

**ASSESSMENT OF SOLID WASTE MANAGEMENT PRACTICES IN A
UNIVERSITY STAFF RESIDENCE: A CASE STUDY OF THE
UNIVERSITY OF BENIN JUNIOR STAFF QUARTERS, UGBOWO
CAMPUS, BENIN CITY.**

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PLAGIARISM

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DEDICATION

This project is dedicated to my parents and siblings who have supported me with their prayers and sacrifices throughout my academic journey.

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I give thanks to God Almighty for his love, wisdom, strength, and wonderful works in my life.

My gratitude goes to my project supervisor, Engr. Dr Animetu Rawlings, for her patience, endurance and consistent guidance throughout this research.

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ABSTRACT

Solid waste management remains a critical environmental and public health challenge within university environments, especially in residential staff quarters where large quantities of solid waste are generated on a daily basis but there is lack of proper management practices. Hence this study aims investigate the solid waste management practices in the junior staff quarters located within the University of Benin.

The study employed quantification and characterization of household waste at the point of generation, collection of data with the aid of structured questionnaires and an observational checklist. Data were collected from the residents of the junior staff quarters over a seven day period to determine the rate and composition of waste generation among the residents of the staff quarters. Descriptive statistical tools were used to analyze the data obtained from the questionnaires. A pilot test and a reliability test using Cronbach's alpha was also conducted to validate the clarity of the questionnaire items and to ensure the internal consistency and dependability of the questionnaire.

Results obtained from the questionnaire showed that waste disposal posed a major challenge in the university of Benin Junior Staff Quarters as 97% residents reported there was no waste point availability, 75% reported that the waste collection frequency was irregular and 78% of residents reported that they did not practice waste segregation in the junior staff quarters. Observational checklists revealed that solid waste generated by residents were stored in open containers and sack bags with frequent spillage and non-collection. Waste characterization further showed that organic waste constituted the largest portion (64.64%), nylon constituting 12.98% plastic constituting 5.96% Miscellaaneous constituting 11.1% metal and paper constituting the lowest with 4.43% and 0.89% respectively.

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ACRONYMS

SWM	- Solid Waste Management
JSQ	- Junior Staff Quarters

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Solid waste management has emerged as one of the most pressing environmental challenges facing rapidly urbanizing societies, particularly in developing countries like Nigeria. As urban populations grow and consumption patterns evolve, the generation of municipal solid waste (MSW) has increased significantly, leading to serious environmental, public health, and infrastructural concerns (Afon, 2012; Imam et al., 2008). In many Nigerian cities and institutional communities, improper disposal, limited waste segregation, and inefficient waste collection systems have compounded the difficulty in maintaining clean and sustainable environments.

Within the Nigerian context, especially in public institutions such as universities, the issue of solid waste management is particularly acute due to the high population density and concentrated consumption within relatively confined spaces. Academic institutions, especially their residential quarters, generate a wide variety of waste ranging from biodegradable food waste to plastics, paper, and electronic refuse (Ogwueleka, 2013). However, these institutions often lack tailored waste management strategies that consider their unique waste composition, behavior of occupants, and infrastructural limitations (Adewole, 2012).

In the University of Benin, one of Nigeria's leading tertiary institutions, solid waste accumulation has become a recurring issue, especially within residential staff quarters such as those occupied by junior staff members. These residential areas often lack regular waste collection schedules, functional waste bins, and adequate public awareness on environmentally friendly waste disposal practices. Studies such as that by (Uwadiae et al., 2017) provided an in-depth analysis of waste generation and management in the University

of Benin. Their research revealed that the average per capita waste generation on campus stood at approximately 0.455 kg/day, with organic materials comprising over 30% of the total waste. Other significant components included plastics (26.7%), paper (18.7%), and metals (11.1%). The authors emphasized that despite the clear waste characterization, the campus lacked proper waste segregation and relied heavily on indiscriminate dumping and open burning. They recommended the adoption of an integrated solid waste management (ISWM) framework that includes source segregation, recycling, composting, and the establishment of sanitary landfills.

These findings align with earlier observations by Asikia and Olaye (2011), who examined solid waste management practices in Benin City and reported that poor monitoring frameworks, weak institutional capacity, and low community involvement have severely limited the success of contracted waste management services. According to their study, several efforts by the Edo State Waste Management Board (ESWMB) to regulate and monitor waste collection were thwarted by operational inefficiencies, public non-compliance, and lack of proper funding structures.

The failure of many government institutions and municipalities to implement effective solid waste management strategies is often traced to both institutional and behavioral factors. As Nzeadibe and Ajaero (2012) observed, there is a disconnect between policy formulation and practical implementation, with many waste management systems relying on outdated practices such as indiscriminate dumping and open-air incineration. Moreover, Oguntoyinbo (2012) highlighted that urban waste management often suffers from weak inter-agency coordination, limited technical expertise, and underinvestment in sustainable technologies.

These systemic challenges are particularly evident in university residential quarters, where waste is generated daily but collection and disposal mechanisms are inconsistent. Junior

staff quarters, such as those in the University of Benin, exemplify how poor waste infrastructure and minimal environmental education contribute to growing waste accumulation. The situation not only degrades the aesthetic and sanitary quality of these environments but also poses serious health risks, including the spread of vector-borne diseases, blocked drainage, and soil and water contamination (Longe & Williams, 2012). In addition, (Uwadiae et al., 2017) argued that institutions like the University of Benin should serve as models for environmental sustainability by implementing structured waste management programs, including environmental education campaigns and routine waste audits. They further stressed that waste management in such institutional settings must be evidence-based and customized to local realities, especially considering the volume and type of waste produced.

1.2 Statement of the Problem

The management of solid waste is universally acknowledged as a global issue and this problem is particularly dominant in developing countries like Nigeria due to a variety of interrelated social, economic, and environmental factors like rapid urbanization, inadequate infrastructure service, and economic constraints. At the University of Benin junior staff quarters, despite being an integral part of the university community, they often lack appropriate waste management infrastructure, such as segregated waste bins, regular waste collection services, and facilities for recycling. Many residents of the junior staff quarters dispose of waste without segregation, leading to an accumulation of mixed refuse. This practice harms the local environment and reduces efficiency in utilizing recyclable and compostable materials. Furthermore, inadequate waste storage facilities and infrequent waste collection services exacerbate the situation, leading to overflowing bins and the spread of waste across the community.

1.3 Aim and objectives

The aim of this study is to evaluate the solid waste management system practice in the University of Benin junior staff quarters.

The specific objectives are to:

1. To evaluate the existing waste management systems in the University of Benin junior staff quarters, to identify their effectiveness, strength and weakness.
2. To examine the environmental and health impacts of the current waste management practices within the staff residence.
3. To investigate resident's attitudes and behaviors towards solid waste management and recycling initiatives.
4. To analyze waste generation patterns in the staff residence, to understand the volume and types of waste produced.

1.4 Scope of Study

The scope of study will involve:

1. Evaluating the existing solid waste management systems in the University of Benin Junior Staff Quarters using questionnaire surveys and observational checklists.
2. Assessing the environmental and health impacts of the current waste management practices within the staff residence using questionnaire surveys and observational checklists.
3. Investigating resident's attitudes and behaviours towards solid waste management and recycling initiatives using questionnaire survey and observational checklists.
4. Analyzing waste generation patterns in the staff residence using quantification at the point of waste collection method.

1.5 Justification of Study

Solid waste management is an essential aspect of sustainable development, yet in many institutional settings such as universities, attention to waste practice is unevenly distributed. While academic and administrative buildings often benefit from structured waste systems, residential areas especially those occupied by junior staff are frequently neglected. Improper waste disposal practices not only degrade the environment but also pose serious health risks to residents. This study is therefore necessary to evaluate the current state of waste management in the

Junior staff quarters, identify key deficiencies, and propose sustainable solutions. By providing accurate data and practical recommendations, the study aims to improve waste handling, promote public health, and enhance the quality of the living environment and community.

The usefulness of this study extends to helping university management and local waste authorities develop better strategies for waste collection, storage, and disposal. It will encourage the adoption of proper waste segregation and recycling practices among residents, reducing the burdens on the environment and supporting a cleaner and more organized campus community. Additionally, the study encourages community participation and stakeholder engagement, which are widely recognized as critical components of effective and sustainable solid waste management (Abarca-Guerrero et al., 2013). In the broader context, this research has the potential to serve as a model for other institutional residential areas facing similar challenges, thereby contributing to Urban waste management practices across Nigeria.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Solid waste management (SWM) has become a critical concern in both urban and institutional settings. Recent studies show that solid waste generation is rising rapidly due to urban expansion, population growth, and changing consumption patterns (UNEP, 2023). Globally, municipal solid waste generation reached approximately 2.24 billion tonnes in 2020 and is projected to grow to 3.88 billion tonnes by 2050, with low- and middle-income countries experiencing the fastest growth (World Bank, 2022). High-income countries contribute over 30% of this waste but have more advanced infrastructure and technology for managing it efficiently. Developed nations leverage digital tracking, waste-to-energy systems, and community-based sorting models to manage solid waste sustainably (Kaza et al., 2018; Wilson et al., 2021).

In contrast, developing countries continue to face persistent challenges such as inadequate infrastructure, poor enforcement of policies, low public participation, and insufficient funding (UN-Habitat, 2023). For instance, in Sub-Saharan Africa, waste collection coverage remains below 50%, and much of the generated waste ends up in open dumps, posing severe environmental and health risks (Adelekan & Adebayo, 2020; Kaza et al., 2018).

In Nigeria, higher education institutions are increasingly burdened by solid waste management issues, primarily due to growing populations and outdated waste systems (Iheanacho et al., 2022). Universities tend to prioritize academic expansion over environmental health, which often results in neglect of waste disposal infrastructure. Waste in university environments is generated from academic activities, residential zones, and support services. While student hostels and lecture halls have received some research

attention, junior staff quarters where many non-academic personnel reside remain largely understudied (Adeniran et al., 2020). These quarters contribute significantly to overall waste output but are frequently marginalized in institutional policies, resource allocations, and waste planning (Edeh et al., 2023).

2.2 Conceptual Framework of Solid Waste Management

The conceptual framework of solid waste management includes all the key components, processes involved in the management of solid waste:

- a. Solid Waste: All discarded and unwanted solid materials resulting from human and animal activities that are normally solid and are discarded as useless (Tchobangolous et al, 2014).
- b. Municipal Solid Waste (MSW): Waste generated from households, institutions (e.g., schools, hospitals), markets, and offices within urban areas (MDPI, 2024; UNEP, 2024).
- c. Waste Generation: Creation of waste materials as byproducts of human activity marks the start of the waste stream (WHO, 2024).
- d. Waste Segregation: Separation of waste into categories (organic, recyclable, hazardous) at the point of generation (UNEP, 2023).
- e. Source Separation: The practice of sorting and separating waste materials at the point where they are generated.
- f. Waste Storage: Temporary holding of waste in containers or designated areas before collection and disposal (Tchobangolous et al., 2014)
- g. Color-Coded Waste Bins: Bins designated by color to promote segregation: green for organic, blue for recyclable, red for hazardous, black for residual waste (UNEP, 2023).
- h. Waste Collection: Activities involving picking up waste from the source and transporting it for treatment or final disposal (UNEP, 2023).

