KNOWLEDGE, PRACTICES AND IMPACT OF IMPROPER SOLID WASTE DISPOSAL AMONG UNDERGRADUATES IN HALLS OF RESIDENCE UNIVERSITY OF BENIN UGBOWO CAMPUS, BENIN CITY

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF HEALTH SAFETY AND ENVIRONMENTAL EDUCATION, FACULTY OF EDUCATION, UNIVERSITY OF BENIN, BENIN CITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE (B.Sc) DEGREE IN ENVIRONMENTAL EDUCATION

OCTOBER, 2025.

CERTIFICATION

This is to certify that this study was carried out by **AJIBOYE OMOKHABOH GIFT** with matriculation number **EDU2102491** in the department of Health, Safety and Environmental Education, Faculty of Education, University of Benin and was approved adequate in scope and quality in partial fulfillment of the award of Bachelor of Science degree in Environmental Education.

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DEDICATION

I dedicate this project work to Almighty God, my unfailing strength and greatest support.

Thank You for Your mercy, wisdom and understanding, kindness, favor, and endless provision throughout the course of this study

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ABSTRACT

The purpose of this study examined the knowledge, practices, and impact of improper solid waste disposal among undergraduates in the Halls of Residence, University of Benin, Ugbowo Campus. The study was guided by five research questions which focused on the students' knowledge of proper solid waste disposal, their awareness of disposal facilities and methods, their understanding of the health and environmental consequences of improper disposal, the extent of their participation in improper disposal practices, and the challenges that hinder effective waste management in the halls of residence.

The study adopted a descriptive survey design. The population consisted of undergraduate students residing in the 12 Halls of Residence at the University of Benin, Ugbowo Campus, with a total estimated population of 12,234 residents (Student Affairs, ICT Department, 2025). A sample of 180 students was selected using the stratified sampling technique, with each hostel serving as a stratum to ensure fair representation of the population. The instrument for data collection was a structured questionnaire. The validity of the instrument was ensured through expert judgment by my project supervisor and two other specialists in the field. To establish reliability, the split-half method was

employed. The questionnaire was administered personally to the respondents, ensuring adequate coverage of all hostels. Data collected were analyzed using frequency counts, percentages, means, and standard deviations.

Findings showed that the majority of respondents (80%) demonstrated high knowledge of proper solid waste disposal while 20% showed low knowledge. Awareness was moderate: about 65% of students reported having received information or education on waste disposal and 59.4% were aware of disposal facilities in their hostels, yet only 52.2% could correctly distinguish biodegradable from non-biodegradable waste. Participation in sanitation activities was low (41.7%), and only 36.7% believed their peers were sufficiently aware. On perception, students recorded a high cluster mean (3.22), indicating strong recognition that improper disposal contributes to pest infestation, water pollution, flooding, respiratory problems, and communicable diseases such as cholera, typhoid, and malaria. Despite the generally high knowledge and risk awareness, some improper practices were still reported, though they were not predominant (cluster mean = 2.19). Lapses included dumping refuse near drainage channels, throwing waste out of windows or balconies, and flushing inappropriate items into toilets; respondents largely attributed these behaviours to inadequate waste facilities (insufficient bins) and irregular collection services. Students also demonstrated high awareness of the systemic challenges hindering effective hostel waste management (82.2%), identifying inadequate infrastructure, irregular collection, weak institutional enforcement, and limited

sensitization as principal obstacles. Overall, these results point to a clear knowledge–practice gap that requires both behavioural interventions and institutional improvements.

CHAPTER ONE

INTRODUCTION

Background of the Study

Solid waste management has emerged as one of the most challenging environmental issues of the 21st century. With rapid population growth, urbanization, and industrialization, the volume of waste generated globally has increased significantly. According to the World Bank (2018), the world generates over 2.01 billion tonnes of municipal solid waste annually, and this figure is expected to rise to 3.4 billion tonnes by 2050. Developing countries like Nigeria face even greater challenges, as infrastructural deficits, weak policy implementation, and low public awareness continue to hamper effective waste management. Among the various sectors contributing to waste generation, educational institutions particularly tertiary institutions play a significant role, as they bring together large numbers of young people who engage in a wide range of waste-generating activities.

Solid waste, in general terms, refers to discarded materials that are not liquid or gas, including paper, plastic, food remnants, textiles, glass, and metal waste. These materials, if not properly disposed of or managed, can pose serious health risks and environmental hazards. In many Nigerian universities, solid waste is often disposed of indiscriminately in gutters, roadsides, open fields, or even through unauthorized burning. The implications

of such practices are far-reaching, as they affect not only the immediate university community but also the larger urban ecosystem in which these institutions are embedded.

The University of Benin, Ugbowo Campus, like many other tertiary institutions in Nigeria, has not been immune to the problem of improper waste disposal. With an ever-growing student population and increased infrastructural development, the volume of waste generated daily on campus has surged. Students residing in hostels, attending lectures, buying food from vendors, or organizing social events generate significant amounts of refuse. While the university management has made efforts by placing waste bins in designated areas and engaging waste collection contractors, the implementation of these measures remains inconsistent. It is common to observe refuse heaps accumulating near hostels and classrooms, overflowing waste bins, blocked drainage systems, and the open burning of waste. These are clear indicators of an ongoing struggle to maintain a sustainable and sanitary campus environment.

Several factors contribute to the persistence of this problem. One of the most pressing is the lack of awareness and environmental education among students. Many undergraduates are unaware of the environmental consequences of their disposal practices or the potential health risks associated with poor waste management. For example, when waste clogs drainage systems, it can lead to flooding during the rainy season a problem that has become recurrent on the Ugbowo campus. Floodwaters can serve as a breeding ground for mosquitoes and a vector for waterborne diseases such as

cholera, typhoid fever, and hepatitis. Additionally, open burning of waste releases toxic fumes, including dioxins and furans, which have been linked to respiratory diseases and cancer (Olukanni & Nwafor, 2019).

Another contributing factor is infrastructural inadequacy. In many parts of the University of Benin campus, waste bins are either absent, insufficient in number, or poorly maintained. When bins are filled and not emptied regularly, students are forced or choose to dump their waste in nearby bushes, on walkways, or into drains. Furthermore, some students may feel detached from the responsibility of maintaining environmental hygiene, considering it the sole duty of cleaners or campus authorities. This attitude reflects a deeper issue related to environmental values and social responsibility.

Cultural and behavioral factors also play a role. Studies have shown that people's waste disposal habits are often shaped by societal norms and peer behavior. On a university campus, if the prevailing norm is to dump waste indiscriminately without facing any consequences, students are likely to follow suit. Peer pressure and the absence of deterrent penalties reinforce these habits. Moreover, waste segregation a globally recommended practice to facilitate recycling and reduce landfill dependency is almost nonexistent on Nigerian campuses. All types of waste, whether biodegradable or non-biodegradable, are mixed together, making effective recycling nearly impossible.

From a policy standpoint, the absence of enforceable campus-wide waste management regulations also exacerbates the situation. Although the university may have internal

sanitation policies, they are often not well-publicized or enforced. There is a lack of coordination between student affairs departments, campus security, and environmental services in ensuring that students comply with appropriate waste disposal procedures. Additionally, student unions and associations, which could play an instrumental role in sensitization campaigns, are not always actively involved in promoting environmental awareness.

The problem of solid waste disposal is not limited to the physical aspect of waste accumulation; it also impacts the mental and emotional well-being of students. A dirty and disorganized environment contributes to stress, discomfort, and decreased academic performance. According to the Environmental Protection Agency (EPA, 2020), clean learning environments are essential for cognitive function and psychological well-being. Students who are forced to navigate through waste-filled areas on their way to classes or while studying in hostels may experience reduced morale, anxiety, or apathy toward their academic goals.

The economic implications of improper waste disposal should not be overlooked either. The university spends considerable amounts on cleaning services, waste disposal contracts, and infrastructural repairs due to blocked drains and sanitation-related damage. These funds could be better utilized in improving academic infrastructure, providing scholarships, or enhancing student welfare. Additionally, missed opportunities in

recycling and waste-to-wealth initiatives such as composting organic waste or selling recyclables reflect an inefficient use of campus resources.

There is a growing global shift toward sustainable waste management, especially in academic environments. Universities in developed countries have embraced "zero waste" policies, recycling programs, and student-led sustainability initiatives. These efforts not only reduce the environmental footprint of campuses but also serve as practical educational tools that prepare students for environmentally responsible citizenship. Nigerian universities, including the University of Benin, must not be left behind in this trend.

Given the multidimensional nature of the waste disposal problem, there is a critical need for empirical research that examines the specific dynamics within the University of Benin. While there are general assumptions about the lack of awareness and poor attitudes among students, few studies have systematically explored the knowledge, practices, and perceived impacts of improper waste disposal on campus. Such data is crucial in informing policy, designing effective environmental education programs, and implementing practical solutions tailored to the unique context of the university.

This study therefore seeks to fill this knowledge gap by investigating the current state of solid waste disposal among undergraduates at the Ugbowo Campus of the University of Benin. By examining their level of awareness, daily practices, and the environmental and health effects they experience or perceive, the research aims to provide evidence-based

recommendations for improving campus sanitation and promoting a culture of environmental responsibility.

Understanding the root causes and the broader impacts of these waste disposal issues is essential for developing effective and practical solutions. This study will also aims to explore the various dimensions of improper solid waste disposal and management within the halls of residence of the University of Benin, Ugbowo. It will investigate the knowledge and practices of students regarding solid waste management, assess the effectiveness of existing disposal systems, and evaluate the environmental and health-related consequences of poor solid waste management practices. By doing so, this research seeks to contribute valuable insights that can inform policy development, awareness campaigns, and the implementation of sustainable solid waste management strategies within the university and similar institutions.

Statement of the Problem

Despite the University of Benin's efforts to maintain a clean and conducive learning environment, the problem of improper solid waste disposal and inadequate waste management systems within the halls of residence remains unresolved. Many of the hostels continue to suffer from poor sanitation, frequent accumulation of refuse, and the associated risks of disease outbreaks and environmental pollution. Students and staff alike are frequently exposed to unhealthy living conditions, which can affect academic performance, physical health, and general wellbeing.

