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Waste Management Practices in Taraba State University, Jalingo, Nigeria

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Abstract

This paper focuses on the management of solid waste generated on the campus of Taraba State University, Jalingo. The study examines the points and methods of waste reduction, problems faced during waste storage, disposal methods used, preliminary waste management strategies, and challenges encountered. Secondary data was gathered from various sources, including interviews with the university's environmental sanitation unit. The study involved 327 respondents and found that burning and open dumping were the primary disposal methods used by the university community. The research highlights the environmental and health hazards posed by these practices and emphasizes the need for more sustainable waste management approaches. Recommendations include adopting landfilling, organizing waste collection points, conducting environmental sanitation exercises, and implementing waste-to-energy conversion activities. Overall, the findings suggest a shift towards more environmentally friendly waste management practices is necessary for Taraba State University.

Keywords: Waste Management, TSU Jalingo, Nigeria

Introduction

Waste is any substance or material which requires to be disposed of as being broken, worn out, contaminated or otherwise spoilt and as such lost its usefulness [1]. The Global Waste Management Outlook (GWMO) further describes the word waste as unwanted or discarded materials rejected as useless, unneeded, or excess to requirements, and it can be viewed as the combination of the wrong substance, of the wrong quality, and in the wrong place at the wrong time [2]. Wastes can be also defined as substances or Objects, which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law [3]. They also refer to any item, material or substance you as an individual consider useless at a given time and place [4]. They are also termed as materials generated from the result of human daily activities resulting from areas such as households, public places, city, streets, shops, offices, hospitals and many other different industrial sectors [5].

Solid waste is the term used to describe non-liquid waste materials arising from domestic, trade, commercial, agricultural, industrial activities and from public services. It could be in liquid or solid form and could be hazardous. These classification ranges from garbage or refuse from homes and other places where human or animal lives exist [6]. Types of solid waste are categorized as different items of waste such as paper, packaging materials, plastic, textiles, glass, food related, metals, and kitchen-related waste [7].

Waste generation and characterization is a fundamental step taken for effective waste management [6]. In Nigeria, the increase in waste quantity and variety has been due to population growth and industrialization and its basic solid waste management stem based on collection, transportation and disposal has remained highly inefficient and ineffective [8,9]. The principal sources of Solid Waste in an urban area are: Municipal (from street sweeping, sewage, waste from schools, markets and other institutions); Domestic (garbage, rubbish and often large waste from homes); Commercial (from

stores and offices); Industrial (from manufacturing plants); Mining (from coal mining, strip mining etc.); Construction and Demolition (new construction sites, road repairs, renovation sites razing broken pavements); Agriculture [10].

Municipal solid waste (MSW) has usually been divided into six categories: food residues, wood waste, pulp, textiles, plastics, and rubber. Products may be further divided into subgroups within each grouping [11]. Properly regulated waste will support the society economically and socially through recycling and, where possible, reusing waste. Solid waste treatment main elements include on-site managing, processing and storing; garbage collection; waste management transfer and transport, reduction and final disposal. Solid waste involves trash, building rubble, industrial refuse, sewage or waste disposal sludge or air quality control plants, among the other recycled items [12].

The practices related to urban solid waste management from the point of generation before final disposal can be divided into the six functional components: Generation of waste, Storage of waste, Collection of waste, Transportation of waste, Process of segregation, and Disposal of waste [13].

Solid waste management practice is a process of integrated management of waste minimization at the generation point and safe disposal in a proper manner [14]. Solid waste management has become one of a major concern in environmental issues [15]. This is particularly true to urban areas where population is rapidly growing and amount of waste generated is increasing like never before [16]. Waste generation increase proportionally to this population number and income, creating the needs of effective management [21]. Urbanization and industrialization lead to new lifestyles and behavior which also affects waste composition from mainly organic to synthetic material that last longer such as plastics and other packaging material [17].

