

**THE IMPACT OF SOLID WASTE MANAGEMENT ON THE
ENVIRONMENTAL LIVABILITY OF BENIN CITY.**

BY

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SSC1708099

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

FACULTY OF SOCIAL SCIENCES

UNIVERSITY OF BENIN

BENIN CITY

OCTOBER, 2023

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**A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF
GEOGRAPHY AND REGIONAL PLANNING, FACULTY OF SOCIAL
SCIENCES, UNIVERSITY OF BENIN IN PARTIAL FULFILMENT OF THE
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UNIVERSITY OF BENIN, BENIN CITY.**

OCTOBER, 2023

CERTIFICATION

We the undersigned certify that this research work was carried out by Onotevure Emuejevoke Mark in fulfillment of the requirements for the award of Bachelor of Science (B.Sc.) Degree in Geography and Regional Planning of the University of Benin, Benin City, Nigeria.

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DEDICATION

This work is dedicated to God Almighty for his grace and divine guidance prior to and through my academic years in University of Benin and to my parents who have been a strong pillar of support for me.

ACKNOWLEDGEMENT

I would like to take this opportunity to express my profound gratitude to God Almighty who gave me the enablement to run this programme successfully and to my family who stood by me throughout my stay in this institution.

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ABSTRACT

The study was conducted to ascertain the impact of solid waste management on the environmental livability in Benin city. It reveals that the problems of Solid waste management, effects of solid waste on the environment as it is related to the livability, how indiscriminate dumping of solid waste can be controlled, and the solution towards achieving a better livable environment.

Data for this study were collected from the secondary and primary sources. The secondary data was gathered from extant literatures that borders on the subject matter while the primary data was collected from (126) respondents with the aid of a questionnaire. The data gotten with the structured questionnaire was then analysed with statistical package for social science (SPSS)version 22, and presented using frequency count, percentage and tables.

The study found that indiscriminate dumping of solid wastes is a serious problem on Benin City. It was revealed that majority of the respondents earn below a monthly income of #51,000 though they have tertiary level education. It was revealed also that majority of the respondents are aware that poor solid waste management can be toxic to the environment. In terms of problems faced with solid waste collection in the study area, it was revealed that 24.6% affirmed lack of waste vehicles as the most prominent issue. Inadequate waste management workforce is the second major problem by 21.4% of respondents while 11.8% and 19.0% stating that indiscriminate waste dumping and irregularity in waste collection by the waste managers are the major problems with waste collection in the study area.

The study concluded that indiscriminate dumping of solid waste and poor solid waste management are the major problem in Benin City. Based on this findings, the study recommends that the government of Benin City (EDSWMB)should equip waste managers with better vehicles, and other equipment. Enforcing waste management laws to prevent the indiscriminate dumping of solid waste. Ensuring the removal of illegal waste managers from the system and ensuring adherence to the situated authority.

CHAPTER ONE

BACKGROUND TO THE STUDY

1.1 Introduction

One of the biggest issues facing emerging nations, including Nigeria, is solid waste management. Wastes of various kinds, in both purposeful and inadvertent forms, are produced every day. According to Uchegbu (2002) and Adewole (2009), wastes are any objects that people, animals, or plants have thrown because they are unusable or undesirable in the environment. According to Douglas (1992), waste is whatever we no longer need and want to get rid of. When wastes are not properly disposed of, the environment might be thought of as being dirty. Ayo (2015) defines waste as any object that has been used and is no longer desired since the valuable and useful components have been removed or used. According to the Collins (1978) study, which was cited by Osagie (2011), solid waste is defined as items that have been used up but are still in existence. Examples include pieces of paper and clothing, canned and packaged goods, and food items, as well as large, impressive piles of trash, cars, metal scraps, electronics, abandoned furniture, and tools for construction. Waste is any substance that is considered to be scrap materials, effluents, or other undesired substances that result from the application of any process, according to the Federal and State Environmental Edicts (FSEE) Section 32(4) of 1985. According to these definitions, something that is seen or regarded as waste by one person may be a resource to another (WHO, 1999; 2004; 2016).

Solid waste is defined as a substance that is firm-hard, compact, dense, or a combination of all three (Herbert 2007; Mishra 2008). Municipal waste includes solid waste, according to Cunningham and Cunningham (2012). Municipal or metropolitan solid wastes are the ideal terms to use to describe or refer to solid wastes produced in urban areas (Above 2001; Uchegbu 2002). According to Wright and Boorse (2011), there are three (3) basic categories into which urban solid wastes can be separated practically. These include industrial wastes, building and construction wastes, and municipal wastes. Municipal solid waste is the most prevalent and often produced type of waste materials among these three types. Municipal solid wastes are the waste products produced by cities, towns, and public spaces. Building and construction wastes are wastes produced at construction and demolition sites, whereas industrial wastes are produced by the chemical, glass, and manufacturing industries. According to Gilpin's study from 1976, solid waste management is a planned system for efficiently regulating the creation, storage, collection, transportation, processing, and disposal or utilization of garbage in a way that is hygienic, aesthetically pleasing, widely accepted, and financially viable. Gilpin (1996) stated that in addition to the actual treatment of waste materials, solid waste management also involves all administrative, financial, legal, and planning tasks. According to studies by Cunningham and Cunningham (2012) and Ibrahim (2016), solid waste management has five (5) functional stages on a worldwide scale. Waste generation, storage, collection, recovery, recycling, and disposal are these stages. The worth of human health, safety, and the environment's advantages to humans and other living things in

and on ecosystem components is what the idea of environmental quality is concerned with. This suggests a healthy environment with clean water, air, and land. Odiette (1993) and Agbebaku (2014) cite Wright and Nebel (2002) in their works.

These environmental indices serve as the prerequisites for human life and sustainability, claim Wright and Nebel (2002). Environmental quality is the status of the "atmosphere, hydrosphere, and lithosphere" components of the environment that supports man and other living things in the biosphere (Okecha 2000). The level of human activity organization, planning, and control determines the environment's quality. According to Paul and Steven (2010) and Oseghale (2011), this is in terms of rising human population, urban expansion and development, waste management, the caliber of building infrastructure development, and the level of public health services and amenities.

The Clean Air Act (1970, 1977, and 1990), the Clean Water Act (1972), the Clean Land Act (1987), and the WHO Act (1999; 2004) are just a few of the established Acts that are used globally to measure environmental quality. These Acts were established by groups of organizations and stakeholders from various nations to promulgate regulations, policies, and standards for international environmental issues and practices, as well as to address the need to safeguard ecosystem components from environmental dangers like the problem of solid waste (WHO, 1999; USEPA, 2006). The environmental quality regulation laws of Nigeria and Benin City, however, are aligned with the requirements set forth in the international regulatory body's environmental quality laws (FEPA, 1988; WHO, 2004; NESREA, 2008; and LASEPA, 2010).

In response to this concern, the Federal Government of Nigeria has enacted a number of laws and regulations to protect the environment. These include the National Environmental Standards and Enforcements Agency Act of 2008 and the Federal Environmental Protection Agency Act of 1988. In Nigeria, environmental regulations are managed and upheld by the Federal Ministry of Environment. These organizations are in responsible of managing, using, and disposing of the solid waste produced (Madupin and Adedoyin, 2015).

The issues with solid waste management have been the subject of numerous research in Benin City. The lack of solid waste services was cited by Ogu (2000) as the main obstacle to the management of trash in the Benin city. The majority of homes in the Benin metropolitan region lack any kind of official waste collection and disposal system. This suggests that the majority of residential homes and their areas have less access to public or private garbage services. According to the study by Akujieze and Irabor (2014), Benin City is in terrible shape since the old moat monument has been used as a receiver for various wastes, including domestic, agricultural, industrial, and flood channels. Insufficient funding for waste management infrastructure, human attitudes, improper technology, a lack of or poor implementation of governmental regulations, population behavior patterns, and a lack of public knowledge are all challenges, according to the report by Egbenoma (2016). According to Ogwueleka's 2009 report, Nigeria's solid waste procedures and issues are characterized by ineffective collection techniques, inadequate coverage of the collective system, and poor disposal processes. The trash generation rates varied from 0.44 to 0.66 kg per capita per day,

while the garbage density ranged from 280 to 370 kg/m³. He stated that the most frequent challenges faced by environmental agencies included a lack of institutional structure, inadequate funding, a lack of by-laws and standards, rigid work schedules, a lack of data on the quantity and makeup of waste, and inappropriate technology.

The need to understand the issues with solid waste and how they affect the environment in Benin City is what sparked interest in this study. With a sizable human population and a concentration of social and economic activities, the Benin metropolis is a sizable region. It is generally accepted that areas with high concentrations of human activity produce large amounts of solid trash, which are often disposed of carelessly and poorly managed. The environment's ability to support life is impacted by poor solid waste management. The management and disposal of solid waste, as well as its consequences on the livability of the environment in Benin City, must thus be studied in this research.

1.2 Statement of the Research problem

As we all know, managing solid waste is a very difficult undertaking. It causes several issues for individuals, such as flooding due to blocked drainage, traffic congestion, health risks, and ugly surroundings. Additionally, the world community has major concerns about environmental degradation caused by solid wastes in urban areas. Because all types of pollution affect our food chain, health, comfort, amenities, values, and level of living. Today,

environmental changes and government efforts to manage these changes have an impact on all enterprises.

In Benin City, the issue of solid waste disposal practices is getting worse. On the city's roadways and main streets, it's typical to see domestic and municipal trash waste. The debris is piled up for weeks, resulting in filthy situations that smell horrible and, worst of all, spread diseases including cholera, malaria, typhoid fever, and diarrhea. Residents of Benin City frequently dispose of solid trash they produce in open landfills, gutters, and at the back of houses.

The challenge is made even more difficult by the fast urbanization and population growth, which have an impact on the amount of garbage generated as well as the availability of solid waste disposal services (Zerbock, 2013).

In order to address the issue, the State Government hired the assistance of the business sector from 2004 to 2006. But starting in 2007, the government, through the Edo State Waste Management Authority (ESWAMA), assumed primary responsibility for the disposal of solid garbage. To no avail, the Authority has devised numerous solutions to the issue. The Authority has the right to bring legal action against anyone who break sanitation regulations while also offering tools for managing solid waste, like bags and cars.

In order to determine which method is more goal-oriented, the study will first assess the degree of livability of the physical environment of Benin City from the perspective of the solid waste management system in place. The findings of this study have the potential to improve

policy toward adequate solid waste disposal practices among Benin City neighborhoods with a view to greatly raising the level of livability of the city's physical environment.

1.3 Research Questions

The following questions are important to provide guidelines in this research work:

1. What are the impacts of solid waste management on livability level of the environment of Benin city?
2. What are the various ways by which solid waste is being disposed in the study area?
3. What are the approved government methods of solid waste management in Benin City?
4. What are the problems of solid waste collection and disposal system in the study area?

1.4 Aim and Objectives of the Study

The aim of this study is to assess solid waste management and its effect on the environmental livability in neighborhoods of Benin city. In order to achieve this aim, the specific objectives are to:

1. Identify the various types and composition of waste generated in the study area.
2. Examine the impacts of solid waste on the livability level of the environment of Benin city
3. Examine the problems of solid waste management in the study area
4. Examine the systematic effect of solid waste management on the livability of the environment in Benin City.

5. Recommend the most effective and efficient ways of solid waste management system for the study area

1.5 Research Hypotheses

In accordance with the research objectives, the following hypotheses were formulated for testing in the study.

Ho: There is no significant relationship between solid waste management and the environmental livability of Benin city.

Ho: There is no significant difference among the methods of solid waste disposal and management practices in the study area.

Ho: The problems of solid waste disposal practice do not differ significantly among neighborhood in Benin city.

1.6 Significance of the Study

The primary importance of this study is that it will significantly contribute to the creation and upkeep of an effective waste management system in the study area. Additionally, it will contribute to enhancing Benin City's environmental situation. Finally, it will aid in the prevention, mitigation, and management of the disease linked with solid wastes. The outcomes of this study will serve as the foundation for subsequent research in the study area.

1.7 Study Area

1.7.1 Location

Benin City is the capital of Edo state. It is located between latitudes 6.20°N and 6.26°N and Longitudes 5°38'E and 5°41'E. It is situated 80 metres above sea level. It presently covers Egor, Oredo, Ikpoba-okha, part of Ovia North East and part of Uhumwonde Local government areas. It is situated 321.8km by road east of Lagos.