- i. Waste Transfer Station: Facility where waste is temporarily held before being sent to treatment or disposal (UNEP, 2023).
- j. Waste Transportation: Movement of waste from collection points to treatment/disposal facilities using trucks, carts, or other vehicles (UNEP, 2023).
- k. Waste Treatment: Processes that alter waste characteristics to reduce volume or hazard, recover usable materials or energy, and protect health and environment (EPA, 2023).
- l. Recycling: Recovering and reprocessing of materials (paper, plastics, glass, metals) into new products to prevent resource wasting, reduce pollution, and conserve energy (Abarca-Guerrero et al., 2015).
- m. Quaternary recycling: It involves energy recovery from waste through incineration, or other thermochemical processes (UNEP, 2011). The material is used for another product but it's energy content is recovered.
- n. Waste-to-Energy (WTE): Conversion of non-recyclable waste into electricity, heat, or fuel through processes like incineration, gasification, pyrolysis, anaerobic digestion, or landfill gas capture (Kaza et al., 2022; Science of the Total Environment, 2024).

2.3 Factors limiting Efficient Solid Waste Management

Efficient solid waste management (SWM) is essential to maintaining environmental integrity, public health, and urban sustainability. However, numerous interconnected challenges limit its effectiveness, particularly in developing nations and urban communities. These limiting factors are best understood through the lens of the Integrated Sustainable Waste Management (ISWM) framework, which emphasizes the technical, social, institutional, financial, and environmental dimensions of waste systems (Kaza et al., 2018; UNHabitat, 2023).

a. Institutional and Governance Limitations: Institutional weaknesses, overlapping agency mandates, and poor coordination mechanisms hinder the operational success of SWM systems. In many developing countries, fragmented responsibilities and lack of regulatory enforcement result in inefficiencies and policy conflicts. The absence of decentralization and limited municipal autonomy also restrict effective implementation and monitoring (World Bank, 2022; Maalouf & Agamuthu, 2023).

b. Financial and Economic Constraints: Solid waste management is capitalintensive, requiring sustained investment in infrastructure, personnel, and logistics. However, cost recovery systems in many cities are underdeveloped. Poorly structured user fees, low public willingness to pay, and overdependence on national subsidies or donor funds result in inadequate resources to sustain or expand waste services (UNEP, 2023; Volsuuri et al., 2022).

c. Infrastructural and Technological Deficiencies: Lack of modern equipment (e.g., collection trucks, bins, recycling facilities), poorly maintained infrastructure, and limited access to technological innovations reduce the capacity and efficiency of SWM systems. The adoption of smart systems like GPS tracking, IoT bins, or composting technologies remains low in developing regions (Al Qurashi et al., 2025; Ghahramani et al., 2022).

d. Socio-Cultural and Behavioral Barriers: Public perceptions of waste as a government-only responsibility, coupled with low environmental awareness, result in limited citizen participation in source separation and recycling. Cultural norms, apathy, and misinformation further discourage behavior change needed for effective waste practices (UN-Habitat, 2023; Memon, 2021).

e. Environmental and Geographical Constraints: Geographical conditions such as mountainous terrain, flood-prone zones, and proximity to rivers or coastal regions pose challenges for landfill siting and waste logistics. Additionally, climate-related disruptions like heavy rainfall and heatwaves impact infrastructure and service delivery (Science of the Total Environment, 2024).

f. Legal and Policy Gaps: Outdated environmental laws, lack of enforcement, and weak integration of polluter-pays or circular economy principles leave waste governance fragmented. Where policies exist, inadequate implementation and low penalties for illegal dumping make them ineffective (OECD, 2022; Ellen MacArthur Foundation, 2021).

2.4 Waste Segregation in Solid Waste Management

Solid waste management (SWM) has emerged as one of the most pressing environmental issues confronting both developed and developing nations. Among the multiple components of an effective waste management system, waste segregation holds a pivotal role. Waste segregation refers to the process of separating waste into different categories at the point of generation, based on its physical and chemical properties (Guerrero et al., 2013). This segregation is foundational to successful waste minimization, recycling, composting, energy recovery, and safe disposal.

In institutional settings such as university staff quarters, especially in developing countries, the absence of effective segregation systems often leads to indiscriminate disposal, increasing environmental hazards, operational costs, and health risks. This section provides an in-depth examination of waste segregation, covering its conceptual framework, operational mechanisms, significance, limitations, and global best practices.

2.4.1 Categories of Waste for Segregation

This helps to streamline waste management by ensuring that each type of waste is handled properly whether through recycling, composting, safe disposal, or special treatment in the case of hazardous materials. These categories are grouped into:

- a. Biodegradable Waste: Organic materials such as food scraps, kitchen waste, garden trimmings, and paper products. These are suitable for composting or anaerobic digestion.
- b. Recyclable Waste: Includes items like plastic containers, glass bottles, metals (aluminum cans, tins), cardboard, and some types of paper.
- c. Hazardous Waste: Toxic, corrosive, or infectious substances including batteries, pesticides, cleaning agents, paints, solvents, and medical waste.
- d. Residual Waste: Non-recyclable and non-compostable materials such as sanitary waste, diapers, multilayered plastic packaging, etc.

2.4.2 Importance of Waste Segregation

Waste segregation, the systematic separation of waste into categories such as organic, recyclable, hazardous, and non-recyclable waste at the source of generation, is a critical component of effective solid waste management (UNEP, 2016). It serves as the foundation for resource recovery, environmental protection, and sustainable waste processing. The importance of waste segregation includes:

1. Promotes environmental sustainability: Segregating waste prevents harmful materials like plastics, chemicals and hazardous substances from contaminating soils, air, and water bodies (Guerrero et al., 2013).
2. Enhance recycling and resource recovery: Segregation supports reuse and the transformation of waste into new materials or products, conserving natural resources (Wilson et al., 2012).

3. Protects public health and safety: Separating hazardous and biomedical waste (used needles, sanitary waste) prevents exposure to infectious materials, especially for waste handlers (Moqsud et al., 2011).

4. Facilitates composting and organic waste management: Organic waste when separated, can be composted into nutrient- rich manure, improving soil fertility in agricultural practices.

5. Supports legal and policy compliance: Many local, national, and international environmental regulations mandate waste segregation at the source (UNEP, 2016).

Compliance avoids fines and legal actions for individuals and institutions.

2.4.3 Challenges to Effective Waste Segregation

While waste segregation is widely recognized as a foundational practice in solid waste management, its implementation often encounters problems in real world settings including:

a. Lack of Awareness and Education: Residents and staff often lack information on how to segregate waste properly or why it matters. This leads to non-compliance and confusion about what belongs in which bin (Zurbrugg et al., 2012).

b. Behavioral and Cultural Barriers: Waste disposal habits are often rooted in culture and convenience. Many people prefer a single bin system due to laziness or reluctance to change (Guerrero et al., 2013).

c. Inadequate Infrastructure: The absence of color-coded bins, segregated collection vehicles, and recycling centers can make segregation efforts fail even when people are willing (Asian Development Bank, 2013).

d. Weak Institutional Policies: Institutions may lack clear policies or enforcement mechanisms to support segregation, making it difficult to implement long-term behavioral change (Moqsud et al., 2011).

2.4.4 Strategies for Implementing Effective Waste Segregation

Effective waste segregation requires a well-planned combination of institutional support, public participation, infrastructure development, and policy enforcement. The following strategies are essential for promoting and sustaining proper waste segregation practices:

1. **Awareness Campaigns and Sensitization:** Ongoing education through workshops, posters, radio, and social media is essential to build knowledge and support among residents (Wilson et al., 2012).
2. **Infrastructure Development:** Universities and municipal authorities must invest in color-coded bins, signage, and vehicles designed for separated collection and processing.
3. **Policy Implementation and Enforcement:** Strict rules and penalties for nonsegregation, as well as rewards for compliance, can drive participation. Integration of waste segregation into broader institutional environmental policies is critical.
4. **Monitoring and Evaluation:** Periodic monitoring and feedback systems can track segregation rates, identify issues, and help refine strategies. Simple waste audits and resident surveys are useful tools.
5. **Community Participation and Stakeholder Involvement:** Involving the community and stakeholders ensures acceptance and sustainability.

2.5 Waste Valorization

Waste valorization is a strategic approach in solid waste management that focuses on transforming waste materials into valuable products. Rather than disposing of waste in landfills or through open burning, which contributes to environmental pollution and resource depletion, valorization seeks to create economic and environmental value from waste streams (European Commission, 2015). This concept aligns with the principles of a circular economy, where resources are kept in use for as long as possible, and waste is minimized through continual reuse and recovery.

According to Fan et al. (2021), waste valorization not only improves resource efficiency but also helps in reducing the environmental footprint of human activities. As the global population continues to grow, urbanization increases, and industrialization accelerates, the volume of waste generated has reached unprecedented levels. This calls for innovative and sustainable methods to manage waste, valorization of waste being one of the most promising solutions.

2.5.1 Benefits of Waste Valorization

Below are some of the key benefits of waste valorization, which highlights its roles in improving environmental sustainability, resource efficiency, and economic development:

- a. Resource Conservation: Recovers metals, minerals, and fossil fuels, conserving scarce resources (Ellen MacArthur Foundation, 2021).
- b. Environmental Sustainability: Reduces landfill use and methane emissions, while mitigating groundwater pollution (Zhang et al., 2022; UNEP, 2023).
- c. Energy Security: Increases local energy supply, reducing reliance on imported fuels (Smith & Patel, 2020).
- d. Economic Opportunities: Creates value chains in secondary materials and energy sectors, reducing raw material costs (Achillas et al., 2019).
- e. Job Creation: Generates employment in recycling facilities, bioenergy plants, and logistics (Maalouf & Agamuthu, 2023).

2.5.2 Challenges and Limitations of Waste Valorization

Despite its many environmental and economic benefits, waste valorization faces several challenges and limitations that hinders its effectiveness. These challenges can affect technical feasibility, economic viability, public participation and policy implementation.

The key challenges and limitation includes:

- a. High Initial Costs: Technologies like pyrolysis and anaerobic digestion require significant capital and skilled labor (Moya & García, 2019).
- b. Policy and Institutional Gaps: Limited regulatory incentives and unclear policies constrain adoption in emerging economies (OECD, 2022).
- c. Public Participation: Contaminated feedstocks due to poor source separation in households hinder efficiency (UN-Habitat, 2023).
- d. Market Instability: Fluctuating prices for recycled goods undermine economic viability (Cimpan et al., 2021).

2.6 Waste Reuse

Waste re-use is the use of materials or products multiple times, either for their original purpose or for a new purpose, rather than disposing them off as waste (EPA, 2020; WRAP 2019). Waste reuse is a crucial element in sustainable solid waste management practices, emphasizing the repeated use of materials in their original or minimally altered form. It represents a strategy that prevents materials from becoming waste by finding new ways to utilize them without significant modification or energy-intensive processing (United Nations Environment Programme [UNEP], 2013). Unlike recycling, which often involves complex mechanical or chemical transformation, reuse retains the integrity of the original item, thereby conserving energy, reducing material demand, and minimizing environmental degradation.

2.6.1 Benefits of Reuse in Waste Management

Reuse is a fundamental principle of sustainable waste management that involves extending the life of materials of products by using them again for the same or different purpose. This practice offers numerous benefits, they include:

1. **Environmental Advantages:** One of the core benefits of reuse lies in its ability to significantly reduce environmental pollution. By preventing materials from entering landfills or incinerators, reuse lowers methane emissions from anaerobic decomposition and reduces the release of toxic gases from burning waste (UNHabitat, 2010). Furthermore, it reduces the environmental footprint of manufacturing processes by conserving raw materials and energy inputs.

