic waste management in building in Auchi, Edo state. The study covers a period of five (5) years from 2018 to 2022

1.8 Limitation of the Study

The major challenge faced in this work is inability to get enough material and documentation on the study area, domestic waste water management. Combining academic work with research was not an easy task.

1.9 Operational Definition of Terms

i. **Building:** According to Matthew, (2016) A building, or edifice, is a structure with a roof and walls standing more or less permanently in one place, such as a house or factory. Buildings come in a variety of sizes, shapes, and functions, and have been adapted throughout history for a wide number of factors, from building materials available, to weather conditions, land prices, ground conditions, specific uses, prestige, and aesthetic reasons. To better understand the term building compares the list of non-building structures.

ii. **Waste:** Is a product or substance which is no longer suited for its intended use. Whereas in natural ecosystems waste (i.e. oxygen, carbon dioxide and dead organic matter) is used as food or a reactant, waste materials resulting from human activities are often highly resilient and take a long time to decompose.

iii. **Environment hazard:** An environment hazard is a substance, a state or an event which has the potential to threaten the surrounding natural environment or adversely affect people's health, including pollution and natural disasters such as storms and earthquakes

iv. **Disposal:** An act or instance of disposing; arrangement: the disposal of the troops. A disposing of or getting rid of something: the disposal of waste material.

v. **Waste Management:** Waste management includes the processes and actions required to manage waste from its inception to its final disposal.

vi. **Waste Management Practice:** Waste management refers to the practice of collecting, transporting, processing or disposing of, managing and monitoring various waste materials. It is important to observe sustainability in this aspect so that every bit of waste can be managed in an efficient manner rather than just dumping it all in landfills.

vii. **Household:** A household is defined as a person or group of people staying together in the same dwelling unit whether or not they are related by blood or marriage (ZimStat, 2012). The households are some of the generators of solid waste.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Domestic Waste Management in Auchi, Edo State

Waste management is a matter of great concern, especially in less developed countries. The magnitude of the waste management needs of the populace in these countries rises phenomenally by the day. This is on account of rapid growth and urbanization occurring there, and the lack of a commensurate increase in housing stock (Lewin, 1981). Housing quality is usually examined in terms of the quality of design, building materials, standard of construction, and the provision and performance of public amenities. Olotuah (2006) citing Jagun (1983) affirmed that 75% of the dwelling units in urban centres in Nigeria are substandard and the dwellings are sited in slums. The environment in which the buildings are located in most cases is squalid, and this usually leads to slum conditions. When waste disposal sites are in close proximity to residential structures, such environment is adversely affected as organisms that thrive in such dirty places are also agents of disease outbreak. Therefore, the aim of shelter as a place where people live and play in a hygienic manner is defeated when the stench from the nearby dump sites is a constant menace. In addition, these dump sites can contaminate ground water which in turn affects the purity of the water fetched from wells, hence, if residents of a city are devoid of access to portable water, it will take its turn on their health. This is a precarious situation and it adversely affects the residential environment. In addition, a medium sized urban center like Auchi need to be investigated to collect existing data and make appropriate resolutions. This can be used to avert the future eruption of the non-habitability and environmental problems being suffered by bigger cities like Benin and Lagos; and caused by the inadequate planning at the inception of their growth and development. This becomes imperative now that the political and economic statuses with the accompanying population influx are influencing the development of Auchi. Hence, the choice of the study area is for the applicability to other cities in the State, Nigeria and other developing countries. Waste management is a global environmental challenging issue that is severe especially in developing countries where increased urbanization, poor planning and lack of adequate resources contribute to the poor state of Municipal Solid waste management (Mwanthi et al., 1997). Proper management of solid waste has been established to be critical to the health and wellbeing of urban residents (World Bank, 2001). Folz (2004) indicates that the type of service which various institutional waste managers provide may be categorised into two broad areas: direct waste management related services and support services. The direct waste management related services primarily deal with the provision of services for different stages of waste management chain i.e. collection, transportation, pre-treatment, recycling/recovery and disposal. The support service category deals with the provision of services which indirectly enhance the effectiveness and efficiency of waste management and include and include awareness creation, provision of information, technical expertise as well as financing.

As far as waste management practices are concerned, the key global practices include: source reduction; product reuse; product recycling; waste collection; waste composting; waste incineration as well as landfilling/dumping (World Bank, 2012). Each of the waste management practices poses challenges (apart from source reduction which is regarded as ideal). For instance, waste incineration is expensive and contributes to air pollution as well as greenhouse gas emissions. There is also the challenge of disposing of ash. Landfills require land and as susceptible to opposition from potential neighboring populations. Waste collection vehicles contribute significantly to air pollution (Agwu 2012; World Bank 2012).

2.2 Waste Disposal Methods Commonly Used in Auchi, Edo State

2.2.1 Recycling

Recycling is generally considered an important strategy for alleviating the pressures of society on the environment. Natural resources can be saved, emissions can be decreased, and the burden of solid waste can be reduced. Likewise, recycling in the cases of some materials is an important economic activity that creates employment and attracts investments. The term "recycling" has two dimensions—recovery and utilization. Recovery refers to the diversion and collection of waste materials from landfills, incinerators, or other disposal methods. Utilization refers to the processing of diverted waste into new and useful materials and products. In recent years the industrialised countries of the North have observed significant increases in the quantity of waste recovered and utilized. These trends have resulted from higher disposal costs, increased public concern about the health and environmental impacts of waste disposal, and a general perception that recycling can result in resource conservation. In many countries of the North, policies have been adopted to encourage or mandate the recovery of waste materials. Policies have also been adopted to mandate the utilization of wastes for example, mandated recycle material content in selected products and government procurement practices that favour recycled materials.

