NEAR EAST UNIVERSITY
INSTITUTE OF GRADUATE STUDIES
DEPARTMENT OF ENVIRONMENTAL EDUCATION AND MANAGEMENT

KNOWLEDGE OF SOLID WASTE MANAGEMENT AMONG UNDERGRADUATES OF THE UNIVERSITY OF IBADAN, NIGERIA

M.Sc. THESIS

ADEKANMBI OLUWASEUN PETER

Nicosia
June, 2022

NEAR EAST UNIVERSITY
INSTITUTE OF GRADUATE STUDIES
DEPARTMENT OF ENVIRONMENTAL EDUCATION AND MANAGEMENT

KNOWLEDGE OF SOLID WASTE MANAGEMENT AMONG UNDERGRADUATES OF THE UNIVERSITY OF IBADAN, NIGERIA

M.Sc. THESIS

ADEKANMBI OLUWASEUN PETER

Supervisor
Assoc. Prof. Dr. Engin BAYSEN

Nicosia
June, 2022

Approval

We certify that we have read the thesis submitted by **Oluwaseun Peter Adekanmbi** titled **"Solid Waste Management Among Undergraduates At The University of Ibadan"** and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Educational Sciences.

Examining Committee	Name-Surname	Signature
Head of the Committee:	Prof. Dr. Serife Gonda	.....
Committee Member:	Prof. Dr. Aşkın Kiraz	.....
Supervisor:	Assoc. Prof. Dr. Ergin Bayser Y.	.....

Approved by the Head of the Department

29./7../2022

Prof. Dr. Aşkın Kiraz

Head of Department

Approved by the Institute of Graduate Studies

01../8/2022

Prof. Dr. Kemal Hüsnü Can Başer

Head of the Institute

Declaration

I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

Adekanmbi Oluwaseun Peter

30/06/2022

Acknowledgments

I Adekanmbi Oluwaseun Peter also want to say a big thanks to everyone …

I will like to give Jehovah God for being merciful and forgiving of my shortcomings, as well as for bestowing his grace upon me. I say to you that you alone deserve all of the credit and gratitude for getting me this far.

I would like to appreciate the following people, without whom I would not have been able to get to this stage ..

I will like appreciate my family and parent who made this possible for me and also The Faculty of Educational Science, Department of Environmental Education, Near East University, especially to my advisor, Professor Dr. Askin Kiraz, and my thesis supervisor, Associate Professor Dr. Engin Baysen, whose kept me going even from day 1 to this day … really appreciate you ….

God bless everyone for me

Abstract

Solid Waste Management Among Undergraduates At The University of Ibadan

Adekanmbi Oluwaseun Peter
MA, Department of Environmental Education and Management
June 2022, 66 pages

This study investigated the knowledge of solid waste management among undergraduates of the University of Ibadan, Nigeria. The quantitative research design was adopted, data was collected from a conveniently selected 200 undergraduates, using the instrument designed by Vitharana (2017), and analysed using descriptive statistics (percentage and frequency count). Results were presented in tables. The majority of the surveyed undergraduates of the University of Ibadan, Nigeria positively perceive solid waste management, and have plausible solid waste management knowledge through the information available on posters, in school, on radio, at public meetings, and on TV, respectively, and they support solid waste recycling. Also, the undergraduates generate food wastes, paper and carton, plastics, tins and cans, fibre bags, and glass respectively, and use waste containers such as wastebaskets, plastic bags, old buckets, and carton, respectively, before disposal of solid waste in dug holes in the compound, valley lake riverside, open space, road street side, public bin, and itinerant waste van respectively. Results further indicated that the undergraduates dispose of waste at intervals, once in a day, once in a week, once in three days, and once in two days, respectively. Similarly, the surveyed undergraduates of the University of Ibadan observed that solid waste is indiscriminately disposed of by the roadside, public area, incessant burning of refuse, and pollution of the natural environment, and these impair the environment and human health, a negative environmental impact on the environment in Ibadan.

In addition, we found that the surveyed undergraduates of the University of Ibadan, Nigeria, are knowledgeable about sustainable development, believe that solid waste management is impactful on sustainable development, and think that a designed sustainable development framework is essential in Ibadan. Also, the students believe that environmental conservation is a sine qua non of sustainable development, see achieving sustainable development as a collective effort, and are not oblivion of the

implications of environmental pollution on sustainable development, as well as the health implications of waste generation, and indiscriminate waste disposal. The students believe that environmental conservation is a sine qua non of sustainable development, see achieving sustainable development as a collective effort, and are not oblivion of the implications of environmental pollution on sustainable development, as well as the health implications of waste generation, and indiscriminate waste disposal. Other research interests may be expanded in the area of waste-to-wealth generation, especially among youth to give them entrepreneurial opportunities as the rate of unemployment burgeons in the nation.

Key words: knowledge, solid waste management, undergraduates, University of Ibadan, Nigeria

Table of Contents

CHAPTER IV

CHAPTER V

CHAPTER VI

List of Tables

List of Figures

List of Abbreviations

SWM- Solid Waste Management

UI- University of Ibadan

CHAPTER I
Introduction

This chapter includes the problems, aims, importance, limitations and related descriptions of the research.

Background of the Study

Waste generation is increasingly becoming a worrisome development across developing cities. According to Sinha and Enayetullah (2000), waste management, especially in the urban areas is considered as one of the most critical environmental challenges confronting developing countries, and industrialised cities. Waste management can be described as a deliberate and conscious entire set of procedures of collecting, transporting, recovering, and disposing of waste, and the coordination of the processes and after-care of dumpsites. The management of solid waste encompasses the reduction in human-generated waste presence in public, and the environmental and health impacts on the people and the community (Jerie and Tevera, 2014). Indiscriminate dumping or disposal of waste has adverse effects on the environment, causes environmental pollution, and impairs human health.

Waste management as presented in the waste management pyramid is a strategic procedure premised on prevention, recovery, and disposal of waste. Minimising or reducing waste encompasses waste prevention, internal production waste recycling, and source-oriented waste quality improvement as well as product reuse. Additionally, energy recovery, waste sorting, external recycling, and waste reuse are essential measures in waste management. The coordination and control of activities tied to generated waste, resources conservation, and human health protection are all the focus of waste management. Waste-related activities includewaste utilisation,waste handling processesand waste-creating processes. Waste can be solid or liquid and may require different, though related measures in managing them.

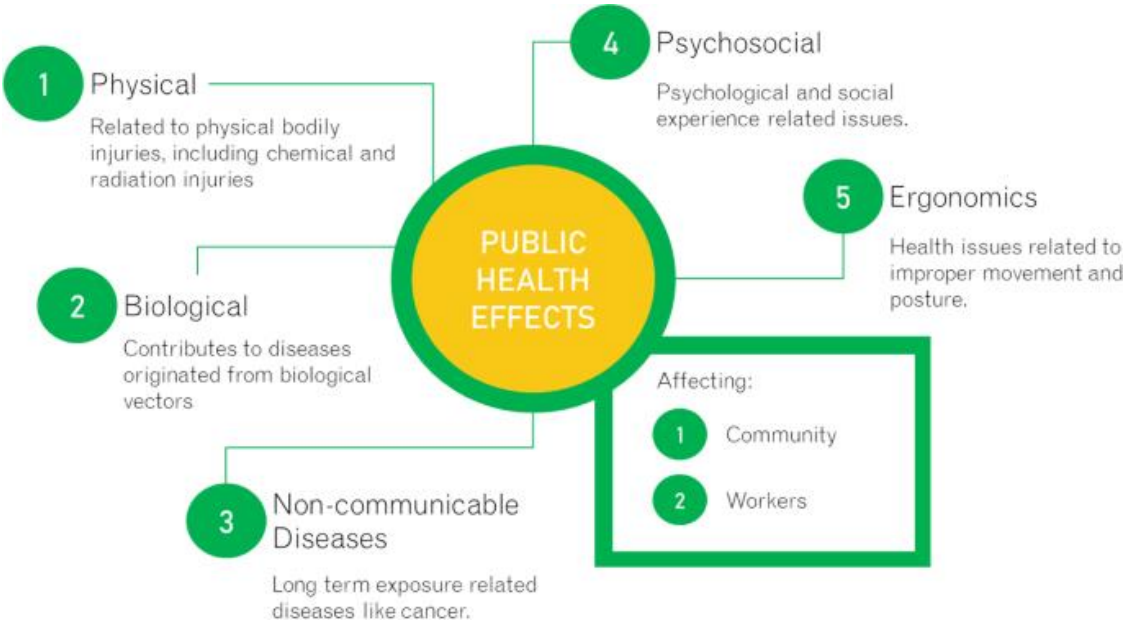
Solid waste management describes the measures, steps, and procedures of discarded or disposed of solid material collection, treatment, and disposal after use or for reuse. The inappropriate disposal of solid waste leads to environmental pollution, and the eruption of several health implications, especially vector-borne disease, that is diseases spread by vectors or carriers such as rats and flies. Managing solid waste

is a herculean task that has economic, administrative, and social implications (Nathanson, 2020).

Open dumping is the most common and affordable dumpling method across many African cities, especially in Nigeria. It is a low capital, operational, and maintenance cost dumping method (Moh and Manaf, 2014). Public health is put at risk when solid waste is ineffective and inappropriately managed. There can be non-communicable diseases, biological, physical, ergonomics, and psychological health risks implications resulting from poor solid waste management (see Fig. 1) (Ziraba, Haregu, Mberu, 2016; Aminuddin & Rahman, 2015: Ncube, Ncube, Voyi, 2017). The poor waste disposal practices are great hindrances to achieving integrated solid waste management first in the households, and the society at large (Fadhullah, Imran, Ismail, *et al*., 2022). Categorically, the health implications of poor solid waste management are enormous, and it has a multiplying effect on society at large.

Figure 1

Effect of Ineffective Household Solid Waste Management On Public Health



By implication, the knowledge of acceptable solid waste management practices determines to a large extent, the level of environmental sanity achievable in the society. This is so because the knowledge help in making environmental-conscious and responsible decisions. Best solid waste management practices afford

citizens to live a healthy life and make the society environmental-friendly. Solid waste management aims to address the health, environmental and economic implications of improper solid waste management. Inadequate solid waste management could be a result of limited financial resources, insufficient access to solid waste management tools, systems, and equipment, lack of technical know-how of the equipment, inadequate technical expertise and awareness of best solid waste management practices, lack of political will or political turnover, lack of planning and evaluation, lack of government coordination, inadequate staff/employee, inconducive work condition, bridge in communication with relevant stakeholders, limited available land, climatic, topographic, and geographical conditions, and cultural norms (United States Environmental Protection Agency Office of Resource Conservation and Recovery, 2020). Furthermore, source reduction and reuse, recycling/composting and organic waste management, energy recovery, and treatment and disposal were identified as the components of the solid waste management hierarchy (see Fig. 2)

Figure 2

Waste Management Hierarchy

Solid waste management best practices are centred around critical collective stakeholders' engagement and involvement to better manage solid waste. Wastes could be food/organic, papers, plastics, metals, aluminum, and cardboard, and these require varying solid waste management strategies. Identified best solid waste management practices are identification of the source of waste, the quantity of the waste, waste composition, future waste projection, and accounting for special wastes (United States Environmental Protection Agency Office of Resource Conservation and Recovery, 2020).