2. **Economic and Cost-Saving Impacts:** From a financial perspective, reuse reduces costs on multiple fronts. Households save money by delaying or avoiding new purchases, while municipalities benefit from lower solid waste collection, transportation, and disposal expenses (World Bank, 2018). For businesses, reusing packaging, machinery parts, or construction materials leads to direct savings and improved profit margins.

3. **Social and Community Benefits:** Socially, reuse promotes resource equity by improving access to goods for marginalized groups. In many urban areas across Africa, Latin America, and Asia, informal waste pickers collect reusable items, which they either sell or repurpose. These actors contribute to urban cleanliness while earning a livelihood in the process (Medina, 2008).

2.6.2 Barriers to Effective Reuse Implementation

Despite its many benefits, waste reuse faces several challenges including:

a. **Consumer Perceptions and Behavior:** In many societies influenced by consumerist ideologies, there is often a stigma attached to reused or recycled items. Such products are frequently perceived as inferior, unsafe, or unhygienic, which limits consumer acceptance and market viability (Singh & Ordoñez, 2021).

b. **Health and Safety Regulations:** While reuse can be safe when properly managed, lack of regulation or oversight can pose health risks particularly when dealing with hazardous or medical waste (UNEP, 2013).

c. **Product Design Limitations:** Many contemporary goods are not designed with reuse in mind. Features such as disposable packaging, sealed electronics, and integrated components make disassembly, repair, and reuse difficult ultimately shortening product lifespans and increasing waste (Bocken et al., 2022).

d. **Insufficient Policy Support:** In many countries, there is limited regulatory emphasis on reuse. Absence of economic incentives, subsidies, or public procurement guidelines for reused goods limits their uptake (Zero waste Europe, 2021).

2.6.3 Global Examples and Innovations of Waste Reuse

Several regions have demonstrated how reuse can be integrated into sustainable waste management strategies. In Catalonia, Spain, reuse centers have been established to collect, repair, and sell second-hand goods. These centers not only reduce waste volumes but also provide employment for vulnerable groups (Agència de Residus de Catalunya, 2019).

In Japan, the traditional value system known as *mottainai*, which expresses regret over wastefulness, underpins a cultural approach to reuse and conservation. Public policies and private practices align to promote item repair, reuse, and maintenance (MOE Japan, 2015).

In Nigeria, informal reuse economies flourish in urban centers like Lagos. At Alaba International Market, for instance, used electronics and spare parts are refurbished and traded, creating a vibrant second-hand economy that diverts waste from landfills (Adelekan, 2012).

2.7 Waste Handling in Solid Waste Management

Waste handling is a critical phase in the solid waste management process, involving all activities related to the collection, containment, and movement of waste from the point of generation to the point of storage or final disposal. It includes processes such as sorting,

packaging, temporary storage, loading, and internal transportation of waste within residential, commercial, or institutional premises (Tchobanoglous et al., 2014).

Effective waste handling is essential for ensuring public health, environmental safety, and operational efficiency, particularly in densely populated urban areas where waste accumulation can lead to the spread of diseases and environmental contamination if not properly managed (UN-Habitat, 2010). It serves as the bridge between waste generation and subsequent management steps such as collection, recycling, and disposal.

2.7.1 Importance of Proper Waste Handling

Proper handling of solid waste brings a range of environmental, health, and economic benefits:

Environmental Protection: Prevents illegal dumping, minimizes air and water pollution, and supports better recycling outcomes (UNEP, 2013).

1. **Public Health:** Reduces the risk of vector-borne diseases like cholera, typhoid, and malaria by controlling waste exposure and accumulation (WHO, 2014).

2. **Operational Efficiency:** Makes collection smoother and faster, especially when waste is pre-sorted and well-packaged, saving time and fuel during transportation (World Bank, 2018).

3. **Cost Savings:** Minimizes the need for extensive post-collection sorting and reduces maintenance costs on vehicles and equipment (Ghosh, 2016).

2.7.2 Challenges of Waste Handling

Despite its importance, waste handling is often overlooked and poorly managed, especially in low-income or densely populated areas. Common challenges include:

1. **Inadequate Waste Bins:** Many communities lack enough standardized waste containers or suffer from poorly maintained bins, leading to spillage and littering (Hoornweg & Bhada-Tata, 2012).

2. **Lack of Public Awareness:** Many households and businesses lack adequate awareness of the importance of proper waste separation and packaging, resulting in mixed waste streams and contamination that reduce recycling efficiency (UNHabitat, 2023).

3. **Occupational Hazards:** Informal waste workers, who make up a large share of the handling workforce in developing countries, often work without safety gear or medical insurance (Wilson et al., 2012).

4. **Limited Funding and Resources:** Municipal authorities frequently operate with limited budgets and equipment, hampering their ability to provide adequate handling infrastructure (Guerrero et al., 2013).

2.7.3 Strategies for Improving Waste Handling

To ensure safer and more efficient waste handling, the following interventions are commonly recommended:

1. **Provision of Standardized Containers:** Local governments and institutions should ensure the availability of strong, covered, and color-coded bins for different waste types. These containers should be regularly cleaned and strategically located to encourage proper use (UNEP, 2013).

2. **Training and Awareness Programs:** Regular public education campaigns can promote awareness on how to properly handle waste and why it matters. Training programs for waste handlers should also be developed to improve safety and professionalism (FAO, 2017).

3. **Institutional Policies and Guidelines:** Developing local guidelines and standard operating procedures (SOPs) on waste handling can institutionalize best practices. These should include minimum standards for container size, PPE requirements, and waste movement protocols (Gálvez-Martos et al., 2018).

4. Community Participation: Involving local residents, shop owners, students, and staff in waste management decisions encourages ownership and better compliance. Community-led monitoring or incentive systems can also be introduced to reward good handling behavior (Zero Waste Europe, 2021).

2.8 Review of Past Works (2010–2025)

2.8.1 Global Perspectives on Solid Waste Management

Over the past two decades, solid waste management (SWM) has emerged as a major global concern due to increasing urbanization, economic development, and shifts in consumption patterns. A comprehensive study conducted by the WorldBank (2018), covered municipal solid waste (MSW) generation and management in 217 countries. The study found that global MSW generation reached

approximately 2.01 billion tonnes per year in 2016 and projected an increase to 3.4 billion tonnes by 2050. Alarmingly, only 13.5% of global waste was being recycled at the time, exposing the inefficiency of existing waste management systems (Kaza et al., 2018).

Further research titled Municipal Waste Management Report by the European Environment Agency (2020) evaluated the performance of European countries like Germany, Sweden, and Austria. The study reported that Germany diverted over 67% of its MSW through recycling and composting, thanks to strong enforcement of the Packaging Ordinance and Extended Producer Responsibility schemes. In Japan, Yoshida et al., (2012) conducted a study on the sustainable solid waste management in Japan policy and performance and they reported that the country processes approximately 77% of its municipal waste through incineration with energy recovery and high- efficiency recycling, due to strict source separation laws and the containers and packaging recycling law. Japan's emphasis on technological innovation, such as gasification and advanced incineration, significantly reduces waste volume while recovering energy.

In South Korea, Moqsud et al., 2021 conducted a study on the impact of the volume-based waste fee system on municipal solid waste and they reported that it contributed to a recycling rate exceeding 60% in the country.

The national environment agency of Singapore conducted the waste statistics and recycling rate Study (2020), which reported a national recycling rate of 59% due to integrated policies combining waste-to-energy (WTE) incineration, effective public education, and the use of centralized incinerators.

In Brazil, Lino et al. (2023) conducted a study on municipal solid waste and found out that despite high waste collection coverage, the country still relies heavily on landfilling and illegal dumping, with poor infrastructure for waste separation and treatment.

In India, the central pollution control board (CPCB) in its annual report on the implementation of solid waste management rules (2020) showed that over 70% of MSW is still disposed of in open dumps or poorly engineered landfills. The earlier study conducted on municipal solid waste management in Indian cities, a review by Sharholly et al. (2008) highlighted key barriers, including inadequate segregation, poor collection efficiency, and lack of public cooperation despite the introduction of the Solid Waste Management Rules (2016).

In Nigeria, Ogwueleka (2009) conducted a study on municipal solid waste Characteristics and Management in Nigeria and showed that less than 50% of waste is collected in urban centers, with most of it being openly dumped or burned. Another study on municipal solid waste management problems in Nigeria evolving knowledge management solution conducted by Abila & Kantola, (2013) emphasized structural weaknesses such as limited funding, outdated policies, and institutional fragmentation that hinder sustainable solid waste management.

In China, a study conducted on municipal solid waste management in China by Zhang et al. (2010) assessed conditions in urban areas like Beijing, Guangzhou, and Shanghai. The study found that mechanical-biological treatment, landfill gas recovery, and mandatory source separation policies significantly reduced landfilled waste. Shanghai's 2019 mandatory waste classification regulation led to a 30% reduction in residual waste in its first year.

2.8.2 Waste Management Challenges in Developing Countries

Developing countries face systemic barriers to effective waste management, including poor financing, inadequate legislation, low public awareness, and heavy reliance on informal waste pickers (Wilson et al., 2012). Solid waste assessment in these regions often lacks comprehensive data, limiting effective planning.

Wilson et al. (2012) conducted a comparative analysis of municipal solid waste (MSW) systems in 20 cities across developing and developed countries using the Integrated Sustainable Waste Management (ISWM) framework. Their study assessed performance indicators such as collection coverage, disposal methods, and informal sector engagement. The results revealed that most middle-income cities achieved over 90% waste collection coverage and controlled disposal, while low-income cities recorded significantly lower rates about 41% had controlled waste disposal systems. Informal waste pickers were found to play a vital role, contributing to 20–30% of material recovery at little to no cost to municipal authorities. The study emphasized that successful systems must align with local socio-economic contexts, incorporating inclusive planning, effective regulation, and participatory approaches.

Guerrero et al. (2013) examined waste management systems in over 30 cities within developing countries by analyzing stakeholder engagement, system infrastructure, and community participation through structured surveys and interviews. The study found that

inadequate transportation, limited landfill availability, and weak institutional frameworks were key barriers to effective waste management. It also identified a lack of public awareness and weak integration of the informal sector as major constraints. Despite these issues, the study noted that where community participation and informal sector integration were prioritized, waste management performance improved. Their findings underscore the need for robust policies, infrastructure investment, and inclusive strategies to strengthen waste management in developing cities.

In Nigeria, Ogwueleka (2009) assessed solid waste management practices in major urban centers and reported widespread open dumping, inefficient collection systems, and a lack of engineered landfills. The study showed that over 60% of urban waste was disposed of in open spaces or waterways, leading to flooding, pollution, and disease outbreaks. The results highlighted the critical need for investment in waste infrastructure and policy enforcement.

In Ghana, Fobil et al. (2008) conducted a case study in Accra focusing on the sociopolitical dynamics of urban waste management. Their findings revealed that although public-private partnerships (PPPs) had been implemented, their impact was limited due to poor contract enforcement, lack of performance monitoring, and political interference. The study stressed the need for decentralized governance and transparent stakeholder engagement.

In Ethiopia, Desta et al. (2014) analyzed the performance of Addis Ababa's waste management system. The results indicated that waste collection covered less than 50% of the population, and less than 30% of waste was disposed of in a sanitary manner. Informal recycling and composting played a substantial role, yet these activities were marginalized by formal institutions. The authors recommended integrating the informal sector and investing in community-based recycling programs.