The root of this issue appears to be multifaceted, involving behavioral, institutional, and infrastructural shortcomings. There is a lack of comprehensive policies or consistent enforcement mechanisms guiding waste disposal practices among students. Sanitation facilities are often insufficient or not properly maintained, while the attitude and awareness of students toward waste management are also reportedly low. The absence of structured recycling programs and delayed waste collection services further aggravate the situation.

Given these challenges, there is a pressing need to examine the causes and effects of improper solid waste management in these residential areas, and to develop targeted strategies for improvement. This study seeks to fill that gap by investigating the scope and impact of the solid waste problem within the university's halls of residence and providing actionable recommendations that can enhance cleanliness, promote student health, and foster a culture of environmental responsibility.

Research Questions

To guide the investigation into the knowledge, practices and impacts of improper solid waste disposal among undergraduates in the halls of residence, University of Benin, Ugbowo Campus, the following research questions will be addressed:

1. What methods and facilities are currently used for solid waste disposal and management in the hostels?

2. What is the level of awareness of students towards proper solid waste disposal?
3. To what extent do students understand the environmental and health risks associated with improper waste disposal?
4. How frequently do students engage in improper waste disposal practices, such as open dumping and littering?
5. What challenges hinder effective waste management in the university's residential halls?

Purpose of the Study

The purpose of this study is to investigate the knowledge, practices and impacts of improper solid waste disposal among undergraduates in the halls of residence, University of Benin, Ugbowo Campus, with the aim of identifying challenges and recommending sustainable solutions to improve sanitation, health, and environmental conditions.

Specific Objectives are

1. To examine the methods and facilities currently used for solid waste disposal and management in the hostels.
2. To determine the level of awareness of students towards proper solid waste disposal.
3. To investigate the extent to which students understand the environmental and health risks associated with improper waste disposal.

4. To assess how frequently students engage in improper waste disposal practices, such as open dumping and littering.
5. To identify the challenges that hinder effective waste management in the university's residential halls.

Scope/Delimitation of the Study

The scope of the study is the knowledge, Practices and Impacts of Improper Solid Waste Disposal among Undergraduates in the Halls of Residence, University of Benin, Ugbowo campus, Benin City while it is delimited to students domiciled in the Halls of Residence of the University of Benin, Ugbowo, Benin City.

Significance of the Study

This study is significant for several reasons, as it addresses a critical environmental and public health issue within the University of Benin's halls of residence. First, it provides valuable insight into the nature and scale of waste disposal problems affecting students' living conditions. By identifying the root causes and consequences of improper solid waste management, the research can help raise awareness among students, hostel staff, and university authorities about the urgent need for behavioral and structural changes.

Secondly, the findings of this study will be useful for university administrators and policy makers in designing and implementing more effective waste management policies and systems tailored to the specific needs of the hostels. This could include improved waste

collection schedules, increased provision of waste bins, better enforcement of sanitation regulations, and the introduction of waste reduction and recycling programs.

Furthermore, the study can serve as a reference for other academic institutions facing similar challenges, encouraging the adoption of sustainable waste management practices across campuses. It also contributes to the broader field of environmental health and sustainable development by highlighting the link between sanitation, student wellbeing, and academic productivity.

Finally, this research will benefit students by promoting a cleaner, healthier, and more conducive living environment, ultimately improving their overall university experience and quality of life.

Definition of terms

- **Waste**: Waste refers to any material, substance or by-product that is discarded after it has fulfilled its intended purpose or is no longer of use.
- **Solid Waste**: Solid waste refers specifically to discarded materials in solid form which are generated from human activities and can come from homes, businesses, industries and institutions.
- **Waste Management**: Waste management involves the collection, transportation, disposal, recycling and monitoring of waste materials.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The review of related literature will be discussed under the following sub-headings:

- Theoretical Framework
- Concept of Solid Waste, Classification and it's sources
- Concept of Improper Solid Waste Disposal
- Solid Waste Management and Disposal Practices
- Impacts of Improper Solid Waste Disposal on Health and the Environment
- Challenges of Solid Waste Management in Universities
- Strategies for Improving Solid Waste Management
- Summary of Literature Review

Theoretical framework

This study is underpinned by four interrelated theories that help explain students' behavior toward solid waste management, as well as the institutional factors influencing their actions: the Theory of Planned Behavior, Social Cognitive Theory, Systems Theory, and Environmental Education Theory. Together, these provide a holistic lens for understanding the knowledge, practices, and impacts of improper solid waste disposal in a university setting.

Theory of Planned Behavior (TPB)

Proposed by Ajzen (1991), the Theory of Planned Behavior states that an individual's behavior is influenced by their attitude toward the behavior, the social norms around them, and their perceived control over performing the behavior. Applied to solid waste management, this theory helps explain how a student's knowledge, beliefs, and environmental awareness affect their willingness to dispose of waste properly. If students believe that proper waste disposal is beneficial (attitude), see their peers participating (subjective norm), and have access to disposal options like bins (perceived control), they are more likely to engage in responsible behavior.

Social Cognitive Theory (SCT)

Developed by Bandura (1986), this theory emphasizes that people learn from observing others and from the consequences of their actions. In the context of the university, students often mirror the behavior of their peers, lecturers, or staff members. If waste management behaviors such as recycling or proper bin use are modeled and reinforced on campus, students are more likely to adopt those behaviors themselves. The SCT also highlights self-efficacy the belief in one's ability to perform a behavior as a key driver of action.

Systems Theory

Systems Theory considers institutions like universities as interconnected systems where every component affects the whole. Solid waste management cannot function in isolation; it involves infrastructure, administrative policy, student behavior, and environmental conditions. A breakdown in any of these components such as insufficient bins, lack of enforcement, or poor education can result in improper waste disposal. This theory supports the idea that effective waste management requires a coordinated approach involving multiple stakeholders working together.

Environmental Education Theory

This theory supports the notion that education fosters sustainable attitudes and behaviors. When students are taught about the environmental, social, and health impacts of waste, they are more likely to act responsibly. Environmental education, through classroom

learning, campus campaigns, or student-led activities, increases awareness and cultivates a sense of stewardship for the environment. This theory justifies incorporating waste management education into university curricula and orientation programs.

In summary, these theories provide a strong foundation for understanding how knowledge and behavior around solid waste disposal are formed and influenced. They also highlight the importance of institutional support, education, and peer influence in promoting sustainable waste practices among university students.

CONCEPT OF SOLID WASTE, CLASSIFICATION AND ITS SOURCES

Solid waste refers to a diverse category of materials that are discarded after serving their original purpose and are no longer considered useful by their owners. These materials may exist in solid or semi-solid form and are typically generated from human activities such as domestic living, commerce, industry, agriculture, healthcare, and institutional operations. In practical terms, solid waste encompasses everyday items like food remnants, paper, plastic containers, packaging materials, textiles, broken furniture, electronic gadgets, and other discarded products.

The term "solid" in this context is not limited strictly to dry, compact matter; it also includes semi-solid substances like sludge from wastewater treatment plants, and certain enclosed gases that require safe disposal. The common denominator of all forms of solid

waste is that they are unwanted in their current state and must be managed properly to prevent harm to human health and the environment.

On university campuses such as the University of Benin, solid waste is generated through a wide range of activities. Students, staff, and visitors contribute to waste production through learning activities, administrative operations, food consumption, accommodation use, and recreational engagements. The waste produced includes paper from lecture notes and handouts, used stationery, plastic bottles and wrappers, food waste from cafeterias, disposable containers, and other forms of residue from daily campus life.

Solid waste is not a uniform entity; it comprises various materials that differ in origin, composition, and potential for recycling or harm. Some waste is biodegradable and can decompose naturally, while others are non-biodegradable, remaining in the environment for extended periods if not properly managed. Some types of waste may be hazardous and require special handling due to their toxic, flammable, or corrosive nature. Consequently, effective solid waste management requires sorting, collection, treatment, and environmentally safe disposal.

The management of solid waste is not solely a technical issue but also a matter of public health, environmental sustainability, and social responsibility. When poorly managed, solid waste can lead to serious consequences including pollution of land and water bodies, spread of communicable diseases, obstruction of drainage systems, emission of harmful gases from waste burning, and degradation of the physical environment. These effects not

only diminish the aesthetic quality of spaces like campuses but also increase the risk of health emergencies and long-term environmental damage.

However, solid waste is not inherently harmful; its impact largely depends on how it is handled. With proper awareness, infrastructure, and responsible practices, waste can be minimized, reused, or transformed into resources such as compost, recycled products, or energy. Understanding the nature of solid waste is therefore the first and most crucial step in developing sustainable and effective waste management strategies especially within institutions where high population density and concentrated activities accelerate waste generation.

In summary, solid waste is an unavoidable by-product of human existence and development. It is generated in varying forms across multiple sectors and must be handled with a combination of knowledge, responsibility, and structured practices to ensure that it does not pose a threat to the environment or public health.

Classification of Solid Waste

Solid waste is a broad term that encompasses various discarded materials resulting from human and institutional activities. The classification of solid waste is essential for understanding its nature, determining suitable disposal or treatment methods, and identifying potential health and environmental risks.

Solid waste can be classified based on its origin, physical form, chemical composition, or potential for degradation. The most common and practical classification divides solid waste into the following categories:

- Biodegradable Waste: These are organic wastes that decompose naturally through microbial activity. They include food scraps, paper, garden trimmings, and animal waste. On university campuses, such waste primarily originates from cafeterias, hostels, and landscape maintenance.
- Non-Biodegradable Waste: These materials do not decompose easily and can persist in the environment for long periods. They include plastics, metals, glass, and synthetic textiles. A significant portion of campus waste such as plastic bottles, nylon wrappers, and broken electronics falls under this category.
- Hazardous Waste: This includes waste that is toxic, flammable, corrosive, or reactive. Although less common in general campus settings, it may arise from laboratory chemicals, batteries, expired pharmaceuticals, and e-waste, which require special disposal methods to prevent health risks.
- Recyclable Waste: These materials can be processed and reused in the production cycle. Common examples include paper, cardboard, glass bottles, aluminum cans, and certain plastics. In university environments, these are often generated from academic and administrative activities.