It is also observed that in the developing world, there is a poor solid waste management practice from generation point to final acceptable disposal [18]. This poor practice of solid waste management causes severe damage to human health and becomes a source of pollution, which is the largest environmental cause of disease and one of the contributors to premature death globally [19]. Hence, the management and control of wastes at all stages of production, collection, transportation, treatment and ultimate disposal is a relatively social imperative [20].

Sustainable waste management practices are crucial for universities to reduce their environmental impact and promote a circular economy. Recent research has highlighted several key practices that universities can adopt to improve their waste management. One of the most important practices is implementing comprehensive recycling programs. Universities should provide clearly labeled recycling bins throughout the campus and educate students and staff on proper recycling procedures [21,22]. This can include recycling of paper, plastic, glass, and electronic waste. Innovative recycling technologies, such as those explored by the National Waste and Recycling Industry Council (NWRIC) in Australia, can also help universities recover valuable materials from their waste streams [21].

Organic waste management is another critical area for universities. Composting food waste and other organic materials can significantly reduce the amount of waste sent to landfills [21,23]. Universities can set up on-site composting facilities or partner with local composting services to handle their organic waste. Implementing these programs not only reduces waste but also produces nutrient-rich compost that can be used for landscaping and gardening on campus [21]. Waste audits and assessments are essential for universities to understand their waste streams and identify opportunities for improvement [21,24]. By quantifying and categorizing the types of waste generated, universities can develop targeted strategies to reduce, reuse, and recycle specific waste streams. Adopting lean manufacturing principles can also help universities streamline their operations and minimize waste [21]. This can involve optimizing processes, redesigning products, and using materials that generate less waste.

Finally, universities should engage their students, faculty, and staff in their waste management efforts. Providing education and training on sustainable practices, as well as involving the campus community in the decision-making process, can foster a culture of sustainability and encourage widespread participation [21,25]. By implementing these sustainable waste management practices, universities can not only reduce their environmental impact but also serve as models for their local communities and inspire other institutions to follow suit.

It is worth knowing that institutions in Nigeria are not exempted from the problem of solid waste generation and management; therefore, it is based on these concerns, this paper sets out to examine the points and methods of waste reduction, problems faced during waste storage, disposal methods used, preliminary waste management strategies, and challenges encountered.

Methodology

Study Area

The study was conducted at the Taraba State University Jalingo. It is located in Jalingo, Jalingo Local Government Area of Taraba State which lies roughly between Latitudes 6° 25" North and 9° 30" North of the equator and Longitudes 9° 39" East and 11° 45" East of the Greenwich Meridian (Taraba State University Master Plan).

Materials and Methods

The methods used in sourcing of the required information included the field surveys to enable the researcher get acquainted with the study area, interviews with occupants in the study area and also the physical planning and development department of the institution, personal observations in the various activity areas, as well as administering of questionnaires. Photographs of the existing waste management strategies employed in the study area.

Types of Data

The study used both primary data (collected from the field) and secondary data. The primary data were mainly obtained through reconnaissance survey and administration of questionnaires. The reconnaissance survey included all the observations on the physical state of Taraba State University Jalingo, the types of wastes generated, availability of waste collection points as well as their adequacy, waste disposal and collection processes while questionnaires administered to respondents within the study area focused on waste types generated, availability/ adequacy of waste collection points, frequency of solid waste evacuation from the collection points, methods of reduction of solid waste generated on campus, problems faced during the temporal storage of solid wastes on campus, disposal methods frequently used, preliminary waste management strategies employed by the university before final disposal (if any) and some attendant challenges faced, final disposal method for solid wastes employed by the university as well as its effectiveness, quantity of solid wastes generated on campus. The secondary data used for the study was obtained from books, journals, articles, Taraba State University Jalingo Master Plan as well as other vital information sourced through interaction with the environmental sanitation unit of the physical planning and development unit of the university.