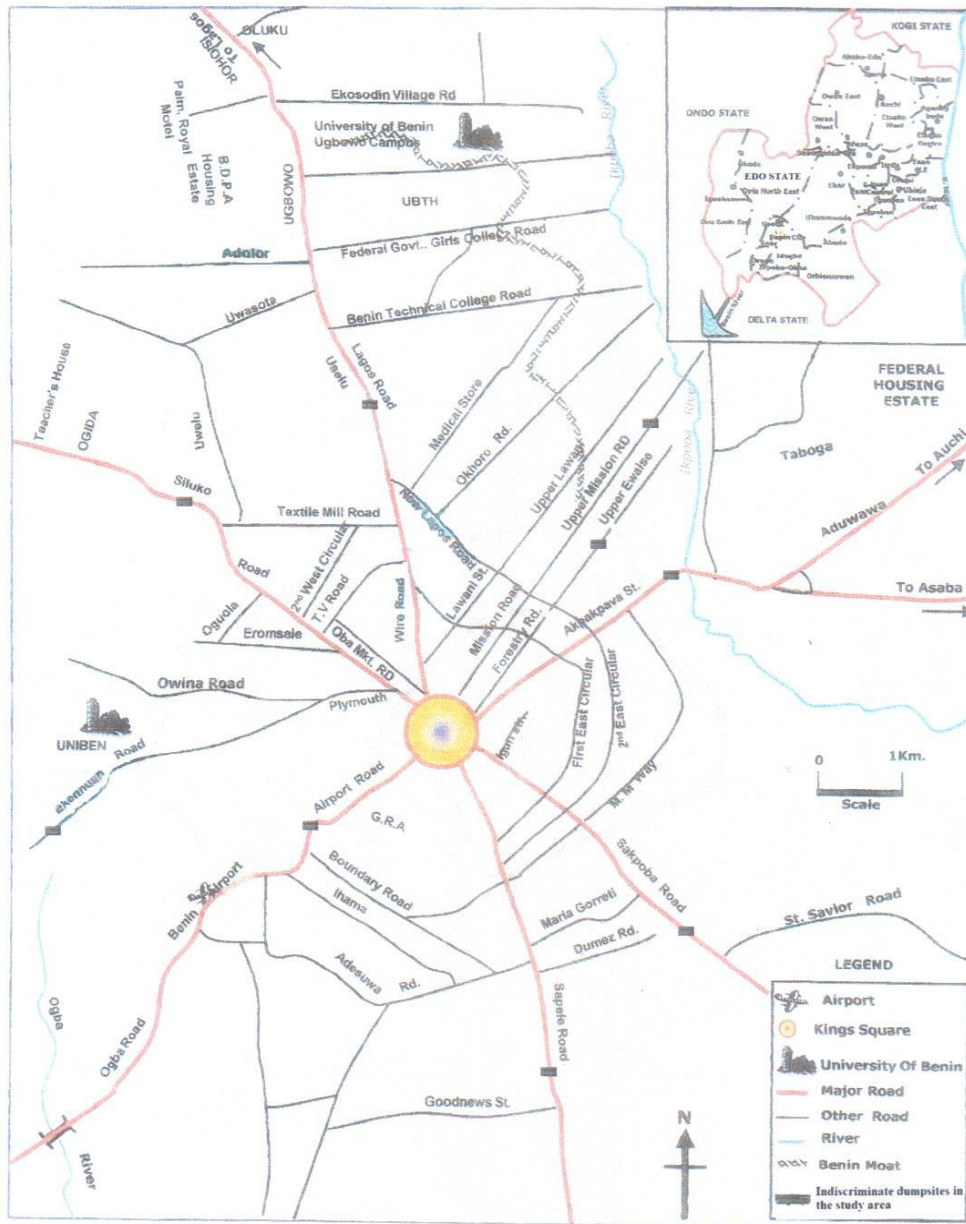


FIG. 1. MAP OF BENIN CITY AS STUDY AREA
 Source: Ministry of Lands and Survey, Benin City 2023

1.7.2 Population

According to the 2006 census, there are 1,147,118 people living in Benin City. From this total population, 334,879 people live in the Egor local government region, 374,671 people live in the Oredo local government area, and 371,106 people live in the Ikpoba-okha local government area. Benin City's population, however, is made up of 61,442 people who live in portions of Uhumwonde and Ovia North East.

1.7.3 Climate

The city has a mean daily temperature of 27°C, 80% relative humidity, and an annual rainfall between 1750mm and 2000mm. It is situated in the humid tropical rainforest area of Nigeria. Seasonal variations occur there. The dry season starts in November and lasts until March, whereas the rainy or wet season lasts from April to October.

1.7.4 Vegetation

The tall trees that previously distinguished the vegetation are now mostly replaced by low trees and grasses. This is a consequence of human activity in Benin City. However, in the suburbs, where human activity has not been as prevalent, there are not many tall trees to be found.

1.7.5 Geomorphology

Ikpoba River and Ogba River are the two rivers that drain Benin City. The area has 91 meters of elevation above sea level. The soil is loamy, sandy-clay, and very deep red. It is also very well drained.

1.7.6 Socio-economic Activities

Benin City's socioeconomic activities at the moment are primarily secondary and tertiary. The secondary operations include manufacturing businesses including confectioneries, saw mills in different regions of the city, and pure water plants, among others. Banking, commerce, administration, communication, and transportation services, as well as malls and rental services, are examples of tertiary activity. The majority of these are clustered in and around the city's CBD. Benin city is the administrative headquarters of Edo state. It is the seats of most government ministries and parastatals.

Benin City's socioeconomic landscape is also dotted with additional small-scale companies such retail stores, business centers, restaurants, and saloons. The Oba market is located near King Square, the New Benin Market is located at the intersection of Mission Road and New Lagos Road, the Oliha Market is located in the Oliha Quarters, and so on. The volume of socioeconomic activity in Benin City is made up of all these markets, business hubs, manufacturing companies, banking institutions, transportation companies, bronze casting establishments (most of which are centered at Igun Street), etc.

1.6.7 Educational Activities

Several basic schools, secondary schools, technical colleges, and university institutions are currently located in Benin City. The University of Benin at Ugbowo and Ekenwan Road, the Benson Idahosa University at G.R.A., the School of Health Technology at Dumez Road, Olua Primary School, Uselu, etc. are only a few examples.

1.8 Definition of Terms

Waste- They are materials or items that have been abandoned as being useless, undesirable, damaged, or having further value for the user and should be rid of.

Solid waste- is undesired or any waste products produced by human activity that are not free flowing.

Waste Management - is characterized as the discipline concerned with managing the production, storage, collection, transfer, transportation, processing, and disposal of solid or gaseous waste in a way that adheres to the highest standards of public, health, economic, environmental preservation, and aesthetics. It is also accountable to the public's attitudes.

Solid waste management - is the process of treating solid waste items at the point of generation and disposal.

Waste treatment- With the help of waste treatment procedures, trash can be made easier to dispose of by being changed into a more manageable form, having less volume, or having less toxicity. Reusing products and reducing trash are both waste prevention strategies.

Solid waste disposal - the method of removing solid trash from a collection point or dump site such that it does not cause odor or environmental annoyance.

Recycling- it refers to the removal of items from waste stream to be used as raw materials in the manufacture of new products. It occurs in three phases. First the waste is sorted out before recycling can be carried out effectively and recyclables collected, the recyclables are used to

create raw materials such as glae, plastics, papers and tyres. These raw materials are then used in the production of new products.

CHAPTER TWO

CONCEPTUAL AND THEORETICAL FRAMEWORK

2.0 Introduction

In the study of the impact of solid waste management on the environmental viability of Benin City, this section reviews relevant literature, theory, and concepts. The theories and concepts listed below are important for comprehending this study project.

2.1 Conceptual and Theoretical Framework

2.1.1 Concept of Waste

Waste can be described as any material, whether it be solid, liquid, or gaseous, that is left behind after a substance has been processed and for which the organism or system that produced it can find a use (Allaby, 2012). Waste, then, is defined as materials or items that have been abandoned as being useless, undesirable, defective, or having no further use for the user and should be disposed of (Ekpo, 2010). According to Olouwande and Bartone (2002), waste can also be defined as any leftovers or old goods, whether they are liquid, solid, or gaseous, that have no market value and must be thrown away.

2.1.2 Types of Waste

Waste can take on many different forms, and there are various ways to characterize waste. Physical states, physical qualities, reusable potentials, biodegradable potentials, source of production, and the level of environmental effect are some of the criteria frequently utilized in the classification of garbage (Demirbas, 2011; Dixon & Jones, 2005; White et al., 1995).

According to White et al. (1995), waste can be roughly categorized into three basic categories based on their physical states: liquid, solid, and gaseous waste. Despite the fact that it is obvious that several classes exist in various nations. The categories that are most frequently utilized are; **Solid waste**

Solid waste is undesirable or pointless stuff that is produced in a given region by a combination of commercial, industrial, and residential activity. According to its origin (household, industrial, commercial, construction, or institutional), contents (organic material, glass, metal, paper), or potential hazards (toxic, non-toxic, flammable, radioactive diseases), it can be divided into three categories. It is also described as undesired or any waste products that come from people and are not freely flowing. Solid waste is defined by Tchobanoglous et al. (1993) as waste generated by human activities that is in a solid or semi-solid form and is discarded as useless products. According to Beranek (1992), solid wastes are a broad category of wastes created by a variety of activities, such as agricultural activities, landscaping activities, and other processes, such as home and commercial operations.

2.1.3 Types of Solid Waste

2.1.3.1 Municipal Solid Waste (MSW)

A significant waste stream and one of the most researched is municipal solid waste (MSW). According to White et al. (1995), MSW has a number of ramifications. They stated that as individuals frequently come into contact with this waste stream, local government and politicians view the collection, treatment, and disposal of it as an essential function. Municipal

solid waste is defined by Kaseva & Gupta (1996) as the garbage that the city authorities collect, which includes domestic garbage, non-hazardous solids from industry, commercial, and institutional waste, as well as non-pathogenic hospital waste. MSW is defined by Buah et al. (2007) as wastes gathered from home and commercial sources for municipal authorities. Municipal solid waste (MSW) was defined by White et al. (1995) as waste generated from residential and commercial spaces. Additionally, they noted that municipal solid trash only makes up a minor portion of all solid waste generated. Municipal solid trash, according to Vergara & Tchobanoglous (2012), is a reflection of the habits and way of life of the people who generate it. They further stated that if MSW is not adequately handled, it may have a detrimental effect on both the environment and public health.

According to Dixon & Jones (2005), soil, garden and food waste, wood, paper, ashes, plastics, textiles, and rubber are among the components of municipal solid waste. They came to the conclusion that municipal solid wastes are a group of wastes originating primarily from domestic and commercial sources. Similarly, Buah et al. (2007) highlighted that the majority of MSW is made up of textiles, paper or cardboard, plastics, glass, and metals in addition to food and garden waste. They claimed that the MSW's composition made it simple to utilise the garbage for fuel production or energy recovery. According to White et al. (1995), municipal solid trash is composed of a variety of different materials and is typically subject to changes from city to city and country to country, unlike other waste streams that are more homogeneous and contain a good percentage of each element.

2.1.3.2 Industrial Solid Waste

According to Ngoc and Schnitzer (2009), industrial wastes are waste that results from the processing of raw materials to create new goods. They emphasized that they might be in mills or industries, as well as in mines. According to Shafigh et al. (2014), a significant portion of the total solid waste generated in Malaysia, Indonesia, and Thailand comes from the production of palm oil. According to the survey, Thailand's palm oil industry generates roughly 3.2 million metric tons of solid waste annually. The equivalent amount for Malaysia and Indonesia is 47 and 40 million tons, respectively. This amount represents the waste from industry, including bunches of fruit, fruit shells, and palm fiber. According to Ngoc & Schnitzer (2009), several forms of solid waste are created by various sectors; they also noted that some of these wastes are toxic and others are not.

2.1.3.3. Commercial Solid waste

Given the enormous volume of solid waste produced by the commercial sector, commercial solid waste is a significant waste stream. According to the Environment & Heritage Service, over 1.5 million tonnes of solid waste were produced by commercial and industrial activity in Northern Ireland in 2005. More than half of the entire amount of solid waste generated during that year was due to commercial activity, according to the research. According to the findings of a survey of industrial and commercial establishments in England (DEFRA, 2009), commercial trash made up almost 11% of all garbage produced in 2002.

According to Tchobanoglous (1993), commercial solid wastes include solid or semi-solid wastes generated by operations in establishments including shops, restaurants, marketplaces, offices, hotels, motels, print facilities, service stations, and auto repair facilities. According to the literature (Buah et al., 2007, Ogwueleka, 2009, and White et al., 1995), commercial garbage is frequently covered or categorized as municipal solid waste. Williams (2005) did observe that the information on the division of trash into home and commercial is typically not easily accessible. According to McLeod et al. (2011), the components of solid waste generated by home and business operations are identical. However, they noted that the trash in the UK are not gathered collectively for disposal. Consumer electronics, batteries, tires, white goods, paper, cardboard, metal, plastics, food trash, wood, and glass are some of the most typical wastes created by the commercial sector (Tchobanoglous, 1993).