Waste composition is different in every city, urban center, country, and region worldwide, across low, middle, high-income countries (Kaza et al. 2018). The increasing population in major cities across the globe have direct implication on waste generation, especially with the industrialisation of cities to become more habitable for the people and engender commercialisation. These human and mechanical activities translate to huge waste generation, which if not well-managed can be chaotic. There is a huge deposit of natural resources explorable for industrialisation and globalisation in developing economies, for instance in Nigeria. These generate solid waste and impact the environment heavily. The responsible use of natural resources, human consuming behaviour, and waste management predicts environmental protection and development. Waste management is the collective responsibility of stakeholders in the formal and informal sectors of the economy (Jerie and Tevera, 2014), and the transformation of such waste into useful eco-friendly items and materials.

Based on the population of people, Ibadan is the third-largest city in Nigeria. Also, It has the largest geographical scope in Nigeria. Furthremore, in Oyo state, Ibadan is the most populated city, not only in state but also in South West, Nigeria,West African region. Ibadan is home to the Yoruba people and accommodates many other ethnic nationalities. It is a developing economic hub in the South West region, a veritable location, and home to

Agro-allied, Textile, Food processing, Health Care and Cosmetic, Tobacco processing and Cigarette manufacturing, Leatherworks, and furniture making factories and industries. Ibadan is also home to many reputable international organisations such as the International Institute of Tropical Agriculture (headquarters), and there, the first citadel of learning in Nigeria, the University of Ibadan is situated.

These economic activities are drivers for the solid waste generation which impacts the environment positively or negatively. When solid waste generated through various industrialisation activities and human consumption are efficiently managed and recycled, it leads to increased Internally Generated Revenue, while the poor management of solid waste leads to serious environmental pollution, and this could be chaotic for human lives, and stall healthy living in the society. The array of economic activities going on daily in Ibadan directly points to a very high volume of solid waste generation. The massive waste generation pressurises the waste disposal system and this pressure overwhelms the waste disposal system, leaves heaps of wastes across the road sites, and constitutes a health hazard to the people (Jerie and Tevera, 2014).

Over the years, there have been reports of increasing indiscriminate dumping of solid waste across the city of Ibadan, and this has become an eyesore.] While the protection of the environment is the sole responsibility of the government through designated agencies and ministries, it goes without saying that environmental protection is a collective responsibility and citizens must play significant roles in the protection of their immediate environment. The University of Ibadan is a mixed community that comprises students, academic and non-academic staff, and members of the public who reside on campus. The waste generated by students in the halls of residence, and by other members of the University community are enormous, and there is the need to manage the solid waste appropriately to ensure a healthy and environmentally-friendly university community. To this end, this study will assess the knowledge of solid waste management among the undergraduates of the University of Ibadan, review relevant literature and gain the environmental protection perspectives of citizens to engender responsible waste management of healthy living.

Statement of the Problem

The skyrocketing increase in population, industrialisation, and infrastructural development in many cities across Nigeria, for instance, Ibadan, the Oyo State capital, cannot be over-emphasised. Citizens' daily socio-economic activities generate massive solid waste which terrifically pressures the existing waste management systems, and leaves streets across communities in Ibadan, saturated with massive human-generated solid wastes, an alibi for health and environmental

hazards. The indiscriminate dumping of solid waste by citizens cannot be inseparable from non-challance, ignorance, irresponsibility, or lack of knowledge to appropriately manage solid waste for the public good.

Arguably, the lack of knowledge about a concept or ideology creates a vacuum in the mind of people in the best way to address related issues and development. When there is a lack of knowledge of solid waste management, it becomes impossible to function in tandem with best solid waste management practices. Believing that the gown is expected to influence the town, this study will focus on the University of Ibadan community and assess the knowledge of solid waste management among the undergraduate population to see if the University is training environmentally-conscious students who will, in turn, impact the larger society with best solid waste management practices and globally acceptable environmental behaviours for the public good.

Objectives of the Study

The objectives of this study are to:

i) assess the solid waste management practices among the undergraduates of the University of Ibadan.
ii) investigate how SWM practices affect the University of Ibadan environment.
iii) assess how SWM practices affect sustainable development at the University of Ibadan.
iv) investigate the difference between the Perception and Knowledge of Solid Waste Management of the undergraduates according to Faculty.
v) investigate the difference between the Perception and Knowledge of Solid Waste Management of the undergraduates according to Gender.

Research Questions

This study will be guided by the following research questions:

i) What are the solid waste management practices among the undergraduates of the University of Ibadan?
ii) How do the SWM practices affect the University of Ibadan environment?
iii) How do SWM practices affect sustainable development at the University of Ibadan?

Significance of the Study

The outcome of this study will drive a positive attitude to solid waste management among the students of the University of Ibadan, and engender the best solid waste management practices in the university community and the larger Ibadan city. The findings of this study will help to create awareness about solid waste management best practices among the students of the University and other members of the public in Ibadan. The findings of this study will help to drive a positive attitude and perception towards solid waste management among the public, especially the University of Ibadan community for a healthy and environmentally-friendly community. Also, the findings of this study will help in policy formulation and designing of solid waste management systems to promote a safe environment devoid of pollution and outbreak of diseases for a sustainable future. The findings of this study will aid educational, economic, and environmental policies as well curriculum development to train an eco-conscious population of students.

Scope and Limitation of the Study

This study will cover the knowledge of the undergraduates of the University of Ibadan on solid waste management, assess their perception of solid waste management, identify their solid waste management practice(s), and how these practices affect the university community. This study will be limited to only regular undergraduates from 100 to 700 level, it does not include other categories of students.Due to COVID 19 restrictions, data collection is taken slowly as respondents are concerned about contacts that may have health implications on them. This cost the researcher more time to get the required number of respondents to participate in the study.

Planning of the Study

The introductory part of this survey is chapter one which comprises of the background of the study, statement of the problem, objectives of the study, research questions, research hypothesis, significance of the study, scope and limitation of the study, and the study plan. The second chapter comprises of conceptual, theoretical, and empirical review of literature on solid waste management. The research methodology-research design, population of the study, sample and sampling procedure(s), data collection methods, methods of data analysis, and statement of

ethical considerations are presented in chapter three. Chapter four contains the analysis of data, presentation of the data. Chapter five focuses and the discussion of the findings, while the summary, conclusion, and recommendations are presented in chapter six.

CHAPTER II

Literature Review

Research related conceptual definitions, descriptions and information related to the subject that already exists in the literature are given in this chapter.

Solid Waste Management for Sustainable Development

Nations across the globe are faced with huge challenges of proper, and sustainable solid waste management practices(Maity, 2018). However, countries of the world have been deploying varied capacities, resources, and technologies according to their respective levels of development and advancement. Thus, developed and developing nations show more zeal and concern about achieving sustainability in managing solid waste, and they considerably derive economic benefits from the best solid waste management practices deployed. This comes in the form of recycling and transforming solid waste into eco-friendly products, a way of protecting the environment from harsh climate change implications. Developing nations like Nigeria have not been significantly forthcoming in achieving sustainable development goals, especially as the nation is bedeviled with numerous political, socio-cultural, security, and economic challenges. These quagmires are distractions to the concentration on essential environmental and health issues such as solid waste management (Ike, Ezeibe, Anijiofor, & Daud, 2018).

Solid waste management is a chain of activities that involves many individuals, experts, and stakeholders' contributions and efforts. It encompasses waste generation, human activities (individual or collective), collection, storage, processing/recovery, transportation, and finally the disposal stage (all, usually carried out by specific agencies and (trained) individuals) (Ugwu, Ozoegwu&Ozor, 2022).Categorically, apart from the initial stage, which is the waste generation, all other processes are carried out by the same set of persons to the disposal stage. During these phases, proper solid waste management practices make it possible to respective nations to boost their economy through solid waste transformation generated revenue.

Solid wastes are temporarily gathered or stored from one contact person to another at different collection sites where they are moved onward to other persons to recycle, reuse or dispose of as the case may be. These happen between the waste

collection and transportation stages of solid waste management. Wastes are evaluated and examined to know how to categorize them and transfer them to various sections. For instance, solid wastes such as plastic, rubber, or polythene made are separately gathered from metals or iron, bottles, etc. (Coker, Achi, Sridhar &Donnett, 2016). QuotingUgwu, Ozoegwu&Ozor et. al. (2021) "*applying the necessary reduction/minimization, prevention or recovery approach results in the realization of two important values for the institution or municipality, viz; reduced institutional expenditure and an increased life span of the sanitary landfill (if there is)"*. This implies that the adoption of adequate solid waste management strategies has economic and environmental implications for individuals, institutions, and the larger society.

For institutions of higher learning, it is expected that they contribute to the reduction in solid waste generation through research and innovation-induced plans and policies. As a vanguard for social change and reconstruction institutions of higher learning are expected to propagate the gospel of responsible solid waste disposal and management, train and equip the student with the required knowledge and consciousness to protect their immediate environment, and also inculcate a sense of responsibility into people in the society through regular sensitizations and enlightenment programmes in languages and channels through which the people can be best reached (Coker, Achi, Sridhar &Donnett, 2016). These efforts will have a wide implication on the local environment, across the state and the nation when institutions of higher learning across the nation see solid waste management as a matter of national importance, and a sense of responsiveness to them. Reduced solid waste generation is a sine qua non to the reduction in solid waste-driven environmental and climatic conditions such as global warming/depletion of the ozone layer.

Solid Waste Classes

According to Kemp (1998), the classification of solid waste follows certain patterns which are not unconnected with the composition or elements of the solid waste. This implies that the source, origin, elements, properties, or form of the solid waste are employed in grouping or classifying them into families. For instance, clinical waste originating from health facilities, domestic refuse, originating from homes and households; industrial wastes originating from industries, companies, and

agricultural waste originating from farms, among others. Waste can also be grouped into liquid, liquid, or gas as the case may be. This, different approaches and techniques are required to manage them. In addition, waste can be classified based on the level of toxicity, biodegradables, inertness, and combustibility (Kemp, 1998).These categorisations are presented in Table 1.

Table 1.