2.8.3 Solid Waste Management in Nigeria: National Outlook

Nigeria produces approximately 32 million tonnes of solid waste annually, with major urban centers such as Lagos, Abuja, and Port Harcourt facing serious solid waste management challenges (LAWMA, 2020). Researchers across Nigeria have conducted a range of empirical studies to assess municipal solid waste management and its effectiveness in different regions.

In Taraba State, Chukwu (2024) distributed 400 questionnaires to obtain information on the solid waste disposal method practices in Jalingo local government area and found that open dumping was the most commonly employed disposal method accounting for 38% of household response. Additionally, 52% of respondents considered the current solid waste management practice in the ineffective and 71% of respondents generated daily waste yet only 18% of it was disposed daily.

In Lagos State, Chidiebere et al. (2018) evaluated municipal solid waste generation across 13 (LGAs) using surveys and interviews, concluding that waste generation rates exceed existing management strategies and that strengthened government response could foster sustainable development and job creation.

In Benue State's Makurdi, Tume et al. (2025) analyzed waste composition at three major dumpsites over six months; they found organic waste comprising 46% (rainy season) to 44.7% (dry season), plastics remaining stable with significant spatial variation, and metals fluctuating with seasonal construction trends.

In Oyo state, Alaka et al. (2023) evaluated municipal solid waste generation. The study pointed to a lack of public awareness, inadequate waste policies, poorly trained personnel, insufficient funding, minimal technical infrastructure, and weak community participation.

2.8.4 Solid Waste Management in Nigerian Universities

Tertiary institutions in Nigeria, particularly public universities, reflect the broader national waste challenges but also offer unique insights as controlled environments. Studies show that poor disposal culture, lack of waste segregation, open burning, and absence of recycling programs are common on campuses. At the University of Nigeria, Nsukka (UNN), Chijioke and Chinedu (2014) conducted an observational assessment to examine the types of waste generated and the adequacy of bin infrastructure across the campus. Findings revealed that paper waste was the dominant component of the campus waste stream, but bins were either missing or situated in inaccessible areas, leading to extensive littering and mismanagement of waste. The researchers emphasized the need for strategic bin placement and improved campus-wide sanitation policy.

Akinwale et al. (2020) carried out a campus-wide infrastructure and policy assessment at Obafemi Awolowo University (OAU) in Ile-Ife. They discovered that the infrastructure for solid waste storage and collection was significantly inadequate, and the university lacked a formalized waste management strategy. This deficiency, they argued, impeded sustainable waste handling and necessitated urgent institutional reform, including the drafting of a waste management policy and increased student engagement.

In the University of Ilorin, Ogwueleka (2013) conducted a waste audit to quantify waste generation and assess the disposal methods employed on campus. The findings underscored the need for systematic waste segregation, designated collection points, and environmentally sound disposal strategies to mitigate health and ecological hazards.

At Lead City University, Ibadan, Ojedokun and Balogun (2019) focused on behavioral aspects of waste management by assessing student awareness and participation in sanitation. Their study was set out to determine how knowledge levels influenced waste disposal habits and the use of available facilities.

Employing structured questionnaires and in-depth interviews, they found that low environmental awareness among students resulted in widespread littering and improper bin usage. The study recommended the introduction of environmental education programs and institutional policies that promote better student compliance and accountability in campus sanitation efforts.

Further addressing quantitative and compositional aspects, Ugwu et al. (2020) performed a solid waste quantification and characterization study at the University of Nigeria, Nsukka (UNN) using the ASTM D5231-92 protocol. Their goal was to estimate the volume of waste generated daily and to assess its suitability for recycling or composting. The results showed that the campus produced an average of 2,218.66 kg of waste daily, predominantly comprising organic waste (32.36%) and polythene (34.29%). Strikingly, 96.58% of the waste was recyclable, and over 51% was suitable for composting. These results supported the need for an integrated waste management framework including waste segregation, recycling stations, and composting units.

Nwoke et al. (2022) expanded on this research by conducting a one-week waste audit at UNN across different functional zones including cafeterias, academic buildings, and dormitories. Their objective was to assess per capita waste generation and recyclable potential. Their findings indicated a total weekly waste generation of 4,821.1 kg, with paper (37.7%), organic matter (24.9%), and plastics (20.2%) as the most common constituents. Of this, 28.4% was compostable and 64.5% was recyclable, suggesting that over 92% of the university's waste could be recovered if appropriate systems were put in place.

2.8.5 Solid Waste Management in the University of Benin (UNIBEN)

The University of Benin, one of Nigeria's premier universities, located in Edo State, reflects many of the challenges found across other Nigerian tertiary institutions. The campus comprises academic buildings, laboratories, halls of residence, staff quarters, cafeterias, clinics, and commercial centers each generating different types of waste. Recent studies have attempted to assess the solid waste situation at the University of Benin.

Omorogbe and Okunzuwa (2021) conducted an in-depth waste characterization study aimed at understanding the composition and types of solid waste generated within the University of Benin, with a particular focus on student hostels. Their research methodology involved sampling waste over a defined period and categorizing it into various components. Through this systematic analysis, they found that over 60% of the waste produced in student hostels was organic in nature. This included food remnants, biodegradable packaging materials, and other decomposable refuse. The remaining waste fractions were comprised of plastics, paper, glass, and metal, reflecting a diverse but largely unsorted waste stream.

Idu and Eguavoen (2017) investigated the operational aspects of waste management across the University of Benin. Their research focused on the institutional mechanisms and infrastructure used in solid waste collection and disposal. Through interviews with university maintenance personnel and direct observation, they observed that the institution predominantly relies on manual waste collection and open dumping as its primary disposal method. Their study further revealed that the involvement of private contractors is sporadic and uncoordinated. Importantly, they reported that there is no systematic approach to waste segregation at the source, and in certain health-related faculties, incineration is still practiced as a means of waste disposal, particularly for medical and sanitary waste.

Aghimien et al. (2020) directed their research toward assessing the state of solid waste management within the university's staff residential quarters. Their study employed a mixed-method approach involving surveys distributed to residents and physical inspection of waste infrastructure. Their findings indicated a critically low ratio of waste bins to residents, which leads to frequent overflows and unhygienic conditions. They also noted significant delays in the evacuation and collection of waste, exacerbating health risks. Moreover, the study found that there was a general lack of awareness and education among staff members and their dependents regarding proper waste handling practices.

In a more recent investigation, Ogbemor (2022), through a postgraduate study, sought to explore the level of knowledge and practices related to recycling, reuse, and composting among students and staff at the University of Benin. The study utilized questionnaires and focus group discussions to assess knowledge gaps and behavioral trends, it also highlighted that both students and staff possessed inadequate understanding of sustainable waste practices, including recycling, composting, and reuse techniques. A large proportion of the respondents were unaware of the correct procedures for waste sorting, and there was widespread dissatisfaction with the existing waste management system within the university.

2.9 RESEARCH GAP

Although the global literature on solid waste management (SWM) has expanded significantly in recent years, particularly between 2010 and 2025, several critical research gaps persist. At the global level, numerous studies have explored solid waste management systems in urban centers, focusing on modern technologies, regulatory frameworks, and sustainable practices such as waste segregation, recycling, and circular economy principles (Wilson et al., 2012; Guerrero et al., 2013; Kaza et al., 2018). However, much of this research tends to concentrate on cities in developed countries or large metropolitan areas

in developing regions. There is a noticeable scarcity of literature assessing waste management practices in smaller, contained communities such as educational institutions, junior staff quarters, particularly in the Global South. This study addresses that gap by providing a detailed assessment of solid waste management practices in the University of Benin junior staff quarters, aiming to generate insights that can inform targeted improvements and institutional policy development.

CHAPTER THREE

METHODOLOGY

3.1 Study Area

The study area for this research is the Junior Staff Quarters located within University of Benin (UNIBEN), Ugbowo Campus, in Benin City, Ovia North-East Local Government Area, Edo State, Nigeria, at approximately 6.3350°N latitude and 5.6275°E longitude. The University of Benin established in 1970, is a federal government–owned institution situated within the humid tropical rainforest zone of Southern Nigeria and experiences a tropical climate with a wet season (April– October, 2,000–2,500 mm rainfall) and a dry season (November–March, 27– 32°C). Geologically, the University of Benin lies within the Benin Formation which is part of the Niger Delta sedimentary basin, characterized by sandy soils with some clay and laterite deposit



Figure 3.1: A Map Showing Junior Staff Quarters (JSQ) in the University of Benin



Figure 3.2: Aerial View of the Study Area

3.2 Research Design

The study adopted a descriptive and exploratory approach aimed at assessing solid waste management practices in the University of Benin staff residence (Junior Staff Quarters). This blend is imperative to all four research objectives, which includes the identification of the current solid waste management system, assessment of the environmental and health impact, understanding resident's attitudes, and determining the volume and type of waste generated.

3.2.1 Questionnaires Design and Administration

The questionnaires administered to residents of the Junior Staff Quarters consisted of structured and semi-structured questions designed to collect information from residents on the existing waste management systems within the University of Benin junior staff quarters, the environmental and health impacts of the current waste management practices and also the resident's attitudes and behaviors towards solid waste management and recycling initiatives.

Questionnaires were administered to selected households within the junior staff quarters. The questionnaires were printed and hand-delivered to selected residents within the junior staff quarters. Respondents were guided on how to complete the forms and they were given the opportunity to complete the questionnaires on the spot or within 48 time frame during which delayed submissions were followed- up.

3.2.1.1 Sample Size and Sampling Techniques

This research employed a stratified sampling technique to ensure adequate representation of residents across the different sections of the University of Benin Junior Staff Quarters, Ugbowo Campus. This technique divided the study area into distinct strata based on residential zones. Within each stratum, participants were selected giving every household an equal and independent chance of being included. In addition to the selected household respondents, key informants from within the staff quarters were also selected. These individuals were selected using random sampling, based on their knowledge, experience, or involvement in waste management activities within the residential area. The sample size was determined using the Yamane's formula (1967):

$$N = \frac{N}{1+N(e^2)} \quad (3.1)$$

Where;N= sample size

N = total number of households e = margin of error (expressed as decimal)

3.2.1.2 Reliability of Questionnaires

To validate the reliability of the questionnaire a pilot test was conducted using 15% of the total sample size. The results obtained from the pilot test was analyzed using the Cronbach's alpha reliability test further ensuring the internal consistency of the data gotten.

3.2.2 Observational Checklist

An observational checklist was used to collect information on the nature of the current solid waste management system or practice in the University of Benin junior staff quarters. Observations was also carried out each day to ensure consistency.