Another trend is the increasing trade of secondary materials between the North and the South. Waste materials recovered in the North increasingly are being exported to the South for utilization. As a result, the North has developed into a net supplier of recyclable waste while the South has developed into a net importer. As is the case with any commodity, international trade of secondary materials allows countries with different comparative advantages to exercise those advantages to bring about a more efficient allocation of resources. In the absence of market failures, international trade in secondary materials allows gains in both the North and the South. However, when market failures occur such as health and environmental externalities international trade may lead to an increase rather than a decrease in total environ- mental damages. Further, international trade in secondary materials may lead to development patterns in the South that are in contrast to the preferences of both the South and the North. The increased trade of secondary materials between the North and the South raises the question whether recycling in the South is different from recycling in the North, and whether international trade in secondary materials has positive or negative economic, environmental, and social impacts. Not only are these issues relevant for national policy makers who must decide about legislation concerning this type of trade; these issues also are important to international interest groups, such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and the World Trade Organisation (WTO).

2.2.2 Chemical-Physical and Biological Treatment

Wastewater treatment involves physical, chemical and biological procedures, in order to remove pollutants and hazardous characteristics before release into a body of water, without harming the environment or human health (Aguilar et al., 2002). Initial pretreatment (e.g., grease traps, sand traps, and roughing) consists of a physical process to remove large solids (López & Martin, 2015). The next step is primary treatment, which requires physical and chemical processes, such as decanting and neutralization. In this stage of the treatment, the purpose of eliminating solids suspended in residual water (López & Martin, 2015, Manahan, 2007). Coagulation is a process in which colloidal particles are destabilized through addition of chemicals and agitation, which calories wastewater and reduces turbidity, color, and even the concentration of some pathogenic microorganisms. Factors such as pH, turbidity, agitation speed and time, coagulant dose, and the size of colloidal particles directly impudence the size of the clot (Fúquene & Yate, 2018).

Secondary or biological waste water treatment uses the metabolism of microorganisms to reduce pollutant load (Wiesmann et al., 2007). Populations of bacteria, fungi, or other microorganisms in the wastewater use, in an isolated or synergistic manner, the pollutants present as a source of energy, carbon or electrons in their anabolic or catabolic routes (Fritsche & Hofrichter, 2008). However, these populations will also require adequate physical and chemical conditions for their metabolism and the genetic and enzymatic machinery to use these pollutants (Nielsen et al., 2014; Visser et al., 1977). Finally, the tertiary treatment improves wastewater quality. Depending on its use, different processes can be conducted, such as bleach disinfecting, nutrient reduction, or chemical precipitation (López & Marín, 2017)

2.2.3 Landfill

Landfill is the oldest method of urban waste disposal and the last link in the chain of their management. It was always considered as a best possible treatment of any domestic waste due to its low cost. However, the process of landfilling has completely changed due to changes in regulations, increasingly problematic environmental issues and the emergence of new technologies that are both reliable and economical. On the contrary, these new technological developments have led to increased investment, infrastructural and operating costs. Besides, these newly developed landfills are engineered and it uses protective barriers to prevent the risks of leachate pollution to the groundwater and soil. The existence of non-engineered landfills, generally in the former quarries, generates severe health and environmental impacts on the environment. The release of greenhouse gases (GHG), as well as the proliferation of insects and rodents also causes serious disturbances to the health and the environment. River streams, groundwater and surface water are exposed to the run-off and infiltration of leachate from the landfills, which by their nature, their quantity and their constitution can generate organic, physicochemical and bacteriological pollution of water. The pollutant load present in leachate varies according to the composition of the waste, the age of waste, the operational mode of the landfill, the metrological conditions and conditions of deposit. Besides, it also contains major elements such as sulphates, nitrates, bicarbonate and chlorides.

In landfills, organic matter ferment and produce greenhouse gas emissions (50 to 60% methane, 40 to 50% carbon dioxide CO_2 and the remaining ammonia and hydrogen sulfide). To give an idea of the potentiality of producing biogas from landfill, a ton of waste produces ~180 to 200 m^3 and the release time is estimated to be between 24 and 40 years. However, the risks of producing biogas from landfill includes the following: asphyxiation due to carbon dioxide, hydrogen sulfide emission and other odour related problems. The release of methane, especially from compacted landfills poses a significant risk of explosion with air. In addition to these direct and local effects, greenhouse gases causes global warming. From the Moroccan perspective, ~7.5% of greenhouse gases emitted are from landfills. On a positive note, plastics disappeared permanently from Moroccan landfills after the adoption of the new law No° 77-15 that banned the use of plastic bags.