2.1.3.4 Institutional Solid Waste

Paper, plastic, glasses, etc., produced by educational, administrative, and public facilities like schools, colleges, offices, prisons, etc., make up the majority of this Institutional: This is mostly made up of paper, plastic, glasses, etc.

2.1.4 Solid Waste Management

Solid waste management is a process that "controls the generation, storage, collection, transfer, transportation, processing, and disposal of solid waste in a manner that is consistent with the best principles of public health, economic engineering, conservation, aesthetic, and

other environmental considerations that are also responsible to public attitude" (Ukabam, 2010). According to Oyideran (2009), solid waste management entails gathering, moving, storing, treating, and disposing of garbage. Solid waste management is defined as the production, separation, collection, transportation, and disposal of solid waste in a manner that considers environmental aesthetics and public health (Eze, 2015). The process of treating solid waste from generation at the source through disposal is known as solid waste management (UN, 2007). Waste management, according to Demirbas (2011), is the process through which wastes are collected, transported, and processed before any leftover residues are disposed of. Similar to this, Tchobanoglous et al. (1993) define solid waste management as the efficient supervision and managing of waste during collection, handling, storage, conveyance, treatment, and disposal in a way that protects the environment and the general public.

2.1.4.1 Solid waste disposal: In order to prevent odor nuisances in the environment, this is the procedure of removing solid waste from the collecting point or dumpsite. The activities included in the process are those that are intended to effectively remove the trash at the end (Haynes, 2011).

2.1.4.2. Solid waste Treatment: The procedures aim to change the solid waste into a more manageable form, decrease the volume, or lessen the toxicity of the waste, making it simpler to minimize the solid waste before disposal. The type, quantity, and composition of the solid waste material are taken into consideration while choosing a treatment procedure. Biological

processes, dumping on land or in landfills, and extremely high temperatures are just a few of the waste treatment techniques currently in use (Gertsaki and Lewis 2003).

2.1.4.3. Waste recovery, recycling and reuse

Trash prevention techniques include trash reduction and product reuse. They lessen the need for large-scale treatment and disposal facilities by eliminating waste creation at the point of typical generation. Making products with less packaging, encouraging consumers to bring their own reusable containers, promoting the use of reusable products like cloth napkins and reusable plastic and glass containers, backyard composting, and encouraging the public to share and donate any unwanted items rather than throwing them away are all ways to reduce waste (Ogboi and Okosun 2003). Recycling is the process of removing objects from the trash stream so they can be used as raw materials to create new products. As a result, recycling happens in three stages: Recycling is done first, after which the recyclables are gathered and used to make raw materials like paper, plastic, and tires.

The creation of new products then uses these basic resources. For selected collection by the municipality, recycling can be separated at the source (i.e., within the home), or it can be dropped off by the trash producer at a recycling facility (Okoli, 2013). When managing trash, methods of waste reduction, waste reuse, and recycling are preferred. These techniques can have a significant positive impact on the environment. They lessen or prevent the release of pollutants, the production of greenhouse gases, the need for waste treatment technologies, and

the need for landfill space. Therefore, it is recommended that these techniques be used and included in the waste management plan.

2.1.4.4 Sanitary landfill

When an operation is carried out to limit environmental health hazards, sanitary landfill is defined as a controlled technique of disposing of wastes by spreading them out into layers, compacting them into the smallest practicable volume, and covering them with solids. 2013 (Richard)

2.1.5 Concept of Livability

Studies conducted today have shown the importance of the notion of livability for communities, including the need for planners, designers, and policymakers in industrialized countries to give it more thought (Schomberg et al., 2011). According to Saitluanga (2013), livability is a comprehensive concept that is similar to the idea of a human being (Wyatt, 2009). There is no widely accepted understanding of it, as it has been described by many academics based on the setting, period, and subject of their research (National Research Council, 2002). People's desires for public facilities have been viewed as being reflected in urban livability (Besser et al., 2012), and it is acknowledged as a key factor in fostering social wellbeing (Anderson et al., 1997).

According to Safer et al. (2000), the term "livability" refers to how a community and its surroundings interact. The key factor in a city's livability is how well it functions for its

residents. Since city dwellers want services for their wellbeing, the idea of a livable city inevitably arises. No literature has offered a consistent definition of livability or a livable city, nor has it presented a standardized way to measure it. According to the Centre for Livable Cities (2011), a city that has outstanding planning that generates a lively, beautiful, and secure environment for its residents to live, work, and play is said to be livable. It has strong leadership, a vibrant economy, a high standard of living, and a sustainable environment. As a result, it is an urban structure that supports everyone living there in terms of their physical, social, and personal growth (Song, 2011). According to Economic Intelligent Unit (2012), one of the factors that determines quality of life is livability. According to Shuhana et al. (2012), a high standard of living will have an impact on a citizen's lifestyle, health, and ability to maintain the built environment. Van (2012) defined livability as the harmony between a community's built environment and its inhabitants. In his view, a community where outdoor spaces were collaboratively maintained by the people would be ideal. Castellati (1997) defined livability as feeling like a real person in the city. Similar to this, Southworth (2007) saw it as a factor in determining how well a city serves its residents. According to Lennard's definition of a livable city from 1997 (Timmer et al., 2006), a city should have the following basic qualities. These include places where the built environment and natural environment coexist, diverse, legible, and educational built landscapes, safety of all residents, preservation of cultural heritage, history, and ecology, human community, and interaction. They also include low

traffic speed, volume, and congestion, affordable and decent housing, access to schools, shops, and other services.

However, their meanings differ, and their effects and perspectives are on different scales (Hovey, 2008), there is still a significant conceptual overlap between livability and sustainability (Sanford, 2011), as well as the quality of life (Schomberg et al., 2011). In conclusion, livability is described as a group of traits that explain the allure of a location for people to live and rest. When it comes to the idea of livability, the environment is the fundamental component of the community that can be improved since it brings together other components and influences people's behavior (Linden, 1996).

From a different perspective, the concept of urban livability is complex and focuses on the various elements that affect an urban community's overall quality of life (Loewus, 2008). Urban livability applies to three components of the community: environmental quality, neighborhood amenity, and individual well-being (Lennard et al., 1995). It aims to inspire urban regions to reach an ideal level (McCann, 2008). Urban livability also takes into account raising one's level of motivation in cities by concentrating on issues related to the economy, society, and environment, including urban planning and public space usage.

Researchers and academics have disputed the ideas of urban livability and have taken diverse characters to build a livable city based on their opinions. Lynch (1981) first identified five components for creating successful cities: vitality, sense, fit, access, and control. Twenty years later, Balsas (2004) supported Lynch's position and added the component of viability.

According to Douglass (2000), raising the standard of living will enable a habitable city to materialize. He sees urban livability as being based on four pillars: (1) having access to meaningful work and livelihood opportunities, (2) access to meaningful work and livelihood opportunities, (3) having a safe and clean environment, and (4) establishing good governance.

Urban livability is a general concept without a clear or widely accepted definition. The idea encompasses related ideas like community wellbeing, sustainability, quality of life, and the "character" of a place. According to Andrews (2001), livability is a "ensemble concept" whose constituents comprise a wide range of intricate traits and conditions. The concept of livability, which encompasses a community's capacity to meet "the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987), is similar to the Bruntland Commission's definition of sustainability. The need for intergenerational justice is emphasized by sustainability, which also acknowledges the constraints imposed by ecological factors like the limited availability of some natural resources like fossil fuels.

In many ways, urban livability can be seen as including a variety of issues connected to general "quality of life and well-being." It makes sense to think of it as a "place-based" term, referring to components of a city, neighborhood, or home that enhance quality of life and wellbeing. The terms "quality of life" and "well-being" refer to the parameters that can be used to assess a person's living situation or status. They can range from the more impersonal quality of life measures, such as social capital, qualitative expressions of personal contentment, and the

like, to the more impersonal indicators of economic wellbeing, such as human capital (Ley et al., 2010).

Broad human requirements, such as those for food and basic security, as well as aesthetic appeal, cultural expression, and a sense of place or community, are all included in the concept of livability. The term "quality of life" first appeared in the 1960s as part of the Social Indicators Movement, which challenged conventional wisdom regarding the link between economic and social well-being as well as the nuanced differences between material and immaterial well-being experienced by individuals and society. According to Myers (1988), a citizen's pleasure with their home surroundings, traffic, crime rates, career prospects, or the amount of open space might be considered their quality of life. Alternately, the phrase might allude to abstract concepts like social justice and freedom of speech (Land, 1996). Some of these same characteristics are taken into account by character of place as collections of qualities associated with certain locations (such as how the health of a population is impacted by air quality or access to healthcare).

The ideas of sustainability and livability work together to help us think about the quality of life for all community members or inhabitants as well as how their decisions and actions will affect the lives of future generations. One livable community cannot be maintained at the expense of its neighbors; the placement of waste facilities in low-income areas is an example of environmental injustice that has a high social cost. A sustainable community would not be founded on consumptive practices that cannot be sustained over two generations. You can find

a lot of useful information online using the terms "livability" or "sustainability" and "examples of community-derived indicators of livability." Numerous communities share the metrics they prefer, and these might act as models for other communities.

The concept of urban livability connects a lot of the other ideas. It refers to the extent to which a place's characteristics, in interaction with one another and with activities in other locations, can satiate its inhabitants by addressing their economic, social, and cultural needs, fostering their physical and mental well-being, and safeguarding its ecosystem's natural resources. Urban livability, as a transversal term, aids in the assessment of the cumulative effects of public and private actions and inactions, and it aids in the capture of some of the externalities disregarded or incorrectly valued by market systems. These processes include consumer, business, and governmental purchasing decisions, risk/reward analyses, and lending and investment rules. Concern about the impact of transportation networks on the environment, economic health, and social well-being at geographic sizes ranging from the local to the national is growing as interest in livability does. The development, packaging, integration, and use of data in decision-making have all changed as a result of the Internet. Americans have seen a rise in municipal, state, and even national livability goals and objectives over the past ten years. Examples at these scales include the redevelopment of the 79th Street Corridor in Miami-Dade, Florida; the Smart Investment Plan in California; and the Livable Communities Initiative of the Clinton-Gore administration (U.S. White House Task Force on Livable Communities, 2000). Furthermore, livability principles and practices are essential to cutting-

edge public policy initiatives like trading pollution credits, location-efficient mortgages, and taxation plans to stop urban sprawl. Additionally, a lot of commercial companies use livability data when making decisions related to facility siting, job creation, insurance, and marketing.

A measure of environmental justice, which makes sure that no one group of the population is either subjected to excessive exposure to environmental risks or is denied access to environmental amenities like urban open space, is crucial for many urban residents, especially communities made up of minorities. According to Wackernagel et al. (1996), decreasing our ecological "footprint" and making measures to minimize pollution, decrease waste, maintain natural resources and wildlife habitat, as well as safeguard endangered species are all key factors in promoting livability.

2.1.2.1. Concept of solid waste management

Solid waste management is the systematic process of creating, collecting, storing, moving, treating, using, and discarding unwanted or waste materials. The idea of solid waste management, according to Gilpin (1976), as mentioned by (Mishra, 2008) and (Ibrahim, 2016), encompasses all administrative procedures, financial and legal ramifications, and planning functions, in addition to the actual physical part of trash processing. The value of human health, safety, and the environment's benefits of people and other living things in and on ecosystem components is what the idea of environmental quality is concerned with. This suggests a healthy environment with clean water, air, and land. Odiette (1993) and Agbebaku (2014) both quote Wright and Nebel (2002). In order to maintain man and other living things in the

biosphere, the environment's "atmosphere, hydrosphere, and lithosphere" must be in a healthy, hospitable, and friendly state. (FEPA, 1988; 2014; EPA, 2008, and LASEPA, 2010), referenced by Iqbal (2011) and Agbebaku (2014), state that laboratory testing is the best method for determining the physical and chemical characteristics of water samples. The process is the same for measuring air quality because these polluting gases may be assessed using a flue gas analyzer, but for measuring land pollution, soil samples will be examined in a lab. Most nations throughout the world, including Nigeria, have followed and implemented the global health organization's (WHO) recommended requirements for the indices of environmental quality (clean air, water, and land) (LASEPA, 2010).

According to Mishra (2008), the universal drives for the concept of sustainable development of solid waste management is concerned about (a) respect and care for community life (b) improve quality of human life (c) conserve the earth's vitality and diversity (d) minimize the depletion of non-renewable resources (e) change personal attitude and practice (f) enable community to care for their own environment (g) keep within the earth's carrying capacity and (h) provide a national framework for integrating development of and conservation and create a global alliance. According to Polt (2014), the notion of integrated waste management is a system that places a greater emphasis on trash disposal than it does on the other phases of waste management. Before ultimate deposits to dumpsites, landfill combustion, or incineration, the notion emphasizes the practice of sorting (sorting and segregating) waste materials by types and classifications and determining the optimal use and reuse for the

abandoned products. The management approach of effective planning, supervision, organization, coordination, controlling, and disposal of municipal solid waste from the source of generation to the point of recycling, re-discovery before final disposal is depicted by the model of management on solid waste, as observed by Agbebaku and Fagbemi (2013) and Okecha (2000) and Sridhar and Akintola (2012). The optimal methods for collecting, storing, transporting, reducing, and disposing of garbage are all addressed by the management model, though.