Wastes Generated On Campus and their Characteristics (Ugwu, Ozoegwu, Ozor, Agwu & Mbohwa, 2021)

Type	**Characteristics**	**Recyclability**	**Items Considered**	**Source/Origin**	**Management Strategy(s)**
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 Recyclable Energy Generation
Garbage	Waste is usually biodegradable and organic in nature. However, when dry, it is combustible.	Recyclable	Usually left overs from meat, cheese, cakes, soups, foods, uneaten sandwitches, 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, beakers, buckets, platci forks and spoon, plastic, tires, chairs, , tubes, plastic pens, cables, and burrettes.	Waste can be industrial or domestic in nature. Such as waste from medical center, labouratories, plastic, production facilities, restaurants etc.	Recyclable

Type	Characteristics	Recyclability	Items Considered	Source/Origin	Management Strategy(s)
Metals/Junks	It is non biodegradable as well as incombustible.	Recyclable	Disused cars, lorries, buses, buckets, plastics, boxes, spoons, aluminium, scrap electronic equipments, pots, boxes, cans, metal cups, scrap automobile parts, etc.	Waste emanates majorly from industries such as from store rooms, hotels, markets, vehicls, steel wastes, guest buildings etc.	Refurbishing for new uses, Recycling, Source separation.
Ashes	Incombustible in nature but very biodegradable	Non-recyclable	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 includes threads, cotton, nylon, wool, abandoned clothes etc.	Uusally the waste is gotten domestically. It may emanate from clothing stores, tailoring shops, hotels, school buildings, etc.	Rags can be resued, recycled and source separation can also be used.
E-Waste	E-waste are 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 accessories	Usally the wastic is gotten from industrial and domestic surrondings. This includes electrical stores, offices, appliances, store rooms, commercial areas, quarters.	Reusable Recyclable Source separation

Type	Characteristics	Recyclability	Items Considered	Source/Origin	Management Strategy(s)
Leather	Combustible but not biodegradable	Recyclable	Bags, leathers and shoewares.	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 non-biodegradable.	Either recyclable or non-recyclable depending on the type of waste.	Hospital waste and waste from cottages, construction and demolition rubbles, solid chemicals, ceramics, masonry-works and nightsiol.	These waste usually emanate from the hospital and clinics on campus. Furthermore, construction waste such as industrial and chemical waste also can be found.	Depens on the type of waste that is identified. This will lead to an effectively deployed strategy to counteract it.

Waste Utilization and Reduction Strategies

Solid waste is not a waste, especially in countries that have the political will, resources, and expertise required to turn waste into wealth. Wealth generation has been connected with waste recycling, reuse, and transformation. Thus, profitable utilization of solid waste and its reduction to the barest minimum requires concerted efforts, and strategies. Therefore, the utilization and reduction of waste in the society and human domains require an appropriate choice of practices, and strategic implementation of such practices, technological innovations, tools, machinery, and infrastructural components are preponderance in achieving a sustainable system of waste utilization and reduction.

Furthermore, x-raying the Integrated Solid Waste Management (ISWM) presented in Fig. 1, there is a systematic occurrence of the processes and procedures of solid waste management. These strategies in chronological order listed as follows: (a) waste prevention (b) minimizing and reducing waste through recovery processes (c) reusing any waste that is reusable (d) recycling anything deemed recyclable (e) utilizing waste for energy such as composting of waste for electrical energy generation (f) reusing waste that is receovered (e) finally, disposing the waste at regulated, sanitary and approved landfills.

Figure 3

Integrated Solid Waste Management Hierarchy (Ugwu, Ozoegwu, Ozor, Agwu & Mbohwa, 2021)

Solid Waste Management: Stakeholders, Issues and Implications

Wastes are mostly generated from industrial and domestic activities among others. Thus, respective countries have outlined policies, most times in tandem with the United Nations Sustainable Development Goals which are aimed at pushing sustainable practices across all facets of life, for the good of the human race. Wastes are categorized based on the source or origin, that is, the location or setting from where they are generated. These could be household-generated, commercial activities-generated, industrial-generated, and healthcare-generated, among others, Similarly, the waste could be liquid or solid, dangerous, or non-dangerous (Brazil, 2010). The nature of the generated waste informs the way and manner in which it can be managed to ensure the safety of humans, other living things, the environment, and the ecosystem.

Solid waste management is a collective responsibility. The government, non-governmental organisations, and the formal and informal sector stakeholders all have roles to play in ensuring that solid waste is generated through individuals and

companies. Jerie and Tevera (2014) posited that the informal sector has a role to play in the solid waste transformation. The increasing solid waste generation, and the challenges of managing enormous waste generated over time.The government has a significant role to play in solid waste management through government policies, strategic actions, and action plans at the national and international levels, especially in tandem with the sustainable development goals of the United Nations (Jerin, Sara&Radia, 2022). According to the Brazilian National Solid Waste Policy (NSWP) (2010), waste management encompasses any form of conscious actions or activities carried out or undertaken by an individual or some group of individuals to retrieve or collect, transfer or transport, treat and dispose of generated wastes in tandem with the world's best practices. Focusing on solid waste management, this describes the conscious efforts to stop generation, or reduce, put to use again, recycle or transform, the non-generation, reduction, reuse, recycling, and treatment of waste, and, disposal.

Population growth, urbanization, and changing consumption patterns have led to theproduction of waste in large quantities, which is now a menace facing most rural and urban communities as a result of the improper waste management system (Damghani et al., 2008, Liu et al., 2019; Achankeng, 2003). Like other countries and regions' administrative plans and policies, the USEPA in the Middle East proposed the Integrated Municipal Solid-Waste (IMSW) management strategies to reduce, recycle, compost, incinerate, and landfill waste as a universal practice (Tchobanoglous and Kreith, 2002). Most prominently, landfilling is widespread across many developing countries' communities. However, composting appears to be the most adopted waste management option in countries where the potential for organic waste production is significantly high.

Policy implications were attributed to the solid waste management challenges across the globe. As a universal phenomenon, waste generation and its ineffective management have terrible implications on the environment and the climate. It is believed that good policy documents and conscientious execution of such, translates to sustainable solid waste management practices. A report submitted that policies on solid waste management have international and local perspectives. On the international level, policies and formulated and then recommended for nations to adopt and domesticate in tandem with their respective country's peculiarities. However, it was reported that the domestication of these policies has not been holistic enough to yield desired outcomes. Identified weaknesses in the

domestication processes are policies summersault, policy ambiguity, homogeneity, and policy insufficiency. On this premise, the need for more efforts to address policy implications of solid waste management remains unending. Similarly, the government across many nations has been identified to be irresponsive, and docile, lacking in commitment, and political will, and lacking in participatory mechanism for the solid waste management needs of the people (Muheirwe,Kombe&Kihila, 2022).

Arguably, spontaneous population growth, solid waste management infrastructural deficit, and limited land space are major challenges to solid waste management across many cities across the world (Doorga,Rughooputh, Chung&McGivern2022). As earlier stated, solid waste management is a collective effort and responsibility. All stakeholders, citizens, the government, and non-governmental agencies have strategically-dependent roles to play in ensuring a waste-management efficient society. A report from Brazil showed that waste management has declined and the solid waste management systems no longer can absorb or contains the humongous generated wastes across cities and towns, especially cities with huge economic and industrial activities (Silva&Morais,2021). Consequently, these cities risk huge environmental hazards and challenges which can better be avoided through the circular economy model, as the various stakeholding segments take up responsibilities.

Furthermore, many other socio-economic, cultural, environmental, or health factors have implications on waste management, especially universal factors. As a health phenomenon, waste management can not be disconnected from health implications and developments. According to Singh, Kumar, Mishra& Kumar (2022), solid waste management (SWM) is a service of public health service, thus, improper or inadequate solid waste management can have critical health implications for the people and society. In times of disease outbreak, for instance, the recent COVID-19 outbreak, the essence of cleanliness and proper disposal of the generated wastes was re-emphasised to avoid the spread of the virus. Further stress that the coronavirus outbreak exacerbates the solid waste management challenges, its real essence, as an essential service becomes more glaring and obvious.

Like other issues, the coronavirus outbreak triggered solid waste management dynamics, and this informed more concerted efforts and attention toward solid waste management. For instance, there were more biomedical wastes to manage, while the

pandemic was raging and widespread ration globally in nearly every sector which has therefore raised the need for special attention. Thus, it suffices to say that open dumping is a major, perhaps the biggest challenge experienced during and after the coronavirus pandemic that shook the world (Singh, Kumar, Mishra & Kumar, 2022).

Similarly, Khan, López-Maldonado&Khan, et al. (2022) opined that solid waste generation surged as a result of industrialization, increasing world population, and urbanization. Waste generation is a local issue thathas global implications, thus, managing the increasing solid waste is a herculean task across populations. To address the challenge, strategic actions are required, especially to drive positive and significant sustainable goals. Depending on the peculiarities of various countries, solid waste management strategies are deployed to promote solid waste management, reduce waste, collect, recycle, reuse or dispose of waste without having any adverse effect on the people and society. Countries with innovations and technological capacities have moved ahead, especially many European countries, and have been able to harness solid waste management economic growth
through thermochemical and biochemical conversion which are energy recovery technologies.

Empirical Review

In literature, many pieces of research have been carried out on solid waste management to understand, the roles of all stakeholders, and the implications of solid waste management in tandem with sustainable development goals. A 2014 survey in one of Zimbabwe's cities, Gweru, among informal enterprises revealed that the enterprises experience inefficiency in materials used, and this informs huge waste generation which is indiscriminately and haphazardly disposed of. Inference from this outcome establishes deficient solid waste management in the city as wastes were not frequently collected as the system of waste management is weak to handle the rate of waste generation (Jerie & Tevera, 2014).

A 2022 study in Bangladesh reported that the country’s solid waste management is grossly inefficient, as the waste collection, reduction, recycling, and disposal are not in tandem with acceptable international standards (Jerin, Sara&Radia, 2022). The government is failing in political will, policy development, design, and implementation to drive an efficient waste management system for Bangladesh. Food waste and plastic are one of the most generated solid waste,

especially from the homefront. This is so because food consumption is a regular activity, this implies huge waste generation. A study reported that households in Panji, Malaysia generate mostly debris from food as well as plastic, an average population is knowledgeable about solid waste management, thus, they segregate their waste, and the majority of them know the health and environmental implications of improper waste management as there was a relationship between bad waste management practice and dirty locality, and other socio-economic characteristics (Fadhullah, Imran, Ismail*et al.* (2022). There are indications that economically disadvantaged areas and households improperly manage waste, unlike locations and areas where elites reside. By implication, there is a difference in waste management across socio-economic strata, and this informs the difference in waste management practices.

In a similar vein, a survey reported that to significantly protect the environment, there is the need to drive efficient, effective proactive, and reactive regulations to manage solid waste, and engender compliance with the regulations for sustainability. These, coupled with the political will from the government across the board are required to address the solid waste management quagmire (Muheirwe,Kombe&Kihila, 2022).

Consistent with this literature, Ariva& Sherly &Norsiah& Chin (2015) identified that sustainable waste management is best achieved through two major practices, waste separation, and waste reduction, though without the commitment and will of households and communities, those practices may not be sustainable. Findings from an Indonesian population showed that there is a connection between the cleanliness mentality in the community and waste management practices. By implication, if households and the community by extension develop a sense of belonging and responsiveness towards the cleanliness of the environment through waste separation and waste reduction for a sustainable waste management practice.

In another study, the role of the government in solid waste management was significantly established as the government is said to be in control of all machineryto drive efficient waste management practice through policy designs and implementations. In China, findings indicated that solid waste management policies designed and executed have shown a significant level of effectiveness as the policies address solid waste reduction, solid waste harmlessness, solid waste reclamation, solid waste pollution avoidance, solid waste supervision and management, solid

waste circular economy, solid waste secondary pollution, and solid waste recycling among others, while the government shows commitment is consistent optimization of waste management policies for a China's'waste-free city (Tan,Ren,Han&Chen, 2021).

Addressing municipal solid waste, Lin, Zhao&Kuo, et al. (2022) proposed deep learning approaches rather than the traditional treatment approaches which have proven inadequate for solid waste management over time. The traditional approaches have been ineffective as a result of waste composition heterogeneity, solid waste generation increase, and waste management process complexities. To circumvent these challenges, the smarter and digital approaches present a better solid waste management solution(s) as it unravels hidden patterns or extractrelationships for which traditional treatment approaches encounter challenges. Deep learning approaches propose high capacity in solid waste collection, transportation, and disposal.