- Inert Waste: This category refers to waste that does not undergo significant physical, chemical, or biological changes. Construction debris and sand fall into this group. While less prevalent on campuses, small-scale repairs and renovations can produce inert waste.
- Non-Recyclable Waste: These are materials that cannot be economically or effectively reprocessed into new products due to their chemical composition, contamination, or composite structure. Examples include food-stained wrappers, plastic straws, multi-layered snack packaging, sanitary waste, and certain low-grade plastics. On university campuses, non-recyclable waste is common in cafeterias, hostels, and social event venues (UNEP, 2016; World Bank, 2018).

Type	Characteristics	Recyclability	Items Considered	Sources/Origin	Management Strategies
Cardboard or Paper	When the material is wet it is usually biodegradable. However, when it is dried, it can combust.	Recyclable	Papers and allied packages- tissue papers, carbon papers, cartons, cement bags, cardboards and wrappers.	The waste usually emanates from industrial and domestic waste such as hotels, quarters, photocopying centers, mini-markets, offices, school halls, etc.	Source separation. Reusable. Recycle. Energy Generation.

Garbage Waste	Is usually bio-degradable and organic in nature. However, when dry, it is combustible	Recyclable	Usually left over from meat, cheese, cakes, soups, foods, uneaten sandwiches, banana peel, leaves from vegetables and fruits, eggs, diseased animals, milk etc.	It majorly originates from domestic wastes such as from cake production/ bread production as well as consumption, kitchen wastes, refectories, restaurants, lecturer quarters, and markets.	Waste to energy generation, compost production, and livestock feed.
Plastics, packaging foils and polythene	When heated up, it gives off a residue that hardly decays. Moreover, it is not biodegradable	Recyclable	Such materials include waterproof bags, caps, cups, bags, syringes, pipettes, beaker, buckets, plastic forks and spoon, plastic, tires, chairs, tubes, plastic pens, cables, and burettes.	Waste can be industrial or domestic in nature. Such as waste from medical-center, laboratories, plastic, production facilities, restaurants.	Re-use and Recycle
Metals/Junks	It is non-biodegradable as well as incombustible	Recyclable	Disused cars, lorries, buses, buckets, plastics, boxes, spoons, aluminum, scrap electronic equipment, pots, boxes, cans, metal cups, scrap automobile parts, etc.	Waste emanates majorly from industries such as from store rooms, hotels, markets, vehicles, steel wastes, guest buildings etc.	Refurbishing for new uses, Recycling, Source separation.
Ashes	Incombustible in nature but very biodegradable	Nonrecyclable	This includes burnt leaves, char, paper, burnt wood, and spent charcoal	Can be both industrial and domestic waste emanating from offices, quarters, guest-houses, kitchen areas, store rooms	Techniques include source separation and soil enriching as well as

					treatment.
Rags	Biodegradable by nature. However, incombustible	Recyclable	Materials include threads, cotton, nylon, wool, abandoned clothes etc.	Usually, the waste is gotten domestically. It may emanate from clothing stores, tailoring shops, hotels, school buildings, etc.	Rags can be reused, recycled and source separation can also be used.
E-Waste	E-waste is usually made from various categories of materials that are not normally biodegradable. However, there are some infused components within it that are combustible such as rubber and plastics.	Recyclable	Electric cables, printers, cartridge, phones access	Usually, the waste is gotten from industrial and domestic surroundings. This includes electrical stores, offices, appliances, store rooms, commercial areas, quarters.	Reusable Recyclable Source separation
Leather	Combustible but not biodegradable	Recyclable	Bags, leathers and shoe wares	This waste majorly is domestic from hotels, and quarters.	Reusable Recyclable
Sanitary waste	Non-biodegradable	Non-recyclable	Pads, diapers and cotton wools	Mostly from the quarters and the hostels	Hygienic disposal

Miscellaneous refuse	Although some materials are combustible, most are nonbiodegradable	Either recyclable or nonrecyclable depending on the type of waste.	Hospital waste and waste from cottages, construction and demolition rubbles, solid chemicals, ceramics, masonry works and nightsoil	These waste usually the hospital and clinics on campus. Furthermore, construction waste such as industrial and chemical waste also can be found.	Depends on the type of waste that is identified. This will lead to an effectively deployed strategy to counteract it.

Sources of Solid Waste

Understanding the sources of solid waste is crucial for developing targeted waste management strategies. On a university campus such as the University of Benin, solid waste is generated from diverse and dynamic sources including:

- Academic Activities: Classrooms, laboratories, and libraries generate paper, plastic wrappers, broken stationery, and obsolete equipment. Laboratory experiments may also contribute hazardous and chemical waste.
- Residential Halls: Hostels and student accommodations produce a mix of biodegradable and non-biodegradable waste, including leftover food, beverage containers, clothing, and personal care products.
- Commercial Outlets: On-campus shops, cafeterias, and vendors contribute significantly to solid waste generation. Common wastes include food remnants, packaging materials, disposable cutlery, and drink containers.

- Administrative Offices: These produce office waste such as used paper, printer cartridges, broken furniture, and outdated files or electronic devices.

- Recreational and Social Events: Events like departmental gatherings, concerts, and student celebrations generate large volumes of waste including disposable packaging, flyers, food waste, and decorations.

- Maintenance and Landscaping: Campus maintenance activities produce waste such as tree trimmings, grass cuttings, broken tools, and cleaning residues.

The diversity in both classification and sources of solid waste on university campuses highlights the need for an integrated and informed waste management system. By identifying what types of waste are generated and where they originate, institutions can design more effective collection, segregation, recycling, and disposal strategies. Furthermore, educating undergraduates about these categories and sources empowers them to make responsible choices that reduce environmental impact and promote sustainability.

CONCEPT OF IMPROPER SOLID WASTE DISPOSAL

Improper solid waste disposal refers to the careless, unregulated, or irresponsible discharge of waste materials into the environment in ways that pose threats to public health, environmental integrity, and social well-being. (Tchobanoglous et al., 1993). It includes practices such as indiscriminate dumping, open burning, burying in unauthorized

locations, and littering. Unlike formal disposal methods that emphasize containment, segregation, recycling, and environmental safety, improper disposal bypasses these safeguards, resulting in negative consequences such as unsanitary conditions, pollution, and long-term degradation of ecosystems.

In university environments such as the University of Benin, improper disposal manifests in various forms, including littering in public spaces, dumping refuse in unauthorized areas, and burning waste in open spaces without adequate control. These behaviors are frequently driven by a lack of awareness, inadequate waste infrastructure, poor attitudes towards hygiene, and insufficient enforcement of waste management policies.

At its core, improper waste disposal represents a disconnect between waste generation and responsible waste handling. When individuals or institutions fail to properly sort, store, transport, or treat waste, it becomes a burden on the environment rather than a manageable by-product of human activity. On campuses, this may take the form of students dumping refuse in drainage systems, leaving garbage on walkways, or improperly disposing of food containers, plastics, and electronics.

The consequences of improper waste disposal are far-reaching. Environmentally, it contributes to air, soil, and water pollution. Blocked drainage channels from indiscriminately dumped waste can cause flooding, particularly during the rainy season a common occurrence in urban Nigerian campuses. Biodegradable waste, when left unmanaged, attracts pests and releases foul odors, while non-biodegradable and

hazardous waste like plastics, e-waste, and chemical residues can leach toxins into surrounding ecosystems (UNEP, 2016).

Health-wise, improperly disposed waste can harbor disease vectors such as rodents, flies, and mosquitoes, increasing the risk of outbreaks of illnesses such as malaria, cholera, typhoid, and respiratory infections (World Bank, 2018). The accumulation of solid waste in living and learning environments also reduces the aesthetic appeal of campuses and undermines the overall student experience.

Moreover, improper disposal reflects broader challenges of environmental governance and civic responsibility. The issue is not solely technical but also behavioral and systemic. Many undergraduates, though aware of the presence of waste bins or collection points, may still choose convenience over responsibility, and also from a systems perspective, improper disposal is not just a behavioral issue; it reflects gaps in infrastructure, enforcement, and engagement. If disposal bins are not regularly emptied or properly maintained, even well-meaning individuals may resort to throwing waste in open areas. Similarly, if there are no clear penalties for littering, students may feel emboldened to continue such habits without fear of consequences. This creates a feedback loop in which improper disposal becomes normalized.

Addressing improper solid waste disposal therefore requires an integrative approach that combines infrastructural development, policy enforcement, environmental education, and personal responsibility. Educating students on the lifecycle of waste, the dangers of

careless disposal, and the benefits of proper waste handling can significantly reduce the frequency of such practices. More so, creating functional waste management systems on campus including color-coded bins, regular waste collection, and student-led initiatives can help promote a culture of cleanliness and sustainability.

Improper disposal is particularly problematic for institutions of higher learning because these environments are designed to model leadership, innovation, and social consciousness. When waste is mismanaged, it contradicts the educational values that institutions aim to instill. Additionally, it negatively impacts learning by degrading the cleanliness and functionality of academic spaces, triggering health hazards, and reducing overall campus appearance.

SOLID WASTE MANAGEMENT AND DISPOSAL PRACTICES

Solid Waste management refers to the collective processes involved in the generation, storage, collection, transportation, treatment, and disposal of solid waste materials in a manner that minimizes their adverse impact on human health and the environment (Wilson et al., 2012). It is a critical component of sustainable development, especially in urban and institutional settings where population growth and resource consumption are high. The global increase in waste generation is a direct consequence of industrialization, urbanization, and changing consumption patterns, which collectively exert pressure on environmental systems (UNEP, 2021).

Improper waste management particularly the mismanagement of solid waste leads to numerous environmental and health problems, such as land and water pollution, the proliferation of disease vectors, and the degradation of aesthetic and ecological landscapes (Guerrero et al., 2013). These issues are particularly evident in many developing countries, including Nigeria, where inadequate infrastructure, low public awareness, and poor policy enforcement exacerbate waste challenges.