Sampling and Sampling Techniques

Questionnaires were designed to capture responses from targeted population so as to obtain data from critical areas of waste generation and management in the study area. The sample size for the field work was determined from Krejcie and Morgan's (1970) method of determining sample size as quoted in Nwosu, et al (2021) which states that for an area with a population between 2000-2200, the sample size to be used is 327 [26]. The questionnaires were distributed randomly to residents on the campus comprising of students and staff across the various activity areas on campus. 121 respondents indicated they were students undergoing various programmes on campus, 147 indicated they were staff of the university, while 59 indicated they were operating various types business centres on campus.

Hence, a total number of 327 respondents in the study area were sampled to achieve the aim of the research work.

Method of Data Analysis

Data obtained from the questionnaires distributed were presented in tables and charts so as to give a clear and concise view and understanding. Also photographs of different waste dumpsites, collection points, as well as management methods in the study area were also presented.

Data Presentation, Analysis, and Discussion of Results

This aspect deals with presentation and analysis of data collected from questionnaires administered in order to analyze the waste management strategies in the study area. It includes a summary of the demographic and socio-economic characteristics of respondents (Section A) while types of wastes generated, availability and adequacy of waste collection points, frequency of evacuation of the stored wastes as well as problems associated with temporal storage of solid wastes in the study area, factors mitigating against solid waste management, and disposal methods employed within the study area (Section B).

Demographic and Socio-Economic Characteristics of Respondents

• Sex Distribution of Respondents

S/No	Sex	Frequency	Percentage (%)
1	Male	209	64
2	Female	118	36
	TOTAL	327	100

Source: Research, 2024

Table 1: Sex Distribution of Respondents

From Table 1, 64% of the respondents are males while 36% are females which gives a gap of 28% attributed to the fact that most residents on campus are males. It could also be attributed to the cultural and religious pattern of Northern Nigeria which ascribes less dominant role performed by women.

• Age Distribution of the Respondents

S/No	Age	Frequency	Percentage (%)
1	Less than 20	33	10
2	21-25	59	18
3	26-30	59	18
4	30-40	88	27
5	Above 40	88	27
	TOTAL	327	100

Source: Research, 2024

Table 2: Age Distribution of the Respondents

Table 2 showed that 10% of the respondents are less than 20 years of age, age ranges 21-25 and 26-30 are 18% each, age ranges 30-40 and above 40 are 27% apiece. This shows that about 90% of the respondents are above the age of 20 years and were able to provide information necessary for the study.

• **Educational Level of Respondents**

S/No	Educational Level	Frequency	Percentage (%)
1	Undergraduate	65	20
2	B. Sc	82	25
3	M. Sc	85	26
4	Ph. D	95	29
	TOTAL	327	100

Source: Research, 2024

Table 3: Educational Level of Respondents

From Table 3, it is evident that 20% of the respondents are undergraduates who are undergoing their first degree and resident in students hostels while 25%, 26%, and 29% have their B. Sc, M. Sc, and Ph. D respectively. This shows the high level of literacy in the study area as it is a higher institution of learning. Therefore, perception on waste management is expected to be positive and of key interest to them alongside the need to ensure a sustainable campus environment free of pollution and environmental hazards.

Domestic Solid Waste Management Strategies Employed in the Study Area

• **Major Solid Waste Types Generated in the Study Area**

S/No	Educational Level	Frequency	Percentage (%)
1	Undergraduate	65	20
2	B. Sc	82	25
3	M. Sc	85	26
4	Ph. D	95	29
	TOTAL	327	100

Source: Research, 2024

Table 4: Major Solid Waste Types Generated in the Study Area

Table 4 shows that six (6) types of wastes were identified in the study area which include: paper, organic wastes/ food residue, polythene bags/ nylons, plastic materials, glass, and metals. Polythene bags/ nylons contribute to the highest percentage of waste materials in the study area with 36%, followed by organic wastes/ food residue (21%), paper (18%), plastic materials (14%), Glass (7%), and metals (4%). The primary type of waste found within an institution include Polythene bags/nylons and organic wastes/food residue [27]. This can be attributed to pockets of commercial activities carried out within academic areas, residential areas (staff and student), and student areas of which polythene bags/ nylons are used for packaging items purchased by residents.