An evaluation of municipal solid waste management in some eastern coastal regions in China revealed a reduction and decline in some eastern coastal cities, while a spontaneous increase in waste generation in Shandong, Guangdong, Zhejiang, and Fujian provinces was recorded. The China waste management practice encompasses (52%) landfill adoption, (45%) incineration, and (3) compositing approaches (Khan, Anjum, Raza, Bazai&Ihtisham, 2022). These findings indicate a relatively low waste management efficiency in China, like many other countries, A 2022 Brazilian study indicated that the Brazilian restaurant operates a Solid Waste Management System for Restaurants (SGRS-R) which drives significant change in the meal preparation and production chain in tandem with waste avoidance processes and procedure, reduction, reuse, and recycling into eco-friendly products. The surveyed restaurant, through sanitary landfills, reduced waste by 90%, and the system of solid waste management adopted can be adapted by other restaurants provided it suffices to strategically modify the entire chain of solid waste management, reduce it to the barest minimum, the environmental impacts associated with food service (Kfouri, Fernandes, Bernardo, Proença, Uggioni,Rodrigues,Proença,2022).

A study on a similar population to our study reported that the universities in Nigeria are acting and operating below expectation in solid waste management for sustainable development. It is a scholarly belief that the gown is designed to

influence and shape the town through plans, policies, programmes, and initiatives. Sadly, this expectation is far from reality as Nigerian universities have not shown responsibility unlike their counterparts in other developing and developed nations. Solid wastes generated in universities in Nigeria are metal/cans,polythene, organic, polystyrene food pack, plastic, e-waste,medical and rubber paper/cardboard, sanitary, leather/textiles, wood, and glass/bottle among others. However, plastic, paper, organic, and polythene were found to pose more threats to environmental peace and sustainability. Prominently, waste prevention, minimizing and reducing waste through recovery processes, reusing any waste that is reusable, recycling anything deemed recyclable, utilizing waste for energy such as composting of waste for electrical energy generation, reusing waste that is receovered and finally, disposing the waste at regulated, sanitary and approved landfills (Ugwu, Ozoegwu,Ozor, Agwu&Mbohwa, 2021).

Summary of Review

Evidence from this review is that solid waste management is a universal phenomenon addressed by respective countries, based on its socioeconomic, cultural, and political peculiarities. Out of this reviewed literature, there is little evidence of research evaluating the knowledge of undergraduate of Nigerian universities towards sustainable development. To this end, this study will assess the knowledge of solid waste management among the undergraduates of the University of Ibadan, South West, Nigeria. The findings of the study will serve as a policy document to guide the administrative echelon of Nigerian universities to be more conscious of their responsibility to drive a sustainable solid waste management practice in the university community, and the larger society.

CHAPTER III
Methodology

This chapter provides information about the research design, participants/sample, data collection and analysis procedures as well as how the findings are analysed.

Research Design

This study employed the quantitative research design commonly employed in assessing opinions and perceptions about an entity, a situation, experience, or occurrence (Tasiran, 2014).Previous studies in environmental studies have adopted this research design to assessthe perception and opinions of study participants, make inferences from their perceptions to make academic statements, and expand the body of knowledge.

Population and Sample

Location Description

The population of this study is domiciled in Nigeria, the most populous nation in West Africa. Nigeria is a multi-ethnic and lingual nation. These ethnic groups are of diverse cultural peculiarities. Nigerians are well-read, and highly industrious people. Crude Oiland Agriculture are major sources of revenue for the nation. Thus, there is enormous human activity and pressure on the environment, and have adverse impacts on the environment, and contributes to the increasing global climate change. Ibadan is one of the largest cities in Nigeria. The city is home to many first institutions in Nigeria, one of which is the University of Ibadan established in 1948.

Population and Sample

The population of the study is defined as the overall and total number of people, entities, or whole being subjected to scientific observation or study. It is the totality of the participants, or individuals who share similarities, or that are characteristically related. In research, the population of a study is the total number of respondents of a study, that share similarity, and differences, and are observed to get or gain knowledge from them for information purposes, or advancement in

knowledge. The population of this study is 14,000 undergraduates of the University of Ibadan,spread across the faculties of Agriculture, Arts, Education, Environmental Design and Management, Law, Multidisciplinary Studies, Pharmacy, Renewable Natural Resources, Science, Social Sciences, Technology, Veterinary Medicine, and the College of Medicine.

Sample Size Determination

As a result of the impossibility of reaching the entire undergraduates of the University of Ibadan, Nigeria at once to administer copies of the questionnaire to them, and in tandem with research principles of representation, we select a sample out of the population, and this sample were deemed representative enough of the population. The process of selecting this sample is referred to as sampling, a procedure of sample portion selection from a given population. As a result of COVID-19 restrictions and the on going Academic Staff Union of Universities industrial action in Nigeria, it was difficult to access many of the undergraduates, as many have left the campus, and travelled home. On that premise, the convenience sampling technoques was adopted, ans 200 undergraduates were selected as sample for the study.

Inclusion and Exclusion Criteria

For inclusion to participate in this study, the researcher included only students in the undergraduateprogramme, who are in 100-700 level as regular students.For the exclusion criteria, students in the postgraduateprogramme, and undergraduates in the Diploma or Distance Learning programme were excluded (Bhandari, 2021).

Data Collection Tools

Questions Form

This adopted the solid waste management questionnaire designed by Vitharana (2017). The first section gives an introduction about the instrument and the study and also contains a statement of voluntary participation in the study. It collects data on the socio-demographic characteristics of the respondents. Section II collects data on solid waste management, section III collects data on environmental impacts, and section IV collects data on sustainable development. Before, choosing this instrument, the researcher got approval from the researcher that designed it. The e-

mail for request and approval is in the appendix. Data collection is proposed to span between May and July 2022.

Data Collection Procedures

The researcher hired 2 Research Assistants to help with the data collection process at the University of Ibadan, Nigeria. Theyassisted the researcher to administer copies of the questionnaire to the students of the University of Ibadan in their respective faculties and halls of residents.

Data Analysis Procedures

After the data collection, the copies of the questionnaire werearranged and sorted, and subsequently, data were entered into the Statistical Package for the Social Sciences (SPSS version 20). After the data entry, the data was run using respective tests. We employedsimple percentages and frequency to analysed and interpret the data presented in tables.

Reliability and Validity

The instrumentquestionnaire adopted for this survey is a standardized instrument (solid waste management for sustainable development survey questionnaire) designed by Vitharana (2017). Reliability and validity indicate and ascertain if the instrument is fit to be used for data collection, and if it collects the data it was designed to collect and can do so at any other time. Being a standardized instrument already used in a previous study, the instrument is deemed reliable and good for data collection for the study.

Ethical Considerations

The researcher applied to the Ethical Committee at the Near East University and got ethical approval to conduct this survey. The ethical approval takes care of compliance with data collection principles, the principle of informed consent, as well as a statement of confidentiality regarding the personal information of respondents.

CHAPTER IV

Findings and Discussion

This chapter presents the findings based on the collected data.

Findings and Discussion

The fourth chapter of this thesis contains the presentation of study data, statistical analysis, and table presentation of the demographic, in tandem with the study's research objectives.

Table 2.

Distribution of Descriptive Characteristics (n=196)

Variables	Number (n)	Percentage (%)
Gender		
Male	106	54.1
Female	90	45.9
Age		
16-20 years	26	13.3
21-25 years	100	51
26years and above	70	35.7
Faculty		
Arts	21	10.7
Education	20	10.2
Social Science	20	10.2
Science	20	10.2
Veterinary Medicine	20	10.2
Medicine	19	9.7
Agriculture	20	10.2
Technology	20	10.2
Law	20	10.2
Human Nutrition	16	8.2
Academic Level (Grade)		
100L	11	5.6
200L	55	28.1
300L	63	32.1
400L	37	18.9
500L	19	9.7
600L	11	5.6

Table 2 contains the representation of the socio-demographic variables of the studied undergraduates of the University of Ibadan, Nigeria. The majority (54.1%) of the studied undergraduates were male, while the majority (51%) are between the ages of 21-25 years. The respondents were selected from across the 10 faculties, and the majority were undergraduates in their third year of study. Being a standardized

instrument (questionnaire) designed and earlier used by Vitharana (2017), this instrument is adjudged reliable and valid for data.

Research Question One: What are the solid waste management practices among the undergraduates of the University of Ibadan?

This research question will be answered with the knowledge of waste management, waste generation (type of waste) and storage, and disposal which encompass solid waste management practice among the undergraduates of the University of Ibadan.

Table 3.

Knowledge of Solid Waste Management

s/n	Knowledge of Solid Waste Management	Yes (%)	No (%)
1	Have you ever heard of solid waste management?	195(99.5)	1 (.5)
2	Have you ever been educated on proper waste disposal by the school?	178(90.8)	18(9.2)
3.	Are there any public bin near your house?	90(45.9)	106 (54.1)
4	Based on your own discretion, do you think the waste disposal method being employed is problematic within your area?	125 (63.8)	71 (36.2)
5	Are youn aware of any waste management facility in University of Ibadan?	159 (81.1)	37 (18.9)
6.	Is the waste management process being employed by the management facility in the University of Ibadan of optimal satisfaction to you? (In orderwords, are you satisfied with their services?)	166 (84.7)	30 (15.3)
7	Have you ever heard about the importance of recycling?	176 (89.8)	20 (10.2)
8.	Do you agree to solid waste recycling?	171 (87.2)	25 (12.8)
9.	If an efficient recycling programme is put together to minimize waste, would you be open to separate waste into designated bags for collection and processing?.	142 (72.4)	54 (27.6)
10.	Are you satisfied with the Ibadan waste collection process?	182 (92.9)	14 (7.1)

The results presented in Table 3 indicated that the studied undergraduates of the University of Ibadan are knowledgeable about solid waste management, as they

have been inundated with proper waste disposal by the school to identify and employ the best waste disposal methods, encourage and participate in solid waste recycling.

Table 4.

Source of Solid Waste Management Knowledge

Source of Solid Waste Management Knowledge	**Frequency**	**(%)**
On poster	144	73.5
Over radio	14	7.1
In school	23	11.7
Public meeting	8	4.1
Over TV	7	3.6)

The result presented in Table 4 showed that the majority (73%) of the undergraduates of the University of Ibadan know of solid waste management through posters pasted around the school community and environment by the university and environment protection advocacy groups. Furthermore, the types of solid waste generated by the undergraduates are presented in Table 5.

Table 5.

Types of Solid Waste Generated

Types of Solid Waste Generated	**Frequency**	**(%)**
Paper and carton	11	5.6
Plastics	6	3.1
Food waste	170	86.7
Tins and cans	5	2.6
Fibre bags	2	1.0
Glass	2	1.0

Results presented in Table 5 shows that the types of solid wastes generated by the surveyed undergraduates are food wastes (87%), paper and carton (5.6%), plastics (3.1%), tins and cans (2.6%), fibre bags and glass (1%) respectively. Results further indicated that the undergraduates make use of baskets to dispose of their solid wastes as presented in Table 6.

Table 6.