2.2.4 Incineration

Incineration is the process of controlled combustion of garbage to reduce it to incombustible matter such as ash and waste gas. The exhaust gases from this process may be toxic, hence it is treated before being released into the environment. This process reduces the volume of waste by 90 per cent and is considered as one of the most hygienic methods of waste disposal. In some cases, the heat generated is used to produce electricity. However, some consider this process, not quite environmentally friendly due to the generation of greenhouse gases such as carbon dioxide and carbon monoxide.

2.2.5 Waste Compaction

The waste materials such as cans and plastic bottles are compacted into blocks and sent for recycling. This process prevents the oxidation of metals and reduces airspace need, thus making transportation and positioning easy.

2.2.6 Biogas Generation

Biodegradable waste, such as food items, animal waste or organic industrial waste from food packaging industries are sent to bio-degradation plants. In bio-degradation plants, they are converted to biogas by degradation with the help of bacteria, fungi, or other microbes. Here, the organic matter serves as food for the micro-organisms. The degradation can happen aerobically (with oxygen) or anaerobically (without oxygen). Biogas is generated as a result of this process, which is used as fuel, and the residue is used as manure.

2.2.7 Composting

All organic materials decompose with time. Food scraps, yard waste, etc., make up for one of the major organic wastes we throw every day. The process of composting starts with these organic wastes being buried under layers of soil and then, are left to decay under the action of microorganisms such as bacteria and fungi. This results in the formation of nutrient-rich manure. Also, this process ensures that the nutrients are replenished in the soil. Besides enriching the soil, composting also increases the water retention capacity. In agriculture, it is the best alternative to chemical fertilizers.

2.2.8 Vermicomposting

Vermicomposting is the process of using worms for the degradation of organic matter into nutrient-rich manure. Worms consume and digest the organic matter. The by-products of digestion which are excreted out by the worms make the soil nutrient-rich, thus enhancing the growth of bacteria and fungi. It is also far more effective than traditional composting.

2.3 Environmental and Health Implication on Domestic Waste Management

The world is faced with problems related to the management of wastewater. This is due to extensive industrialization, increasing population density and high urbanized societies (EPA, 2013; McCasland *et al.*, 2018). The effluents generated from domestic and industrial activities constitute the major sources of the natural water pollution load. This is a great burden in terms of wastewater management and can consequently lead to a point-source pollution problem, which not only increases treatment cost considerably, but also introduces a wide range of chemical pollutants and microbial contaminants to water sources (EPA, 2013, 2006; Eikelboom and Draaijer, 2019; Amir *et al.*, 2004). The prevention of pollution of water sources and protection of public health by safeguarding water supplies against the spread of diseases, are the two fundamental reasons for treating wastewater. This is accomplished by removing substances that have a high demand for oxygen from the system through the metabolic reactions of micro organisms, the separation and settling of solids to create an acceptable quality of wastewater effluents, and the collection and recycling of microorganisms back into the system, or removal of excess microorganisms from the system (Abraham *et al.*, 2017). In municipal wastewater treatment systems, the common water quality variables of concern are biological oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen (DO), suspended solids, nitrate, nitrite and ammonia nitrogen, phosphate, salinity and a range of other nutrients and trace metals (DeCico, 2019; Brooks, 2016). The presence of high concentrations of these pollutants above the critical values stipulated by national and international regulatory bodies is considered unacceptable in receiving water bodies. This is because, apart from causing a major drawback in wastewater treatment systems, they also lead to eutrophication and various health impacts in humans and animals (EPA, 2000; CDC, 2012; Runion, 2018). In recent years, the reuse of treated effluent that is normally discharged to the environment from municipal wastewater treatment plants is receiving an increasing attention as a reliable water resource. In many countries, wastewater treatment for reuse is an important dimension of water resources planning and implementation. This is aimed at releasing high quality water supplies for potable use. Some countries, such as Jordan and Saudi Arabia have national policies to reuse all treated wastewater effluents, thus have made considerable progress towards this end. In China, sewage use in agriculture has developed rapidly several decades ago and millions of hectares are irrigated with sewage effluent. The general acceptance is that wastewater use in agriculture is justified on agronomic and economic grounds, although care must be taken to minimize adverse health and environmental impacts (FAO, 2012; Metcalf and Eddy, 2013; Rietveld *et al.*, 2019; Sowers, 2019). Furthermore, wastewater reuse is increasingly becoming important for supplementing drinking water needs in some countries around the world. The option of reuse of wastewater is becoming necessary and possible as a result of in- creased climate change, thus leading to droughts and water scarcity, and the fact that wastewater effluent dis- charge regulations have become stricter leading to a better water quality (Rietveld *et al.*, 2019). The objective of this paper is to discuss the characteristics of waste- water effluents and the impacts of wastewater quality on health and the environment. The effluents generated from domestic activities or wastewater constitutes the major sources of the natural water pollution load. This is a great burden in terms of wastewater management and can consequently lead to a point source pollution problem and could also introduce a wide range of pollutants and microbial contaminants to water sources (Eikelboom and Draaizer, 2019). This includes groundwater pollution in wells and boreholes. This has created negative environmental impacts and increased the health risk of the residents. Wastewater that is directed to the environment is the prime breeding sites for mosquitoes, houseflies, rodents, and other vectors of communicable diseases such as dysentery, diarrhea and. The two fundamental reasons why wastewater should be properly managed includes the prevention of pollution of water sources and the protection of public health by safeguarding the environment against the spread of diseases. Wastewater management is presently poorly done or even nonexistent in Nigeria and most other developing countries. The quality of domestic wastewater effluents is one of the main causes of degradation of the receiving water bodies such as rivers, lakes, streams etc. The potential health hazards of polluted wastewater effluents on the quality of receiving water bodies are many and depend on the volume of the wastewater discharge, the microbiological and chemical concentration of the effluents. It also depends on the type of discharge, for example, the amount of suspended solids or hazardous pollutants like heavy metals or organic matter (Owuli, 2003). By extension, using the water for recreational purposes and anyone else coming into contact with the degraded water is at risk, children playing around contaminated wastewater are most vulnerable to getting infected with diseases. The impact of such degradation may result in physical changes to receiving waters, release of toxic substances, decreased levels of dissolved oxygen, increased nutrient loads and bioaccumulation in aquatic life (Environmental 2017). The increasing release of domestic wastewater containing hazardous substances and the lack of adequate finances for treatment may likely cause an increase in the incidence of water borne diseases as well as more rapid degradation of the environment.