• **Availability of Waste Collection Points**

S/No	Waste Collection Points	Frequency	Percentage (%)
1	Available	88	27
2	Not Available	239	73
	TOTAL	327	100
Source: Research, 2024			

Table 5: Availability of Waste Collection Points

According to Table 5, it was revealed that a significant proportion of respondents (73%) reported a lack of waste collection points in their respective areas, while 27% indicated the presence of such facilities (see plate 2). The research also highlighted that waste collection points in academic areas were predominantly established by departmental/ faculty student associations and in cases where the school authority provided these collection points, there is no uniformity in their sizes and shapes. whereas in students' hostels, the school management typically provided these facilities. In cases where waste collection points were not available or inadequate, students resorted to using plastic buckets as temporary waste collection containers until the school authorities conducted final waste disposal. However, the study noted instances where waste remained uncollected for extended periods, resulting in unsightly conditions (see plate 1), unpleasant odors, and other related issues.



Plate 1: Waste Collection Point Provided by the School Management in One of the Female Hostels (Former Faculty of Agriculture) Awaiting Evacuation



Plate 2: Waste Collection Points Provided by the Departmental/ Faculty Students Associations to Complement the ones Provided by the School Management

• Adequacy of Waste Collection Points

Effectiveness of Solid Waste Management Points depends on the facilities and equipment, human resources capacity, and frequency of waste collection and disposal [28]. The study as presented in table 6 reveals that, only 10% of the respondents attests to the fact that the waste collection points at their disposal are adequate while a majority of 90% indicates that the waste collection points are not adequate.

S/No	Adequacy of Waste Collection Points	Frequency	Percentage (%)
1	Adequate	33	10
2	Not Adequate	294	90
	TOTAL	327	100

Source: Research, 2024

Table 6: Adequacy of Waste Collection Points

Table 6 shows that only 10% of the respondents attests to the fact that the waste collection points at their disposal are adequate while a majority of 90% indicates that the waste collection points are not adequate.



Plate 3: An Old and Dilapidated Waste Collection Point Within the Staff Residential Area which is not Adequate Leading to Open Dumping Where Light Wastes are Dispersed by Wind and Domestic Animals

• **Frequency of Solid Waste Evacuation from Collection Points**

S/No	Frequency of Solid Waste Evacuation	Frequency	Percentage (%)
1	Daily	59	18
2	Weekly	0	0
3	Fortnightly	0	0
4	Monthly	0	0
5	Not at all	268	82
	TOTAL	327	100

Source: Research, 2024

Table 7: Frequency of Solid Waste Evacuation from Collection Points

Table 7 outlines the frequency of solid waste evacuation from collection points. The data shows that a significant majority (82%) of respondents do not evacuate their waste at all, while only 18% of respondents reported daily waste evacuation. This finding is concerning as it indicates potential issues with waste management practices among the population studied. Non-evacuation of waste can lead to environmental pollution, health hazards, and degradation of aesthetic value of the environment [29]. Several factors could contribute to this high level of non-evacuation. These may include lack of awareness about the importance of regular waste disposal, inadequate waste management infrastructure, or cultural practices [30]. Addressing this issue might involve educational campaigns on the importance of regular waste disposal, implementing more accessible and efficient waste collection systems, and policy enforcement to ensure adherence to proper waste management protocols.

For additional context, it was found that daily evacuations are mainly done at male student hostels while female hostels still combust their wastes at collection points (e.g., plate 3). This practice of burning waste can have detrimental effects on the environment and human health, releasing harmful pollutants into the air [29,30]. Thus, there is a need for improved waste management practices and infrastructure, as well as increased public awareness and policy enforcement.