Within university environments, such as the University of Benin, Ugbowo Campus, solid waste is generated daily from academic, residential, and commercial activities. Materials such as paper, plastic containers, food waste, and packaging materials contribute significantly to the waste stream. When such waste is not managed properly either through open dumping, burning, or neglect it can cause blocked drains, breeding grounds for mosquitoes and rodents, foul odours, and general environmental degradation.

Waste Management Hierarchy: An Integrated Approach

Effective solid waste management is built upon a structured approach known as the Waste Management Hierarchy, which ranks waste handling options according to their desirability and environmental benefits. As defined by the United States Environmental Protection Agency (EPA), this hierarchy is visually represented as an inverted pyramid

(Figure 2), with waste prevention at the top and disposal at the bottom. Each level of the hierarchy reflects a step that contributes to minimizing the negative environmental impact of waste (EPA, 2023). It focuses first on preventing waste generation and progressively moves towards less desirable options such as disposal. The hierarchy serves as both a policy tool and a practical roadmap for minimizing waste generation and maximizing resource recovery. It categorizes waste management practices in an order of environmental preference, urging stakeholders to consider more sustainable options before defaulting to disposal.

The waste management hierarchy generally consists of five major stages:

- Waste Prevention (Source Reduction)
- Minimization
- Reuse
- Recycling and Composting
- Energy Recovery (Incineration with Energy Capture)
- Disposal (Landfilling and Incineration without Energy Recovery)

Each stage is explained below:

Waste Prevention (Source Reduction)

Waste prevention is the most preferred option in the hierarchy. It focuses on strategies and practices that avoid the generation of waste at its source. This means reducing the volume or toxicity of waste before it is even created. For example, in universities, waste prevention can include digitalization of academic materials to reduce paper usage, encouraging students to use reusable containers, and implementing efficient procurement policies that avoid unnecessary packaging.

By preventing waste generation, institutions not only minimize environmental harm but also save resources and reduce the costs associated with waste handling.

Waste Minimization

When total prevention is not feasible, waste minimization becomes the next priority. This involves reducing the quantity or harmfulness of waste generated through more efficient use of materials and resources. For instance, laboratories and cafeterias within the university can adopt practices that optimize material usage, reduce food waste, and utilize environmentally friendly products. Minimization helps limit the volume of waste that must be managed downstream and further contributes to resource conservation.

Reuse

The reuse stage involves finding ways to use items multiple times before they become waste. Reusing materials extends their lifespan and delays their entry into the waste stream. In the university context, reusable water bottles, second-hand textbooks, furniture,

and office equipment are examples of how reuse can be implemented. By reusing items, universities reduce the demand for new products and lower the environmental burden associated with manufacturing and disposal.

Recycling and Composting

Recycling involves processing used materials into new products, thereby diverting waste from landfills and reducing the need for virgin raw materials. Composting, a form of organic recycling, converts biodegradable waste such as food scraps and garden waste into nutrient-rich compost that can be used for landscaping on campus.

For effective recycling programs, the university must provide adequate sorting facilities, student education on recyclable materials, and reliable partnerships with recycling firms. Recycling helps conserve resources, save energy, and lower greenhouse gas emissions.

Energy Recovery (Waste-to-Energy)

Energy recovery involves converting non-recyclable waste materials into usable energy through processes such as incineration with energy capture. Although it still requires burning waste, the process generates electricity or heat, offering some environmental benefit compared to simple disposal.

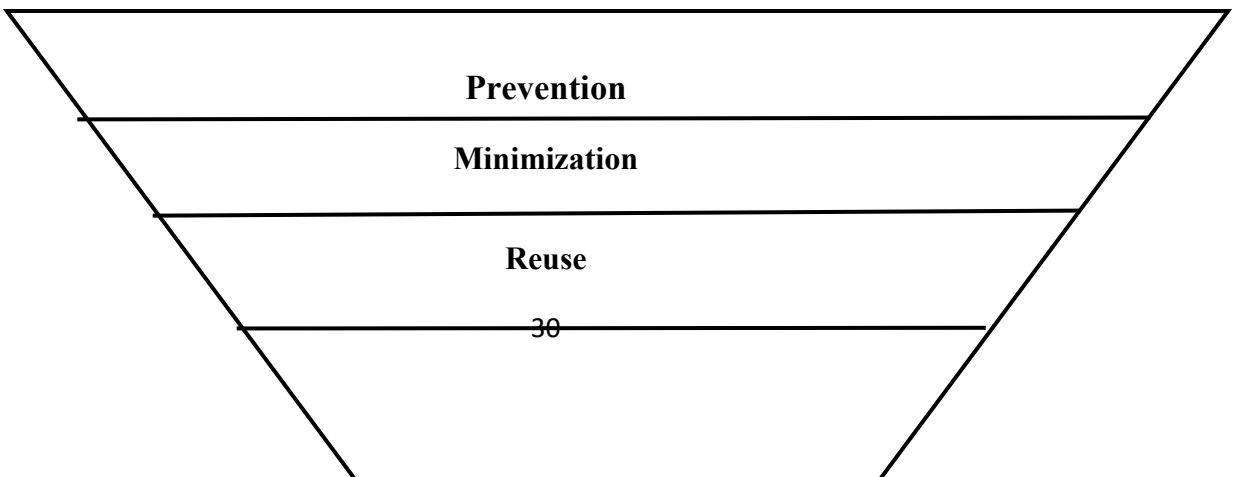
While energy recovery is not widely implemented in many developing countries due to high costs and technology demands, it remains an important option in situations where recycling is not possible.

Disposal (Landfilling and Incineration without Energy Recovery)

Disposal is the least preferred option in the hierarchy and involves placing waste in landfills or incinerating it without energy capture. Disposal is often necessary for waste that cannot be prevented, minimized, reused, recycled, or converted to energy. However, landfilling poses significant environmental threats such as groundwater contamination, greenhouse gas emissions, and land degradation.

Universities should aim to minimize reliance on disposal methods and focus more on the higher levels of the hierarchy to promote sustainable waste management.

Waste Management Hierarchy (Adapted from EPA, 2023)



Recycling

Energy Recovery

Disposal

SOLID WASTE DISPOSAL PRACTICES

Solid waste disposal practices refer to the various ways by which waste materials are managed from the point of generation to the point of final elimination. These practices play a crucial role in ensuring environmental safety, public health protection, and campus hygiene, especially in high-density environments like university campuses. Disposal practices differ based on the level of awareness, infrastructure, accessibility, and institutional commitment to sustainable waste management. Where proper systems are in place, solid waste is collected regularly, sorted appropriately, and disposed of using environmentally acceptable methods. Where such systems are lacking, however, indiscriminate dumping, open burning, and poor handling become common, exposing both humans and the environment to significant harm (UNEP, 2016).

Within the University of Benin campus, waste disposal practices vary depending on student behavior, available disposal infrastructure, and the presence or absence of

sanitation enforcement. Many students engage in improper disposal habits due to inadequate awareness or inconvenience, leading to overflowing bins, littering, and the blockage of water channels during rainfall. The consequences of such practices are not limited to untidy surroundings; they also include health hazards, pollution, and the breeding of disease vectors.

In many campus environments, even when waste receptacles are available, inconsistent waste evacuation schedules and poor maintenance often discourage proper use. Some waste bins overflow due to delayed removal, while others are not clearly labeled, making segregation difficult. In the absence of visible consequences or enforcement, individuals may feel little responsibility for the impact of their disposal behavior. Over time, such habits contribute to a culture of negligence where environmental sanitation becomes a secondary concern.

Broadly, solid waste disposal practices can be grouped into two categories:

Proper Disposal Practices

These include organized, safe, and environmentally conscious methods of waste management, such as:

- Use of waste bins: Properly labeled waste bins placed in strategic locations encourage organized disposal of biodegradable and non-biodegradable waste.

- Regular collection and transportation: Involves scheduled evacuation of waste by sanitation teams to designated dumpsites.

- Segregation at source: Sorting waste into categories such as paper, plastics, metals, and food waste for possible recycling or composting.

- Recycling and composting: Reuse of materials or conversion of organic waste into compost for agricultural use (World Bank, 2018).

- In institutions where proper disposal methods are embraced, there tends to be a visible improvement in cleanliness, odor control, and overall public health. Proper practices also reduce the burden on landfills and contribute positively to environmental conservation by cutting down on pollution and resource wastage.

Improper Disposal Practices

These are practices that pose threats to environmental and human health. They include:

- Open dumping: Disposing of waste in unauthorized open spaces like behind hostels or near drainage systems.

- Burning of waste: Especially plastics, which release harmful substances like dioxins into the air.

- Littering: Careless disposal of wrappers, bottles, and used paper across lecture halls and roadsides.

- Flushing non-degradable waste into drains: This leads to the clogging of drainage systems and promotes flooding during the rainy season (Tchobanoglous et al., 1993).

Improper practices often occur when individuals prioritize convenience over responsibility or when institutional structures fail to support sustainable habits. Sensitization campaigns, provision of adequate waste bins, student-led sanitation initiatives, and strict enforcement of disposal policies are necessary steps toward improving waste disposal behavior.

Moreover, the presence of role models in the campus community such as student leaders and sanitation staff can influence disposal habits positively. When individuals observe responsible behavior being practiced consistently, they are more likely to adopt similar routines, especially when reinforced by supportive policies and accessible facilities.

Promoting effective waste disposal practices requires collaboration between university authorities, students, vendors, and cleaners. The sustainability of any solid waste management system depends not just on physical infrastructure, but also on the collective discipline and environmental consciousness of those who generate the waste.