Wastewater more often than not forms stagnant pools in the neighborhood since mostly the drainage channels are either nonexistent or blocked. Poorly drained wastewater could collect at the foot of buildings, commonly along fence lines, building frames and foundations leading to cracks and eventually collapse of the structure. The most common health hazards associated with domestic wastewater includes disease caused by viruses, bacteria and protozoa that may get washed into drinking water supplies or receiving water bodies (Kris, 2007). Microbial pathogens have been identified as critical factors contributing to numerous waterborne disease outbreaks. Many of these pathogens found in domestic wastewater can cause chronic disease with long term health effects such as stomach ulcer and degenerative heart disease. The detection and identification of the different types of microbial pathogens in domestic wastewater are always difficult, expensive and time consuming. To overcome this problem indicator organisms are commonly used to determine the risk of the possible presence of a particular pathogen in wastewater (Paillard *et al.,* 2015). Chronic exposure toxins produced by these organisms can lead to health problems like liver damage, gastro-enteritis, skin irritation, nervous system impairment and liver cancer in animals (Eynard *et al.,* 2000). According to (Toze, 2017) and (Okoh *et al.,* 2017), viruses are considered as been among the most important and potentially most hazardous pollutants in domestic wastewater. They found out that they are generally more resistant to treatment; most infectious, more difficult to detect and require smaller doses to cause infections. Bacteria are also one of the most common microbial pollutant in domestic wastewater. They cause a wide range of infectious diseases such as dysentery, diarrhea, skin and tissue infection etc, such bacteria found in wastewater include E. Coli, Salmonella, Leptosporosis, etc. These cause mostly dysentery and typhoid fever which is very endemic in the developing world Nigeria inclusive.

2.4 Wastewater Management Strategies in Auchi

1. **Irrigation:** Irrigated agriculture needs rapid expansion as it ensures double cropping for a year for several of the stable food crops whose importation contributes most in depleting the country‗s foreign reserves. The concentrations

of these are in the North where billions of Naira has been sunk on dams. Presently, small earth dams have been discovered as being more adaptable to the farmers and presently the governments are constructing many of these dams. Expected investments in this area would boast Agriculture.

2. **Water Supply:** The demand for potable water is growing sharply as a result of population increase, industrialization and high standard of living. Also, by placing water supply among top priorities in water resources development, the country hopes to demonstrate its great efforts to meet the aims of the millennium development goals MDGs – the supply of safe and adequate water and sanitation for all, projected for the year 2015 which, may be tenable in few southern states.

3. **Hydro-Electric Power Generation:** Nigeria has many rivers that carry large volumes of water throughout the year which are basically favourable for the generation of power. If self reliance in energy is to be achieved by the country in the future, hydroelectric power generation is to be explored and exploited further in water resources development planning. Presently the Kanji Dam power station is a major hydroelectric power generating station in Nigeria. It is expected that these big dams would aid the generation of electricity to the success of the transformation agenda of the Government.

4. **Flood Control:** Owing to heavy rains, all the rivers in Nigeria swell above their normal flow levels. After spilling over their banks during the rainy season, they flood the surrounding fields; damages are caused to cultivated lands,

buildings and life. Floods has become uncontrollable and taking its toll. This is attributed to the climatic changes that are taking its tolls all over the world now. Hundreds of people die and properties destroyed in thousands by heavy flood.

5. **Drainage:** The lowland and swamp coastal areas of the country need drainage and protection from salt water intrusion. Inlands, especially in southern parts of the country where the pressure of population on land is most acute, many patches of arable fields become water-logged and remain so for a long period during rainy season. The problem of urban and rural drainage is getting serious because of anthropogenic factors and drawing more attention.

6. **Navigation:** With the growth of industrialization in the country, the cost of provision of inland navigable waterway as a cheaper means of transportation of goods, have become economically justifiable. In the present state of the nation, navigation development, have started with river regulation and river dredging. River dredging is going on variously but has not gone on as expected. Mismanagement though seems to be affecting the well thought out venture of dredging of navigable rivers in Nigeria. The River Niger of Onitsha has recently been delivered of a new port that would enhance transportation between the North and South of Nigeria.