Waste Container

Waste Container	**Frequency**	**(%)**
Carton	21	10.7
Waste Basket	121	61.7
Old Bucket	23	11.7
Plastic Bag	24	12.2
Tin Can	7	3.6

Results presented in Table 6 shows that the majority of the surveyed undergraduates use a wastebasket (62%), plastic bag and old buckets respectively (12%), and carton (3%), as waste container before disposal of solid waste. Additionally, it is noteworthy that waste disposal is an integral part of solid waste management practice and process. Thus, our results show that the majority of the surveyed undergraduates of the University of Ibadan primarily dispose of their waste.

Table 7.

Place of Waste Disposal

Place of Waste Disposal	**Frequency**	**(%)**
In the public bin	59	30.1
In the itinerant waste van	18	9.2
Valley lake river side	32	16.3
Road street side	10	5.1
Open space	3	1.5
In a hole in own compound	74	37.8

Results presented in Table 7 shows that the majority of the surveyed undergraduates of the University of Ibadan dispose of wastes in dug holes in their compound (37.8%), public bin (30.1%), valley lake riverside (16.3%), itinerant waste van (9.2%), road street side (5%), and open space (1.5%) respectively. In addition, the waste disposal is done at certain intervals as represented in Table 8.

Table 8

Frequency of Waste Disposal

Place of Waste Disposal	**Frequency**	**(%)**
Once a day	95	48.5
Once in two days	22	11.2
Once in three days	24	12.2
Once a week	55	28.1

Results from Table 8 shows that the majority of the studied undergraduates of the University of Ibadan, 48.5%) once a day, (28.1%) once a week, (12.2%) once three days, and (11.2%) once two days, disposal their generated wastes.

Research Question Two: How do the SWM practices affect the University of Ibadan environment?

Research question two focuses on the solid waste management practices for sustainable development in Ibadan. Results are presented in Table 9.

Table 9.

Environmental Impact of Solid Waste Management

s/n	***Environmental Impact of Solid Waste Management***	**Yes (%)**	**No (%)**
1	Are you aware of the impact of waste on the environment?	180(91.8)	16 (8.2)
2	Have you ever seen waste on the land, road, and public area?	188(95.9)	8(4.1)
3.	Have you seen waste in our water resources such as the sea, lakes, rivers, ponds etc.?	189(96.4)	7(3.6)
4	Have you noticed any individual buring waste in public environment?	189(96.4)	7(3.6)
5	Do you know of the negative impact of solid waste on the buman body?	186 (94.9)	10 (5.1)
6.	Would you say, categorically, that solid waste is a major problem affecting Ibadan's environmental areas.	165 (84.2)	31(15.8)
7	Would you say the information being made available is sufficient enough on environmental impact of solid waste in your immediate environment.	171 (87.2)	25 (12.8)
8.	Do you think there can be massive improvement in the environmental issues confronting Ibadan, if waste is efficiently dealt with?	181 (92.3)	15 (7.7)
9.	Would you agree that the developmental projects being implemented are part of the issues leading up to solid waste generation in your surrounding?	164 (83.7)	32 (16.3)

Results presented in Table 9 indicated that the environment can be positively or negatively impacted by solid waste management. The surveyed undergraduates of the University of Ibadan observed that solid waste is indiscriminately disposed of by the roadside, public area, incessant burning of refuse, and pollution of the natural environment, and these impairs the environment and human health; a negative environmental impact.

Research Question Three: How do SWM practices affect sustainable development at the University of Ibadan?

Research question three focuses on the solid waste management practice effects on sustainable development in Ibadan. Results are presented in Table 10.

Table 10.

Solid Waste Management practices impacts on sustainable development

	Sustainable Development	**Yes (%)**	**No (%)**
1.	Have you heard of sustainable development?	164 (83.7)	32 (16.3)
2.	Are you aware of sustainable development in Ibadan?	157 (80.1)	39 (19.9)
3.	Do you think solid waste management should be developed in Ibadan for sustainable development?	176 (89.8)	20 (10.2)
4.	Would you say that the sustainable development of Ibadan can be impacted by solid waste management?	180 (91.8)	16 (8.2)
5.	Are you in agreement of the need to provide environmental conservation for sustainable development in Ibadan?.	186 (94.9)	10 (5.1)
6.	Are you of the opinion that every individual in Ibadan has a social responsibility to contribute sustainable development in the region?	182 (92.9)	14 (7.1)
		Concerned	**Unconcerned**
7.	Thinking of environmental pollution impacts on Ibadan, how concerning is this issue to you?	177 (90.3)	19 (9.7)
8.	How concerned are you about the health impact of waste?	197 (91.3)	17 (8.7)
9.	How concerned are you about sustainable development?	181 (92.3)	15 (7.7)

Results presented in Table 10 show that the surveyed undergraduates of the University of Ibadan, Nigeria, are knowledgeable about sustainable development, believe that solid waste management is impactful on sustainable development, and

think that a designed sustainable development framework is essential in Ibadan. Results also further indicated that the students believe that environmental conservation is a sine qua non of sustainable development, see achieving sustainable development as a collective effort, and are not oblivion of the implications of environmental pollution on sustainable development, as well as the health implications of waste generation, and indiscriminate waste disposal.

CHAPTER V
Discussion

This chapter presents the discussion of these findings in comparison to the studies in the literature.

Discussion

The standardized research instrument (solid waste management for sustainable development survey questionnaire) designed by Vitharana (2017) was adopted in eliciting data for this study from 200 selected undergraduates of the University of Ibadan, Nigeria. Responses from well-filled 196 copies of the questionnaire were analysed to assess the knowledge of solid waste management among the Undergraduates of the University of Ibadan, Nigeria. The findings/results are discussed respectively.

Solid waste management practices among the undergraduates of the University of Ibadan

Our study found that the studied undergraduates of the University of Ibadan are knowledgeable about solid waste management, as they have been inundated with proper waste disposal by the school to identify and employ the best waste disposal methods and participate in solid waste recycling. Recycling is identified as a solid waste management practice in the University of Ibadan, especially, plastic waste which is mostly collected by members of the university community and other individuals interested in earning economic gains from plastic (bottle) collection on campus, and around Ibadan. This corroborates Yang, Ma, Thompson, & Flower (2018) & (Abdullah, Salleh & Ismail, 2017) who reported that waste recycling is essential for economic growth and development.

Our survey also found that the majority of the undergraduates of the University of Ibadan know of solid waste management through mostly posters, in school, and public meetings such as symposiums, sensitization, campaigns, on the radio, and the television. The posters identified as the most accessed are pasted around the school community and environment by the university and environment protection advocacy groups. This finding points to the source of solid waste management information, and sources of accessing such information. Our finding is

consistent with a report that her study respondents access solid waste management knowledge through information on the radio, on TV, in public meetings, in a school, and on a poster (Vitharana, 2017). Our finding is supported by Akintunde, Elijah & Wahab, Bolanle & Agbola, Babatunde (2020) who posited that solid waste management knowledge among Jos residents in Nigeria are oral traditional indigenous knowledge, electronic, internet, print media such as posters, newspapers, magazines, etc. Also, Ndukwe, Uzoegbu, Ndukwe, & Agibe (2019) found media (print and electronic), in school, and religious centres as sources of solid waste management knowledge and information among residents in Umuahia and Environs, Southeast, Nigeria.

We also found that the types of solid wastes generated by the surveyed undergraduates are food wastes (87%), paper and carton (5.6%), plastics (3.1%), tins and cans (2.6%), fibre bags, and glass (1%) respectively. This indicates that household settings tend to generate solid waste more from food/human consumption(s). Our finding is consistent with a recent Malaysian study that reported food debris, plastic, and bottle materials respectively, as the most generated solid waste among residents of the East Coast of Malaysia (Fadhullah, Imran, Ismail, *et al*., 2022). Supporting our finding on huge food waste generation, Jerie & Tevera (2014) reported that humongous vegetable and biodegradable material wastes were generated by people in Geru, Zimbabwe, in dominated locations such as the market, and these wastes are indiscriminately disposed of.

In addition, consistently, Lim, Chin, Yusof, Yahya A, Tee in a 2016 Malaysian study and Jaya (2010), as well as Zhou, Yang, Xu, Wang, Zhou, & Li, et al (2020), based on the humongous food waste, posited the need to design a food waste management system, as improper food waste management is a healthcare emergency, and a ticking time bomb, which requires a concerted effort to management for the sake of public health; a healthy nation can become a wealthy nation. Also consistent with our findings, cardboard, paper, and plastic were reported as solid waste types generated in the informal sector in Gweru, Zimbabwe (Jerie & Tevera, 2014). Our finding also corroborates which report that food waste, plastics, tree leaves, used papers, carton, and plastic in the household and business places (Vitharana, 2017).

Also, the surveyed undergraduates use a wastebasket (62%), plastic bag and old buckets respectively (12%), and carton (3%), as waste containers before disposal

of solid waste. This is also consistent with another survey which reported that waste containers used in a waste collection before disposal are mostly used buckets, and were subject to decontamination during the COVID-19 pandemic to reduce the risk of contracting or spreading the virus (Oyedotun, Kasim, Famewo, Oyedotun, Moonsammy, Ally & Renn-Moonsammy, 2020). However, Jerie & Tevera (2014) identified skips as major temporary waste disposal and storage sites for solid waste collection. Also consistent with our finding, Vitharana (2017) reported that residents and businesses in Hambantota Municipal Council (HMC) in Sri Lanka use carton, waste baskets, old buckets, plastic bags or a tin/can as a waste container for waste storage or collection before disposal.

The surveyed undergraduates of the University of Ibadan dispose of wastes in dug holes in their compound (37.8%), public bin (30.1%), valley lake riverside (16.3%), itinerant waste van (9.2%), road street side (5%), and open space (1.5%) respectively. This finding aligns with Fadhullah et al., (2022) who reported that residents of Panji district in Malaysia's solid waste management practice include using an allotted public bin, and or waste collection centre, which they consider appropriate. Also, our finding corroborates which report that Nigerians dispose of their solid wastes on dumpsites, through burning in their compound or around their houses, or by dumping them in rivers. Similarly, a survey recorded that metal or plastic bins are used for waste collection.

As earlier stated, we reiterate that the solid waste management practice is largely dependent on the method of disposal. Some of these practices have health and environmental implications. In addition, the waste disposal is done at certain intervals, our study found that the studied undergraduates of the University of Ibadan, 48.5%) once a day, (28.1%) in a week, (12.2%) once three days, and (11.2%) once in two days, disposal their generated wastes. The waste disposal schedule and frequency are connected with the huge food waste generation which requires frequent emptying of waste containers to avoid the foul smell and air pollution. This finding aligns with a report which has it that different from the Guyana population, Nigerians during the COVID-19 dispose of waste once per week, twice per month, once per month, and daily, respectively (Oyedotun, Kasim, Famewo, Oyedotun, Moonsammy, Ally & Renn-Moonsammy, 2020). This routine is in tandem with commendable solid waste management practices. However, a study among the Malaysian population reported that the residents disposed of their waste multiple

times weekly as designed by the waste-collecting establishment (Abdullah, Salleh, Ismail, 2017), stating the importance of regular, perhaps daily waste disposal (Vitharana, 2017).