The model also stipulated that in order to fulfill organizational goals, missions, and aspirations, the required tools and equipment for waste service delivery should be made available. The concept suggested that institutional, legislative, technological, and operational constraints should be properly controlled and administered. Integrated Solid Waste Management (ISWM) employs a comprehensive strategy to develop environmentally sound, socially acceptable, and economically feasible sustainable systems. The collecting and sorting of garbage is essential to the operation of an integrated solid waste management system, which uses a variety of different treatment techniques. It is crucial to remember that there is no one treatment technology that can effectively manage all garbage in an environmentally friendly manner. The optimal mix of the various solutions suitable to the specific community must therefore be chosen after an equal evaluation of all treatment and disposal options. Therefore, efficient management plans must function in a way that best satisfies the municipality's existing social, economic, and environmental requirements.

2.1.2.2. Impact of Solid Waste Management and Environmental livability in Benin city

(a) Impact on Residents: The study by Egbenoma (2016) demonstrates the importance of environmental managers and health officials closely monitoring and controlling waste items to prevent unpleasant scenes, drainage problems, traffic jams, offensive odors, seepage, breed-insistence rodents, disease epidemics, environmental deterioration, and land degradation. According to studies by Agunwamba (1998) and the WHO (2014), indiscriminate waste disposal sites can spread infectious diseases to people and other living things. Residents need to be aware of the kinds of resources they use and the waste they produce. For example, the citing landfills, open dumps, and burning of refuse in habited areas speak of the abysmal level of man on the impact of waste deposits to human health and the environment. Ruth (2016) concurs that when dumpsites are established or located within human habited areas, environmental quality is at risk; this action may lead to epidemic disease, seepage, odour, pollution, and contamination of land, water, and air ecosystems. According to Ruth (2016), 65% of his dejected respondents concur that dumpsite placements have a detrimental effect on homes in terms of environmental quality.

(b) Impact on Human Health: According to the (WHO, 1999) the quality of the environment a person lived in, including the availability of clean water, air, and land as well as wholesome food, had an impact on their level of fitness and health. According to the UNEPA (2006), improperly managed (disposed of) waste, particularly excreta and oil spills and other solid waste from households, businesses, and communities, poses major health risks and may

promote the spread of infectious diseases and diseases of affluence. According to Cunningham and Cunningham (2005; 2012), the amount of garbage that remains in towns and cities poses a threat to public health.

According to a study by Egbemona (2016), the practice of dumping solid trash carelessly and everywhere without adequate planning and management control poses a risk to the environment and public health. Ibrahim (2016) asserts that the accumulation of trash and the careless disposal of solid waste pose a serious threat to public health and related issues. He continued by saying that improper handling of solid waste will have an adverse effect on the local population. This includes, among other things, an unclean atmosphere, offensive odors, fly and mosquito attractiveness, water source contamination, the spread of food and water-borne illnesses, and the prevalence of STDs. Moreover, according to Ibrahim (2016), who cited a report from a joint summit in 2004 by the World Health Organization (WHO) and United Nations International Children Education Fund (UNICEF), 2.4 billion people will probably be at risk of needless disease and death by 2015 due to poor sanitation, a failing or nonexistent sewage system, and common illnesses like diarrhea, which claim the lives of children every 21 seconds. **(c) Impact on Environment:** According to Agbebaku's (2016) study, the environment has a role in the circumstances and conditions that have an impact on people's lives. According to the research of Odiette (1993), any environmental harm depletes capital, which eventually lowers the value of its ongoing services. The study of the Italian Environmental Association (IEA, 1999) as reported in Awake (2002), observed that a glass

bottle thrown into the sea is estimated to decompose in about 1, 000 years; papers in three months while cigarettes butts or filter pollutes the sea for up to five (5) years; car up to 500 years; and polystyrene (a very light soft plastic that is usually white, used especially for making containers that prevent heat loss) is 1, 000 years.

According to a study by Zurbrugg (1999), since waste generation cannot be stopped, man's only choice is to make sure that its presence is controlled such that it no longer has any harmful consequences on him or his surroundings. According to Cunningham and Cunningham's (2012) research, the condition of ecosystems on land, in the water, and in the air all affect how healthy an environment is. The natural environment in Nigeria has recently gotten worse and is currently on the decline. More anthropogenic causes than natural ones are to blame for this (Odiette, 1993). The government develops a number of public education campaigns and sensitization programs as part of its World Environmental Day celebrations to raise awareness of the need to safeguard ecosystems from further environmental deterioration, such as solid waste. Studies have demonstrated that environmental degradation brought on by solid waste can result in ecological problems and ecosystem imbalances, and in places where these things happen, environmental quality is at risk (Agbebaku, 2015).

(d) Impact on Finance: According to Sridhar (2012) and Ibrahim (2016), citing research by Wright and Nebel (2002) and Wright and Boorse (2011), trash management is a labor- and capital-intensive process that can account for 20 to 50 percent of a municipality's operating budget. Ibrahim (2012) stated that by successfully managing garbage that would otherwise end

up in seas, rivers, lakes, or landfills, capital and operational cost savings can be achieved. Solid waste has been acknowledged as a significant source of pollution for land, air, and water bodies in addition to its economic impact (Awake, 2002). According to Irvbijaro and Akintola (2012), funds for departments and organizations that are concerned about the dangers of solid waste around the world should be steadily increased. According to Agbebaku's (2015) report, Nigeria's States and Local Authorities should be given a larger budgetary allocation for ecological funds to keep up with the issues posed by solid waste.

Findings show that since Gianfranco Rafaelli dumped 8,000 drums of PCBS waste in "Koko Town" in Delta State on June 10, 1988, Nigerians have become more aware of the need to protect their environment. This unhygienic act compelled the Federal Government of Nigeria to redefine the definition of our environment that had previously been used. Huge amounts of money are invested in order to protect the ecosystem's constituent parts. The Federal and State ecological funding and waste sanitation subvention have continually been evaluated and raised over the past 25 years to address the growing hazard posed by the careless dumping of waste materials on the environment (FOS, 2006). For instance, the state budgetary allocation for solid waste management was doubled from 15% to 25% in Benin City in 2012. This will stop the overreach of this threat (ESWMB, 2017).

(e)Impact on climate change: It takes a long cycle for a substance or product to become solid trash; this cycle includes the removal and processing of the raw materials, the production of the product, the transportation of the materials and products to the market, and the use of energy to

power the product. Each of these actions has the potential to cause one or more of the following greenhouse gas emissions:

1. Energy consumption: The energy used in raw material extraction, product manufacturing, and market transportation all contribute to greenhouse gas emissions.

2. Methane emissions: when organic wastes decompose in landfills it generates methane which is major component of greenhouse gases.

3. Carbon storage: Trees sequester carbon by absorbing CO₂ from the air and storing it in their wood. Reducing waste and recycling paper and wood goods enable more trees to remain standing in the forest where they can continue to absorb CO₂ from the air, thereby reducing climate changes. Recycling now lessens methane emissions by avoiding the need for energy to collect and process raw materials. Communities wanting to mitigate climate changes should do so by putting in place an integrated solid waste management plan.

2.1.2.3. Issues and Challenges on the impact of Solid Waste Management on the Environmental livability of Benin City

Everywhere in the world, solid waste management is becoming an increasingly serious environmental issue. To manage this hazard and lessen its effects, sophisticated more sophisticated methodologies and practices are required. According to the study by Medupin and Adedoyin (2015), which was cited by Enahoro (2016), "solid waste management" refers to all activities and actions necessary to manage waste from its creation to its final disposal. These activities and actions include waste generation, collection, storage, transportation, treatment,

and disposal, among others. According to Kumar (2016), who cited Konteh's 2009 study, solid waste management varies from location to place and from developed to developing nations. He continued by saying that among the factors contributing to the failure of technologies for solid waste management in developing nations are the unchecked increases in human population, weak institutional capabilities, deficient legislation, lack of funding for infrastructure, and poor public behavioral patterns toward waste management.

According to the interviews conducted for Osagie's (2011) study, of the issues and challenges relating to solid waste in Benin City, 15% are attributable to inadequate solid waste services, 20% to poor organization, 25% to inadequate equipment, 20% to non-compliance with bye-laws, and the remaining 20% are attributable to a lack of knowledge of the impact of waste disposal on environmental quality. Insufficient funding for waste management infrastructure, human attitudes, improper technology, a lack of or poor implementation of governmental regulations, population behavior patterns, and a lack of public knowledge are all challenges, according to the report by Egbenoma (2016). According to studies by Umunna (2009) and Monday and Danieles (2011), Nigerian towns and cities are now dealing with environmental issues brought on by subpar garbage management. With growing urbanization, rising population, and advancements in technology, Nigeria has seen an increase in the rate of garbage produced. In order to preserve a sustainable urban environment, solid trash is produced at a rate that is greater than what the local government can manage Sridhar (2012).

According to the study by Egbenoma (2016), solid waste poses a serious hazard to the Benin metropolitan and requires strict control and immediate treatment. The incapacity of the government to provide the necessities and enforce laws, as well as the lack of local government officials to administer the necessary, he continued, are all contributing factors. He argued that ineffective handling, collecting, and disposal of trash are caused by incoherent waste management policy and their implementation. The appalling state of waste management in Benin City is largely due to a constitutional flaw that prevents clear duties and responsibilities between state and local agencies, a lack of manpower planning and inadequate technical training, inadequate funding, and a culture of lax accountability among those in charge of waste management.

2.2 Literature Review

The generation of waste is a direct effect of environmental problems and is an almost inevitable result of human activities. People produce more garbage than ever before today, in part due to the rapid growth in population, but also because of changes in consumption patterns and the makeup of solid waste.

According to Goorah (2009), the effects of solid waste on health and the environment have long been a topic of concern on a global scale. He claimed that solid wastes are sources of environmental contamination because they release chemical substances into the environment that are above their legal limits. Minghua (2009) investigated the methods used to manage the solid waste from China's Pudong New Area. Important waste management concepts have been

shown, including the present state of garbage collection, transportation, and disposal in the Pudong region. According to Moqsud and Hayashi's (2006) evaluation of solid waste management practices in Japan, land filling accounts for 20.3% of all solid waste created there, including ash from burning fossil fuels. In Japan, almost 75% of the total quantity of municipal solid trash produced each year is burned, producing an estimated 2.5 million kilowatts of power in the process.

In Pakistan's metropolitan areas, Mahar (2007) reported on an assessment and analysis of the solid waste management status. He claims that one of the main reasons for environmental degradation in Pakistan is inadequate solid waste management. In terms of kg/capita/day solid waste generation on a global scale, Rajput (2009) found that municipal solid waste generation displayed a divergent trend and a favorable link with economic development. According to the analysis of solid waste management scenarios in the current Indian environment, garbage creation in India ranges from 200 to 600 kg per person per day, and collection effectiveness is between 50 and 90 percent.

According to Anthony (2007), only 800 tons of the daily 2000 tons of municipal solid garbage generated in Kano city could be evacuated. According to Nabegu (2010), solid waste is disposed of "in a more or less uncontrolled manner" throughout the Kano city. In certain circumstances, dumpsites appear out of nowhere at any vacant area, including major roads. He also noted that a thorough analysis of the garbage's properties should be done before managing municipal solid waste.

Effective management of solid waste is challenging when diverse waste categories are not taken into account during collection and disposal, according to Danbuzu (2011). In order to provide the most effective and efficient means of managing trash, this study attempts to describe the garbage produced in the Sabon-gari district of Kano, Northern Nigeria. The features of household solid trash produced by Sabon-gari people (neighborhood) in Kano urban area have been identified, according to Bai and Sutano's 2002 observation. Using the findings of this characterization study as a reference, he claims that formal composting (for 57.5% of the trash) and recycling facilities (for roughly 25% of the waste) need to be established within the Sabon-gari area. It is also advised that private companies take part in the collection, processing, and disposal of municipal solid trash.

According to Sule (2011), inefficient management of solid wastes and a lack of seriousness in the implementation of the solid waste disposal code are the main causes of Nigerian cities' poor environmental conditions. According to Karley (2013), the main metropolis lacks appropriate sites for the disposal of solid waste, which we attribute to the social and economic development's inability to keep up with the natural population growth and rural-to-urban migration.