7. **Erosion Control:** Some drainage basins in the country such as Anambra and Imo, lower Benue are facing serious erosion of surface. The erosion has double adverse effects of causing wastage of large residential and potential agriculture areas as well as providing sediment that are transport by surface runoff and

eventually deposited in local streams and lakes that are fast losing their morphology and depths due to sedimentation. They are also a serious aspect of pollution to these streams, lakes and rivers

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter comprises the methodology that will be use in carrying out the research survey which include; the research design, population, sample size, sampling techniques, sources of data collection, method of data presentation and method of data analysis.

3.2 Research Design

The research design to be adopted is this study is the survey and descriptive design method. The design is adopted because the study involves the use of a representative from the population and drawing of conclusion based on the analysis of available data.

3.3 Population of the Study

The population of this study will comprises of individual involve and witnesses of domestics waste management. Population of 80 housing units which gave 100 housing units were randomly selected in the study area for examination. Household heads (Men or women) will be used as primary respondents in each household. Sample will be a representative of the whole. It involves taking a portion out of the population or a general body and from this sample conclusion are drawn relating to the whole. The previous population of the study area was 216,468 and current population is 232,126.

3.4 Sampling Size

A total number of 110 questionnaires shall be distributed at random among victim, but 100 copies were retrieved from the respondents. The returned questionnaires will be used for the analysis.

3.5 Sampling Technique

To analyze the data generated, statistical technique shall be used. Simple percentage shall be used to analyses the respondent opinions in the structured questionnaire. In testing the various hypotheses, the chi-square (X^2) statistic shall be employed. The research draw inferences from the data generated from primary and secondary source.

3.6 Method of Data Collection

In gathering the data required for this research, the researcher shall use two major sources of data, which are as follows:

Primary Data: Data that shall be generated from the use of questionnaires and personal interview constituted the primary sources of data for this research work.

i. Questionnaire: Questionnaires shall be administered to some individuals in the affected areas. They shall be designed to find out the respondent's opinion about domestic waste management in buildings in Auchi, Edo State.

ii. Personal Interview: Apart from the questionnaires, there shall also be personal interview with some persons.

Secondary Data: In order to be more comprehensive, the researcher shall use data collected from textbooks, journals and internet.

3.7 Validation of the Instrument

Validity of the instrument is the extent to which an instrument measures what it is supposed to measure and performs? As it is designed to perform the face and content validity of the instrument was carried out by the researcher's supervisor and two other experts in the Department of Building Technology (Auchi Polytechni, Auchi). They ensured that the questions were relevant and unambiguous so that each of the items in the questionnaire measures what it was intended to measure.

3.8 Reliability of the Instrument

For the reliability, the test-retest reliability procedure was employed in determining the reliability of the instrument. To determine the reliability coefficient of the questionnaire, the questionnaire was administered and re-administered after two weeks to the same subjects. The Pearson Product Moment Correlation Coefficient was used to correlate the results collected from the first and second administration to determine the reliability coefficient. A reliability coefficient of 0.70 was attained and considered a good fit for the final administration. Value of reliability coefficient ranges from 0-1.0, 0 means no reliability and 1 means perfect reliability, for a reliability of 0.70 is considered a good fit.

3.9 Method of Data Analysis

The data collected shall be presented in tables to show the frequency of responses to the questionnaire. The researcher shall make use of simple percentage to analyze the data collected to ensure that results arrived at are valid and not of chance while chi-square shall be use for testing the hypothesis.

Formular for chi-square

$X^2 = \underline{(Fo-Fe)^2}$

Where:

X^2 = Calculated value of Chi-square

Fo = Observed Frequency

Fe = Expected Frequency

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND HYPOTHESIS TESTING

4.1 Introduction

This chapter is concerned with the presentation and analysis of the data obtained via the administered questionnaires, and to test the hypothesis stated in the chapter one of this research work.

4.2 Data Presentation and Interpretation

This chapter was specifically written under the sub headings below, data presentation, analysis and discussion of findings, the data collected from the respondent via the questionnaires were presented in tables and analyzed by simple percentage as shown in the tables below

Table 4.1: Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	86	78.2	78.2	78.2
	Female	24	21.8	21.8	100.0
	Total	110	100.0	100.0	

Source: Field Survey (2022)

From the above table, out of 86 respondents, (78.2) are males while 24 (21.8%) are females

Table 4.2: Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-30yeras	11	10.0	10.0	10.0
	31-40years	31	28.2	28.2	38.2
	41-50years	44	40.0	40.0	78.2
	50yeras and above	24	21.8	21.8	100.0
	Total	110	100.0	100.0	

Source: Field Survey (2022)

Form the above tables of age distribution 20-30 represent (10%), 31-40 represent (28.2%), 41-50 represent (40.0%), above 50 represent (21.8%). In conclusion 37-5 years of age is more than other age distribution.

Table 4.3 Academic Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	P.hd	8	7.3	7.3	7.3
	M.sc	58	52.7	52.7	60.0
	B.sc/HND	44	40.0	40.0	100.0
	Total	110	100.0	100.0	

Source: Field Survey (2022)

The table of academic qualification, PHD represents (7.3%), MSC represent (52.7%), BSC/HND represents (40%). In conclusion Msc qualification is more than other qualification.