• **Strategies to Reduce of Solid Wastes Generated in the Study Area**

S/ No	Strategies to Reduce Solid Waste Generation in The Study Area	Frequency	Percentage (%)
1	Reduction in activities that unnecessary generates wastes	59	18
2	Resell/ recycle/ reuse of waste items	180	55
3	Others	88	27
	TOTAL	327	100
Source: Research, 2024			

Table 8: Strategies to Reduce of Solid Wastes Generated in the Study Area

Table 8 outlines strategies to reduce solid waste generation in the study area. The data shows that a significant majority (55%) of respondents advocate for reselling, recycling, or reusing waste items, while 18% of respondents recommend reducing activities that unnecessarily generate wastes and 27% suggest other unspecified strategies. This finding aligns with the principles of sustainable waste management, which emphasize the importance of waste reduction at the source and the recycling or reuse of waste materials [31]. Resell/Recycle/Reuse of Waste Items strategy, supported by 55% of respondents, is a key component of the circular economy model, which aims to extend the lifecycle of products and materials, thereby reducing waste. It involves collecting and processing used items to make them suitable for reuse, or breaking them down into raw materials that can be used to manufacture new products [32]. Reduction in Activities that Unnecessarily Generate Wastes strategy, advocated by 18% of respondents, involves optimizing processes or avoiding excessive consumption to minimize waste generation from the onset. It aligns with the principle of waste prevention, which is considered the most desirable waste management option as it eliminates the need to handle, transport, treat, or dispose of waste [33]. Other Strategies: The 27% of respondents who suggested other unspecified strategies highlight the need for a comprehensive and holistic approach to waste reduction. These include strategies such as composting organic waste, implementing waste-to-energy technologies, and improving waste collection and sorting systems [34]. Therefore, the data presented in the table underscores the need for proactive measures in waste management—either by minimizing waste generation or optimizing the handling of generated wastes through recycling and reusing—to mitigate environmental impacts [35].

● **Problems Encountered with Solid Waste During Temporal Storage at Collection Points/ Dumpsites**

S/ No	Problems Encountered with Solid Waste During Temporal Storage at Collection Points/ Dumpsites	Frequency	Percentage (%)
1	Odour	82	25
2	Breeding of flies/ insects	101	31
3	Attraction of rodents	82	25
4	Visual eye sore	62	19
	TOTAL	327	100
Source: Research, 2024			

Table 9: Problems Encountered with Solid Waste During Temporal Storage at Collection Points/ Dumpsites

As presented in table 9, four main problems were identified: odour, breeding of flies/insects, attraction of rodents, and visual eyesore. Breeding of flies/insects is the most significant issue, accounting for 31% of the reported problems. This suggests that the breeding of flies and insects takes place at waste storage sites which are conducive environments for such and could potentially lead to public health issues such as the spread of diseases. Odour and attraction of rodents constitutes 25% of the reported issues. The presence of odour indicates the decomposition of organic waste, which can also attract rodents. Rodents are known carriers of various diseases, posing a significant health risk [36]. Visual eyesore accounts for 19% of the problems. Waste storage sites, if not properly managed, can become visually unappealing, affecting the aesthetics of the surrounding environment and potentially leading to decreased property values [28]. These findings suggest that biological factors (flies/insects and rodents) and sensory pollution (odour and visual disturbance) are primary concerns in waste management at these sites. It would be essential to explore integrated pest management strategies to mitigate the breeding of flies/insects, implement odor control mechanisms, and enhance the environmental quality around these collection points/dumpsites [32].

● **Factors Mitigating Against Effective Solid Waste Management on Campus**

S/No	Factors Against Effective Solid Waste Management	Frequency	Percentage (%)
1	Inadequate funding	131	40
2	Poor attitude of users to available waste disposal facilities	49	15
3	Incompetent supervision	98	30
4	Increase in population on campus	33	10
5	Lack of awareness programme	16	5
	TOTAL	327	100