According to Nze (2009), although flaws have been linked to poor financial and logistical management, attitudes of the general public regarding garbage management should not be disregarded. He also listed a number of elements that worked together to encourage the large accumulation of urban waste and garbage. He was the result of insufficient infrastructure,

poor environmental management structures, a disregard for fundamental aesthetics, industrial and commercial development, and other human forces. He claims that because urban garbage in Nigeria is viewed as "non resources" with only a minimal nuisance value, it is not surprising that the government has chosen a similarly unfavorable approach to controlling waste from urban concentration. This is indisputable since the Nima residential neighborhood in Accra is severely struggling with this issue as a result of bad planning, a lack of logistics, and poor attitudes toward the treatment of solid garbage. Domestic garbage generated at home makes up the majority of waste produced in urban settings, according to Benneh (2010).

Tins, cans, and paper are likely responsible for just 5% to 10% of the overall garbage created, whereas these neighborhood wastes are known to have high densities, high moisture contents, and an organic component that properly accounts for roughly 70% to 90% of solid wastes. In addition, he contended that because there is still a lack of infrastructure to handle all of the waste generated by neighborhoods, roughly 83% of the populace dumps trash in either permitted or unauthorized locations in their neighborhood, which leads to unhealthy circumstances. Additionally, he contended that a lack of communal restrooms can result in open defecation near drains, beaches, and other public areas as well as the propensity for feces to mingle with garbage from the neighborhood.

Stirrup (2011) noted that the type of community served, its financial capacity, the kind of materials arising, climatic conditions, and the desirability of using materials in some circumstances compared with the imperative need to use them to assist in the provision of

essential raw materials must all be taken into consideration when determining the method of solid waste disposal. The key reasons of waste management issues in Kumasi, according to Abrokwah (2012), are ignorance, negligence, a lack of legal sanctions for sanitary violators, and a low degree of waste management technology. Accra is not an exception to these findings. He believes that households need to be made aware of the need to manage domestic garbage and the risk that improperly disposed of waste poses to both the environment and to individuals.

According to Edmunson (2011), the study on trash management in Kumasi revealed that most locations used for rubbish dumps are selected without taking into account the travel time required by locals. He suggested that sanitary locations close to waste producers be noted. One cannot argue the fact that far-off disposal sites deter residents and merchants from using them, as Adelaide (2008) noted that Accra's disposal sites are located quite a distance from residents or vendors. He consequently turned to writing down everything around them. He further contends that citizens, merchants, consumers, and industrialists indiscriminately discard waste on the streets, in troughs, and other unapproved locations. He attributes these unacceptable practices to a lack of waste disposal culture among the general public as well as inadequate waste disposal facilities. This demonstrates how crucial mindset is to problems with trash management.

According to Akinola and Salami (2010), Solid Waste Management has grown to be a significant issue in Nigerian cities. The federal government of Nigeria issued decree 58 for the establishment of a Federal Environmental Protection Agency (FEPA) on December 30, 1988,

in response to the mountainous piles of solid waste that deface Nigerian cities and the ongoing untreated industrial contamination of streams and rivers. When it comes to the development of solid waste, the environment has not been sufficiently protected despite the creation of FEPA and the National Environmental Policy. Waste collection is inconsistent and limited to a few locations in the cities, while badly placed open dumps degrade a number of other locations and threaten public health by promoting the spread of illness and odor. Solid trash generated by an ordinary Nigerian every day is estimated to be roughly 0.49 kg, with commercial centers and homes accounting for almost 90% of the total wastes found in urban centers due to uncontrolled recycling of contaminated goods and pollution of water resources (Solomon 2009).

Oluwade and Okpala (2008) investigated how solid waste was handled in a few Nigerian cities in an effort to discover a workable solution. They noted that despite several efforts to address the issues, the current state of sanitary conditions in the majority of Nigerian cities is far from sufficient. Eze and Asadu (2003) noted that one of the most persistent issues facing modern cities worldwide, particularly in emerging nations, is the solid waste management issue that has developed as a result of urbanization and urban development. They found that appropriate sensitization of all stakeholders is necessary when creating a new strategy for effective solid waste management in Nigeria. They will be able to agree upon, accept, and carry out practical action plans as a result. They demanded that Nigerians shift their focus toward changing their attitudes through quality education and technological advancements in the field of environmental management.

According to Ubani (2006), the threat of solid waste management has caused significant environmental issues in practically all cities as a result of the inability of solid waste management authorities to fulfill their duties. This is seen by the careless way that trash is disposed of in Nigerian cities, which often results in drainage into bodies of water. He noted that there hasn't been much of a change in solid waste management despite the government's involvement. He suggests a solid waste management policy that is based on community and commercial sector involvement. Every member of society must contribute to successful solid waste management, according to Ogbazi (2008).

She continued, "Public participation supports democracy and gives citizens opportunities to influence and control the making of decisions that affect them. He stated that participatory planning, involves an institutional arrangement whereby members of the public have the power to take part in arriving at decisions and policies that affect them, in implementing and assessing outcomes. The aforementioned concept was backed by the urban design and research team (ND), Federal University of Technology Akure. According to the Team, public engagement allows the general public the chance to contribute ideas to community planning, designs, and implementation of policies and proposals that affect them. According to Yelola and Babatunde (2008) (b), proper categorization of municipal solid waste management is essential for the development of municipal waste management services. Waste management is a crucial component of environmental protection. In Nigeria, they investigated the source characteristics of market and home solid wastes.

The source, specific quantity, and classification of municipal solid trash have all been addressed by Gawaikr and Decphande (2006). They contend that the source, precise quantity, and characterization of municipal solid waste are of utmost importance since they permit an accurate evaluation of waste load and make efficient planning of the solid waste management system simpler. This would aid in accomplishing the goals of effective resource use, environmental protection, and public health promotion. The significance of source-specific quantification and characterization of municipal solid waste was therefore emphasized.

According to Fielder (2006), there are a number of concerns related to the garbage produced in metropolitan areas, particularly for the communities who reside close to the waste disposal sites. Therefore, a lot of researchers tried to assess the health issues with urban waste. He conducted studies using retrospective analysis to evaluate the effects of landfills on the health of nearby inhabitants. He evaluated environmental monitoring data and compared health indicators between a community living close to a garbage site and a group with similar socioeconomic status. He came to the conclusion that, despite the cluster of instances of gastroschisis postulated its opening, the area surrounding the dump site had an increased prevalence of documented congenital abnormalities, which before the opening of the landfill. Air samples from the surrounding community contained benzene and hydrogen sulfide, two pollutants released from the site.

During their investigation of the Ugwuaji dumpsite in Enugu, Nigeria, Oyelola et al. (2009) discovered a few health issues related to the dumping of solid waste. Their study

outlines the relationship between worker health risks and exposure factors (smoke, odor, and dust). They discovered a strong association between ocular discomfort from dust and breathing trouble from smoke, as well as between typhoid, dysentery, and malaria. The majority of the diseases that impacted the workers at the dumpsite and the scavengers were eye irritation (86%), breathing difficulties (66%), asthma (48%), cough (10%), pneumonia (82%), malaria (46%), typhoid (46%), dysentery (44%), cholera (42%), and weariness (96%). This demonstrates how solid waste disposal in open pits has an impact on the employees' health. The dangers of disposing of household batteries in municipal solid trash were evaluated by Selvapathy and Madhavan in 2003. They stated that the non-carcinogenic dangers discovered by the risk assessment research and increased heavy metal concentrations in the leachate both exceeded the set limit. As a result, they recommended disposing of battery waste separately because it is considered a hazardous waste.

Abul (2010) investigated the health issues affecting people who live close to a landfill in Enugu. The respondents were divided into groups based on how far they lived from the landfill. The first group consists of those who live in Enugu within 200 meters of the dumpsite. The study, which was carried out among locals, discovered a bad correlation between living far from a landfill and having your health impacted by its pollutants. The determination of the health, economic, and labor supply issues of residents living close to trash dumpsites in Nigeria has been approached similarly in this study.

Adejobi and Olorunnimbe (2012) evaluated the health effects of inappropriate garbage management and disposal on city populations. They looked at the variables affecting household involvement in waste disposal. They showed that there is little household understanding of the environmental issues caused by inappropriate management and disposal of residential garbage in the city. Significant correlations between socioeconomic factors and engagement in home garbage disposal and management were also found. In order to increase household participation in domestic trash disposal and management in the city, they came to the conclusion that there is a need for environmental education, particularly on waste disposal and management approaches.

In addition to researching environmental sanitation and health issues in metropolitan areas, Yongsi (2008) looked into the connection between home waste and diarrhea in Enugu cities. He came to the conclusion that there were constant differences between neighborhoods in the frequency of diarrhea attacks. A cross-sectional epidemiological study was carried out in 2009 by Yongsi et al. to investigate the health issues associated with Enugu's various garbage disposal systems. The study discovered a 14% prevalence of diarrhea among the respondents, and a strong statistical correlation between household waste management practices and respondents' incidence of diarrhea was discovered.

Idiata et al. (2013), studied the dangers of sachet water in Benin City. Africa produces a lot of solid garbage every day, which is then dumped in landfills and down drains. Environmental consequences of solid waste management include incomplete or insufficient garbage collection and recovery of recyclable or recycled waste. Because the Sachet water

package wastes are comprised of thermoplastics, they have a significant negative impact on Nigeria in general and Benin City in particular. An average sachet water pack has a surface area of 0.0211m², Benin City has a population of 1.225 million, and an average male should consume two to three litres of water daily. The volume of waste is expected to increase by 3.3% from 2010 to 2025. The garbage generated from sachet water will range from 4,610,880 to 7,503,926.4, or 97,289.6m² to 158,332.8m² when it is translated to an area covered by waste (0.0211m²). This is a serious issue for the nation as a whole and the environment. The methods thus far identified have the potential to endanger the health of nearby inhabitants because some wastes may have decomposed and released unpleasant odors.

Urban rubbish is typically disposed of or discarded along major roadways near residences, public spaces, and sometimes even close to rivers where they obstruct the free flow of water from the rivers' courses, according to Nabegu (2013) and Butu and Mshelia (2014). It should be emphasized that these instances of careless waste dumping occur despite the fact that certain state environmental protection authorities have deliberately placed trash or waste containers in select locations and alongside important routes. According to Nabegu (2013), more than two thirds of the population does not dispose of their waste at permitted dumpsites.

The practice of disposing urban solid wastes indiscriminately in the words of Butu, Ageda and Bichi (2013) and Omole and Alakinde (2013), has a price to pay in terms of collection, transportation and disposal costs and loss of valuable raw materials (recyclables, reusable and repairable) and the impact on the environment due to air, water and soil pollutions

and associated health risks that ultimately impact the economic sustainability, and this no doubt, can lead to more environmental degradation in our urban centres and for an urban centre like Abakaliki where government is still battling to provide the basic social amenities and as a result of poor waste management, heaps of refuse may soon become a norm.

Asuquo et al. (2012) found that urban residents in Calabar, Cross River, Nigeria, dispose of their trash in garbage cans (64%), their backyards (17%), gutters, pits, open places, and road sides. A peek into their observations reveals that the approaches are common and used in practically all Nigerian urban centers, especially given that different state governments appear to be overburdened by the growing mounds of garbage dumps. Without a doubt, this exposes them to unnecessary health risks. The problem of inhabitants manually evacuating their garbage to places (un)designated as dump sites, like Water Works Road near CAS in Abakaliki, Ebonyi state, is something we frequently observe in most of our city. As the case may be, very few of them use a vehicle, bicycle, or wheelbarrow (Sule, 2001). People will occasionally leave their trash on the highways at night because it is less dangerous and they won't be spotted. According to Isaac and Olanike (2007), Ogwueleka (2009), and Atta (2013), the phrase "waste disposal" refers to all actions done to regulate the generation, transportation, and discharge of garbage in a sanitary manner. The term serves as a reminder that garbage disposal is typically done to lessen its impact on health, the environment, or aesthetics. It should be noted that a sustainable waste disposal system offers a comprehensive interdisciplinary framework for addressing the issues associated with managing urban wastes;

therefore, modernizing the waste disposal system and services and boosting efficiency is a requirement for raising the environmental quality of urban centers.

It should be noted that the most popular disposal techniques in Nigeria, such as the availability of customized EBSEPA waste bins and stationary trucks in the state of Ebonyi, are never problematic because they are never intended to dispose of waste in a specific location for beneficial use. For instance, Nigerians frequently dump their trash. The trash has frequently been portrayed as being carelessly strewn on open spaces, particularly streets. This approach is based on "throw away culture," in which wastes are disposed of carelessly into the nearest public area, on land, or in surface water. In actuality, this exemplifies the "not in my backyard syndrome," in which waste is merely moved to another site where it is believed to have less of an annoyance value (Okpala, 1997; Oyeniya; and Tobore, 2013). In the urban center of Abakaliki, for instance, garbage are occasionally buried or utilized in landfills in the vain hope that out of sight, out of mind, but the consequences are always worse afterwards. Composting, recycling, and garbage burning or incineration have all been criticized for being insufficient means of disposing of solid waste in Nigeria since they cannot convert waste to useful forms.