IMPACT OF IMPROPER SOLID WASTE DISPOSAL ON HEALTH AND THE ENVIRONMENT

The improper management of solid waste has become a significant global concern, especially in densely populated communities like universities, where large volumes of waste are produced daily. Improper solid waste disposal poses significant health and environmental risks, particularly in densely populated areas such as university campuses. When waste is not managed properly, it can lead to various adverse consequences that affect both the physical well-being of individuals and the ecological balance of the environment. Understanding these risks is essential in creating awareness and motivating responsible waste disposal practices among undergraduates: These include;

Health Risks

Improper solid waste disposal contributes to a wide range of health problems. These risks often stem from the accumulation of waste in public spaces, open burning, the proliferation of disease vectors, and the contamination of water sources. Below are some of the critical health hazards:

• **Proliferation of Disease Vectors and Epidemics**: One of the most immediate health consequences of improper waste disposal is the rapid spread of disease-causing organisms. Accumulated waste in open areas attracts rodents, flies, cockroaches, and other vectors capable of transmitting illnesses such as leptospirosis, dysentery,

gastroenteritis, cholera, typhoid fever, and salmonella. Improperly disposed waste, particularly in warm and moist environments, creates ideal conditions for the spread of these diseases (World Bank, 2018). These diseases spread quickly in community settings like universities where individuals live, eat, and interact closely. Stagnant water found in dumped waste can become a haven for mosquito breeding, increasing the incidence of vector-borne diseases such as malaria and dengue fever (UNEP, 2016)

• **Food and Water Contamination**: Improperly discarded waste can lead to the contamination of food sources and water systems. Leachates from decomposing waste can seep into groundwater or mix with rainwater to contaminate surface water supplies. This is particularly dangerous when such water sources are used for drinking or cooking without adequate treatment. Contaminated water can transmit a variety of waterborne diseases including hepatitis A, typhoid, and cholera, posing severe risks to student health (World Bank, 2018).

• **Risk to Waste Handlers and Scavengers**: Informal waste pickers, often untrained and unequipped with protective gear, are exposed to numerous health risks including cuts from sharp objects, exposure to medical or chemical waste, and respiratory issues from inhaling harmful fumes. On campuses where waste is not properly sorted, even sanitation workers can face injuries or infections due to hazardous waste mixed with general refuse (Tchobanoglous et al., 1993).

• **Mental Health Impact**: Chronic exposure to unsanitary conditions can also take a toll on mental well-being. Students living near dump sites or consistently exposed to foul odours, unsightly waste piles, and pest infestations may experience anxiety, stress, and decreased academic performance. The psychological burden of living in a polluted environment often goes unnoticed but contributes to the broader negative impact of poor waste management.

• **Respiratory, cardiovascular and Neurological Impacts from Toxins**: Certain hazardous waste materials, such as e-waste and chemicals, when burnt or improperly stored, release neurotoxins like lead, mercury, and cadmium. These substances, even in small concentrations, can impair brain development, lower IQ levels, and cause behavioral disorders. Students and staff exposed to such toxins, especially during open burning, may also suffer from chronic bronchitis, allergic reactions, and weakened immune systems. The open burning of waste common in areas with limited waste management infrastructure releases toxic fumes into the air, including particulate matter, carbon monoxide, dioxins, and other hazardous pollutants. These pollutants pose a significant risk to respiratory and cardiovascular health, particularly among vulnerable populations like children, the elderly, and individuals with pre-existing health conditions. Long-term exposure to air pollution from burning waste has been linked to asthma, bronchitis, and other chronic respiratory diseases (UNEP, 2016).

• **Chemical Poisoning**: Hazardous waste materials such as batteries, expired medications, and certain chemicals require special disposal methods. If these items are improperly discarded in general waste streams, they can pose a poisoning risk to humans and animals. For example, heavy metals like mercury and lead, often found in batteries and e-waste, can leach into the environment and enter the food chain, leading to serious health issues such as neurological damage, kidney failure, and developmental disorders (Tchobanoglous et al., 1993).

Environmental Risks

In addition to the health risks posed by improper solid waste disposal, there are several environmental consequences that threaten the natural ecosystem. These risks, when compounded over time, can lead to irreversible damage to the environment and biodiversity.

• **Degradation of Campus Aesthetics and Ecosystems**: The indiscriminate dumping of waste along walkways, near lecture halls, and around residential blocks detracts from the natural beauty and cleanliness expected in a learning environment. Waste accumulation on green spaces can also smother grass, damage ornamental plants, and degrade the campus' micro-ecosystem. Over time, this creates an unpleasant and unhealthy environment that diminishes institutional pride and community well-being.

• **Pollution of Drainage Systems and Urban Flooding**: Solid waste, particularly non-biodegradable items such as polythene bags, plastic bottles, and food wrappers, often ends up clogging drainage systems. Blocked drains result in waterlogging, which not only disrupts daily activities but also contributes to urban flooding during the rainy season. Flooded environments further increase the spread of waterborne diseases and damage infrastructure (World Bank, 2018).

• **Depletion of Air Quality:** The uncontrolled burning of waste on or near campus releases fine particulate matter (PM2.5 and PM10), sulfur oxides, and volatile organic compounds (VOCs) into the air. These pollutants significantly lower air quality, affecting both indoor and outdoor environments. Frequent exposure to polluted air can trigger respiratory illnesses and allergic reactions, making it particularly hazardous for individuals with asthma or other lung conditions (Tchobanoglous et al., 1993).

• **Greenhouse Gas Emissions**: Organic waste that is improperly disposed of in landfills or open dumping sites decomposes anaerobically, producing methane gas, a greenhouse gas that is about 25 times more potent than carbon-dioxide a potent greenhouse gas that contributes significantly to global climate change. The emission of methane from waste is a global concern, as it has a much higher heat-trapping potential than carbon dioxide, exacerbating the effects of global warming and climate change (World Bank, 2018). University campuses that do not implement composting or aerobic decomposition contribute to this issue, exacerbating global warming and climate change. As institutions

of learning, universities are expected to set examples in climate-conscious behavior, making this issue particularly pressing.

The risks associated with improper solid waste disposal are both far-reaching and multifaceted. On campuses like the University of Benin, failure to adopt proper disposal practices not only endangers students' health and the environment but also contradicts the educational mission of promoting responsible citizenship and sustainable development. By recognizing and addressing these risks, stakeholders especially students can play a pivotal role in transforming waste management culture on campus.

CHALLENGES IN SOLID WASTE MANAGEMENT IN UNIVERSITIES

Despite the recognized importance of solid waste management, many universities particularly in developing nations struggle with multiple challenges that hinder the establishment and maintenance of effective waste systems. These challenges often stem from a combination of institutional, behavioral, infrastructural, and financial factors. Below are key challenges typically encountered in academic environments;

- **Lack of Awareness and Environmental Education**

Many students and staff lack adequate knowledge about the importance of proper waste handling and its environmental consequences. Without targeted education, individuals may fail to separate waste, misuse disposal bins, or engage in careless littering around campus. This is often due to the absence of formal training or awareness programs on sustainability and waste segregation. Environmental education is crucial for cultivating responsible behavior and active participation in waste management practices (UNESCO, 2020).

• **Insufficient Waste Segregation Practices**

Most institutions fail to implement waste segregation at the source. Instead of separating organic, recyclable, and hazardous waste into distinct containers, all waste types are often dumped together, making recycling or composting nearly impossible. This not only undermines recovery efforts but also increases the burden on waste handlers and disposal systems

• **Inadequate Infrastructure and Facilities**

Universities often lack the necessary infrastructure such as color-coded bins, recycling stations, compost pits, and designated collection points. Even when bins are available, they may be poorly labeled, insufficient in number, or irregularly maintained. This leads to overflows, foul smells, and scattered waste across campus grounds.

• **Poor Policy Enforcement and Institutional Neglect**

Even where environmental policies exist, weak enforcement undermines their effectiveness. Waste management units may be underfunded, understaffed, or treated as low priority by school authorities. In some cases, there may be no clear waste management policy at all, leading to fragmented and reactive responses. Institutional commitment is a critical factor in the success of campus-wide environmental initiatives (World Bank, 2021).

• **Irregular Collection and Disposal**

Irregular or delayed waste collection services result in waste accumulation and overflow. This not only causes visual pollution but also attracts pests and rodents, posing serious health hazards. In some campuses, waste may remain uncollected for days or be burned openly, which leads to air pollution and health risks for nearby residents.

• **High Waste Generation from Student Activities**

University environments are highly active spaces that generate large volumes of waste from cafeterias, hostels, laboratories, lecture halls, and recreational events. Food packaging, paper waste, plastic containers, and other refuse accumulate quickly, especially during peak academic sessions or social events, making it difficult to maintain order without a structured system.

• **Financial Constraints**

Implementing and maintaining a sustainable waste management system requires funding for bins, trucks, recycling units, composting facilities, staff salaries, and public education campaigns. Many public universities operate on limited budgets and prioritize academic or infrastructural development over waste control, resulting in underinvestment in environmental sanitations.

Negative Attitudes and Behavioral Habits

Even with available facilities, student indifference or resistance to behavioral change is a major obstacle. Some students do not feel personally responsible for the campus environment and may ignore rules about bin usage, reuse, or recycling. Others may see waste separation as time-consuming or unnecessary due to a lack of visible enforcement or incentives.

Lack of Skilled Personnel

The absence of trained personnel in environmental science, waste management, or public health can limit the development of innovative waste strategies on campus. Maintenance staff may lack the training needed to manage recycling processes or handle hazardous waste safely.

Limited Collaboration with External Waste Agencies

Some universities operate in isolation without proper partnerships with municipal waste agencies, recycling companies, or environmental NGOs. This restricts their access to broader waste handling expertise, professional training, and efficient waste processing technologies.

Strategies Solid Waste Management

Effective waste management in higher institutions such as universities is essential due to the high volume and diversity of waste generated daily. When inadequately managed, this waste leads to environmental degradation, air and water pollution, vector-borne diseases, and general campus disorder. Unfortunately, many tertiary institutions especially in developing countries grapple with ineffective waste management systems due to poor infrastructure, lack of awareness, and limited funding.

To address these issues, various strategies for improving solid waste management have been developed and can be tailored to suit campus environments. These strategies are not only practical but also align with global sustainability frameworks such as the United Nations Sustainable Development Goals (SDGs), particularly SDG 11 (Sustainable Cities and Communities) and SDG 12 (Responsible Consumption and Production).