Source: Research, 2024

Table 10: Factors Mitigating Against Effective Solid Waste Management on Campus

Table 10 outlines the factors militating against effective solid waste management on the study campus. They include: Inadequate funding: which is the most significant issue, accounting for 40% of the reported problems. It suggests that there may not be enough resources allocated for proper waste disposal systems, recycling programs, and educational initiatives to promote sustainable practices. Incompetent supervision: This accounts for 30% of the responses. Effective supervision is crucial in ensuring that waste management protocols are adhered to; thus, incompetence in this area can lead to mismanagement and environmental pollution. Poor attitude of users: This constitutes 15% of the problems, highlights the importance of user engagement in achieving effective waste management. Increase in population on campus makes up 10% of the reported issues, suggests that the waste management infrastructure may not be scalable to cater to the growing campus population. And also, lack of awareness programs: which accounts for 5% of the problems, underscores the need for education and awareness programs on proper waste management habits. Thus, the findings of this study suggest that a multifaceted approach involving increased funding, enhanced supervision quality, user education and awareness programs, as well as infrastructural development that cater to the growing campus population would be essential for effective solid waste management on campus. Further research could focus on assessing the impact of these issues on public health, environmental sustainability, and community well-being.

• **Disposal Methods Frequently Used**

S/No	Disposal Methods Frequently Used	Frequency	Percentage (%)
1	Burning	239	73
2	Open dumping	88	27
3	Burying (Landfilling)	0	0
	TOTAL	327	100

Source: Research, 2024

Table 11: Disposal Methods Frequently Used

Table 11 outlines the disposal methods frequently used for waste management in Taraba State University (TSU). Where the key methods include: Burning Method which is the most common method, accounting for 73% of the reported instances. It suggests that burning is seen as an efficient and cost-effective way to manage waste. However, it's important to note that burning can lead to significant environmental and health impacts, including air pollution and the release of harmful toxins. The open dumping method accounts for 27% of the instances. Open dumping, while convenient, can lead to numerous environmental hazards, including soil and water pollution, and it can also attract pests. The burying (Landfilling) method was surprisingly not employed at all in accordance with the findings. Landfilling is a common waste disposal method worldwide, so its absence here could raise questions about the diversity and sustainability of waste management practices in the study area. Thus, the research findings suggest that there is a heavy reliance on burning and open dumping for waste disposal. There is a need for more sustainable and environmentally friendly waste management practices, such as recycling and composting [32].



Plate 4: Burning of Waste in Front of the Main Administrative Building (DDI Senate Building) with the Sick Bay Adjacent to the Incineration Point



Plate 5: Burnt Waste in Front of the Engineering Complex



Plate 6: Burnt Wastes in Drainage Channel in Front of the DDI Senate Building



Plate 7: Open Dumping of Wastes Within the Staff Quarters Through Gate 1



Plate 8: Open Dumping of Wastes Opposite Faculty of Management Sciences



Plate 9: Open Dumping of Wastes Located in Between Faculties of Theatre Arts and Management Sciences



Plate 10: Open Dumping Around the Academic Area (Beside Faculty of Sciences) Awaiting Burning



Plate 11: Burnt Wastes in Front of the Commercial Area Around the Student Area



Plate 12: Open Dumping of Wastes in Front of Faculty of Health Sciences Awaiting Combustion



Plate 13: Effects of Open Dumping with Light Wastes Dispersed Behind the Pharm. Danbaba Danfulani Suntai Library



Plate 14: Existing Incineration Site Behind the Faculty of Health Sciences Used for Academic Purposes

Summary of Findings

Wastes generated from various activity areas are disposed at temporal points (usually open spaces) within these activity areas from where they are either incinerated, dumped in selected open spaces, or finally evacuated to the government designated dumpsite located outside the campus with no records in place as to the quantity of solid wastes generated in the study area. This system of conveyance to government designated sites outside the study area is currently being hampered as there are no active haulage vans for evacuating these wastes and as such the wastes are left for extended periods of time unattended to which poses health and environmental hazards to residents. However, there is an existing incineration site behind the Faculty of Health Sciences which is only used for academic purposes.