3.2.3 Household Waste Generation and characterization

The rate of waste generation in junior staff quarters was carried out using quantification at the point of waste generation. Solid waste was physically collected from participating households over a one-week period. Each household deposited its daily waste into labelled containers provided. At the end of the collection period, the accumulated waste was segregated into major categories, including organic waste, plastics, paper, metals, nylon and miscellaneous. Each category was then weighed and recorded to determine the volume and composition of the waste generated. The procedure included:

- a. Provision of labelled plastic bag each day for the collection of waste from each flat.
- b. The waste collection process was done by collecting waste on a daily basis from each unit of flat.
- c. Waste was transported to a designated sorting area where it was sorted manually into categories including organic waste, plastic materials, papers, metals, miscellaneous waste and then weighed with a digital scale.
- d. This process continued for a seven days consecutive period. The percentage composition of the solid waste component was estimated using the following equation as specified by Spangle (2018) adopted from Rawlings and Seghosime (2023):

$$\% \text{Composition of Solid waste Component} = \frac{W_s}{T_s} \times 100\% \quad (3.2)$$

Where;

W_s = Weight of solid waste component

T_w = Total weight of solid waste generated

Waste characterization was conducted over seven consecutive days to determine the composition and quantity of solid waste generated. Waste were sorted into the following categories:

- a. Organic/Food Waste; Food scraps, vegetable peels, and biodegradable materials.
- b. Paper/Cardboard; Newspapers, packaging, cardboard, and office paper.
- c. Plastics; Bags, bottles, containers, and packaging materials.
- d. Metals; Cans, aluminium foil, and metallic items.
- e. Miscellaneous waste
- f. Nylon

3.3 Data Analysis

Data from study was analyzed using Statistical Package for the Social Science (SPSS) and Microsoft Excel (2505,2019). SPSS was used to analyses the retrieved questionnaires while the Microsoft Excel was used to analyse the solid waste data.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Results from the Questionnaire Survey

The results from the questionnaire survey are presented in Table 4.1, 4.2, 4.3, 4.4, and 4.5. Table 4.1 indicates the reliability statistics, Table 4.2 shows the socio-demographic characteristics of respondents in the junior staff quarters, Table 4.3 indicate the existing waste management system in the junior staff quarters, Table 4.4 indicate the environmental and health impacts of the existing waste management in the junior staff quarters while Table 4.5 presents the resident's attitudes and behavior toward proper solid waste management in the quarters.

Table 4.1: Reliability Statistics

Cronbach's Alpha Value	Number of Items
0.780	23

The obtained cronbach's alpha value of 0.780 gotten from the reliability test falls within the acceptable reliability range, suggesting that the questionnaire items were consistent and dependable.

4.1.1 Social-demographic Characteristics of Respondents

The results of the Social-demographic characteristics of the respondents in junior staff quarters are presented in Table 4.2 :

Table 4.2: Socio-demographic Characteristics of The Respondents

Variables	Frequency	Percentage
Gender		
Male	40	40.0
Female	60	60.0
Total	100	100.0
Age		
18-25	40	40.0
26-35	10	10.0
36-45	20	20.0
46-55	25	25.0
56 and above	5	5.0
Total	100	100.0
Marital Status		
Single	50	50.0
Married	40	40.0
Divorced	8	8.0
Widow	2	2.0
Total	100	100
Educational Level		
Primary	10	10.0
Secondary	15	15.0
Tertiary	50	50.0
Post graduate	25	25.0
Total	100	100.0
Occupation		
Academic staff	35	35.0
Non-academic staff	30	30.0
Others	25	25.0
Total	100	100.0
Years in Quarters		
Less than 1 year	10	10.0
1-3 years	25	25.0
4-6 years	30	30.0
Over 6 years	35	35.0
Total	100	100.0

From Table 4.2, 40% of respondents were male and 60% of respondents were female indicating a higher population of women in the survey. This suggests greater female representation within the study area.

The age distribution reveals that respondents aged 18–25 years constituted the largest group (40%), followed by 46–55 years (25%), 36–45 years (20%), 26–35 years (10%), and those 56 years and above (5%). The predominance of younger respondents (18–45 years) indicates that the population is mainly composed of students, junior staff, and young adults, typical of a university residential environment. This age category is noteworthy, as individuals within it are often associated with higher consumption rates, resulting in greater waste generation. These results are consistent with the findings reported by Ogwueleka (2014) where household size, income, and education significantly influence waste generation patterns in Nigerian communities.

Regarding marital status, 50% of respondents were single, 40% married, 8% divorced, and 2% widowed. The relatively high proportion of single individuals supports the earlier observation of a youthful population. Married respondents, who make up 40% of the total, are generally linked with larger household sizes, which tend to produce more waste due to increased consumption and domestic activities.

In terms of educational attainment, the majority of respondents (50%) possessed tertiary education qualifications, followed by 25% with postgraduate education, 15% with secondary education, and 10% with primary education. This distribution reflects a high literacy level among residents of the study area, which is characteristic of a university environment.

The occupational level from the questionnaire survey indicates that 35% of respondents were academic staff, 30% non-academic staff, and 25% engaged in other occupations.

Lastly, analysis of respondents' years of residence in the quarters shows that 35% had lived there for over six years, 30% for 4–6 years, 25% for 1–3 years, and 10% for less than one year. This implies that a significant number of respondents have long-term residency in the quarters.

4.1.2 Existing Waste Management System in the Junior Staff Quarters

The results of the existing waste management system practiced in the University of Benin junior staff quarters are presented in Table 4.3.

From Table 4.3, 70% of respondents identified food waste as the major component of the type of waste generated. Other waste generated include paper accounting for (10%), metal (7%), plastic (5%), glass (5%), and others (3%). The dominance of food waste indicates that the majority of waste in the area is organic and biodegradable, which is typical of residential and institutional environments. The finding aligns with Abila and Kantola (2019), who observed that household waste in Nigerian university communities is dominated by biodegradable food residues.

Table 4.3: Existing waste management system of the respondents

Variables	Frequency	Percentage
Types of waste generated		
Food waste	70	70.0
Plastic	5	5.0
Paper	10	10.0
Glass	5	5.0
Metal	7	7.0
Others	3	3.0
Total	100	100.0
Method of waste disposal		
Dumping in open space	80	80.0
Burning	10	20.0
Burying	0	0.0
Others	10	10.0
Designated waste bins	0	0.0
Total	100	100.0
Waste collection frequency		
Daily	0	0.0
Twice a week	5	5.0
Weekly	15	15.0
Irregular	75	75.0
Not collected at all	0	0.0
Total	100	100.0
Waste point availability		
Yes	3	3.0
No	97	97.0
Total	100	100.0
Local segregation practice		
Yes	5	5.0
No	95	95.0
Total	100	100.0
Collection efficiency		
Very effective	15	15.0
Moderately effective	40	40.0
Ineffective	45	45.0
Total	100	100.0

The data from the waste disposal practices showed that 80% of respondents admitted to dumping their waste in open spaces, while 10% resorted to burning and another 10% used other informal methods such as roadside disposal. None of the respondents made use of designated waste bins, reflecting the absence of a structured waste management system.

For waste collection frequency, a large majority (75%) reported irregular waste collection, while 15% indicated weekly collection and 5% experienced twice-weekly collection. None of the respondents reported daily collection. The irregular pattern suggests inadequate institutional coordination and logistical constraints.

With respect to the availability of waste points, only 3% of respondents confirmed the existence of designated waste collection points, while 97% stated that no such facilities exist. The absence of waste points encourages indiscriminate dumping and burning, thereby worsening sanitation conditions.

For waste segregation practices, only 5% of respondents reported separating their waste before disposal, while 95% did not practice any form of segregation. The minimal level of source separation suggests low awareness of recycling and the absence of appropriate infrastructure.

The results from the waste collection efficiency showed that 45% of respondents rated the system as ineffective, 40% as moderately effective, and only 15% as very effective. The low effectiveness rating reflects the inadequacy of current waste management efforts, likely caused by irregular collection schedules, insufficient personnel, and poor logistical planning.

4.1.3 Environmental and Health Impact of Solid Waste Management in the Junior Staff Quarters

The results of the environmental and health impact of solid waste management in the University of Benin Junior Staff Quarters are presented in Table 4.4

Table 4.4: Environmental and Health Impact of Solid Waste Management in Junior Staff Quarters

Variables	Frequency	Percentage
Environmental issues		
Yes	95	95.0
No	5	5.0
Total	100	100.0
Environmental issues types		
Offensive odour	25	25.0
Blocked drainage	20	20.0
Littering of Surroundings	30	30.0
Water contamination	5	5.0
Air pollution	5	5.0
Pest Infestation	15	15.0
Total	100	100.0
Health Problems		
Yes	70	70.0
No	30	30.0
Total	100	100.0
Types of health issues		
Malaria	60	60.0
Cholera	5	5.0
Diarrhea	5	5.0
Skin infections	15	15.0
Respiratory Issues	15	15.0
Others	0	0.0
Total	100	100.0

From Table 4.4, a large majority (95%) of respondents acknowledged the presence of environmental issues associated with waste disposal in their surroundings, while only 5% claimed otherwise. This agreement indicates a high level of environmental degradation resulting from open dumping, irregular collection, and lack of proper waste infrastructure. This finding aligns with observations in similar university areas (Adeniran et al., 2022). For the specific types of environmental problems, littering of surroundings (30%) ranked highest, followed by offensive odour (25%) and blocked drainage (20%). Pest infestation (15%) was also noted, while water contamination and air pollution each accounted for 5%. The predominance of littering and offensive odours underscores the unsanitary state of the junior staff quarters and the inefficiency of waste collection systems.

With respect to health problems, 70% of respondents reported having experienced one or more health issues related to poor waste management, while 30% reported none. The most common ailment identified was malaria (60%), followed by skin infections and respiratory issues 15% each, and diarrhea and cholera (5% each). The prevalence of malaria is closely linked to pest infestation and poor drainage, which create breeding sites for mosquitoes. (Ojo et al., 2020) observed that households exposed to poor waste disposal conditions in Benin City often experience pest-related illnesses and unpleasant odours.

4.1.4 Residents' Attitudes and Behavior Towards Proper Solid Waste Management in the Junior Staff Quarters

The results of the residents' attitudes and behaviors towards solid waste management in junior staff quarters are presented in Table 4.5.

Table 4.5: Residents' Attitudes and Behaviors Towards Proper Solid Waste Management in the Junior Staff Quarters

Variables	Frequency	Percentage
Waste sorting		
Always	5	5.0
Sometimes	75	75.0
Never	25	25.0
Total	100	100.0
Participation willingness		
Yes	10	10.0
No	70	70.0
Maybe	20	20.0
Total	100	100.0
Improvement measures of solid waste management		
Provision of more waste bins	30	30.0
Regular waste collection	50	50.0
Public awareness campaigns	5	5.0
Waste recycling programs	10	10.0
Enforcement of sanitation laws	5	5.0
Others	0	0.0
Total	100	100.0
Solid waste management importance		
Yes	95	95.0
No	5	5.0
Total	100	100.0

From Table 4.5, 5% of respondents reported that they always sort their waste, 75% do so sometimes, and 25% never practice waste sorting at all. This pattern suggests a low level of adherence to sustainable waste management practices. The limited practice of sorting could be attributed to the absence of proper waste segregation facilities and inadequate awareness campaigns.

Regarding willingness to participate in waste management activities, only 10% of respondents expressed willingness to actively engage in improving solid waste management, while 70% showed no interest, and 20% were undecided. This demonstrates a general lack of motivation or trust in existing waste management systems which was also identified by Abila and Kantola (2019), who reported that residents of Benin and other Nigerian Communities often perceive waste management as solely a government responsibility rather than a shared civic duty.

For suggested measures for improving solid waste management, half of the respondents (50%) recommended regular waste collection, followed by provision of more waste bins (30%), waste recycling programs (10%), public awareness campaigns (5%), and enforcement of sanitation laws (5%). This distribution indicates that residents primarily view regular collection and sufficient disposal infrastructure as the most practical and immediate solutions to the waste problem. The emphasis on these factors agrees with Ohwoghere-Asuma and Aweto (2019), who highlighted that irregular waste collection and shortage of bins are the primary causes of littering and illegal dumping in Benin City.

Regarding the perceived importance of solid waste management, an overwhelming 95% of respondents acknowledged that effective waste management is essential, while only 5% did not consider it important. This near-universal recognition of its importance suggests that poor attitudes and practices are not due to ignorance, but rather due to structural and institutional weaknesses that limit residents' ability to practice proper waste disposal.