Strategies for Improving Solid Waste Management in Universities

• Waste Audit and Baseline Assessment

An important starting point is to conduct a waste audit to assess the types, sources, and quantities of waste generated on campus. This helps in identifying problem areas and planning targeted interventions. Data from audits can guide decisions on the number and type of bins required, the frequency of waste collection, and areas that need behavior change campaigns.

A data-driven approach ensures that waste management strategies are relevant, effective, and evidence-based (EPA, 2021).

• Promotion of Waste Segregation at Source

Segregating waste at the point of generation makes it easier to recycle, compost, or safely dispose of materials. This involves providing color-coded bins for different types of waste—such as green for organics, blue for recyclables, and red for hazardous waste. Proper labeling and regular awareness campaigns can encourage compliance among students and staff.

Source separation is key to reducing waste contamination and increasing material recovery rates (UNEP, 2020).

• Establishment of Campus Recycling Programs

Universities can develop on-site or partnership-based recycling programs. Paper, plastics, bottles, and metals can be collected and sent to recycling centers, while electronic waste should be managed through certified e-waste vendors. Recycling clubs and green student organizations can also play a role in managing collection points and raising awareness.

Recycling not only conserves resources but also instills a culture of environmental responsibility among the student population.

• Composting of Organic Waste

Organic waste, especially from cafeterias and gardens, can be composted to produce nutrient-rich manure. This compost can be used in campus landscaping or donated to local farmers. Institutions can establish small-scale composting facilities using bins, windrows, or tumblers, depending on their budget and waste volume.

Composting reduces the amount of waste sent to landfills and contributes to a circular economy by transforming waste into a valuable resource.

• Integration of Environmental Education

Sustainability and waste management topics should be embedded into the curriculum and student orientation programs. Interactive sessions, workshops, and eco-competitions can educate students about the environmental, social, and economic implications of poor waste practices and inspire change.

Education is a long-term investment that shapes attitudes and behaviors toward sustainable waste management (UNESCO, 2020).

• Adoption of the Waste Management Hierarchy

Universities should follow the waste management hierarchy: prevention, minimization, reuse, recycling, energy recovery, and disposal. This framework ensures that waste is handled in the most environmentally sound way, giving preference to upstream solutions (like waste reduction) over downstream methods (like disposal).

Hierarchical models provide strategic direction for sustainable and progressive waste handling.

• Policy Development and Institutional Commitments

A clear waste management policy backed by university administration is essential for sustainable practice. This policy should outline roles and responsibilities, budgeting, enforcement mechanisms, penalties for non-compliance, and long-term goals. Establishing a waste management committee can help monitor progress and address implementation challenges.

Strong institutional will is the backbone of any successful environmental initiative (World Bank, 2021).

• Regular Training for Cleaning Staff and Waste Handlers

Personnel involved in waste collection, sorting, and disposal must be trained in safety protocols, use of protective equipment, waste sorting techniques, and emergency responses for handling hazardous waste. This ensures safe operations and reduces occupational health risks.

• Public Awareness and Behavioral Change Campaigns

Posters, social media campaigns, seminars, and notice boards can be used to inform and engage the campus community. Behavior change communication encourages waste minimization, encourages proper bin usage, and discourages open dumping and littering. Sustainable waste management requires active participation from all campus members; not just cleaning staff.

• Monitoring, Evaluation, and Continuous Improvement

Institutions should periodically review their waste management practices, using key performance indicators such as waste reduction percentage, recycling rates, and student participation. This continuous feedback loop enables updates to strategies, ensuring adaptability and long-term success.

Solid waste management in universities is a multifaceted process that requires technical planning, policy support, behavioral change, and continuous education. With strategic improvements rooted in the waste hierarchy and sustainability principles, universities can reduce their environmental footprint, promote health, and serve as models of eco-responsible behavior for students and the broader community. By embedding waste management into the institutional culture, tertiary institutions can play a vital role in achieving a cleaner, safer, and more sustainable future.

Summary of Literature Review

The review of related literature has provided an extensive understanding of the concepts, issues, and factors surrounding solid waste management among undergraduates in the halls of residence. The concept of solid waste has been defined as any unwanted or discarded material generated from human activities, while improper solid waste disposal refers to the careless and unsafe handling of these wastes without considering their environmental or health consequences.

The classification and sources of solid waste were discussed, showing that wastes may originate from various campus activities such as domestic, academic, and recreational activities. The solid waste management hierarchy was also explored, emphasizing the steps of waste prevention, minimization, reuse, recycling, energy recovery, and final disposal as the globally accepted waste management approach.

The literature reviewed further examined various solid waste disposal practices, revealing that despite awareness, many undergraduates engage in improper disposal methods due to limited infrastructure, poor supervision, and lack of sustained educational programs. The review also highlighted the health and environmental risks associated with poor waste disposal, such as the spread of communicable diseases (e.g., malaria, typhoid, diarrhea), pollution of water bodies, air pollution, and blocked drainages that contribute to flooding.

The theoretical framework supporting this study was built on the Environmental Responsibility Theory and Health Belief Model, which explain how individuals' knowledge, beliefs, and perceived consequences influence their waste management behaviors.

In addition, challenges facing solid waste management in universities were identified, including inadequate funding, insufficient waste disposal facilities, lack of waste sorting practices, weak enforcement of environmental policies, and low student participation in waste reduction activities.

Finally, several strategies for improvement were reviewed, such as increasing waste management education and awareness, providing adequate waste bins, improving waste collection frequency, enforcing waste management policies, and introducing recycling programs.

The reviewed literature has established a solid foundation for the present study, showing the relevance of assessing the knowledge, practices, and impact of improper solid waste disposal among students residing in the halls of residence at the University of Benin.

CHAPTER THREE

METHODOLOGY

This chapter presents the research methods and procedures adopted for the study. This is outlined under the following sub-headings:

- Design of the study
- Population of the Study
- Sample and Sampling Technique
- Research Instrument
- Validity of the Instrument
- Reliability of the Instrument
- Method of Data Collection
- Method of Data Analysis

Design of the Study

The study adopted a descriptive survey research design. This design was considered appropriate as it allows the researcher to systematically collect and analyze data that describe the existing knowledge, practices, and impacts of improper solid waste disposal among undergraduates in the halls of residence. The descriptive survey method facilitated the observation and documentation of the current situation as it exists without

manipulating any variables. It enabled the researcher to gather quantifiable data that reflects the views, behaviors, and experiences of the respondents.

Population of the Study

The population for this study is 12,234 students from the halls of residence (University of Benin Student Affairs Division, ICT department 2025). The target population of this study consists of all the undergraduate students residing in the 12 Halls of residence at the University of Benin,

Ugbowo Campus. This population was chosen because students living within the campus halls generate significant amounts of solid waste, and their practices have a direct influence on the campus waste management system. The population includes male and female students across various faculties and departments.

Sample and Sampling Technique

A sample size of 180 respondents was selected from the undergraduate students in the halls of residence. The sample size was determined using a stratified random sampling technique. The halls of residence served as the strata, ensuring that students from different halls (both male and female) were adequately represented. From each hall, a random selection of respondents was made to form a representative sample size. This technique helped in minimizing sampling bias and ensured that the data collected reflects

the diverse experiences and waste disposal practices of students in different living environments within the halls of residence.

Research Instrument

The main instrument for data collection was a structured questionnaire designed by the researcher. The questionnaire was designed based on the research questions of this study. The questionnaire consisted of both closed-ended and Likert scale questions and was divided into two sections. Section A covered demographic information such as age, gender, level of study, and hall of residence. Section B was developed in line with the research questions and sought information on the methods and facilities that were used for waste disposal in the hostels, students' level of awareness of proper disposal, their understanding of the health and environmental risks associated with improper disposal, the frequency with which they engaged in practices such as open dumping and littering, and the challenges that hindered effective waste management in the halls of residence. The questionnaire was carefully structured to elicit honest and accurate responses from the participants.

Validity of the Instrument

To ensure the validity of the instrument, the draft questionnaire was reviewed by my project supervisor and two experts in health safety and environmental education department. Their feedback was used to refine the content, structure, and clarity of the

questions. Content validity was emphasized to ensure that the items adequately covered the research objectives and variables under study.

Reliability of the Instrument

A test was carried out in order to ascertain the reliability of the instrument used in this study. Reliability of this study was determined by the split half method. This was done by randomly picking 20 questionnaires that were divided into odd and even set of scores.

Method of Data Collection

Primary data were collected through the administration of the validated questionnaires. The researcher personally administered the questionnaire to respondents in their respective halls of residence. Participants were properly briefed on the purpose of the study, assured of confidentiality, and informed of their voluntary participation. Completed questionnaires were retrieved immediately or within a short time frame to ensure a high response rate.

Method of Data Analysis

The data collected were analyzed using Descriptive statistics that is percentages were used to summarize the data. The analyzed data would be presented in tables for clear interpretation and discussion.

CHAPTER FOUR

PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

This chapters deals with the presentation, analysis and interpretation of findings based on the data collected from respondents in relation to the research questions guiding the study.

Research Question 1: What is the level of knowledge regarding proper solid waste disposal among undergraduates?

Table 1: Knowledge of proper solid waste disposal

S/N	Level of Knowledge	Frequency	Percentage
1	Low (1-2)	36	20.00%
2	High (3-5)	144	80.00%
	TOTAL	180	100%

Source: Field survey, 2025

Table 1 shows that the majority of undergraduates (80%) demonstrated high knowledge of proper solid waste disposal, while 20% had low knowledge. This suggests that most students are aware of appropriate waste management practices, although a small fraction still lack sufficient knowledge.

Research Question 2: What is the level of awareness of students towards proper solid waste disposal?

Table 2: Students' awareness of proper solid waste disposal.