Table 4. 3: Profession

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Architech	12	10.9	10.9	10.9
	Engineer	17	15.5	15.5	26.4
	Builder	81	73.6	73.6	100.0
	Total	110	100.0	100.0	

Source: Field Survey (2022)

Form the above tables of profession architect represent (10.9%), engineer represent (15.5%), builder represent (73.6%) In conclusion builder has the majority of respondent.

Table 4.4: Occupation of Respondent

Valid	Father	22	20.0	20.0	20.0
	Mother	22	20.0	20.0	40.0
	Child	52	47.3	47.3	87.3
	Tenent	14	12.7	12.7	100.0
	Total	110	100.0	100.0	

Source: Field Survey (2022)

Form the above tables of occupation of respondent father represent (20.0%), Mother represent (20.0%), child, (47.3) while Tenent, (12.7). In conclusion Child has the majority than every other occupation.

1. Methods of domestic waste water management

S/N	Methods of Domestic Waste Water Management	5	4	3	2	1	SUM	MS	RANK
1.	Composting toilets (dry and wet)	44	51	5	-	-	439	4.39	1ST
2.	Sludge Treatment	32	45	8	9	6	388	3.88	2ND
3.	Sludge water treatment	40	32	8	16	4	388	3.88	2ND
4.	Chemical Water Treatment	26	33	24	10	17	361	3.61	3RD
5.	Solid-liquid separation device	30	25	10	15	20	360	3.60	4TH
6.	Aerated waste water treatment systems	20	45	15	12	8	357	3.57	5TH
7.	septic tanks	35	20	16	17	12	349	3.49	6TH
8.	Physical water treatment	19	31	28	12	10	337	3.37	7TH
9.	Biological Water Treatment	15	35	10	25	15	310	3.10	8TH

Source: Field survey (2022)

From the ranking in table 4.9 above, the most fervent variable of domestic waste water management is composting toilets (dry and wet), with a mean score of 4.39 which ranked 1st. Ranked 2nd is the sludge treatment with a mean score of 3.88. Sludge water treatment ranked 3rd with a mean score of 3.88. The least fervent ones are cigarette, with the mean score of 3.53. rubbish burning has mean score of 3.53and finally the naked flames has a mean score of 3.50.

2. Environmental and health implications of domestic waste water in Auchi

S/N	environmental and health implications of domestic waste water in Auchi	5	4	3	2	1	SUM	MS	RANK
1.	Cholera	**52**	**23**	**14**	**8**	**3**	**413**	**4.13**	**1ST**
2.	Dysentery	**32**	**41**	**21**	**4**	**2**	**397**	**3.97**	**2ND**
3.	Oil and Grease	42	28	9	19	2	389	3.89	3RD
4.	Diarrhea.	**44**	**18**	**23**	**10**	**5**	**386**	**3.86**	**4TH**
5.	Typhoid	**40**	**26**	**17**	**12**	**5**	**384**	**3.84**	**5TH**
6.	Inorganic materials	39	27	15	12	7	379	3.79	6th
7.	Toxic Chemicals,	36	29	15	16	4	377	3.77	7TH
8.	Pathogens,	**38**	**25**	**17**	**14**	**6**	**375**	**3.75**	**8TH**
9.	Sludge	39	23	16	13	9	370	3.70	9th
10.	Organic	23	34	18	6	19	336	3.36	10th

Source: Computation of SPSS E-view

Table 4.10 indicates the perception of respondent towards environmental and health implications of domestic waste water in Auchi. The most fervent variable is that, cholera is one of the major health implication of domestic water waste with a mean score of 4.13, which rank 1st next is Dysentery having a mean score of 3.97, which rank 2nd followed by Oil and Grease with a mean score of 3.86, ranked 3rd While Diarrhea rank 4th with a mean score of 3.86

3 Computation of domestic waste water generated In Auchi?

S/N	Content of domestic waste water generated in Auchi	5	4	3	2	1	SUM	MS	RANK
1.	Carbohydrates	37	36	19	5	3	399	3.99	1st
2.	Dissolved oxygen concentrations	41	29	16	9	5	392	3.92	2nd
3.	Chemical characteristic	**38**	**31**	**16**	**8**	**7**	**385**	**3.85**	**3rd**
4.	Chemical oxygen demand	43	24	14	11	8	383	3.83	4th
5.	Detergents	37	32	14	8	9	380	3.80	5th
6.	Synthetic	31	35	12	12	10	365	3.65	6th
7.	Proteins	16	39	22	10	3	325	3.25	7th

Source: Computation of SPSS E-view

From the ranking in 4.11 above, the most fervent variable of domestic waste water generated in Auchi is Carbohydrates with a mean score of 3.99which ranked 1st. Ranked 2nd is the Dissolved oxygen concentrations with a mean score of 3.85, chemical characteristic ranked 3rd with a mean score of 3.85. While Chemical oxygen demand ranked 4th with a mean 3.83.

