AN ANALYSIS OF SOLID WASTE MANAGEMENT PRACTICES IN AUCHI POLYTECHNIC AUCHI, EDO STATE.

BY

CHRISTOPHER GLORY EJIRO

ENV/2242070169

DEPARTMENT OF URBAN AND REGIONAL PLANNING,

SCHOOL OF ENVIRONMENTAL STUDIES,

AUCHI POLYTECHNIC, AUCHI

BEING A PROJECT PRESENTED TO THE DEPARTMENT OF URBAN AND REGIONAL PLANNING, SCHOOL OF ENVIRONMENTAL STUDIES, AUCHI POLYTECHNIC, AUCHI, EDO STATE, NIGERIA. IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF HIGHER NATIONAL DIPLOMA (HND) IN URBAN AND REGIONAL PLANNING

November, 2022

DECLARATION

I **Christopher Glory Ejiro,** hereby declare that this project titled **"An Analysis of Solid Waste Management Practices in Auchi Polytechnic Auchi Edo state"** is a product of my own researchwork under the supervision of Tpl. Erayanmen R.

_____

Christopher Glory Ejiro

ENV/2242070169

CERTIFICATION

This is to certify that this project titled **"An Analysis of Solid Waste Management Practices in Auchi Polytechnic Auchi Edo state"** was carried out by **Christopher Glory Ejiro** with matricno **ENV/2242070169** as a project in partial fulfillment of the requirements for the award of Higher National Diploma (HND) in the department of Urban and Regional Planning, Auchi Polytechnic,Auchi Edo state.

TPL. Erayanmen R.	**Date**
Project Supervisor	
TPL Edigan, B.I.	**Date**
Head of Department	
Surv. Aweh, D. S	**Date**
Dean, School of Environmental Studies	

DEDICATION

This project is dedicated to God Almighty for giving me the knowledge, wisdom and effort to carry out this project work.

ACKNOWLEDGEMENTS

I am grateful to God Almighty for his kindness to me during the period of my education in Auchi Polytechnic, Auchi. In addition, His endless love, favour, wisdom and strength for the completion of this project work. I owe a great debt of gratitude to my Project Supervisor, TPL. Erayanmen R. for his relentless effort in seeing to the successful completion of this project work. May the good Lord bless you sir.

To the Head of Department, Tpl. Edigan B.I and my lecturers, I thank you all for the knowledge imparted on me. The successful completion of my study is as a result of a combination of the efforts, hard work, sincere moral, financial and material support of my lovely parents, Mr. and Mrs. Christopher, May the good Lord continue to bless and keep you in good health. I wish to express my appreciation to my siblings for their prayer, love and encouragement throughout the course of my study in this great institution. May God Almighty bless you all. I thank my course mates and friends for their unalloyed supports most especially my amiable Class Rep. Olajide Sunday Aruezor, thank you for everything and God bless you sir.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This project analyzes solid waste management practices in Auchi polytechnic. The study adopted the survey approach and primary data was used in sourcing information for the study of which a total of 291 questionnaires was administered in in which 232 was administered to the students while 58 was administered to the staff of the institution using random sampling technique; the department of maintenance was also interviewed in the process. The data was analyzed using tables and percentages. The findings from the study showed that a lot of solid waste is generated in the institution ranging from food waste, papers, plastics, nylons, cans, among others. The studyshowed that the staff disposes their wastes properly due to availability of waste bins in their offices compared collection. The study concluded that there is poor solid waste management in the institution. It was recommended that; the entire populace need to be sensitized and integrated into the waste management plans, furthermore, there should be strict adherence to guidance and cost analysis ofsolid waste options in the institution, the school should construct waste recycling plant so that solid wastes can be recycled in the institution. In addition, there should be environmental and public health education on the danger of indiscriminate solid waste disposal in the area and the school authority should emphasize a 'zero waste' tolerance, whereby all the solid waste generated are recycledand reused among others.to the students where most dispose theirs nonchalantly due to the lack of waste bins for solid waste.