Similar conclusions were drawn by Ohwoghere-Asuma and Aweto (2019), who noted that while most residents of the Ugbowo community understood the value of a clean environment, the absence of sustainable infrastructure and waste management policies hindered behavioral change.

Overall, the findings reveal a disconnect between environmental awareness and practical action among residents of the Junior Staff Quarters. Although most individuals understand the significance of proper waste management, their actual behavior does not reflect this awareness, largely due to the absence of enabling systems such as segregated bins, frequent collection, and recycling programs.

4.2 Waste Generation Rate in the Junior staff Quarters

The data gotten from the waste generation rates in the University of Benin Junior Staff Quarters are presented in Table 4.6

Table 4.6: Waste Generation Rate in the Junior Staff Quarters

Components	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Food waste	13.3	20.0	15.5	15.0	13.5	14.2	18.0
Nylon	2.2	2.1	3.0	3.7	4.5	3.5	3.0
Metal	0.2	0.2	0.1	0.3	0.2	0.3	0.2
Plastic	1.1	1.2	2.5	1.8	0.5	1.5	1.5
Paper	0.5	1.0	0.0	0.7	1.5	3.0	0.8
Miscellaneous	0.2	4.5	3.5	2.7	3.7	1.2	3.0
Total	17.5	29.0	24.6	24.2	23.9	23.7	26.5

From Table 4.6, the daily variation in waste generation within the Junior Staff Quarters, reveals that the total waste production fluctuated notably across the week, ranging from 17.5 kg on Sunday to a peak of 29.0 kg on Monday. The highest waste generation recorded on Monday may be attributed to activities such as canteen reopening, cooking and cleaning as residents resume their weekly routines. The results show that food waste dominated the waste stream throughout the week (13.3–20.0 kg/day), reflecting consistent household cooking and meal preparation activities.

Nylon waste increased gradually from 2.2 kg on Sunday to 4.5 kg on Thursday, indicating higher use of single-use packaging and plastic bags during the work week, when residents purchase more packaged goods. Plastic waste also remained relatively constant (0.5–2.5 kg), confirming its persistent yet secondary contribution to household refuse.

Paper waste and miscellaneous items exhibited occasional spikes particularly on Friday (3.0 kg of paper) and Monday/Thursday (3.7–4.5 kg of miscellaneous waste). These episodic increases likely reflect short-term activities such as household clearance, administrative clean-ups, or end-of-week packaging disposal. In contrast, metal waste remained minimal throughout the week (0.1–0.3 kg), supporting reports by Ohwoghre-Asuma and Aweto (2019) that metals are rarely discarded with general waste because residents commonly reuse or sell them to informal recyclers.

4.3 Characterization of Waste Generated in the Junior Staff Quarters

Table 4.7 presents the data gotten from the characterization of waste generated in the University of Benin Junior Staff Quarters.

Table 4.7: Composition of Waste in the Junior Staff quarters

Components	Value	Percentage
Food Waste	109.5	64.64
Nylon	22.0	12.98
Metal	1.5	0.89
Plastic	10.1	5.96
Paper	7.5	4.43
Miscellaneous	18.8	11.1
Total	169.4	100.0

The composition of waste presented in Table 4.7 reveals that food waste forms the largest portion of total solid waste generated within the Junior Staff Quarters, accounting for 64.64% of the total waste stream. This finding aligns with the study conducted by Ohwohere-Asuma and Aweto (2019) at the University of Benin, Ugbowo Campus, which reported that biodegradable (mainly food) waste made up about 58.85% of total waste generated in the residential quarters. Nylon waste, which accounted for 12.98%, was the second most prevalent category. This proportion is consistent with trends observed in Benin City, where single-use plastics and nylon packaging contribute significantly to municipal waste streams due to widespread consumer dependence on sachet water, polythene bags, and packaged foods (Abila and Kantola, 2019).

Miscellaneous waste, comprising 11.1%, includes mixed materials such as textiles, broken items, and household debris. Similar findings in Benin City indicate that such waste appears sporadically, often increasing during cleaning, renovation, or festive periods (Adeniran, Nubi, and Adelojo 2022).

Plastic waste accounted for 5.96%, and paper waste for 4.43%, reflecting a moderate presence of recyclable materials. These proportions are consistent to those observed by Ohwoghere-Asuma and Aweto (2019) in University of Benin residential and institutional areas, where paper and plastic combined made up less than 10% of total waste.

Metal waste, consisting 0.89%, represented the smallest fraction of the total waste composition. This finding is consistent with Ohwoghere-Asuma and Aweto (2019), who reported minimal metal waste generation within the University of Benin campus, as most metal items are either reused, sold to scrap collectors, or recycled before final disposal.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study examined solid waste management practices within the University of Benin Junior Staff Quarters, using data obtained from questionnaire surveys, direct field observations, and household waste characterization.

The findings revealed that the existing waste management system was poor as a result of unavailability of waste disposal points, low segregation practice, inadequate collection and disposal service resulting in residents storing their waste in open sacks and buckets and this has exposed residents to a lot of health risks such as malaria, skin infections and respiratory issues. The behavior of the residents also reflected inadequate commitment towards proper solid waste management as majority of the residents do not participate in waste sorting and segregation.

From the questionnaire results, it revealed that waste generation within the quarters is dominated by food and biodegradable waste, accounting for more than 60% of the total waste produced. The waste generation rate and composition analysis further reinforced these patterns. Food waste formed the largest fraction (64.64%), followed by nylon and other packaging waste (12.98%), with minor contributions from plastics, paper, and metals. Daily variation data revealed that waste generation was highest on Monday and Saturday with a total of 29kg and 26.5kg respectively.

Overall, the study concludes that the solid waste management system in the University of Benin Junior Staff Quarters remains inadequate because the system suffers key challenges including irregular waste collection, insufficient waste bins, poor segregation at source, and low public participation.

5.2 Recommendations

Based on the research, the study recommends the following to enhance waste management practices within the University of Benin Junior Staff Quarters:

1. Future researchers should focus on a more detailed assessment on the rate and pattern of waste generation within the university of Benin junior staff quarters. The study should include seasonal variations and the influence of household size and income on waste quantity and composition. This will provide more data for efficient waste collection and disposal systems.
2. Future studies should explore how waste materials generated within the junior staff quarters can be recycled and reused. The study should identify recyclable waste components and examine their potential for conversion into useful materials.
3. Residents should be educated and encouraged to separate waste into biodegradable and non- biodegradable categories to make recycling easier.
4. The university management should ensure that sufficient waste bins are provided across the staff quarters to encourage proper storage and disposal. The bins should be strategically placed and regularly emptied.
5. The waste management authorities should adopt a fixed and consistent waste collection schedule and ensure prompt evacuation to prevent waste accumulation and environmental hazards.
6. The university of Benin should enforce sanitation rules and apply appropriate penalties to individuals who engage in illegal dumping or open burning of waste.
7. Sensitization programs should be organized to educate residents about the importance of waste segregation, recycling, and personal responsibility in keeping their environment clean.
8. Residents should be involved in decision making processes and clean-up exercise to

create a sense of ownership and responsibility towards maintaining cleanliness.

9. Regular inspection should be carried out by environmental health officers to ensure compliance with waste management policies and identify areas that need improvement.