4 Wastewater Management Strategies in Auchi, Edo State

S/N	Strategies for waste water management in Auchi	5	4	3	2	1	SUM	MS	RANK
1.	Avoid watering on windy days.	48	18	24	3	7	417	4.17	1ST
2.	Let grass grow taller in hot, dry weather to shade roots and hold moisture	50	25	18	5	2	416	4.16	2ND
3.	Prevention and minimization	50	28	9	6	7	408	4.08	3RD
4.	Recycle nutrients and use energy efficiently	46	28	14	7	5	403	4.03	4TH
5.	Avoid contamination of wastewater flows	51	23	11	8	7	403	4.03	4TH
6.	Treatment for reuse,	17	57	26	-	-	391	3.91	5TH
7.	Water trees slowly and infrequently to encourage deep rooting	27	38	15	20	-	372	3.72	6TH
8.	Handle nutrient-rich flows separately from other waste flows	35	27	17	11	10	366	3.66	7TH
9.	Check for leaks in pipes, hoses faucets, and couplings.	38	20	18	14	10	362	3.62	8TH
10.	Conventional collection and treatment for disposal	12	48	16	8	16	332	3.32	9TH
11.	Put unavoidable pollution on landfill	17	42	10	16	15	330	3.30	10TH

Source: Computation of SPSS E-view

Table 4.12 indicates the perception of respondent towards Wastewater Management Strategies in Auchi, Edo State. The most fervent variable is that, avoid watering on windy days. is one of the major wastewater management strategies with a mean score of4.17, which rank 1st next is let grass grow taller in hot, dry weather to shade roots and hold moisture having a mean score of 4.16, which rank 2nd followed by Prevention and minimization with a mean score of 4.08, ranked 3rd while Avoid contamination of wastewater flows rank 4th with a mean score of 3.86

4.3 Hypotheses Testing

Hypothesis One

H_o: There is no effective waste disposal methods commonly used in Auchi, Edo State

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	271.417[a]	22	.000
Likelihood Ratio	336.58	10	.000
Linear-by-Linear Association	217.104	1	.000
N of Valid Cases	110		

a. 12 cells (60.0%) have expected count less than 5. The minimum expected count is 2.71.

For the result above, shows that effective waste disposal methods commonly used in Auchi, Edo State is not significant at 5%. This means that the alternative hypothesis is accepted at 5% level of significance.

Hypothesis Two

H_o: Environmental and health has no significant implications on domestic waste management in Auchi, Edo State

Table 9

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	341.418[a]	16	.000
Likelihood Ratio	26.518	12	.000
Linear-by-Linear Association	218.04	1	.000
N of Valid Cases	80		

a. 12 cells (60.0%) have expected count less than 5. The minimum expected count is 2.57.

For the result above, environmental and health has significant implications on domestic waste management in Auchi, Edo State is significant at 5%. This means that the alternative hypothesis is accepted at 5% level of significance

CHAPTER FIVE

SUMMARY OF FINDING, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

The following are the findings of the study

The study reveal that there is no waste disposal methods commonly used in Auchi, Edo State is not significant at 5%. This means that the alternative hypothesis is accepted at 5% level of significance. For the result above, environmental and health has significant implications on domestic waste management in Auchi, Edo State is significant at 5%. This means that the alternative hypothesis is accepted at 5% level of significance

5.2 Conclusion

The study concluded that As a result of the volume of wastewater generated in this area and the challenges posed to the environment and to the inhabitants, coupled with the fairly good physico-chemical composition, this wastewater can be reused for other purposes. The benefits of collecting wastewater in this area are numerous; the collected wastewater could be recycled for all domestic activities except cooking and drinking which fortunately accounts for only 4% of water usage in the study area. Wastewater re-use involves passing the wastewater through a treatment system, which involves the removal of solids, inorganic and organic compounds, bacteria and algae and subsequent conversion into economically acceptable water. Wastewater re-use in this area will allow effluents to be disposed of without danger to human health or unacceptable damage to the natural environment.

Wastewater effluents are major contributors to a variety of water pollution problems. Some of these problems include eutrophication, which can stimulate the growth of algae, increased water purification cost, interference with the recreational value of water, health risks to humans and livestock, excessive loss of oxygen and undesirable changes in aquatic populations. Since large amounts of wastewater effluents are passed through sewage treatment systems on a daily basis, there is a need to remedy and diminish the overall impacts of these effluents in receiving water bodies. In order to comply with wastewater legislations and guidelines, wastewater must be treated before discharge.

5.3 Recommendations

i. **Fire Protection:** This can be achieved through running a series of pipes into the area and installing fire hydrants. A short lateral line will be designed to connect each fire hydrant to a distribution main. Shutoff valves will be located at strategic points throughout the system to provide control of any section or service outlet, including hydrants. These valves will serve the purpose of isolating the system for required maintenance and to ensure that a main break affects only a small section.

ii. **Irrigation and fish farming:** As a result of the prevailing climatic conditions in the area, two seasons are clearly identifiable; a seven months of rainy season and five months of dry season. During the dry season water becomes very scarce and the food security of the area and even the country becomes challenged. Treated wastewater can effectively be harnessed for irrigating farmland for dry season production of crops and vegetables. These can be grown at local levels for households or community cooperative bodies with little parcels of land for cultivation. This will go a long way in creating employment, maintaining the environment and boosting the food requirement of the country. This can readily be achieved by piping the treated water to the farm through the series of mains and other distribution network. Fish farmers have to struggle to get water for the farm from wells and boreholes since treated water, especially the one that has undergone both secondary and tertiary treatment has an adverse effect on the fish, and wastewater that has undergone primary treatment only can be used comfortably for this purpose without having any adverse effect on the fish.