According to Ngoka (2001), solid wastes clog urban drainage systems, obstruct traffic flow on highways, and emit disagreeable odors as they decompose. Due to its filthy state, it also lessens the urban landscape's aesthetic appeal. While disease vectors visit trash dumps, pick up bits of the disease pathogens, and infect local residents with such health hazards, attempts to limit the volume of solid wastes, such as by burning, will undoubtedly pollute the

air, so producing air born diseases. On the other hand, liquid wastes (also known as effluents) from enterprises cause much greater harm than sewage from waste dumps in terms of surface and subsurface water pollution.

For example, in Abakaliki urban, the ugliness of most streets has become an eyesore, and the disagreeable odor is one that has led some inhabitants to believe that Abakaliki would never have odor-free streets. The transfer of pollution to waste, which happens when the leached from a garbage dump reaches surface or ground water, is the most harmful and frequently undetected. According to Srihar and Hammed (2014), the six categories that make up the environmental effects of wastes include eutrophication, acidification, biotic resource depletion, and global warming. The fact is that Nigeria is currently grappling with a major national problem related to waste generation and its potential impacts on public health, environmental quality, and urban planning. When it comes to the effects of waste on the environment and human health, Butu and Mshelia (2014:9) note that improper management of solid wastes can lead to putrefaction and decomposition, which can lead to land and water contamination when the waste products seep into subsurface water supplies.

Decomposition of the organic solid waste could produce unpleasant odors. Sometimes stray animals like dogs and birds would get into trash bins and distribute the waste across the area, creating unsanitary and harmful conditions. Urban unmanaged solid waste can contribute to climate change because methane, a more potent greenhouse gas than carbon dioxide, is produced when mounds of solid trash degrade (Butu and Mshelia, 2014). According to Sharma

(2010), cited in Butu and Mshelia (2014), this methane adds to global warming, which may cause climate change due to the degradation of other zone layers. Residents of Abakaliki's metropolitan areas frequently have to deal with risks to their general health and safety. Although the effects of exposure to garbage on health are apparent, they have not been quantified. This is especially true during epidemics like the recent cholera outbreak, which claimed the lives of dozens of city dwellers in Abakaliki.

2.2.1. Summary

The literature that was found indicated that relevant research had been done on the influence of solid waste management on the livability of Benin City's environment. The aforementioned earlier works placed a focus on the harm that irresponsible solid waste can cause to humans, animals, and the environment. When solid waste is not properly disposed of, drainage can become clogged, resulting in flooding, and it can even endanger the life of subterranean water by suffocating and strangling them. Additionally, it can foster the spread of pests and diseases, cause slumps, and harm the environment. Solid trash, such as plastics, papers, metal, and other types of solid waste, should be kept to a minimum and recycled in order to avoid the following. On that note, this study aims to further the body of knowledge.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The procedures that were employed for data collecting and analysis are the main subject of this section. The research methodology describes the steps taken by the researcher to combine the unprocessed data and data processing methods. To that purpose, this section covered the study design, study population, study participants, sample size, sampling process, and data analysis techniques

3.2 Data sources and types

Primary and secondary data made up the types and sources of data.

3.2.1 Primary Data

Personal (direct) observation was employed to acquire the primary data for this investigation and questionnaire survey methods.

Personal observation

This survey was conducted to locate solid waste collection points and the number of dump sites, which helped determine the extent of solid waste generation and their environmental problem. The frequency of solid waste collection through this field survey also assisted in identifying illegal solid waste dumps on the street and other public places.

Questionnaire Survey

This survey was conducted among a sample of residents in the chosen neighborhood. It is grouped into 2 sections; A and B.

Section A: Data were gathered on the respondents' age, sex, household size, educational background, and name of location in Section A, which was focused on their personal information.

Section B: it focused on assessment of social, environmental and Health conditions of the respondents

3.2.2. Secondary data collection methods

. These include review of relevant documents of existing publications related to the study. The different data needed were sourced from relevant books, internet sources, government publications, and research reports. These sources will form the main part of the review of literature for the study.

3.3 Research Population

The research population was adult respondents in each selected neighborhood/quaters from ages 18 years and Above within the study area. The respondents for this research was from Uselu, upper mission road, Sakponba road, Forestry road, Sapele road, Akpakpava,

Ekenwan road, Airport road in Benin city. They provided answers to the investigation on the impact of solid waste management on the environmental livability in the selected neighborhoods in the study area. Respondents from market communities (Commercial Centres) in the selected neighborhoods form part of the study sampled population.

3.5 Sample Size Determination

Using the sample size calculation formula shown below, the study's sample size was calculated:

$$n = \frac{X^2 \times N \times P \times (1-P)}{(ME^2 \times (N-1) + (X^2 \times P \times (1-P)))} \text{ ----- (Equation 1).}$$

Where:

n = Sample Size,

X² = Chi-square for the confidence level at 1 df (3.841),

N = Population Size,

P = Population Proportion (.50),

ME = Margin of error (.05).

$$n = \frac{3.841^2 \times 1,778,985 \times 0.50 \times (1-0.50)}{(0.05^2 \times (1,778,985-1) + (3.841^2 \times 0.50 \times (1-0.50)))}$$

$$n = 383.33.$$

Using the equation, with a 95% confidence level and 0.05 error margin, for a total population of 191,531 persons, the calculated sample size is 383 respondents. These would be proportionately administered across the Local Government Areas in Benin City.

3.6 Sampling Procedure

The sampling figure of 383 was first divided between the various quarters of the study area. The simple random sampling technique will be used in the administration of the questionnaire survey to respondents in the study area. Nine neighborhoods were selected for the study and the questionnaire was distributed equally in all the neighborhoods. Table 3.1 below shows the number of questionnaire to be distributed per neighborhood.

Table 3.1: Number of Questionnaire per Neighborhood of Respondents

Neighborhood of Respondents	Number of Questionnaire
Akpakpava	26
Forestry	26
Ekenwan	26
Urelu	100
Upper Mission road	27
Sakponba	26
Sapele Road	26
Silouko Road	100
Airport Road	26

Source: Field Survey

3.6 Data Collection Method

Direct observation and both structured and open-ended questionnaires were utilized as research tools during the study to gather data. On the first day of the fieldwork, the researcher pre-tested the research questionnaire to make sure it could gather the required data. The investigation took into account any gaps that emerged through the pre-test.

The study made an effort to respond to the specified research questions by using both primary data and secondary data. The researcher spent a lot of time in the study region interviewing study participants and distributing questionnaires. According to the sample size, 383 respondents were believed to have been interviewed. Basic information about the respondents, such as their age, sex, education, location, household size, and length of stay, was gathered using a standard questionnaire. The research area's solid waste management practices and how the environment affects livability were also covered in the questionnaire.

Government publications, including economic surveys, population census reports, text books, journals, the internet, statistical reports, statistical abstracts, and development plans, among others, were used to gather secondary data.

3.7 Method of Data Analysis

The study employed both descriptive and inferential statistics in analyzing the impacts of solid waste Management on the environmental livability of Benin City. Descriptive methods of percentages and frequencies were used in describing the variables of solid waste impact on the environment and livability in Benin City. All statistical analysis will be done through the help of Statistical Package for Social Sciences (SPSS).

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Presentation of Preliminary Survey Details

A total of 383 questionnaire were administered among respondents in the study area, however 126 were returned valid for analysis. 14 questionnaires were administered in each community. The results of the analysis are discussed below.

Table 4.1: Distribution for Households and Market

Name of Quarter/ Neighbourhood	Areas	No. of Questionnaires
Upper Mission Road	Upper Mission Road households	14
Sakponba Road	Sakponba Road households	14
Forestry Road	Forestry Road households	14
Airport Road	Airport Road households	14
Siluko Road	Siluko Road households	14
Sapele Road	Sapele Road households	14
Ekenwan Road	Ekenwan Road households	14
Uselu Road	Uselu Road households	14
Akpakpava Road	Akpakpava Road households	14
Total		126

Source: Author's Field Work, 2023

4.2 Socio-Demographic Characteristics of Respondents

The sociodemographic characteristics of respondents comprising the age, gender, average monthly income, occupation, among others are discussed below.

Table 4.2: Gender of Respondents

Selected Community		Gender of Respondents		
		Male	Female	Total
Upper Mission Road	Count	5	9	14
	% within Community	35.7%	64.3%	100.0%
Sakponba Road	Count	6	8	14
	% within Community	42.9%	57.1%	100.0%
Forestry Road	Count	9	5	14
	% within Community	64.3%	35.7%	100.0%
Airport Road	Count	3	11	14
	% within Community	21.4%	78.6%	100.0%
Siluko Road	Count	7	7	14
	% within Community	50.0%	50.0%	100.0%
Sapele Road	Count	7	7	14
	% within Community	50.0%	50.0%	100.0%
Ekenwan Road	Count	4	10	14
	% within Community	28.6%	71.4%	100.0%
Uselu Road	Count	4	10	14
	% within Community	28.6%	71.4%	100.0%
Akpakpava Road	Count	4	10	14
	% within Community	28.6%	71.4%	100.0%
Total	Count	49	77	126
	% within Community	38.9%	61.1%	100.0%

Source: Author's Field Work, 2023

Table 4.2 presents the gender of respondents by communities. From the table, the majority of respondents at 61.1% are females with the proportion of males given as 38.9%. Across each community, the proportion of female respondents were found to be more than that of male respondents with the exception of Forestry Road, Siluko Road and Sapele Road where the proportion of male respondents is presented as 64, 50 and 50% respectively.

From the above, it can be concluded that there were more female participants than males in this study. This could be attributed to the fact that there are more female traders in the streets and markets in these communities compared to male traders.

Table 4.3: Age of Respondents

Selected Community		Age of Respondents				Total
		Below 20 years	20-40 years	41-60 years	61 & Above	
Upper Mission Road	Count	3	7	3	1	14
	% within Community	21.4%	50.0%	21.4%	7.1%	100.0%
Sakponba Road	Count	1	7	5	1	14
	% within Community	7.1%	50.0%	35.7%	7.1%	100.0%
Forestry Road	Count	5	4	4	1	14
	% within Community	35.7%	28.6%	28.6%	7.1%	100.0%
Airport Road	Count	5	6	2	1	14
	% within Community	35.7%	42.9%	14.3%	7.1%	100.0%
Siluko Road	Count	8	4	1	1	14
	% within Community	57.1%	28.6%	7.1%	7.1%	100.0%
Sapele Road	Count	9	3	1	1	14
	% within Community	64.3%	21.4%	7.1%	7.1%	100.0%
Ekenwan Road	Count	4	8	1	1	14
	% within Community	28.6%	57.1%	7.1%	7.1%	100.0%
Uselu Road	Count	5	5	3	1	14
	% within Community	35.7%	35.7%	21.4%	7.1%	100.0%
Akpakpava Road	Count	4	5	4	1	14
	% within Community	28.6%	35.7%	28.6%	7.1%	100.0%
Total	Count	44	49	24	9	126
	% within Community	34.9%	38.9%	19.1%	7.1%	100.0%

Source: Author's Field Work, 2023

In terms of the age of respondents, the highest proportion of respondents at 38.9% are within 20-40 years and is followed by respondents who are below 20 years with a representation of 34.9%. This was found to be the case across all communities with the

exception of Forestry, Siluko and Sapele Roads where the highest proportion of respondents affirmed that they were below 20 years of age.

It can be concluded that the majority of respondents in the study area are under 40 years old, implying that the population is young, active and growing. This makes them the prime target for a study on waste disposal and management within the study area.

Table 4.4: Education of Respondents

Level of Education	Frequency	Percent
No Formal	9	7.1
Primary	14	11.0
Secondary	29	23.0
Tertiary	74	58.7
Total	126	100.0

Source: Field Survey, 2019

Table 4.4 shows the level of education of the respondents in the study area. From the table, the proportion of respondents who have no-formal education is represented as 7.1%, the proportion of respondents who a primary education is 11.0% while the proportion of respondents who have secondary education is 23.0%. The proportion of respondents who have a tertiary education is represented as 58.7%.

From the above analysis, the level of education with the highest representation is that of respondents who have a tertiary education with a representation of 58.7%. This implies that the majority of respondents in the study area have had access to tertiary education thereby making the study population, an educated population. The level of education with the least representation is that of respondents with no-formal education having a proportion of 7.1%.