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APPENDIX

A. Results From Questionnaire Survey

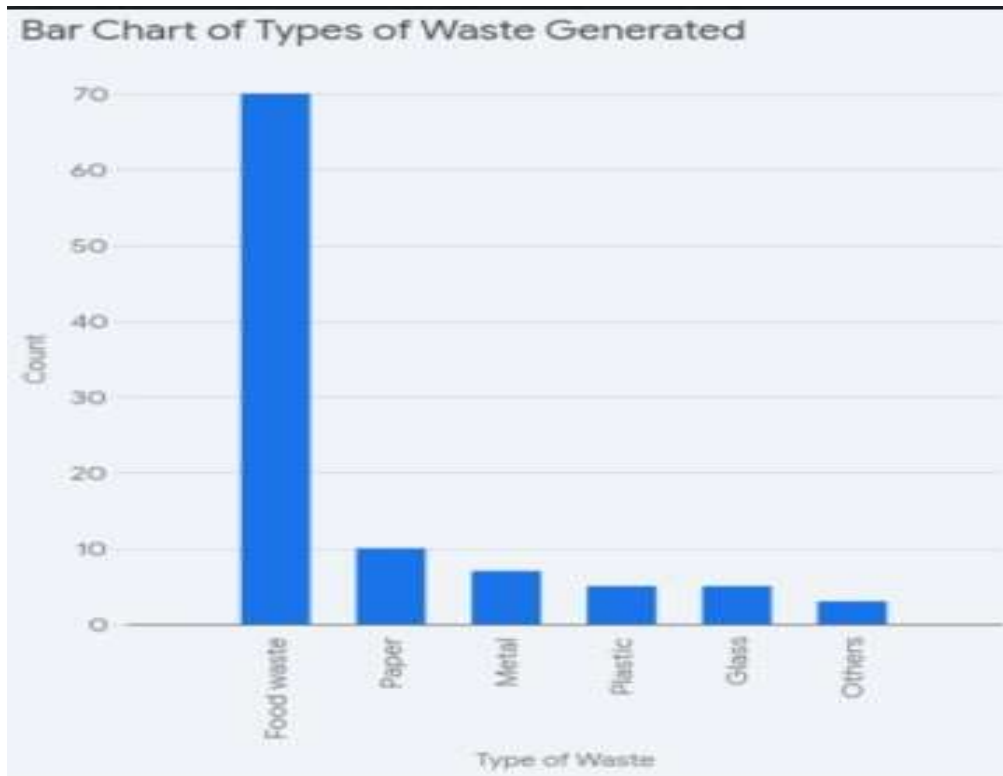


Fig A.1: Bar chart showing types of waste generated in junior staff quarters

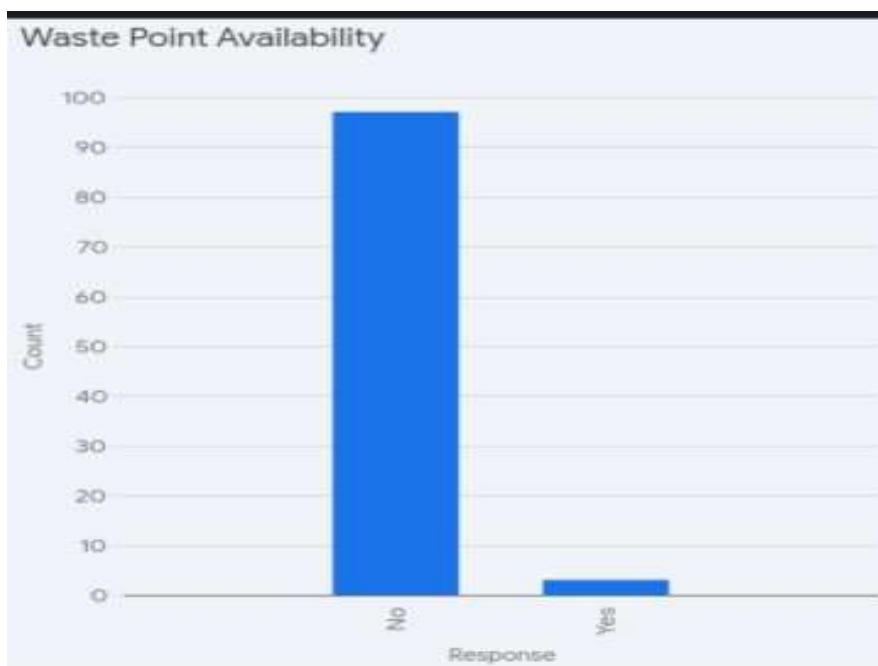


Fig A.2: Waste point availability in junior staff quarters



Fig A.3: Waste sorting participation in junior staff quarters

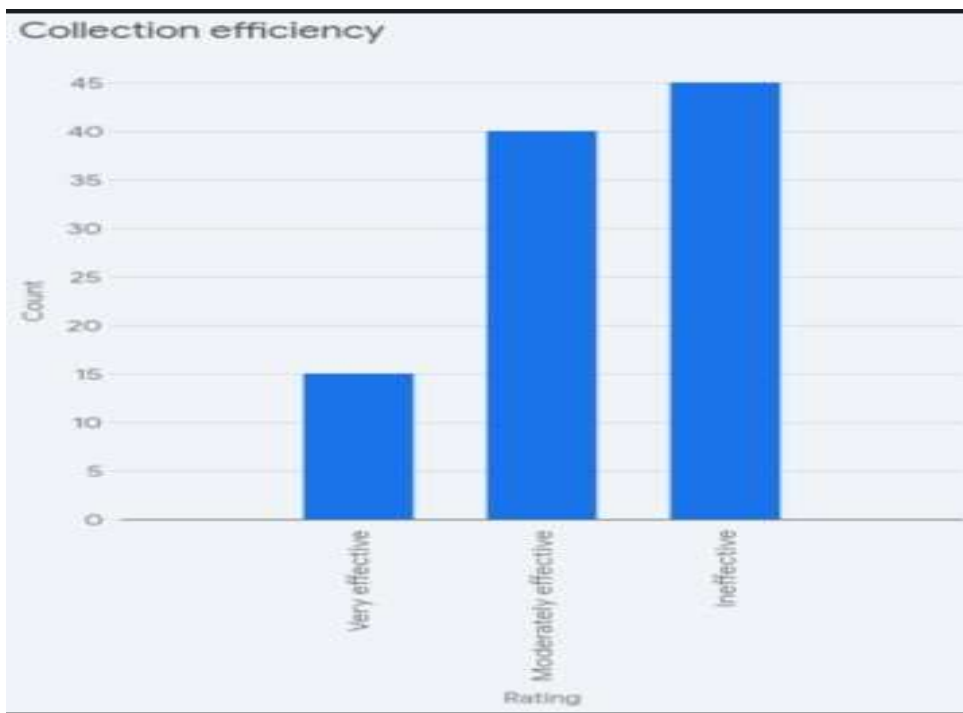


Fig A.4: Collection efficiency of waste in junior staff quarters



Fig A.5: Solid waste management importance in junior staff in junior staff quarters



Fig A.6: Bar chart of waste sorting in junior staff quarters

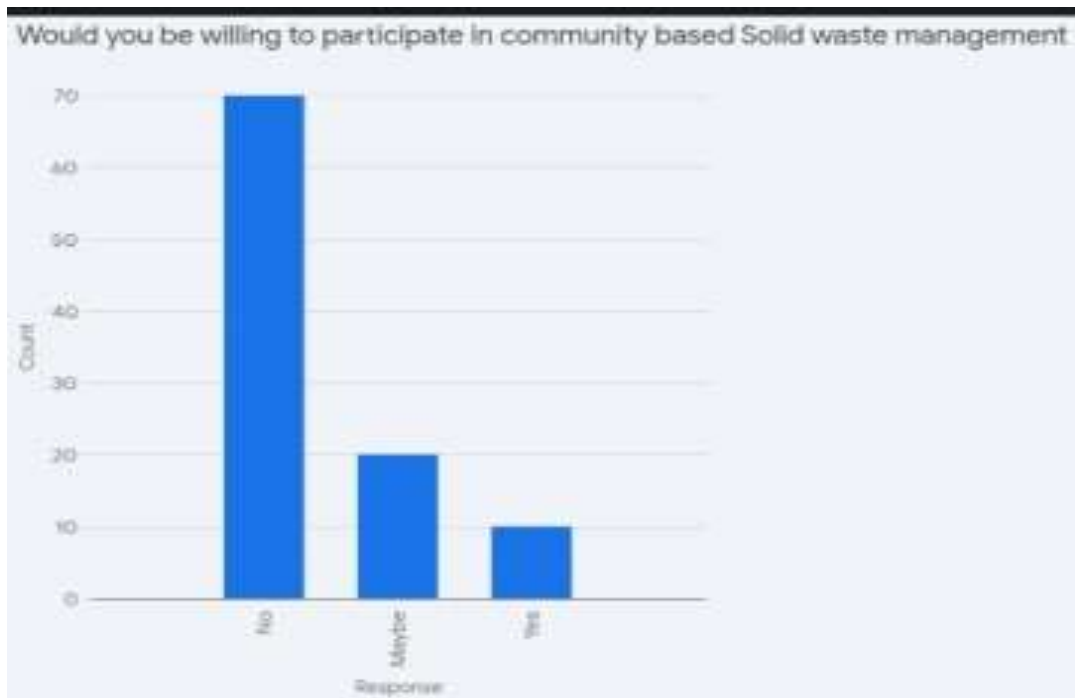


Fig A.7: Residents willingness to participate in community based solid waste management in junior staff quarters

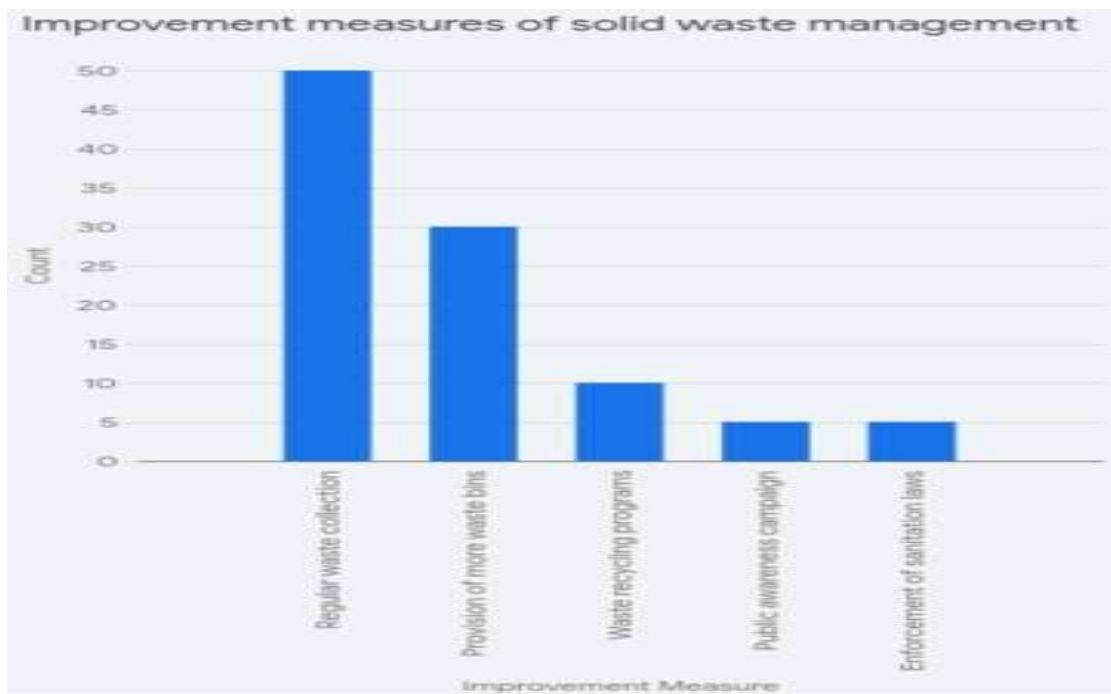


Fig A.8: Improvement measures of solid waste management in junior staff quarters

B. Waste Generation and Characterization in the Junior Staff Quarters

Day	Unit	Food	Nylon	Metal	Plastic	Paper	Misc	Unit_Day_Total
Sunday	Unit 1	1.7	0.15	0	0.06	0.05	0.02	1.98
Sunday	Unit 2	1.66	0.07	0.01	0.02	0.03	0.01	1.8
Sunday	Unit 3	0.31	0.26	0.03	0.17	0.03	0.01	0.81
Sunday	Unit 4	0.84	0.1	0.01	0.13	0.06	0.01	1.15
Sunday	Unit 5	0.42	0.15	0.01	0.04	0	0	0.62
Sunday	Unit 6	1.91	0.23	0.03	0.07	0.01	0	2.25
Sunday	Unit 7	0.74	0.1	0.01	0.02	0.05	0.01	0.93
Sunday	Unit 8	0.04	0.08	0.02	0.14	0.06	0.01	0.35
Sunday	Unit 9	0.78	0.29	0.01	0.05	0.06	0.02	1.21
Sunday	Unit 10	0.05	0.24	0	0.06	0	0.02	0.37
Sunday	Unit 11	1.08	0.03	0	0	0	0.01	1.12
Sunday	Unit 12	1.78	0.2	0.02	0.04	0.01	0.01	2.06
Sunday	Unit 13	1.7	0.1	0.03	0.01	0.05	0.02	1.91
Sunday	Unit 14	0.08	0.1	0.01	0.15	0.06	0.02	0.42
Sunday	Unit 15	0.21	0.1	0.01	0.14	0.03	0.03	0.52
Monday	Unit 1	0.89	0.2	0.09	0.06	0	0.05	1.29
Monday	Unit 2	1.78	0.1	0.1	0.09	0.02	0.44	2.53
Monday	Unit 3	1.27	0.11	0.01	0.08	0.01	0.17	1.65
Monday	Unit 4	0.28	0.2	0.13	0.14	0	0.26	1.01
Monday	Unit 5	0.22	0.19	0.12	0.08	0.02	0.43	1.06
Monday	Unit 6	2.15	0.17	0.08	0.03	0.01	0.26	2.7
Monday	Unit 7	0.38	0.07	0.13	0.01	0.02	0.42	1.03
Monday	Unit 8	0.2	0.18	0.03	0	0.01	0.45	0.87
Monday	Unit 9	2.44	0.22	0.04	0.07	0.01	0.29	3.07
Monday	Unit 10	1.35	0.03	0.13	0.03	0.02	0.17	1.73
Monday	Unit 11	1.45	0.18	0.03	0.08	0.01	0.47	2.22
Monday	Unit 12	2.2	0.1	0.13	0.04	0.02	0.1	2.59
Monday	Unit 13	1.61	0.15	0.04	0.07	0.02	0.23	2.12
Monday	Unit 14	1.46	0.01	0.1	0.08	0.02	0.57	2.24
Monday	Unit 15	2.32	0.19	0.04	0.14	0.01	0.19	2.89
Tuesday	Unit 1	0.7	0.12	0.29	0	0.01	0.35	1.47
Tuesday	Unit 2	1.34	0.3	0.33	0	0.01	0.34	2.32
Tuesday	Unit 3	0.07	0.15	0.21	0	0.01	0.48	0.92
Tuesday	Unit 4	0.56	0.25	0.34	0	0.01	0.08	1.24
Tuesday	Unit 5	0.42	0.22	0.02	0	0	0	0.66
Tuesday	Unit 6	2	0.03	0.15	0	0	0.36	2.54
Tuesday	Unit 7	1.88	0.27	0.13	0	0.01	0.32	2.61
Tuesday	Unit 8	0.98	0.26	0.13	0	0.01	0.32	1.7
Tuesday	Unit 9	2.13	0.03	0.24	0	0.01	0.02	2.43
Tuesday	Unit 10	1.27	0.23	0.15	0	0	0.49	2.14
Tuesday	Unit 11	1.28	0.26	0.06	0	0	0.13	1.73
Tuesday	Unit 12	0.11	0.26	0.08	0	0	0.29	0.74
Tuesday	Unit 13	2.28	0.28	0.08	0	0.01	0.01	2.66