Keywords: Analysis, Solid waste, Solid Waste Management

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Solid waste is a common phenomenon as long as humans exist, this is because the activities of man will always generate wastes one way or another, and thus the management of these waste is necessary to ensure proper functionality in the environment. The generation of solid waste, the non-liquid and non-gaseous product of human activities which could take the form of refuse, garbage and sludge is reportedly on the daily increase, most especially on campuses in the universities with specific pull factors of student population yearly. Every student resident generates waste arising from routine activities such as sweeping, remnants of food, washing and laundry. The common reported type of solid waste found includes paper, grass, nylon (in pure water bags and sachets, ice cream, sweet and candy wrappers) amidst the COVID-19 pandemic, maize or corn cobs and groundnut shells also

contribute to some of these wastes. The increase in population of an area without any corresponding increase in the available social infrastructures often results in the attendant infection of diseases and the problem of environmental sanitation (Nongo, Adejo, & Ubagu, 2021).

The management of solid waste (non-liquid and non-gaseous by-products of human activities that are deemed useless and of no economic value) is an essential aspect of daily life and has been an issue once human beings started forming enough communities to put stress on natural and material resources (Jibril, Ibrahim, & Jamilu, 2012; Bakare, 2012). Solid waste management therefore basically, involves the collection, transportation, processing, disposal, management and monitoring of solid waste materials. The management of solid waste treats all materials as a single class, and it also strives at reducing the harmful environmental impacts of each using the most appropriate methods (Coker, Achi, Sridhar, & Donnett, 2016).

Tertiary institutions of learning have an essential role in innovation and knowledge diffusion as they are seen as agents of improvement in society (Tangwani chagapong, Nitivattananon, Mohanty, & Visvanathan, 2017). They have a critical role in sustainable development (Hugé, Mac-Lean, & Vargas, 2018) because they have prepared professionals not only for the market but also for society. Thus, it is important that teach by giving example and awareness of a suitable way to manage solid waste (Vargas & Campos, 2020). Due to the size of tertiary institutions, they are considered as mini cities. Inside them, there are hospital, restaurants,banks, offices, classrooms, and places for events, among others, for this reason, there is a wide diversity of solid waste produced by these institutions, including construction and demolition waste, electronic waste, office waste, lamp, furniture, metal, hospital waste, and others (Vargas &Campos, 2020).

Effective solid waste management program is generally low in Nigeria. Although, there are legislations and regulatory bodies established to drive the program at the three tiers of government (Local, State and Federal) but less success had been recorded (Nathaniel et al., 2012).There are a host of policies and regulations on solid waste management (SWM) in Nigeria. Despite these, waste management is in its lowest ebb. Though a lot of researches have been carried out on the collection and characterization of solid wastes in some parts of Nigeria, there is little or no data on the characteristics of solid waste generated in most tertiary institution in the country on which to initiate a design for solid waste management system for the institutions (Adeniran, Nubi, & Adelopo, 2017). Auchi polytechnic, one of the famous polytechnics in West Africa has in recent times experienced an increase in population growth and activities within the campus which is as a result of the increase in the number of

students and campus activities in the area. All of these activities are bound to generate solid wastes in one way or the other and the management of these wastes is imperative especially with the campus being an institution of innovation where professionals are made. Thus, this project research focuses on analyzing solid waste managementpractices in Auchi polytechnic.

1.2 Statement of Research Problem

The polytechnic community contributes to environmental degradation by not abiding by the dictates of the three Rs – to reduce, re-use and recycle generated solid waste. The institution isexpected to live up to certain standards and lead by example, but certain factors inhibit this expectation. The institution has one of the responsibilities to prepare young people for the future based on the belief that schools perform better when they take responsibility for their own improvement that should be reflected in their ethos, day-to-day operations and through education for sustainable development. However, solid waste management practices in the school has been of low degree, due to the fact that there is poor waste management culture among the users of the polytechnic community as walking round, one is bound to see the indiscriminate dumping of refuseby staff, students and other users of the polytechnic at various areas of the campuses, due to the lack of infrastructure and other waste management policies in the campuses.