While we reported that the students dispose of their solid wastes regularly using majorly waste baskets, and do not do any sorting whatsoever, Fadhullah et al., (2022) reported that the solid waste management practice among residents in Panji District, East Coast of Malaysia encompasses waste segregation.

SWM practices Effect on the University of Ibadan Environment

The surveyed undergraduates of the University of Ibadan observed that solid wastes are indiscriminately disposed of outside the University community by the roadside, public area, incessant burning of refuse, pollution of the natural environment, and these impairs the environment and human health, a negative environmental impact. This inappropriate solid waste management practice negatively affects the environment. Our finding is consistent with Fadhullah's et al., (2022) report that managing solid waste poorly leads to the outbreak of common diseases such as malaria diarrhea, and typhoid in communities. This is to say that improper waste management is a gateway to an unhealthy environment. The implication of this is that proper solid waste management plays a vital role in primary healthcare as with a neat, clean, and well-managed environment, and waste management system, the possibility of disease outbreak is reduced by almost half. Children are often more exposed to the health implications of ineffective solid waste management as their immune systems can easily be attacked.

Furthermore, Suleman et al., (2015) and Yatim & Arshad (2010) concluded that bad solid waste management poses a serious threat to public health, especially in communities with very high food waste generation, having in mind that food wastes decay quickly, smells, pollutes the environment, and attract pests that are diseases carriers. Focusing on the health implications of inefficient solid waste management, a survey reported that health risks are inevitable in environments where solid wastes are improperly managed, and this can lead to a pandemic. For instance, during the prevalence of COVID-19 across the globe, cleanliness, regular washing of hands, and proper management of all forms of waste, especially solid waste was recommended (Oyedotun, Kasim, Famewo, Oyedotun, Moonsammy, Ally & Renn-Moonsammy, 2020). Our finding that solid waste management affects the

environment supports Vitharana (2017) who reports a correlation between solid waste management practice and the environment, as her study population disposes of waste indiscriminately in unauthorized spots such as river bodies, their backyards, roadside/street, and open spaces among others.

Solid Waste Management Practices Impacts On Sustainable Development

We found that the surveyed undergraduates of the University of Ibadan, Nigeria, are knowledgeable about sustainable development, believe that solid waste management is impactful on sustainable development, and think that a designed sustainable development framework is essential in Ibadan. Results also further indicated that the students believe that environmental conservation is a sine qua non of sustainable development, see achieving sustainable development as a collective effort, and are not oblivion of the implications of environmental pollution on sustainable development, as well as the health implications of waste generation, and indiscriminate waste disposal. Our finding stresses the need to push more efforts to explore SDG goals 3 and 12, the need to ensure the general wellbeing and health of the people across populations, and the assessment of materials, items, or content that enters the human body through contact or consumption. Like our respondents, Panji residents believe that proper waste management is essential for environmental protection, and sustainable development (Fadhullah et al., (2022). Sustainable solid waste management is indeed a sustainable development key driver.

In addition, our finding established that the undergraduates of the University of Ibadan show high concerns about the management of waste to avert environmental pollution, and waste generation health implications, to enable sustainable development. This consolidates a report that some Nigerian and Guyana populations surveyed during the COVID-19 pandemic were considerably concerned with waste generation in avoidance of the virus contamination (Oyedotun, Kasim, Famewo, Oyedotun, Moonsammy, Ally & Renn-Moonsammy, 2020). It is pertinent to conclude that the need for an efficient solid waste management practice, framework, and system cannot be over-emphasised. This is in tandem with Jereme et al. (2015) submission that a consolidated and efficient solid waste management system and service is pivotal to environmental protection, food security, quality of life, and economic development through the generation of revenue, across demographies. Contrary to our finding that the undergraduates of the University of Ibadan are aware

of sustainable development and are concerned about its actualization, reported that residents and businesses in Hambantota Municipal Council (HMC) in Sri Lanka are unaware of sustainable development, however, they agree that the environment should be conserved to engender sustainable development (Vitharana, 2017).

CHAPTER VI
Conclusion and Recommendations

This chapter presents conclusions based on the research findings according to theobjective and sub objective(s) of the research and gives recommendations accordingly.

Summary of Findings

The following conclusions are reached based on the research questions that guided this study.

i) The majority of the surveyed undergraduates of the University of Ibadan, Nigeria have plausible solid waste management knowledge through the information available on posters, and they support solid waste recycling.
ii) The undergraduates generate food wastes, paper and carton, plastics, tins and cans, fibre bags, and glass respectively, and use waste containers such as a wastebasket, plastic bags, old buckets, and carton, respectively, before disposal of solid waste in dug holes in the compound, public bin, valley lake riverside, itinerant waste van, road street side, and open space respectively.
iii) The undergraduates dispose of waste at intervals, once in a day, once in a week, once in three days, and once in two days, respectively.
iv) The surveyed undergraduates of the University of Ibadan observed that solid waste is indiscriminately disposed of by the roadside, public areas, incessant burning of refuse, pollution of the natural environment, and these impair the environment and human health, a negative environmental impact on the environment in Ibadan.
v) The surveyed undergraduates of the University of Ibadan, Nigeria, are knowledgeable about sustainable development, believe that solid waste management is impactful on sustainable development, and think that a designed sustainable development framework is essential in Ibadan.
vi) The students believe that environmental conservation is a sine qua non of sustainable development, see achieving sustainable development as a collective effort, and are not oblivion of the implications of environmental

pollution on sustainable development, as well as the health implications of waste generation, and indiscriminate waste disposal.

Implications for Practice

The world is very much concerned about achieving sustainable development goals and environmental protection, especially, with efforts by the United Nations and other non-governmental organizations across the globe, working to put together measures to drive sustainable development and environmental protection across the globe, and domesticating such efforts to national, state and local levels of government and human environment. The findings of this study are pivotal for the environment and sustainable development policy document design and frameworks, as well as environmental studies curriculum development, to transfer and sustain environmental protection knowledge and consciousness to the undergraduates of the University of Ibadan, and students of other institutions of higher learning in Nigeria.

Based on the findings of the study, the following are recommended.

i) The undergraduates should be encouraged into participating in solid waste recycling for entrepreneurial growth, economic development, and environmental protection. This can be operated under the University Student Work and Study Unit.
ii) The University of Ibadan should prioritize training and sensitization programmes for students, staff, and other members of the University community, and environs on best solid waste management practices to keep the University environment clean, and rid Ibadan of indiscriminate disposal of solid waste, especially as the raining season lingers, accompanied with flooding which destroys properties, and endanger lives at every heavy downpour.
iii) Environmental protection and sustainable development contents should be entrenched into the learning and course contents of the students of the Institution.
iv) The University of Ibadan should provide waste disposal containers for easy disposal of solid waste, in public places, in faculties' quadrangles where students sit, and in halls of residence.

Recommendations for Further Research

Other research interests may be expanded in the area of waste-to-wealth generation, especially among youth to give them entrepreneurial opportunities as the rate of unemployment burgeons in the nation, and as incessant Academic Staff Union of Universities Strike actions disrupt the academic calendar, and wastes students' time. This will enable students to put effort and time into wealth creation by recycling waste to produce eco-friendly products for human use. This will boost their economic growth and contribution to the national GDP. Also, further studies should be extended to children below year 16 to understand and assess their knowledge of solid waste management. Also, further research can assess the knowledge of solid waste management across other populations(cities) in Nigeria.

References

Abdullah, Z., Salleh, S. Md., Ismail, K. N. I. K. (2017). Survey of Household Solid Waste Management and Waste Minimization in Malaysia: Awareness, Issues and Practices, International Journal of Environmental & Agriculture Research (IJOEAR) ISSN:[2454-1850] [Vol-3, Issue-12, December- 2017]

Achankeng E., editor, 2003. Globalization, urbanization and municipal solid waste management in Africa. In: Proceedings...

Akintunde, E.& Wahab, B.& Agbola, B. (2020). Journals, Electronic. (2020). Solid WasteManagement Knowledge Sources and Use Across Residential Densities in JOS, Nigeria: A Case for Indigenous Knowledge.Vol 1: Issue IV,

Aminuddin MSH, Rahman HA. (2015). Health risk survey for domestic waste management agency workers: Case study on Kota Bharu Municipal Council (MPKB), Kelantan. Malaysia Int J Environ Sci Dev. 2015;6(8):629.

Aminuddin MSH, Rahman HA. (2015). Health risk survey for domestic waste management agency workers: Case study on Kota Bharu Municipal Council (MPKB), Kelantan. Malaysia Int J Environ Sci Dev. 2015;6(8):629.

Coker, A.O., Achi,C.G. Sridhar, M.K. C., Donnett, C.J. (2016). Solid waste management practices at a private institution of higher learning in Nigeria, Procedia Environ Sci, 35 (2016), pp. 28-39, 10.1016/j.proenv.2016.07.003

Damghani *et al.* A.M. (2008). Municipal solid waste management in Tehran: current practices, opportunities and challenges, Waste Manag.

Doorga, J. R.S., Rughooputh, S. D.D.V., Chung, S. Y., &McGivern, A. (2022). A geospatial approach for addressing long-term solid waste management issues: Extracting value from waste,Journal of Cleaner Production,Volume 334,130282,ISSN 0959-6526,https://doi.org/10.1016/j.jclepro.2021.130282.(https://www.sciencedirect.com/science/article/pii/S0959652621044474)

Fadhullah, W., Imran, N.I.N., Ismail, S.N.S. *et al.* (2022). Household solid waste management practices and perceptions among residents in the East Coast of Malaysia. *BMC Public Health* **22,** 1 (2022). https://doi.org/10.1186/s12889-021-12274-7

Fadhullah, W., Imran, N.I.N., Ismail, S.N.S. *et al.* (2022). Household solid waste management practices and perceptions among residents in the East Coast of Malaysia. *BMC Public Health* **22,** 1 (2022). https://doi.org/10.1186/s12889-021-12274-7

Ike, C.C., Ezeibe, C.C., Anijiofor, S.C. , Daud, N.N. N. (2018). Solid waste management in nigeria: problems, prospects, and policies, J Solid Waste Technol Manag, 44 (2018), pp. 163-172

Jereme, I. A., Begum, R. A., Talib, B., Siwar, C., & Alam, M. (2015). Assessing Problems and Prospects of Solid Waste Management in Malaysia.

Jerie, S. &Tevera, D. (2014). Solid Waste Management Practices in the Informal Sector of Gweru, Zimbabwe", *Journal of Waste Management*, vol. Article ID 148248, 7 pages, 2014. https://doi.org/10.1155/2014/148248

Jerie, S. &Tevera, D. (2014). "Solid Waste Management Practices in the Informal Sector of Gweru, Zimbabwe", *Journal of Waste Management*, vol. 2014, ArticleID 148248, 7 pages, 2014. https://doi.org/10.1155/2014/148248

Jerin, D. T., Sara, H. H., Radia, M. A., Hema, P. S., Hasan, S., Urme, S. A., Audia, C., Hasan, M. T., &Quayyum, Z. (2022). An overview of progress towards implementation of solid waste management policies in Dhaka, Bangladesh,Heliyon, 8 (2),2022,e08918,ISSN 2405-8440,https://doi.org/10.1016/j.heliyon.2022.e08918.(https://www.sciencedirect.com/science/article/pii/S2405844022002067)

Karim Ghani WAWA, Rusli IF, Biak DRA, Idris A. (2013). An application of the theory of planned behaviour to study the influencing factors of participation in source separation of food waste. Waste Manag., 33:1276–81. https://doi.org/10.1016/j.wasman.2012.09.019.