Tuesday	Unit 14	0.41	0.23	0.27	0	0.01	0.09	1.01
Tuesday	Unit 15	0.07	0.11	0.02	0	0.01	0.22	0.43
Wednesday	Unit 1	0.5	0.25	0.12	0.03	0.1	0.11	1.11
Wednesday	Unit 2	0.1	0.25	0.04	0.03	0.03	0.19	0.64
Wednesday	Unit 3	1.26	0.25	0.14	0.08	0.06	0.2	1.99
Wednesday	Unit 4	1.6	0.25	0.11	0.08	0.04	0.1	2.18
Wednesday	Unit 5	1.49	0.25	0.16	0.03	0.08	0.18	2.19
Wednesday	Unit 6	1.06	0.25	0.16	0.03	0.05	0.2	1.75
Wednesday	Unit 7	0.77	0.25	0.18	0.08	0.09	0.03	1.4
Wednesday	Unit 8	0.7	0.25	0.09	0.02	0.03	0.12	1.21
Wednesday	Unit 9	0.99	0.25	0.05	0.01	0.07	0.17	1.54
Wednesday	Unit 10	1.46	0.25	0.1	0.02	0.12	0.07	2.02
Wednesday	Unit 11	1.75	0.25	0.16	0.01	0.06	0.07	2.3
Wednesday	Unit 12	1.15	0.25	0.17	0.1	0.03	0.21	1.91
Wednesday	Unit 13	0.26	0.25	0.13	0.06	0.09	0.19	0.98
Wednesday	Unit 14	1.6	0.25	0.05	0	0.09	0.12	2.11
Wednesday	Unit 15	0.31	0.2	0.14	0.12	0.06	0.04	0.87
Thursday	Unit 1	0.66	0.33	0	0.05	0.07	0.23	1.34
Thursday	Unit 2	0.25	0.25	0	0.03	0.06	0.47	1.06
Thursday	Unit 3	1.64	0.11	0.01	0.01	0.15	0.11	2.03
Thursday	Unit 4	0.34	0.14	0.03	0.03	0.2	0.41	1.15
Thursday	Unit 5	1.26	0.3	0.01	0.01	0.14	0.1	1.82
Thursday	Unit 6	0.31	0.03	0.02	0	0.16	0.28	0.8
Thursday	Unit 7	1.04	0.02	0.02	0.05	0.11	0.3	1.54
Thursday	Unit 8	1.51	0.39	0	0.05	0.2	0.45	2.6
Thursday	Unit 9	1.52	0.44	0.02	0.07	0.02	0	2.07
Thursday	Unit 10	1.01	0.22	0	0.05	0.03	0.29	1.6
Thursday	Unit 11	1.15	0.49	0.03	0.01	0	0.29	1.97
Thursday	Unit 12	0.56	0.5	0.02	0.06	0.2	0.02	1.36
Thursday	Unit 13	0.13	0.32	0.01	0.01	0.14	0.46	1.07
Thursday	Unit 14	1.7	0.48	0.02	0.04	0.01	0.09	2.34
Thursday	Unit 15	0.42	0.48	0.01	0.03	0.01	0.2	1.15
Friday	Unit 1	0.3	0.18	0.01	0.11	0.08	0.3	0.98
Friday	Unit 2	2.07	0.05	0.03	0.06	0.18	0.01	2.4
Friday	Unit 3	0.06	0.71	0.02	0.1	0.02	0.18	1.09
Friday	Unit 4	1.7	0.12	0.03	0.01	0.09	0.31	2.26
Friday	Unit 5	1.5	0.45	0.01	0.23	0.16	0.2	2.55
Friday	Unit 6	2.01	0.26	0.01	0.21	0.02	0.07	2.58
Friday	Unit 7	0.28	0.23	0.03	0.18	0.17	0.21	1.1
Friday	Unit 8	0.6	0.1	0.02	0.1	0.17	0.37	1.36
Friday	Unit 9	1.24	0.15	0.03	0.03	0.05	0.2	1.7
Friday	Unit 10	2.13	0.1	0.04	0.05	0.07	0.12	2.51
Friday	Unit 11	0.75	0.08	0	0.01	0.19	0.01	1.04
Friday	Unit 12	0.47	0.42	0.02	0.12	0.04	0.18	1.25
Friday	Unit 13	0.15	0.43	0	0.08	0.05	0.18	0.89
Friday	Unit 14	0.09	0.01	0.03	0.02	0.01	0.15	0.31

Friday	Unit 15	0.85	0.21	0.02	0.19	0.2	0.21	1.68
Saturday	Unit 1	1.13	0.36	0.08	0.09	0.02	0.02	1.7
Saturday	Unit 2	0.58	0.1	0.26	0.06	0.08	0.01	1.09
Saturday	Unit 3	0.82	0.14	0.14	0.11	0	0.01	1.22
Saturday	Unit 4	0.62	0.4	0.27	0.04	0.16	0.02	1.51
Saturday	Unit 5	0.07	0.11	0.32	0.01	0.18	0.01	0.7
Saturday	Unit 6	1.65	0.19	0.24	0	0.1	0.01	2.19
Saturday	Unit 7	1.49	0.23	0.29	0.04	0.03	0	2.08
Saturday	Unit 8	1.29	0.36	0.08	0.06	0.16	0.01	1.96
Saturday	Unit 9	1.55	0.02	0.19	0.02	0.14	0.01	1.93
Saturday	Unit 10	0.55	0.15	0.09	0.08	0.07	0.01	0.95
Saturday	Unit 11	1.99	0.2	0.24	0.08	0.16	0.02	2.69
Saturday	Unit 12	1.92	0.1	0.1	0.1	0.13	0.02	2.37
Saturday	Unit 13	1.12	0.45	0.26	0.01	0.13	0.02	1.99
Saturday	Unit 14	1.32	0.1	0.25	0.06	0.05	0.02	1.8
Saturday	Unit 15	1.9	0.09	0.19	0.04	0.09	0.01	2.32

C. Photographs from the field Work





Plate1: Segregated waste material within the University of Benin Junior Staff Quarters



Plate 2: Preparation of Waste bag for Segregation



Plate 3: Segregated waste been carried for disposal within the university of Benin junior staff quarters

APPENDIX

A Sample of Questionnaire

QUESTIONNAIRE ON SOLID WASTE MANAGEMENT IN JUNIOR STAFF QUARTERS, UNIVERSITY OF BENIN.

Dear participant,

I am a student currently conducting a research project on solid waste management as part of my academic work. The purpose of this survey is to gather information and insights that will help us understand the current solid waste management practice and its impact on the environment. Please note that all responses will be kept confidential and used only for academic purpose. Thank you for your valuable time and participation!

SECTION A: SOCIAL DEMOGRAPHIC INFORMATION

1. Gender: Male Female
2. Age: 18–25 26–35 36–45 46–55 56 and above
3. Marital Status: Single Married Divorced Widowed
4. Educational Level: Primary Secondary Tertiary Postgraduate
5. Occupation: Academic staff Non-academic staff Other (please specify):

6. Length of years in the staff's residence : Less than 1 year 1–3 years 4–6 years
 Over 6 years

SECTION B: EXISTING WASTE MANAGEMENT SYSTEM

7. What type of solid waste is commonly generated in your household? (Tick all that apply) Food waste Plastic waste Paper waste Glass Metal
Others (please specify): _____

8. How do you dispose of your household solid waste? Waste bin provided by authorities Dumping in open space Burning Burying Others (please specify): _____
9. How often is solid waste collected in your area?
 Daily Twice a week Weekly Irregular Not collected at all
10. Are there designated waste disposal points in the flats?
 Yes No
11. Are you aware of any waste segregation practices in the area?
 Yes No
12. How would you rate the effectiveness of the waste collection system?
 Very effective Moderately effective Ineffective
13. What do you think are the strength of the current waste management system?

14. What are the major weaknesses of the waste management system?

SECTION C: ENVIRONMENTAL AND HEALTH IMPACT

15. Have you observed any environmental issues due to poor solid waste management?
 Yes No
16. If yes, which of the following issues have you noticed? **(Tick all that apply)**
 Offensive odour Blocked drainage Littering of surroundings Water contamination Air pollution Pest infestation
17. Have you or any household member experienced health problems related to poor Solid waste management? Yes No

18. If yes, what kind of health issues? **(Tick all that apply)**

Malaria Cholera Diarrhea Skin infections Respiratory issues Others

(please specify): _____

SECTION D: RESIDENTS' ATTITUDE & BEHAVIOUR

19. Do you think proper Solid waste management is important?

Yes No Not sure

20. Do you sort your waste before disposal?

Always Sometimes Never

21. Would you be willing to participate in a community-based Solid waste management program? Yes No Maybe

22. Have you ever attended a Solid waste management sensitization program?

Yes No

23. What do you think can improve Solid waste management in your area?

(Tick all that apply)

Provision of more waste bins Regular waste collection Public awareness campaigns Waste recycling programs Enforcement of sanitation laws

Others (please specify): _____

B Sample of Observational Checklist

OBSERVATIONAL QUESTIONNAIRE ON SOLID WASTE MANAGEMENT

Location: Junior Staff Quarters, University of Benin

Date: _____

Time: _____

Observer's Name: _____

SECTION A: PHYSICAL & ENVIRONMENTAL CONDITIONS

1. Estimated Number of Households Observed: _____

2. Visible Waste Types Around Households

(Tick all that apply)

Food waste

Plastic waste

Paper waste

Glass

Metal

Other (describe): _____

3. Primary Method of Waste Disposal (by observation)

Waste bins in use

Waste dumped in open areas

Evidence of burning waste

Waste buried in compounds

Other (describe): _____

4. Frequency Indicators of Waste Collection

Overflowing waste bins

Neat, regularly emptied bins

Piled-up uncollected waste

No visible collection points

5. Presence of Designated Waste Disposal Points

Clearly marked and used

Present but not used

Not present

6. Segregation of Waste Observed?

Yes (separated by type)

No (all mixed together)

SECTION B: ENVIRONMENTAL AND HEALTH CONDITIONS

1. Environmental Hazards Noted Around Premises

(Tick all that apply)

Offensive odor

Blocked or clogged drainage

Litter in public spaces

Stagnant water near waste sites

Visible pests (e.g., rodents, flies)

2. Health Hazards (by indirect observation or public signs)

Posters or signs about waste-related illnesses

Mosquito breeding sites (e.g., open containers, gutters)

Human or animal scavenging of waste

Medical waste disposed improperly

SECTION C: COMMUNITY BEHAVIOR & WASTE CULTURE

1. Community Waste Management Behavior (Observed or Inferred)

Waste sorted at source (multiple bins)

Communal participation in clean-up activities

Signage promoting cleanliness

Public indifference (e.g., dumping beside clean areas)

Children playing near waste sites

2. Community Engagement Indicators

Awareness posters or community boards with waste-related info

Active sanitation groups or waste monitors

Recent sensitization events noticed (e.g., flyers, banners)

3. General Cleanliness of the Area (Rating)

Very clean

Moderately clean

Poorly managed

Extremely dirty

4. Suggestions or Observations from the Data Collector