ITEMS	YES (%)	NO (%)	TOTAL (%)
Have you ever received any information or education on proper solid waste disposal?	117 (65.0%)	63 (35.0%)	180 (100%)
Do you know the difference between biodegradable and non-biodegradable waste?	94 (52.22%)	86 (47.78%)	180 (100%)
Are you aware of the waste disposal facilities provided in your hostel (e.g., bins, collection points)?	107 (59.44%)	73 (40.56%)	180 (100%)
Have you ever participated in any waste management or environmental sanitation activity on campus?	75 (41.67%)	105 (58.33%)	180 (100%)
Do you think students in your hostel have sufficient awareness about proper solid waste disposal?	66 (36.67%)	114 (63.33%)	180 (100%)

Source: Field survey, 2025.

Table 2 above shows that 65% of students reported having received some form of information or education on proper waste disposal. Slightly more than half (52.2%) could distinguish between biodegradable and non-biodegradable waste, while 59.4% were aware of hostel disposal facilities. However, less than half (41.7%) had participated in waste management activities, and only 36.7% believed that students in their hostel had sufficient awareness. Overall, the totals suggest an almost balanced split between “Yes” (51%) and “No” (49%) across all items, indicating moderate awareness with gaps in participation and collective consciousness.

Research Question 3: To what extent do students understand the environmental and health risks associated with improper waste disposal?

Table 3: Students' Perception of the Consequences of Poor Waste Management in Hostels

S/N	ITEMS	SA (%)	A (%)	D (%)	SD (%)	MEAN	S.D	DECISION
1	Open dumping of waste in the hostel environment increases the spread of pests such as rats, flies, and mosquitoes.	88 48.9%	85 47.2 %	5 2.8%	2 1.1%	3.44	.61	Positive
2	Burning waste in the hostel environment exposes students to harmful gases that can cause respiratory problems.	67 37.2%	103 57.2 %	8 4.4%	2 1.1%	3.31	.61	Positive
3	Poor waste management contributes to flooding during the rainy season.	0 0.0%	110 61.1 %	9 5.0%	0 0.0%	2.92	.27	Positive
4	Improper waste disposal leads to water pollution that may affect drinking water sources.	58 32.2%	109 60.6 %	7 3.9%	6 3.3%	3.22	.67	Positive

5	Improper waste disposal can cause diseases such as cholera, malaria and typhoid.	110 61.1%	60 33.3 %	6 3.33%	4 2.22%	3.00	.65	Positive
CLUSTER MEAN						**3.22**		

(Cluster mean; 3.22, Benchmark mean; 2.50) ***Source: Field survey, 2025.***

The analysis in table 3 shows that students overwhelmingly recognize the negative consequences of poor waste management in hostels. A majority (96.1%) agreed or strongly agreed that open dumping increases pests, with a high mean score of 3.44. Similarly, most respondents (94.4%) affirmed that burning waste exposes students to harmful gases (mean = 3.31). While fewer strongly agreed that waste mismanagement contributes to flooding, the mean value of 2.92 still indicates general agreement. Additionally, 92.8% supported that improper disposal leads to water pollution, reflected in a mean score of 3.22. With a cluster mean of 3.22, which is well above the benchmark of 2.50, the overall decision is positive, meaning students are highly aware of the environmental and health risks associated with poor waste management in hostels.

Research Question 4: How frequently do students engage in improper waste disposal practices, such as open dumping and littering?

Table 4: Students' Engagement in Improper Waste Disposal Practices.

S/N	ITEMS	SA (%)	A (%)	D (%)	SD (%)	MEAN	S.D	DECISION
1	I often throw waste on the hostel premises instead of using a bin.	26 14.4%	41 22.8 %	56 31.1%	57 31.7%	2.20	1.05	Negative
2	I sometimes flush materials like sanitary pads or nylon bags in toilets, causing blockages.	15 8.3%	39 21.7 %	61 33.9%	65 36.1%	2.02	.99	Negative
3	I throw waste out of windows or balconies in the hostel.	22 12.2%	45 25.0 %	49 27.2%	9 4%	2.14	1.05	Negative
4	I dump waste near hostel drainage channels or gutters.	28 15.6%	47 26.1 %	48 26.7%	57 31.7%	2.26	1.06	Negative
5	Because bins are inadequate, I resort to improper disposal methods.	30 16.7%	52 28.9 %	48 26.7%	50 27.8%	2.34	1.05	Negative
CLUSTER MEAN						**2.19**		

(Cluster mean; 2.19, Benchmark mean; 2.50) ***Source: Field survey, 2025.***

The findings in table 4 above, reveal that students generally disagreed with statements suggesting frequent engagement in improper waste disposal practices. For example, only 37.2% admitted often throwing waste on hostel premises, while the majority either disagreed or strongly disagreed (62.8%), resulting in a mean score of 2.20. Similarly, flushing inappropriate materials in toilets had a low mean of 2.02, indicating that most students did not engage in such behavior. Throwing waste out of windows, dumping near drainage, and resorting to improper disposal due to inadequate bins all had mean values below the 2.50 benchmark, pointing to infrequent practice. With a cluster mean of 2.19, the overall decision is negative, suggesting that while instances of improper waste disposal exist, they are not the dominant behavior among students.

Research Question 5: What challenges hinder effective waste management in the university's residential halls?

Table 5: Challenges hindering effective waste management in hostels

S/N	**Knowledge Level**	**Frequency**	**Percentage**
1	Low (1–2)	32	17.8%
2	High (3–5)	148	82.2%
	Total	180	100%

(1–2 = Low Knowledge, 3–5 = High Knowledge) **Source: Field survey, 2025.**

Table 5 above shows the categorization of respondents' knowledge regarding challenges hindering effective waste management in hostels. Out of 180 undergraduates, 148 (82.2%) demonstrated high knowledge, while only 32 (17.8%) fell under the low knowledge category. This implies that the majority of students are well aware of the major challenges affecting hostel waste management.

Discussion of Findings

This study assessed undergraduate students' knowledge, awareness, perceptions, practices, and perceived challenges concerning proper solid waste disposal in university hostels. Using a descriptive survey design, data were collected from 180 students through a structured questionnaire, and the findings are here discussed in line with the research objectives.

The results showed that the majority of respondents (80%) demonstrated a high level of knowledge of proper waste disposal, while only 20% exhibited low knowledge. This indicates that most undergraduates are well informed about appropriate waste management practices. Similar results have been reported in other studies, where students displayed high awareness of waste segregation and disposal methods as a result of sensitization and educational exposure (Adeniran et al., 2021; Onwuka & Eze, 2019). However, the minority with low knowledge highlights the persistence of gaps that call for sustained environmental education.

Although knowledge was generally high, levels of awareness and participation were less encouraging. For example, while 65% of the respondents had received information on waste disposal and 52.2% could differentiate between biodegradable and non-biodegradable waste, only 41.7% had participated in waste management activities, and just 36.7% believed that their peers were sufficiently aware. This points to a gap between individual knowledge and collective engagement. Similar patterns have been observed in related works, which noted that while students may understand the principles of waste management, they often fail to translate such knowledge into active involvement in sanitation and disposal programmes (Adams et al., 2020; Eze, 2019).

The findings also showed that students were strongly aware of the health and environmental risks of improper waste disposal, with a cluster mean of 3.22. The majority agreed that poor waste management leads to pest infestation, respiratory problems, flooding, water pollution, and the spread of diseases such as malaria, cholera, and typhoid. This finding supports earlier studies which demonstrated that undergraduates readily connect waste mismanagement with health hazards and environmental degradation (Eze & Nwachukwu, 2022). Such awareness is important, as it provides a foundation for attitudinal and behavioural change.

Despite this, some respondents admitted to engaging in improper waste disposal practices, though not frequently. The cluster mean of 2.19 suggests that practices such as dumping waste near drainage channels or throwing refuse on hostel premises occur but are not

predominant. These behaviours were often attributed to inadequate waste facilities, particularly insufficient bins. This reflects the well-documented knowledge–attitude–practice gap, where students' understanding of proper disposal does not always result in consistent practice. Studies conducted in other Nigerian universities have reported similar lapses, noting that infrastructural deficiencies and irregular waste collection services frequently compel students to dispose of waste indiscriminately (Eneh, 2018; Udo & Akpan, 2019).

Finally, respondents demonstrated high knowledge of the challenges hindering effective waste management in the hostels, with 82.2% identifying issues such as poor facilities, irregular collection, and weak sensitization. These findings agree with the conclusions of Ogunyemi (2021) and Okonkwo (2020), who emphasized that without adequate institutional support and provision of facilities, effective and sustainable waste management in university hostels remains difficult to achieve.

Taken together, the findings show that while students possess strong knowledge and risk awareness, these are not always reflected in their practices. The results highlight the importance of bridging the gap between knowledge and behaviour through improved infrastructure, regular sensitization, and stronger institutional enforcement.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

SUMMARY

The purpose of this study examined the knowledge, practices, and impact of improper solid waste disposal among undergraduates in the Halls of Residence, University of Benin, Ugbowo Campus. The study was guided by five research questions which focused on the students' knowledge of proper solid waste disposal, their awareness of disposal facilities and methods, their understanding of the health and environmental consequences of improper disposal, the extent of their participation in improper disposal practices, and the challenges that hinder effective waste management in the halls of residence.

The study adopted a descriptive survey design. The population consisted of undergraduate students residing in the 12 Halls of Residence at the University of Benin, Ugbowo Campus, with a total estimated population of 12,234 residents (Student Affairs, ICT Department, 2025). A sample of 180 students was selected using the stratified sampling technique, with each hostel serving as a stratum to ensure fair representation of the population. The instrument for data collection was a structured questionnaire. The validity of the instrument was ensured through expert judgment by my project supervisor

and two other specialists in the field. To establish reliability, the split-half method was employed. The questionnaire was administered personally to the respondents, ensuring adequate coverage of all hostels. Data collected were analyzed using frequency counts, percentages, means, and standard deviations.