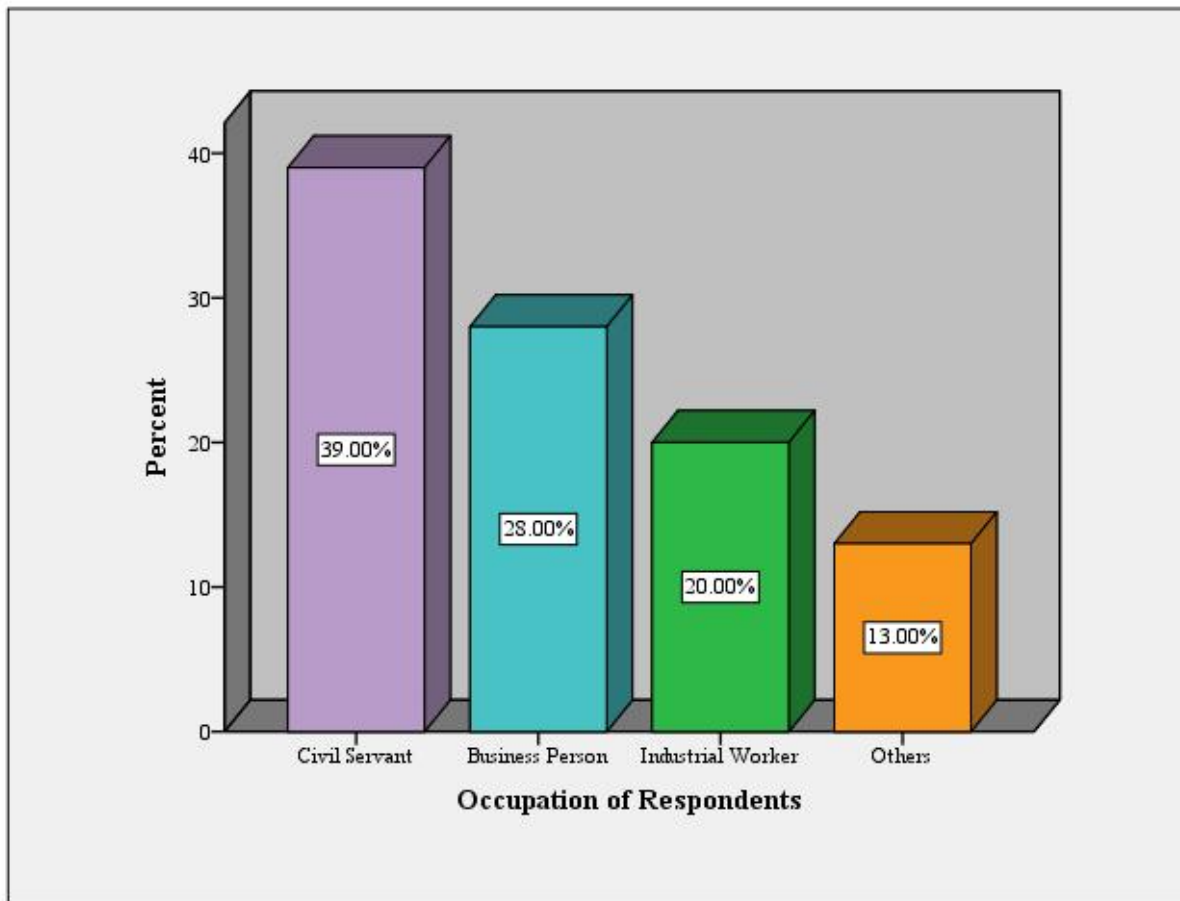


Figure 4.1: Occupation of Respondents in the Study Area
Source: Author's Field Work, 2023

Figure 4.1 shows the distribution of the occupation of respondents in the study area. From the chart, the proportion of respondents who are civil servants in the study area is represented as 39.0%, the proportion of business persons is given as 28.0% with the proportion of industrial workers having a representation of 20.0% while the proportion representation of farmers, artisans, students and respondents who are into other forms of occupation is given as 13.0%.

From the above analysis, the occupation with the highest representation in in Benin City is civil and public servants with the proportion of respondents into business coming in as the second most represented occupation in the study area.

Table 4.5: Marital Status of Respondents

Community		Marital Status					Total
		Single	Married	Divorced	Separated	Widowed	
Upper Mission Road	Count	2	4	4	3	1	14
	% within Community	15.0%	70.0%	6.7%	5.0%	3.3%	100.0%
Sakponba Road	Count	6	6	0	1	1	14
	% within Community	30.0%	65.0%	0.0%	2.5%	2.5%	100.0%
Forestry Road	Count	6	3	2	1	2	14
	% within Community	36.7%	53.3%	3.3%	1.7%	5.0%	100.0%
Airport Road	Count	7	5	0	1	1	14
	% within Community	32.5%	62.5%	0.0%	2.5%	2.5%	100.0%
Siluko Road	Count	8	4	0	1	1	14
	% within Community	28.3%	66.7%	0.0%	1.7%	3.3%	100.0%
Sapele Road	Count	11	3	0	0	0	14

	% within Community	42.5%	57.5%	0.0%	0.0%	0.0%	100.0%
Ekenwan Road	Count	5	3	4	1	1	14
	% within Community	26.7%	55.0%	6.7%	1.7%	10.0%	100.0%
Uselu Road	Count	12	2	0	0	0	14
	% within Community	50.0%	50.0%	0.0%	0.0%	0.0%	100.0%
Akpakpava Road	Count	12	2	0	0	0	14
	% within Community						100.0%
Total	Count	69	32	10	8	7	126
	% within Community	31.5%	60.3%	2.5%	2.0%	3.8%	100.0%

Source: Author's Field Work, 2023

As presented in Table 4.5, the vast majority of respondents at 60.3% affirmed that they are married with a further 31.5% of respondents stating that they are single. This was also affirmed to be the case across all communities in the study area.

It can be concluded from the above that given that the majority of respondents are married while a significant proportion are single with a predominant age bracket of 20-40 years. The population is made up family units that needs to be catered for, hence the predominance of the bazaar economy in the study area.

Table 4.6: Income of Respondents

Income of Respondents	Frequency	Percent
Less than #20,000	31	24.6
#20,000 - #50,000	48	38.1
#51,000 - #100,000	32	25.3
Above #100,000	15	11.9
Total	126	100.0

Source: Field Survey, 2019

Table 4.6 shows the monthly income of respondents in the study area. From the table, the proportion of respondents who earn less than #20, 000 is represented as 24.6%, the proportion who earn between #20,000 - #50,000 monthly is represented as 38.1% while the proportion of respondents earning between #51,000- #100,000 is given as 25.3%. The proportion of respondents who have a monthly income of above #100,000 is given as 11.9%.

From the above analysis, the income bracket with the highest representation is the bracket of #20,000 - #50,000 with a proportion of 38.1% while the bracket with the least representation is above #100,000 with a proportion of 11.9%. However, on a cumulative scale, the proportion of respondents in the study area with a monthly income lower than #100,000 is represented as 88.1% which is overwhelmingly higher than the proportion of respondents having a monthly income that is more than #100,000. It can thus be concluded from the above

that the majority of the residents in Benin City are low-income earners as evidenced by the low income of respondents from the sampled population.

Table 4.7: Respondents' Length of Stay in Community

Length of Stay	Frequency	Percent
Less than 3 Years	15	11.9
3-8 Years	89	70.6
More than 8 Years	22	17.4
Total	126	100.0

Source: Field Survey, 2018

Respondents' length of stay in the study area is presented in the table above. From the table, 11.9% of the respondents have been residing in the study area for less than 3 years, an overwhelming 70.6% have been living in the study area for 3-8 years while 17.4% have been staying in the study area for more than 8 years.

From the above analysis, it can be deduced that the majority of the respondents in the study area have either stayed in their neighborhood 3-8 years. In essence, the majority of respondents are well placed to give accurate information on the environmental management issues in the study area. The proportion of respondents that have stayed in the study area for a period of at least 8 years is given as 17.1%. This proportion comprises mostly the indigenes of the study area.

Table 4.8: Perception of usage Refuse bin or receptacle in households

Selected Communities		Usage Refuse bin or receptacle in households		
		Yes	No	Total
Upper Mission Road	Count	7	7	14
	% within Community	88.3%	11.7%	100.0%
Sakponba Road	Count	10	4	14
	% within Community	90.0%	10.0%	100.0%
Forestry Road	Count	7	7	14
	% within Community	88.3%	11.7%	100.0%
Airport Road	Count	9	5	14
	% within Community	87.5%	12.5%	100.0%
Siluko Road	Count	9	5	14
	% within Community	91.7%	8.3%	100.0%
Sapele Road	Count	11	3	14
	% within Community	92.5%	7.5%	100.0%
Ekenwan Road	Count	9	5	14
	% within Community	91.7%	8.3%	100.0%
Uselu Road	Count	7	7	14
	% within Community	82.5%	17.5%	100.0%
Akpakpava Road	Count	7	7	14
	% within community	82.5%	17.5%	100.0%
Total	Count	76	50	126
	% within Community	60.3%	39.7%	100.0%

Source: Author's Field Work, 2023

On the perception of respondents on the usage of refuse bin or a receptacle, the majority of respondents at 60.3% affirmed they make use of a refuse bin for waste disposal in their household while the proportion of respondents who noted that they do not make use of a refuse bin is presented as 39.7%. This was found to be the case across all communities in the study area.

It can therefore be concluded that the majority of respondents in the study area adopt waste bins or receptacle as their mode of waste disposal in their households across the study area.

Table 4.9: What type of refuse bin are used in Households

		What type of refuse bin are used in Households				
Selected Community		Plastic Container	Metal Drum	Polythene Bag	Others	Total
Upper Mission Road	Count	2	5	6	1	14
	% within Community	10.0%	26.7%	58.3%	1.7%	100.0%
Sakponba Road	Count	1	5	6	2	14
	% within Community	17.5%	32.5%	40.0%	5.0%	100.0%
Forestry Road	Count	1	5	6	2	14
	% within Community	6.7%	35.0%	45.0%	3.3%	100.0%
Airport Road	Count	7	2	5	0	14
	% within Community	40.0%	17.5%	30.0%	0.0%	100.0%
Siluko Road	Count	3	5	5	1	14
	% within Community	21.7%	40.0%	31.7%	3.3%	100.0%
Sapele Road	Count	2	5	6	1	14
	% within Community	15.0%	35.0%	45.0%	5.0%	100.0%
Ekenwan Road	Count	3	5	5	1	14
	% within Community	16.7%	35.0%	36.7%	5.0%	100.0%
Uselu Road	Count	4	4	6	0	14
	% within Community	22.5%	27.5%	50.0%	0.0%	100.0%
Akpakpava Road	Count	2	5	6	1	14
	% within Community	15.0%	35.0%	45.0%	5.0%	100.0%
Total	Count	25	41	51	9	126
	% within Community	19.9%	32.5%	40.5%	7.1%	100.0%

Source: Author's Field Work, 2023

Given that the majority of respondents make use of waste bins in the disposal of wastes as presented as above, the type of waste bin used asked. The highest proportion of respondents at 40.7% affirmed that they make use of polythene bags in the disposal of their wastes with 32.5% stating that they make use of metal drums in disposing their waste. The proportion of respondents who make use of plastic containers for their waste disposal is presented as 19.9%.

By community, the majority of respondents in Upper mission, Sakponba, forestry, Sapele, Uselu, Ekenwan and Akpakpava Roads affirmed they make use of polythene bags for their waste disposal while respondents in Airport and Siluko Roads stated that they make use of plastic containers for their waste disposal.

It can be concluded from the above that, polythene bags and plastic containers are the most predominant methods of disposing refuse in the study area.

Table 4.10: Time taken for refuse bin to fill up

Time	Frequency	Percent
Every two days	22	17.4
Weekly	89	70.6
Every two weeks	15	11.9
Total	126	100.0

Source: Author's Field Work, 2023

As presented in table 4.10, the majority of respondents across the study area at 70.6% affirmed that their refuse bin fills up on a weekly basis with a further 17.4% of respondents stating that their refuse bin fills up every two days. The proportion of respondents whose refuse

bin fills up every two weeks is presented as 11.9%. It can therefore be concluded from the above that the vast majority of respondents across the study area have a need to dispose their refuse bins on a weekly basis.

Table 4.11: Method of Solid Waste Disposal

Selected Community		Method of Solid Waste Disposal				Total
		Pay Labourer	Private agency come to collect them	You dispose it yourself	Others	
Upper Mission Road	Count % within Community	1 1.7%	2 3.3%	1 2.5%	12 30.0%	14 100.0%
Sakponba Road	Count % within Community	0 0.0%	1 2.5%	1 2.5%	12 30.0%	14 100.0%
Forestry Road	Count % within Community	1 1.7%	0 0.0%	2 3.3%	11 18.3%	14 100.0%
Airport Road	Count % within Community	10 71.4%	2 3.3%	0 0.0%	2 5.0%	14 100.0%
Siluko Road	Count % within Community	2 3.3%	0 0.0%	3 5.0%	9 64.3%	14 100.0%
Sapele Road	Count % within Community	6 42.9%	2 5.0%	1 2.5%	5 35.7%	14 100.0%
Ekenwan Road	Count % within Community	4 28.6%	1 1.7%	2 3.4%	7 11.9%	14 100.0%
Uselu Road	Count % within Community	8 57.1%	1 2.5%	2 5.0%	2 5.0%	14 100.0%
Akpakpava Road	Count % within Community	2 3.3%	0 0.0%	3 5.0%	9 64.3%	14 100.0%
Total	Count % within Community	34 26.98%	9 7.1%	15 11.9%	69 54.76%	126 100.0%

Source: Author's Field Work, 2023

In terms of the method of solid waste disposal, the majority of respondents at 54.7% affirmed that use several methods not highlighted in the survey instrument while 26.9% stated that they pay laborers to dispose their wastes. This was found to be case across the study area.