Kemp, D.D. (1998). The environment dictionary. (1st ed.), Routledge, London (1998), pp. 426-427

Kfouri, T., Fernandes, A. C., Bernardo, G. L., Proença, L. C., Uggioni, P. L., Rodrigues, V. M., Proença, R. P. C. (2022). Sustainable solid waste management in restaurants: The case of the Ecozinha Institute, Brazil,International Journal of Gastronomy and Food Science,Volume 27,100464,ISSN 1878-

450X,https://doi.org/10.1016/j.ijgfs.2021.100464.(https://www.sciencedirect.com/science/article/pii/S1878450X21001633)

Khan, A. H., López-Maldonado, E. A., &Khan, N. A., Villarreal-Gómez, L. J., Munshi, F. M., Alsabhan, A. H. &Perveen, K. (2022). Current solid waste management strategies and energy recovery in developing countries - State of art review,Chemosphere,Volume 291, Part 3,2022,133088,ISSN 0045-6535,https://doi.org/10.1016/j.chemosphere.2021.133088.(https://www.sciencedirect.com/science/article/pii/S0045653521035608)

Khan, S. Anjum, R., Raza, S.T., Bazai, N. A., &Ihtisham, M. (2022). Technologies for municipal solid waste management: Current status, challenges, and future perspectives,Chemosphere,Volume 288, Part 1,132403,ISSN 0045-6535,https://doi.org/10.1016/j.chemosphere.2021.132403.(https://www.sciencedirect.com/science/article/pii/S0045653521028757)

Lim WJ, Chin NL, Yusof AY, Yahya A, Tee TP. (2016) Food waste handling in Malaysia and comparison with other Asian countries. Int Food Res J. 23(Suppl):S1–6.

Lin, K., Zhao, Y., Kuo, J-H., Deng, H., Cui, F., Zhang, Z., Zhang, M., Zhao, C., Gao, X., Zhou, T., Wang, T. (2022). Toward smarter management and recovery of municipal solid waste: A critical review on deep learning approaches,Journal of Cleaner Production,Volume 346,130943,ISSN 0959-6526,https://doi.org/10.1016/j.jclepro.2022.130943.(https://www.sciencedirect.com/science/article/pii/S0959652622005807)

Maity, S.K. (2018). Importance of municipal solid waste management, International Journal of Advanced Engineering Research and Science (IJAERS), 5 (2018), pp. 2349-6495, 10.22161/ijaers.5.5.49https://dx.doi.org/

Moh YC, Manaf LA. (2014). Overview of household solid waste recycling policy status and challenges in Malaysia. Resourc, Convers Recycl. 2014;82:50–61.

Moh YC, Manaf LA. (2014). Overview of household solid waste recycling policy status and challenges in Malaysia. Resourc, Convers Recycl. 2014;82:50–61.

Muheirwe, F., Kombe, W. &Kihila, J. M. (2022). The paradox of solid waste management: A regulatory discourse from Sub-Saharan Africa,Habitat International,Volume 119,102491,ISSN 0197-

3975,https://doi.org/10.1016/j.habitatint.2021.102491.(https://www.sciencedirect.com/science/article/pii/S0197397521001806)

Nathanson, J. A. (2020, November 10). *solid-waste management*. *Encyclopedia Britannica*. https://www.britannica.com/technology/solid-waste-management

Nathanson, J. A. (2020, November 10). *solid-waste management*. *Encyclopedia Britannica*. https://www.britannica.com/technology/solid-waste-management

Ncube F, Ncube EJ, Voyi K. A systematic critical review of epidemiological studies on public health concerns of municipal solid waste handling. Perspect Public Health. 2017;137(2):102–8.

Ncube F, Ncube EJ, Voyi K. A systematic critical review of epidemiological studies on public health concerns of municipal solid waste handling. Perspect Public Health. 2017;137(2):102–8.

Oyedotun, T. D. T., Kasim, O. F., Famewo, A., Oyedotun, T. D., Moonsammy, S., Ally, N., Renn-Moonsammy, D. (2020). Municipal waste management in the era of COVID-19: Perceptions, practices, and potentials for research in developing countries, Research in Globalization, Volume 2,100033, ISSN 2590-051X, https://doi.org/10.1016/j.resglo.2020.100033.(https://www.sciencedirect.com/science/article/pii/S2590051X20300228)

Permana, Ariva&Towolioe, Sherly & Aziz, Norsiah& Ho, Chin. (2015). Sustainable solid waste management practices and perceived cleanliness in a low income city. Habitat International. 49. 10.1016/j.habitatint.2015.05.028.

Petaling Jaya Municipal Council (MBPJ) (2010). Composting closing the loop at home. A household home composting program in Petaling Jaya Municipal Council. http://www.ecoideal.com.my/danidaurban/swmc/download/SWMC_CI_Composting%20at%20MBPJ.pdf.

Silva, W. D. O. &Morais, D. C. (2021). Transitioning to a circular economy in developing countries: A collaborative approach for sharing responsibilities in solid wastemanagement of a Brazilian craft brewery,Journal of Cleaner Production,319,128703,ISSN 0959-6526,https://doi.org/10.1016/j.jclepro.2021.128703.(https://www.sciencedirect.com/science/article/pii/S0959652621029024)

Singh, E., Kumar, A., Mishra, R., & Kumar, S. (2022). Solid waste management during COVID-19 pandemic: Recovery techniques and responses,Chemosphere,Volume 288, Part 1,2022,132451,ISSN 0045-6535,https://doi.org/10.1016/j.chemosphere.2021.132451.(https://www.sciencedirect.com/science/article/pii/S0045653521029234)

Sinha, A. H. and Enayetullah, M. M. (2000), *The formal and informal sector linkages in waste recycling: a case of solid waste management in Dhaka City [M.S. thesis]*, 2000.

Sinha, A. H. and Enayetullah, M. M. (2000), *The formal and informal sector linkages in waste recycling: a case of solid waste management in Dhaka City [M.S. thesis]*, 2000.

Suleman Y, Darko ET, Agyemang-Duah W. Solid Waste Disposal and Community Health Implications in Ghana: Evidence from Sawaba, Asokore Mampong Municipal Assembly. J Civil Environ Eng. 2015;202. https://doi.org/10.4172/2165-784X.1000202.

Tan, Z., Ren, Y., Han, J., Chen, S. (2021). Evolving pattern and improvement path of China's solid waste management policies,Chinese Journal of Population, Resources and Environment,Volume 19, Issue 4,Pages 358-368,ISSN 2325-4262,https://doi.org/10.1016/j.cjpre.2022.01.009.(https://www.sciencedirect.com/science/article/pii/S2325426222000092)

Tasiran, Ali. (2014). Research methods in education, 7th edition. Studies in Continuing Education. 36. 10.1080/0158037X.2013.874966.

Ugwu, C. O., Ozoegwu, C. G., Ozor, P. A., Agwu, N. &Mbohwa, C. (2021). Waste reduction and utilization strategies to improve municipal solid waste management on Nigerian campuses,Fuel Communications,Volume 9,2021,100025,ISSN 2666-0520,https://doi.org/10.1016/j.jfueco.2021.100025.(https://www.sciencedirect.com/science/article/pii/S2666052021000182)

Ugwu, C.O., Ozoegwu, C.G. &Ozor, P.A. (2020). Solid waste quantification and characterization in university of Nigeria, Nsukka campus and recommendations for sustainable management, Heliyon, 6 (2020), 10.1016/j.heliyon.2020.e04255

United States Environmental Protection Agency Office of Resource Conservation and Recovery (2020). Best Practices for Solid Waste Management: A Guide

for Decision-Makers in Developing Countries (2020). Best Practices for Solid Waste Management: A Guide for Decision-Makers in Developing Countries, EPA, 1-166.

United States Environmental Protection Agency Office of Resource Conservation and Recovery (2020). Best Practices for Solid Waste Management: A Guide for Decision-Makers in Developing Countries (2020). Best Practices for Solid Waste Management: A Guide for Decision-Makers in Developing Countries, EPA, 1-166.

Yang, H., Ma M, Thompson J. R, Flower R. J. (2018). Waste management, informal recycling, environmental pollution and public health. J Epidemiol Community Health, 72(3):237–43.

Yatim S. R. M., Arshad, M. A. (2010). Household Solid Waste Characteristics and Management in LowCost Apartment in Petaling Jaya. Selangor Health Environ J. 2010;1(2):58–63.

Zhou X, Yang J, Xu S, Wang J, Zhou Q, Li Y, et al. (2020). Rapid in-situ composting of household food waste. Process Saf Environ Prot, 141:259–66.

Ziraba AK, Haregu TN, Mberu B. (2016) A review and framework for understanding the potential impact of poor solid waste management on health in developing countries. Arch Public Heal. 2016;74(1):1–11.

Ziraba AK, Haregu TN, Mberu B. (2016) A review and framework for understanding the potential impact of poor solid waste management on health in developing countries. Arch Public Heal. 2016;74(1):1–11.

Appendices

Appendix A
Questionnnaire

Dear Respondent,

This questionnaire is designed to elicit your views and opinions on the questionnaire Knowledge of Solid Waste Management among Undergraduates of the University of Ibadan, Nigeria. Be assured of confidentiality on all personal information you give as information obtained from this questionnaire will be used for this research only. Participation in this study is voluntary.

Thank you for your anticipated cooperation and contribution.

Part A: Socio-demographic Information

Please, tick [√] you preferred option

Gender: Male [ ] Female [ ]

Age: 16-20 [ ] 21-25 [ ] 26-30 [ ] 31-35 [ ] 36 and Above [ ]

Level: 100L [ ] 200L [ ] 300L [ ] 400L [ ] 500L [ ] 600L [ ] 700L [ ]

Faculty : ……

The importance of solid waste management for sustainable development
By Asiri D Vitharanage

Solid waste management

"Solid Waste" means; ***left-over arising from human, animal or plant activities that are normally discarded as useless"***

9. Have you ever heard about solid waste management?

1. Yes ☐ 0. No ☐

If yes, in what way? *(One or more answers)*

1. over radio ☐
2. Over TV ☐
3. In public meeting ☐
4. In school ☐
5. On poster ☐
6. Other.....

10. Have you ever been educated on proper waste disposal by the council?

1. Yes ☐ 0. No ☐

11. What type of solid waste comes out from your household? (*One or more answers*)

1. Paper and carton ☐
2. Plastics (bags/bottles) ☐
3. Food waste ☐
4. Tins/cans ☐
5. Fiber bags ☐
6. Glass ☐
7. Other.....

12. In what type of container do you collect waste? *(One or more answers)*

1. Carton ☐
2. Waste Basket ☐
3. Old bucket ☐
4. Plastic bag ☐
5. Tin/can ☐
6. Other.....

13. How often is the waste container emptied?

1. Once a day ☐
2. Once in two days ☐
3. Once in three days ☐
4. Once a week ☐
5. Other.....

14. Where do you usually put away collected wastes?

1. In the public bin ☐
2. In the itinerant waste van ☐
3. By the valley/lake side/river ☐
4. By the road or street side ☐
5. On an open space ☐
6. In a hole in own compound ☐
7. Other.....