Findings showed that the majority of respondents (80%) demonstrated high knowledge of proper solid waste disposal while 20% showed low knowledge. Awareness was moderate: about 65% of students reported having received information or education on waste disposal and 59.4% were aware of disposal facilities in their hostels, yet only 52.2% could correctly distinguish biodegradable from non-biodegradable waste. Participation in sanitation activities was low (41.7%), and only 36.7% believed their peers were sufficiently aware. On perception, students recorded a high cluster mean (3.22), indicating strong recognition that improper disposal contributes to pest infestation, water pollution, flooding, respiratory problems, and communicable diseases such as cholera, typhoid, and malaria. Despite the generally high knowledge and risk awareness, some improper practices were still reported, though they were not predominant (cluster mean = 2.19). Lapses included dumping refuse near drainage channels, throwing waste out of windows or balconies, and flushing inappropriate items into toilets; respondents largely attributed these behaviours to inadequate waste facilities (insufficient bins) and irregular collection services. Students also demonstrated high awareness of the systemic challenges hindering effective hostel waste management (82.2%), identifying inadequate infrastructure, irregular collection, weak institutional enforcement, and limited

sensitization as principal obstacles. Overall, these results point to a clear knowledge – practice gap that requires both behavioural interventions and institutional improvements.

CONCLUSION

In light of the findings of this study, the following conclusions were drawn:

1. **High Knowledge and Awareness**: It is evident that undergraduate students in the Halls of Residence, University of Benin, Ugbowo Campus, are generally knowledgeable about proper solid waste disposal and are conscious of its health and environmental implications. However, the results equally demonstrate that this knowledge has not translated fully into positive practices. While many students recognize the dangers of poor waste management, infrastructural and systemic shortcomings continue to hinder consistent adoption of proper practices.

2. **Knowledge – Practice Gap**: Furthermore, the conclusion points clearly to the knowledge –practice gap, which is common in environmental and health-related behavior. Students know the right thing to do, yet they sometimes engage in improper practices due to lack of facilities, irregular collection of waste, and poor monitoring. This gap shows that awareness and knowledge alone cannot guarantee behavioral change without adequate institutional support.

3. **Low Participation in Sanitation Activities**: Another important conclusion is that participation in environmental sanitation and waste management activities is low. Even

though students understand the risks associated with poor disposal, fewer than half have ever actively participated in organized sanitation exercises within the halls of residence. This suggests that waste management is still seen more as an institutional responsibility than a shared community duty. To promote sustainable behavior, students must be actively involved as stakeholders rather than passive beneficiaries.

4**. Recognition of Structural Challenges**: In addition, the results show that undergraduates recognize the challenges facing hostel waste management. They are conscious of the inadequacy of facilities, irregular collection schedules, and weak enforcement. This awareness is important because it reflects that students do not perceive improper disposal solely as an individual problem but also as a structural issue that requires institutional response. Thus, improving waste management on campus will require a combination of both behavioral and systemic interventions.

5. **Need for Institutional Strengthening**: Finally, while the level of knowledge and awareness among students is commendably high, the persistence of improper disposal practices reveals the pressing need for the University of Benin to strengthen its waste management infrastructure, policies, and sensitization programs. Only then will students' knowledge and awareness translate into sustainable practices that promote a healthy environment in the halls of residence.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

1. **Provision and Maintenance of Waste Facilities**: The University of Benin should provide more waste bins across the halls of residence, ensuring that they are strategically located and regularly emptied. Clear and enforceable policies on waste disposal should also be established, with sanctions for offenders and incentives for compliance. This combination of adequate facilities and effective regulation will reduce improper disposal and encourage responsibility among students.

2. **Integration of Environmental Education**: Environmental education should be intensified and integrated into student orientation programs, General Studies (GST) courses, and hostel-level campaigns. Regular workshops, sensitization seminars, and continuous awareness campaigns through posters, flyers, hostel notice boards, and social media should be sustained to reinforce the importance of proper waste management and its health and environmental benefits.

3. **Promotion of Student Participation and Leadership**: Student-led environmental clubs and sanitation committees should be encouraged and supported within the halls of residence. By taking direct responsibility for environmental activities, students will

develop stronger commitment and ownership, thereby bridging the knowledge – practice gap identified in this study.

4. **Incentive-Based Approaches**: The University should introduce competitions, awards, and recognition for the cleanest hostels or the most active student sanitation groups. This incentive-based strategy will promote a healthy sense of rivalry and motivate students to adopt sustainable practices consistently.

5. **Strengthening Monitoring and Supervision**: Institutional monitoring should be enhanced through periodic inspections by hostel wardens and environmental health officers. Clear reporting channels should also be created for students to lodge complaints about lapses in waste collection or facility challenges. This will ensure accountability and quick response to waste management issues.

6. **Collaborations and Broader Sustainability Goals**: The University should collaborate with government agencies, NGOs, and private waste management firms to access technical expertise, funding, and modern solutions such as recycling and composting. Waste management efforts should also be linked to broader sustainability goals like climate change mitigation, biodiversity protection, and public health improvement, so students see their actions as part of a larger societal contribution.

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APPENDIX

DEPARTMENT OF HEALTH, SAFETY AND ENVIRONMENTAL EDUCATION

FACULTY OF EDUCATION

UNIVERSITY OF BENIN, BENIN CITY

KNOWLEDGE, PRACTICES AND IMPACT OF IMPROPER SOLID WASTE DISPOSAL AMONG UNDERGRADUATES IN HALLS OF RESIDENCE UNIVERSITY OF BENIN UGBOWO CAMPUS, BENIN CITY

Dear Respondent,

I am a final-year (400-level) student in the Department of Health, Safety and Environmental Education, University of Benin. This questionnaire is part of my academic research on the topic: 'Knowledge, Practices and Impact of Improper Solid Waste Disposal among Undergraduate in Halls of Residence University of Benin Ugbowo, Benin City'

The purpose of this study is to assess students' level of awareness and understanding of proper waste disposal, their current waste management practices, and the challenges they face in maintaining a clean campus environment. Your honest and accurate responses

will provide valuable insights and will be treated with strict confidentiality. All information gathered will be used solely for academic purposes.

Thank you for your time and participation.

SECTION A: Demographic Information

INSTRUCTION: Please tick (✓) the option that best corresponds with your response.

1. Age: [ ] 16years–20years, [ ] 21years–25years, [ ] 26years–30years, [ ] Above 30years

2. Gender: [ ] Male, [ ] Female

3. Level of Study: [ ] 100L, [ ] 200L, [ ] 300L, [ ] 400L, [ ] 500L

4. Hall of Residence: [ ] Hall 1, [ ] Hall 2, [ ] Hall 3, [ ] Hall 4, [ ] Hall 5, [ ] Hall 6, [ ] Hall 7

[ ] DANJUMA , [ ] Keystone , [ ] NDDC, [ ] NELSON MENDELA, [ ] TETFUND

SECTION B

Research Question 1: What methods and facilities are currently used for solid waste disposal and management in the hostels?

1. **What method of waste disposal is most commonly used in your hostel?**

a) Dustbins placed in rooms/corridors

b) Central waste collection points outside the hostel

c) Open dumping around the hostel premises

d) Others

2. **How often are waste bins/collection points in your hostel emptied?**

a) Daily

b) Every 2–3 days

c) Once a week

d) Rarely

3. **Are there enough waste disposal facilities (bins, bags, collection points) in your hostel to meet the needs of residents?**

a) Yes, they are adequate

b) No, they are inadequate

4. **What challenges do you face with the waste disposal system in your hostel?**

a) Insufficient number of bins

b) Irregular evacuation of waste

c) Lack of awareness among students

d) Poor maintenance of facilities

5. **Who is primarily responsible for managing waste disposal in your hostel?**

a) Hostel cleaners/staff

b) Students themselves

c) University management

d) External waste management company.

Research Question 2: What is the level of awareness of students towards proper solid waste disposal?

S/N	Statement	Yes	No
6.	Have you ever received any information or education on proper solid waste disposal?		
7.	Do you know the difference between biodegradable and non-biodegradable waste?		
8.	Are you aware of the waste disposal facilities provided in your hostel (e.g., bins, collection points)?		
9..	Have you ever participated in any waste management or environmental sanitation activity on campus?		
10.	Do you think students in your hostel have sufficient awareness about proper solid waste disposal?		

Research question 3: To what extent do students understand the environmental and health risks associated with improper waste disposal?

S/N	Statement	SA	A	D	SD
11.	Improper waste disposal can cause diseases such as cholera, malaria, and typhoid.				
12.	Open dumping of waste in the hostel environment increases the spread of pests such as rats, flies, and mosquitoes.				
13.	Burning waste in the hostel environment exposes students to harmful gases that can cause respiratory problems.				
14.	Poor waste management contributes to flooding during the rainy season.				
15.	Improper waste disposal leads to water pollution that may affect drinking water sources.				

Research Question 4: How frequently do students engage in improper waste disposal practices, such as open dumping and littering?

S/N	Statement	SA	A	D	SD
16.	I often throw waste on the hostel premises instead of using a bin				

17.	I sometimes flush materials like sanitary pads or nylon bags in toilets, causing blockages.				
18.	I throw waste out of windows or balconies in the hostel.				
19.	I dump waste near hostel drainage channels or gutters.				
20.	Because bins are inadequate, I resort to improper disposal methods				

Research Question 5: What challenges hinder effective waste management in the University's residential halls?

21. **Which of the following challenges do you face most with waste disposal in your hostel?**

a) Lack of waste bins

b) Overflowing bins not emptied regularly

c) Distance of waste collection points

d) Irregular waste collection

22. **How does overcrowding in hostels affect Waste management**?

a) It increases waste beyond capacity

b) It makes bins full up too quickly

c) It creates littering habits

d) All of the above

23. **If Waste management is to improve, what area should be addressed first**?

a) Increase number of bins

b) Employ more cleaners

c) Enforce hostel rules strictly

d) Educate students on proper waste disposal

24. **What attitude contributes most to waste problems in hostels?**

a) Careless dumping by students

b) Lack of enforcement of sanitation rules

c) Indifference to environmental cleanliness

d) Burning of waste by students

25. **In your opinion, what is the biggest challenge hindering effective hostel waste management?**

a) Insufficient facilities (bins, collection points)

b) Poor funding/support from management

c) Lack of awareness among students

d) Irregular waste collection by contractors