It can therefore be concluded that the use of laborers for waste disposal is a common practice in the study area.

Table 4.12: Rating of neighborhood in terms of the livability of the environment as a result of solid waste management

Selected Community	Rating of neighborhood				Total	
	Very good	Good	Unightly	Very Unightly		
Upper Mission Road	Count	1	2	7	4	14
	% within Community	1.7%	13.3%	50.0%	31.7%	100.0%
Sakponba Road	Count	2	2	4	6	14
	% within Community	7.5%	7.5%	35.0%	40.0%	100.0%
Forestry Road	Count	1	4	7	2	14
	% within Community	10.0%	28.3%	46.7%	13.3%	100.0%
Airport Road	Count	3	3	7	1	14
	% within Community	15.0%	15.0%	60.0%	5.0%	100.0%
Siluko Road	Count	3	3	4	4	14
	% within Community	16.7%	13.3%	38.3%	30.0%	100.0%
Sapele Road	Count	2	4	5	3	14
	% within Community	7.5%	25.0%	37.5%	17.5%	100.0%
Ekenwan Road	Count	1	4	6	3	14
	% within Community	8.3%	23.3%	43.3%	16.7%	100.0%
Uselu Road	Count	1	3	6	4	14
	% within Community	7.5%	12.5%	47.5%	32.5%	100.0%

Akpakpava Road		3 16.7%	3 13.3%	4 38.3%	4 30.0%	14 100.0%
Total	Count	17	28	50	31	126
	% within Community	13.49%	22.2%	39.68%	24.6%	100.0%

Source: Author's Field Work, 2023

On neighborhood rating to examine their livability, the highest proportion of respondents at 39.6% affirmed that their neighborhood is unsightly and unlivable with a further 24.6% rating their neighborhoods as very unsightly. The proportion of respondents who rated the livability of their neighborhoods as good and very good is respectively presented as 22.2 and 13.5%.

This was also found to be the case across the communities. It can therefore be concluded that waste is a major problem across Benin City and there is need for immediate actions geared towards management to be taken.

Table 4.13: Environmental Problems as a result of waste

Environmental Problems	Frequency	Percent
Air pollution	31	24.6
Foul odor	48	38.1
Contamination of underground water	15	11.9
Loss of aesthetic values	32	25.3
Total	126	100.0

Source: Author's Field Work, 2023

The environmental problems being experienced by respondents from indiscriminate dumping of solid wastes is presented in Table 4.13. The highest proportion of respondents at 38.1% affirmed foul odor as the major environmental problem they are facing in their neighborhood, with 25.3% stating that the loss of aesthetic value in their neighborhood due to improper disposal of waste is worrying while the proportion of respondents who affirmed air pollution to be a major problem in their neighborhood given as 24.6%. A further 11.9% pointed at the inevitable underground water contamination as the major problem that arise from indiscriminate dumping of solid wastes in the study area.

It can therefore be concluded from the above that the indiscriminate dumping of solid wastes in the study area has severe environmental consequences which can in turn have a negative effect on the health and vitality of residents of Benin City.

Table 4.14: Awareness of Poor Solid waste management being toxic to the environment

Selected Communities		Awareness of Poor Solid waste management being toxic to the environment		
		Yes	No	Total
Upper Mission Road	Count	7	7	14
	% within Community	88.3%	11.7%	100.0%
Sakponba Road	Count	10	4	14
	% within Community	90.0%	10.0%	100.0%
Forestry Road	Count	7	7	14
	% within Community	88.3%	11.7%	100.0%
Airport Road	Count	9	5	14
	% within Community	87.5%	12.5%	100.0%
Siluko Road	Count	9	5	14
	% within Community	91.7%	8.3%	100.0%
Sapele Road	Count	11	3	14
	% within Community	92.5%	7.5%	100.0%
Ekenwan Road	Count	9	5	14
	% within Community	91.7%	8.3%	100.0%
Uselu Road	Count	7	7	14
	% within Community	82.5%	17.5%	100.0%
Akpakpava Road	Count	7	7	14
	% within community	82.5%	17.5%	100.0%
Total	Count	76	50	126
	% within Community	60.3%	39.7%	100.0%

Source: Author's Field Work, 2023

Table 4.14 presents respondents' awareness of poor solid waste management being toxic to the environment. From the table, the majority of respondents at 60.3% affirmed that they are aware that poor solid waste management can be toxic to the environment while the proportion of respondents who noted that they are not aware is given as 39.7%.

This was found to be case across all the communities in the study area. It can therefore be concluded that the indiscriminate dumping of refuse in the environment and the poor management of these wastes can have a toxic impact on the environment and on human health.

Table 4.15: Solid waste management Practice

Management Practice	Frequency	Percent
Open Landfill	31	24.6
Burning	32	25.3
Burying	15	11.9
Open dumping	48	38.1
Total	126	100.0

Source: Author's Field Work, 2023

The most common solid waste management practice as affirmed by the majority of respondents at 38.1% is open dumping with burning and open landfill being the next most common methods with a representation of 25.3 and 24.6% respectively. Burying of waste has a representation of 11.9% implying that this method of waste management is not very common in the study area.

It can thus be concluded that the majority of respondents in the study area either dump their wastes in open dumpsites or they engage in burning of waste as observed during the field survey. There are several dumpsites located across the study area where people openly dump their wastes.

Table 4.16: Problems faced with solid waste collection in the study area

Time	Frequency	Percent
Inadequate waste management workforce	27	21.4
Lack of waste vehicles	31	24.6
Hostility of residents towards waste collectors	9	7.1
Non-payment of waste fee	10	7.9
Indiscriminate waste dumping	25	19.8
Irregularity in waste collection by waste managers	24	19.0
Total	126	100

Source: Author's Field Work, 2023

In terms of problems faced with solid waste collection in the study area, the highest proportion of respondents at 24.6% affirmed lack of waste vehicles as the most prominent issue. Inadequate waste management workforce was affirmed to be the second major problem by 21.4% of respondents with a further 19.8 and 19.0% respectively stating that indiscriminate waste dumping and irregularity in waste collection by the waste managers are the major problems with waste collection in the study area.

Respondents severally suggested that the government should equip waste managers with the necessary equipment and machines to enable them function effectively. Enforcing waste management laws to prevent the indiscriminate dumping of refuse was also suggested as a possible mechanism to reduce waste pollution in Benin City.

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 Summary

Multiple conclusions can be drawn from the study. These conclusions range from respondents perception about the state of waste management in the study area, their understanding of the current solid waste management, the environmental consequences of poor solid waste management and measures to achieve best case scenarios.

Firstly, the perception of respondents on the usage of refuse bin or a receptacle, in which the majority of respondents at 60.3% affirmed they make use of a refuse bin for waste disposal in their household, it shows that measures are in place to manage wastes in the area as the minority of 39.7% were found not to make use of waste bins. On this evidence, it is understandable why solid waste is still a problem for environmental livability in the study area.

Secondly, the exact system or type of waste bins used was of research interests and findings show that up to 40.7% of respondents make use of polythene bags which pose problems to the environment, especially if the wastes are not properly sorted. Another 32.5% makes use of metal drums while 19.9% uses plastic containers. This study concludes to the effect that proper waste management schemes and information is not available in the study area despite the available management conditions.

Thirdly, the study revealed that majority of respondents in specific zones in the study area makes use of polythene bags and plastic containers, they also agreed that these medium of

refuse disposals require weekly attention of the waste management authority as it fills up within the time space as 70.6%. Thus it is worthy to understand the regularity and effectiveness of the waste collection body. The study found that the use of paid labourers which are not authoritative waste management personnel is responsible for the poor waste management in the environment as while waste is taken from a particular area, the proper disposal of such is another problem as environmental conditions sooner rather than later such as heavy rainfall ensures waste is redistributed back into the environment. The inadequate workforce of the management board, inadequate facilities amongst others are cited problems of the authority.

5.2 Recommendations

Respondents severally suggested that the government should equip waste managers with the necessary equipment and machines to enable them function effectively. Enforcing waste management laws to prevent the indiscriminate dumping of refuse was also suggested as a possible mechanism to reduce waste pollution in Benin City. Ensuring the removal of illegal waste managers from the system and ensuring adherence to the situated authoritative laws is recommended. Institution of recycle methods and rewards for proper waste sorting and right use of waste bins are ways to get the best of the system in Benin City.

5.3 Conclusion

Conclusively, the numerous challenges of waste management in Benin City are associated with the ineffective information on the right waste management system in the study area. The

lack of resources also limits the waste management body from effectively doing their job. Altogether, conclusion involves full-scale involvement of all relevant authorities and individuals within the study area towards a serene and livable environment.

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QUESTIONNAIRE
DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING
FACULTY OF SOCIAL SCIENCES
UNIVERSITY OF BENIN, BENIN CITY

Dear Sir/Madam,

This Questionnaire is primarily designed to collect data for a research project on **THE IMPACT OF SOLID WASTE MANAGEMENT ON THE ENVIRONMENTAL LIVABILITY OF BENIN CITY**. Your response will be treated in strict confidence and used only for academic purpose. Thanks.

Please tick(✓)and comment where necessary

SECTION A: BACKGROUND INFORMATION OF RESPONDENTS

- 1.Name Of Area _____
- 2.Sex Of Respondent (a)Male [] (b) Female []
- 3.Age Of Respondent (a)18-25 [] (b)26-35 [] (c)36-45 [] (d)Above 45 years []
- 4.Educational Level:(a)Non-formal education[] (b) Primary education [] (c) Secondary education [] (d) Tertiary []
- 5.Occupation Of Respondent (a) Trading [] (b) Civil/Public service [] (c) Artisan [] (d) Farming[] (e) Others(Specify).....
6. Marital Status: (a) Single [] (b) Married [] (c) Divorced [] (d) Separated[]
7. What is your estimated Monthly income? (a) Less than #20,000 [] (b)#20,000 -#50,000 [] (c) #51,000-#100,000 [] (d) Above #100,000[]
8. Household Size: (a)1-3 [] (b)4-6 [] (c)7-9 [] (d)More than 10 []
9. How long have you been living in this area? (a) Less than 3years[] (b)4-8 years [] (c) More than 9 years []

SECTION B: ASSESSMENT OF SOCIAL, ENVIRONMENTAL AND HEALTH CONDITIONS

- 10.Do you have a Refuse bin or receptacle for your household? (a)Yes[] (b) No []

11.If your answer to (7) above is Yes, what type of refuse bin is it (a) plastic container [] (b) Metal drum [] (c) Polythene bag [] (d) Others (Specify)_____

12.How long does it take to get full? (a) Every 2 days [] (b) Weekly [] (c) Every two weeks [] (d) Others(Specify)_____

13. How do you dispose off your solid waste? (a) Pay labourer [] (b) Private agency come to collect them [] (c) you dispose it yourself [] (d) Others (Specify)_____

14.What in your opinions are responsible for the poor solid waste management in Benin City?

(I)_____

(ii)_____

(iii)_____

15. How would you rate your neighborhood in terms of the livability of the environment as a result of solid waste management? (a) Very good [] (b) Good [] (c) unsightly [] (d) Very unsightly []

16.What suggestions would you give towards achieving a more livable environment in your neighborhood?

17. What kind of environmental problems have you been experiencing from the indiscriminate dumping of solid waste in your area? (a) Air pollution [] (b) Foul odour [] (c) contamination of underground water [] (d) Loss in aesthetic value []

18. How do you perceive the indiscriminate solid waste disposal and its attendant poor management on your health and environment?

	Very serious	Serious	Not serious
Contamination of underground water			
Foul odour			
Loss of aesthetic value			

Air pollution			
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19. However, are you aware that poor solid waste management could be toxic to the environment? (a) Yes [] (b) No []

20. What are the ways of solid waste disposal and management practice in your area? (a) Open landfill [] (b) Burning [] (c) Burying [] (d) Open dumping [] (e) Others(specify)_____

21. Do you accept that your area livability environmentally can be determined by the level of solid waste management? (a) Yes [] (b) No []

22. What are the problems faced with solid waste collection and disposal in your area? (a) Inadequate waste management workforce [] (b) Lack of waste vehicles [] (c) Hostility of residents towards waste collectors [] (d) Upfront waste fee [] (e) Indiscriminate waste dumping [] (f) Irregularity in waste collection by waste managers []