iii. **Aquifer Recharge:** An aquifer is a subsurface reservoir that transmits water to wells and boreholes. Hand dug wells and boreholes obtain their water from underground reservoirs which in turn get their water from rainfall through infiltration into the ground. However groundwater recharge is limited by so many factors chiefly of which is climatic, rainfall, and geology. During the long dry season this reservoir becomes depleted as a result of pressure from overuse. This vital resource can be recharged artificially. The main purpose of artificial aquifer recharge technology is to store excess water for later use. The method will ensure that groundwater levels are maintained while improving the water quality of the wastewater as it undergoes natural treatment before joining the groundwater system**.**

5.4 Suggestion for Further Study

The study focus on evaluation of the effectiveness of domestic waste water management in building in Auchi, Edo state, it is suggested that further research should carry out research on ways domestic waste management should be control

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APPENDIX I

QUESTIONNAIRE

Department of Building Technology,

School of Environmental Studies,

The Federal Polytechnic,

Auchi.

Dear Respondent,

REQUEST FOR COMPLETION OF QUESTIONNAIRE

The undersigned is conducting a higher National Diploma research survey on "**AN EVALUATION OF THE EFFECTIVENESS OF DOMESTIC WASTE WATER MANAGEMENT IN BUILDING IN AUCHI, EDO STATE ".** Your kind assistance is required in filling the questionnaire and making relevant information available.

Your feedback will provide insight and necessary information in order to achieve the aim and objective of the study.

I wish to assure you that the information so provided will be treated with strict confidence and use for academic purpose only.

Thank you for sparing me your valuable time.

Yours Faithfully,

OFEOSHI FRANKLINE IMOKHAL

APPENDIX II
QUESTIONNAIRE
AN EVALUATION OF THE EFFECTIVENESS OF DOMESTIC WASTE WATER MANAGEMENT IN BUILDING AUCHI EDO STATE
(A CASE STUDY OF HOUSEHOLD)

Section A: The Bio-Data of the respondents

Instruction: Please tick as appropriate

1. Gender: (a) Male [ ] (b) Female [ ]
2. Age: (a) 20-30 [ ] (b) 31-40 [ ] (c) 41-50 [ ] (d) 50 and above [ ]
3. Occupation of Respondent: (a) Father [ ] (b) Mother [ ] (c) Child [ ] (d) Tenant [ ] (e) Landlord [ ] Landlady [ ]
4. Academic Qualification: (a) PHD [ ] (b) Msc [ ] (c) Bsc/HND [ ] (d) Secondary School [ ] (e) primary school [ ]

Section B

3. Methods of domestic waste water management

Please rank them according to the scale defined below based on their effectiveness

Kindly rank them according to the scale defined below;

Highly Effective (5) Effective (4) Non Effective (3) Slightly Effective(2) Ineffective (1)

S/N	**Methods of Domestic Waste Water Management**	**5**	**4**	**3**	**2**	**1**
1	Biological Water Treatment					
2	Chemical Water Treatment					
3	Sludge Treatment					
4	Solid-liquid separation device					

5	Physical water treatment					
6	Sludge water treatment					
7	septic tanks					
8	Aerated wastewater treatment systems					
9	Composting toilets (dry and wet)					

4. **What Are the environmental and health implications of domestic waste water in Auchi**

Kindly rank them according to the scale defined below;

Highly Effective (5) Effective (4) Non Effective (3) Slightly Effective(2) Ineffective (1)

S/N	**environmental and health implications of domestic waste water in Auchi**	**5**	**4**	**3**	**2**	**1**
1	Cholera					
2	Dysentery					
3	Typhoid					
4	Diarrhea.					
5	Pathogens,					
6	Toxic Chemicals,					
7	Oil and Grease					
8	Sludge					
9	Organic					
10	Inorganic materials					

3. What is the content of domestic waste water generated In Auchi?

Highly Effective (5) Effective (4) Non Effective (3) Slightly Effective (2) Ineffective (1)

S/N	Content of domestic waste water generated in Auchi	5	4	3	2	1
1	Chemical characteristic					
2	Carbohydrates					
3	Chemical oxygen demand					
4	Dissolved oxygen concentrations					
5	Fats					
6	Synthetic					
7	Detergents					
8	Proteins					

4 Wastewater Management Strategies in Auchi, Edo State

Highly Effective (5) Effective (4) Non Effective (3) Slightly Effective (2) Ineffective (1)

S/N	Strategies for waste water management in Auchi	5	4	3	2	1
1	Handle nutrient-rich flows separately from other waste flows					
2	Recycle nutrients and use energy efficiently					
3	Avoid contamination of wastewater flows					
4	Put unavoidable pollution on landfill					
5	Let grass grow taller in hot, dry weather to shade roots and hold moisture					
6	Check for leaks in pipes, hoses faucets, and couplings.					
7	Avoid watering on windy days.					
8	Water trees slowly and infrequently to encourage					

	deep rooting					
9	Prevention and minimization					
10	Treatment for reuse,					
11	Conventional collection and treatment for disposal					