15. Are there any public bins near your house?

1. Yes ☐ 0. No ☐

If yes, How long does it take to get there?

1. 5- 10min ☐ 2. 11- 15min ☐ 3.16- 20min ☐ 4. 21-25min ☐
5. Other..... .....

16. If there are public bins, how often are the nearest public bins emptied?

1. Once a week ☐ 2. Twice a week ☐
3. Thrice a week ☐ 4. Everyday ☐
5. Don't know ☐
6. Other.....

17. How can you describe the state of the public bin near your house?*(One or more answers)*.

1. Rusting/ rotting ☐ 2.In a good state ☐
3. Adequate size ☐ 4. Not in a good condition ☐
5. Inadequate ☐ 6. Don't know ☐
7. Other.....

18. Do you think the waste disposal method is a problem in your neighborhood?

1. Yes ☐ 0. No ☐

The importance of solid waste management for sustainable development
By Asiri D Vitharanage

Environmental Impact

Environment" Means,: ***The living and non-living surroundings, natural or man-made, which make life on earth possible.***

28. Do you know about environmental impact of solid waste?

1. Yes ☐ 0. No ☐

29. Do you ever notice waste in the road, land or and public area?

1. Yes ☐ 0. No ☐

30. Do you ever notice waste in water recourses such as the rivers, lakes, sea etc..?

1. Yes ☐ 0. No ☐

31. Do you ever notice burning waste in public area?

1. Yes ☐ 0. No ☐

32. Did you ever hear of health problems due to solid waste?

1. Yes ☐ 0. No ☐

33. Do you notice the presence of the following in and around public waste bin or dumping land? *(One or more answers)*

1. Dark flowing water ☐
2. Odour ☐
3. Mosquitoes and cockroaches ☐
4. Fire ☐
5. Domestic animals ☐
6. Rats ☐
7. Scavengers ☐
8. Other.....

Please tell how concerned you are about these Issues in the table.

	1. Concerned	Not Concerned
34. How concerned are you about environmental pollution in Hambantota?	☐	☐
35. How concerned are you about the health impact of waste?	☐	☐
36. How concern are you about Sustainable Development	☐	☐

37. Would you personally say the solid waste is a major issue currently affecting Hambantota natural environment?

1. Yes ☐ 0. No ☐

38. Do you think there is enough information available about the environmental impacts of Solid waste in your area?

1. Yes ☐ 0. No ☐

39. Do you think most environmental issues in Hambantota could be minimized if solid waste is managed properly?

1. Yes ☐ 0. No ☐

40. Do you agree that the new development process has impact on solid waste generation in your area?

1. Yes ☐ 0. No ☐ 2. Don't Know ☐

41. Overall, how would you rate the quality of the environment in Hambantota as compared to the environment you had 5years ago

1. much better ☐
2. a little better, ☐
3. the same ☐
4. a little worse ☐
5. much worse ☐

Sustainable development

Sustainable Development means; *"Promoting development at a rate and such a way as to ensure that the quality of the environment and the supply of the resource is maintain and, wherever practicable, enhanced to meet the needs of the present generations without compromising future generations 'need",*

42. Have you heard of "Sustainable development"?

1. Yes ☐ 0. No ☐

43. Are you aware of sustainable development in Hambantota?

1. Yes ☐ 0. No ☐

The importance of solid waste management for sustainable development
By Asiri D Vitharanage

44. Can you explain the importance of sustainable development for you?

.....

.....

.....

45. Do you think Solid waste management has impact on sustainable development?

1. Yes ☐ 0. No ☐

46. Do you agree that solid waste management should be developed in Hambantota for Sustainable Development?

1. Yes ☐ 0. No ☐

47. Do you believe that there should be environmental conservation for sustainable development?

1. Yes ☐ 0. No ☐

What is the reason for your answer?

.....

.....

.....

48. Do you agree that every single person has a responsibility to contribute to sustainable development in Hambantota?

1. Yes ☐ 0. No ☐

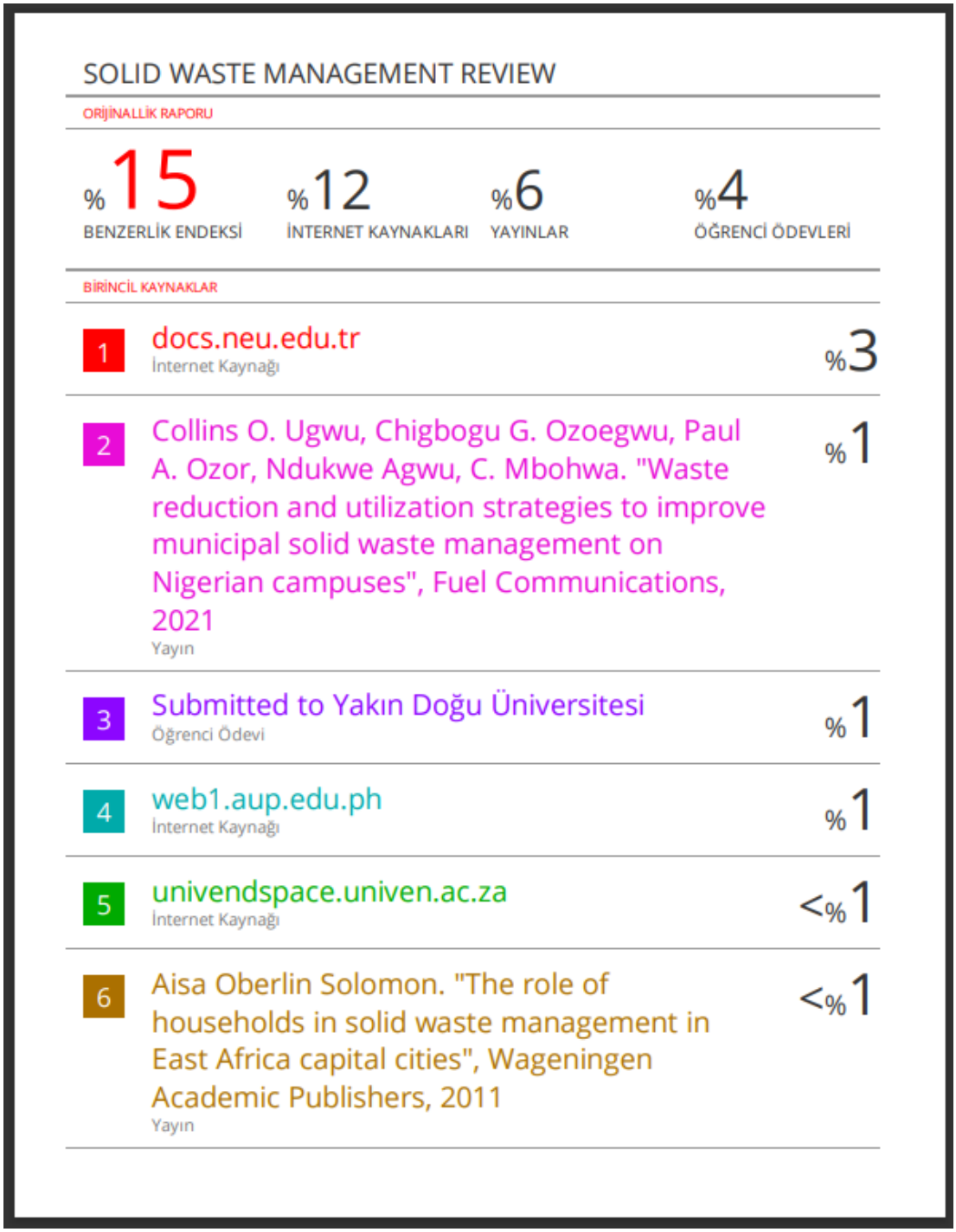
49. Finally, Please tell me, are you satisfied with the Hambantota Municipal Council's waste Collection processes?

1. Yes ☐ 0. No ☐

Thank you for your participation!!!

Appendix B

Turnitin Similarity Report



SOLID WASTE MANAGEMENT REVIEW

ORİJİNALLİK RAPORU

%15	%12	%6	%4
BENZERLİK ENDEKSİ	İNTERNET KAYNAKLARI	YAYINLAR	ÖĞRENCİ ÖDEVLERİ

BİRİNCİL KAYNAKLAR

1	docs.neu.edu.tr İnternet Kaynağı	%3
2	Collins O. Ugwu, Chigbogu G. Ozoegwu, Paul A. Ozor, Ndukwe Agwu, C. Mbohwa. "Waste reduction and utilization strategies to improve municipal solid waste management on Nigerian campuses", Fuel Communications, 2021 Yayın	%1
3	Submitted to Yakın Doğu Üniversitesi Öğrenci Ödevi	%1
4	web1.aup.edu.ph İnternet Kaynağı	%1
5	univendspace.univen.ac.za İnternet Kaynağı	<%1
6	Aisa Oberlin Solomon. "The role of households in solid waste management in East Africa capital cities", Wageningen Academic Publishers, 2011 Yayın	<%1

Appendix C

Ethic Form

NEAR EAST UNIVERSITY SCIENTIFIC RESEARCH ETHICS COMMITTEE

27.01.2022

Dear Adekanmbi Peter Oluwaseun

Your application titled **"SOLID WASTE MANAGEMENT AMONG UNDERGRADUATES IN THE UNVERSITY OF IBADAN"** with the application number NEU/SS/2022/901 has been evaluated by the Scientific Research Ethics Committee and granted approval. You can start your research on the condition that you will abide by the information provided in your application form.

Assoc. Prof. Dr. Direnç Kanol

Rapporteur of the Scientific Research Ethics Committee

Direnc Kanol

Note: If you need to provide an official letter to an institution with the signature of the Head of NEU Scientific Research Ethics Committee, please apply to the secretariat of the ethics committee by showing this document.

CV

ADEKANMBI PETER OLUWASEUN
Suay 2 Door 3 Famagusta, North Cyprus
05391047729
seandasilva0808@gmail.com

EDUCATION

MASTERS | 2020-2022 | NEAR EAST UNIVERSITY

Environmental education and management

BACHELORS | 2009-2013| EKITI STATE UNIVERSITY

Technical education

SKILLS & ABILITIES

Management

Ability to identify problems, deviations and be able to solve them
Ability to be able to work in a team
Decision making
Time management

Sales

Ability to convince and persuade prospective customer
Emotional Intelligence
Confidence
Active listening
Able to set goals and be able to achieve them within specific time period
Verbal Communication

Communication

Ability to understand, relate with other people.
Ability to listen and see from every perceptive.
Ability to be able to manage stress and emotion control.
Employ perceptiveness, sincerity and respect for differences to build trust with diverse groups.
Able to write comprehensive and effective reports and business communication.

Leadership

Ability to think, analyze, think, process and solve problems.
Accept new ideas, solicit consensus, and encourage active participation from team members.
Willing to own responsibilities and accept accountability.

EXPERIENCE

Site Engineer 2017-2019
Construction Kaiser 2017-2019

PERSONAL ACCOMPLISHMENT/HOBBIES

During my spare time, I like learning things and I also play educative mind games like scrabble. They widen my knowledge and vocabulary.