The survey also shows that major solid wastes generated in the study area include: paper, organic wastes/ food residue, polythene bags/ nylons, plastic materials, glass, and metals of which polythene bags/ nylon constitute the highest with 36% with no attempt at sorting them for possible reuse/ recycling/ or reselling. Majority of the campus residents do not have waste collection points as provided by the university authority while the few provided are not adequate as such resident's resort to burning of these wastes generated within their immediate vicinity, any available open space, or in drainage lines and also open dumping as methods of waste disposal. This is to curb the problems associated with temporal storage of these wastes which is largely the breeding of flies, attraction of rodents, visual sores, etc. 55 % of the residents within the study area agrees that reselling/ recycling/ reusing is an effective method of reduction of solid waste generated. It is also agreed by 40% of the residents that inadequate funding of waste management practices is a major factor mitigating against effective solid waste management on campus, while 30% of the residents are of the opinion that inadequate supervision. Other residents indicate that poor attitude of residents to available disposal facilities, increase in population on campus, and lack of awareness campaign/ programme to residents on proper waste disposal habits. This shows that there is a direct relationship between funding of waste management practices and proper supervision whereby when the unit saddled with the responsibility to manage waste in the study area are not properly funded in terms of being equipped with haulage vehicles, personal protective equipment, etc it will affect waste management activities in the study area.

Conclusion and Recommendations

Based on the findings, it can be concluded that the method of waste management in Taraba State University, Jalingo which is majorly burning and open dumping exposes the study area to environmental pollution and its attendant consequences. There is a need to adopt a more sustainable waste management practices that will curb greenhouse effects in the study area.

It is therefore recommended as follows:

- The university community should not tolerate the existing methods of waste management (burning and open dumping), rather the use of landfilling should be adopted. To this end, the land allocated for sanitary landfill in the south-eastern part of the university as proposed in the university's master plan should be put to use which is perceived to be more environmentally friendly. It should be properly designed and engineered with impermeable materials on its bed to avoid pollution of underground water.
- Wastes generated from different activity areas should be collected in a more organized and centralized manner at temporal plastic collection points to be provided by the university authority at strategic areas before transported to the designated landfill site. In this recommended model, the study area is to be segmented into four (4) zones as follows: Zone A (Administrative Areas), Zone B (Academic Areas), Zone C (Commercial Areas), and Zone D (Residential Areas – Staff and Student Housing) where collection points are to be strategically placed for the temporal collection of solid wastes. For a start, 10 collection points are proposed in Zone A, 80 collection points in Zone B, 60 collection points in Zone C to complement the existing ones, and 100 collection points in Zone D. This will also solve distance problems as residents on campus will have the proposed plastic collection points close to them to dispose their generated wastes instead of incinerating them within their vicinities. The plastic collection points should also be monitored by the physical planning and development department of the university to avoid being vandalized or destroyed.
- Daily waste haulage to the designated landfill site from the 250 plastic collection points in the different zones is to be strictly adhered to.
- More funds to be allocated to waste management in the study area through purchase of these proposed 250 waste collection points, equipping the physical planning and development department of the university with functional haulage vehicles for the evacuation of wastes from the collection points to the designated landfill site and also purchase more personal protective equipment for them. Despite the economic implications involved, however other health and environmental hazards will be curtailed.
- Periodic environmental sanitation exercise alongside periodic orientation as well as other awareness programmes on proper waste management habits should be introduced and carried out in the university at scheduled dates. This is to be supervised by the physical planning and development department of the university.
- Organized scavengers of which will be authorized by the university management under the supervision of the physical planning and development department of the university may be permitted periodically to come in and sort these wastes generated to encourage recycling, reselling, and reuse of some of these wastes non-degradable wastes. This will ensure that only bio-degradable wastes are transported to the landfill site.
- A record be put in place for solid wastes generated on campus by the physical planning and development department of the university. This will help the university determine the quantity of wastes to be used for waste-to-energy conversion activities within the landfill facility in the face of epileptic power supply within the study area. This will go a long way to serve as an alternative source of power supply to the university environment.
- The incineration facility behind the faculty of health sciences being used for academic purposes should be strictly meant for that as using it to incinerate the wastes generated from the university will constitute pollution to the adjoining land uses there.

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