Another issue with solid waste management in the institution is the attitude of most personsto waste. People regard wastes as useless and they therefore throw their waste materials anywhere they deem fit in the campus without paying attention to the environmental effect of such actions. Another problem with attitude is that even in places where there are wastes bins, most campus users prefer to dump their refuse on the ground, littering the environment and causing a chaotic scene in the area. Also the separation of solid wastes is not practiced in the polytechnic as there are no measures put in place to differentiate different types of wastes.

In order to reduce waste at the polytechnic, recycling efforts must be improved and organic recycling services must be provided. Additionally, students, faculty, and staff must be properly educated on proper waste management practices. The constant production of new products and packaging means knowledge of recyclable and compostable materials has become a complex and confusing topic for many people. In a society that values convenience, the current "throwaway" lifestyle encourages a linear approach to the production and disposal of products, rather than a circular approach that regards waste as simply another resource (Crigger, Keller, & Le Noir, 2017).Users of the polytechnic community often lead busy lives and value convenience; as they go abouttheir day rushing between activities and classes, the purchase of single-use products is often the most convenient choice.

The consequence of this convenience comes in the form of high quantitiesof waste. The development of the polytechnic as a system is fundamentally hinged on the way the environment is managed. If solid waste generated is not well managed, it will hinder progress generally,be detrimental to health and well-being of residents, affect workers' morale, and generally affect the socio-academic life within the Polytechnic community, thereby hindering progress. This is because the method of waste management dictates the environment and impinges on overall development efforts. The above facilitates the need for this research.

1.3 Research Question

1. What are the socio-economic characteristics of residents in the polytechnic?
2. What is the nature of the solid waste generated within the polytechnic community?
3. What is the solid waste management practices carried out in the polytechnic?
4. What are the challenges encountered with the management of solid waste on campus?

1.4 Aim and Objectives

The aim of this project is to analyze waste management practices in Auchi polytechnic and suggest lasting recommendations.

The objectives of the study are to:

i. Examine the socio-economic characteristics of the polytechnic residents
ii. Identify the nature of the solid waste generated within the polytechnic community
iii. Examine the challenges encountered with the management of solid waste on campus
iv. Identify solid waste management practices and their effectiveness within the study area
v. Suggest policy measures to improve the solid waste management practices in the campus

1.5 Scope of Study

This research work focuses on the management of solid waste using the solid waste generated in Auchi Polytechnic. It examines the socio-economic characteristics of the polytechnic residents, the types of solid wastes generated, the solid waste management practices carried out in the area, the challenges encountered with effective solid waste management practices in the institution as well as examine sustainable ways to curb the problems.

1.6 Significance of the Study

The indiscriminate littering of solid waste has reached an alarming rate. This greatly degrades the environment of its beauty and even causes diseases. Since school students are seen as one of the

key agents of change to work towards a more sustainable future, they should be engaged as young as possible and given a quality array of continuous learning to improve their knowledge on environmental problem such as poor solid waste management. The study will investigate waste management practices in Auchi polytechnic. The purpose is to establish campus residents' awareness level and acceptance of the waste management process as well as to sensitize the residents to the effect of their waste management practices on the environment; familiarize them with the 3Rs and encourage them to manage their solid waste more effectively, in a manner that will, not only impact positively on future generations, but will engender overall improvement, well-being of residents, and subsequently the development of the polytechnic community. Thus, the findings from this study will help to provide some information on the needed actions to carryout to enhance effective waste management characteristics in Auchi polytechnic. It will also contribute to the existing literature on the subject area and will also serve as a tool for proper decision making for researchers and policy makers who may wish to carry out more research on the same problem.

1.7 Study Area

This project work evaluates the solid waste practice seen within the Polytechnic premises: Auchi Polytechnic, Auchi, Edo State Nigeria.

1.7.1 Location of the Study Area

The area of study is Auchi Polytechnic, Auchi, Edo state, Nigeria (this is shown in Figures 1.1 – 1.4). It is located in Auchi town, a rapidly developing urban center and the administrative headquarters of the Etsako West Local Government Area of Edo State. The Polytechnic campus occupies about 224 hectares and is situated on a stretch of undulating land along the eastern edge of the town. It is bounded by Jattu at the North, South Ibie at the East, West by Warrake road, Aviele and the Ewu at the South.

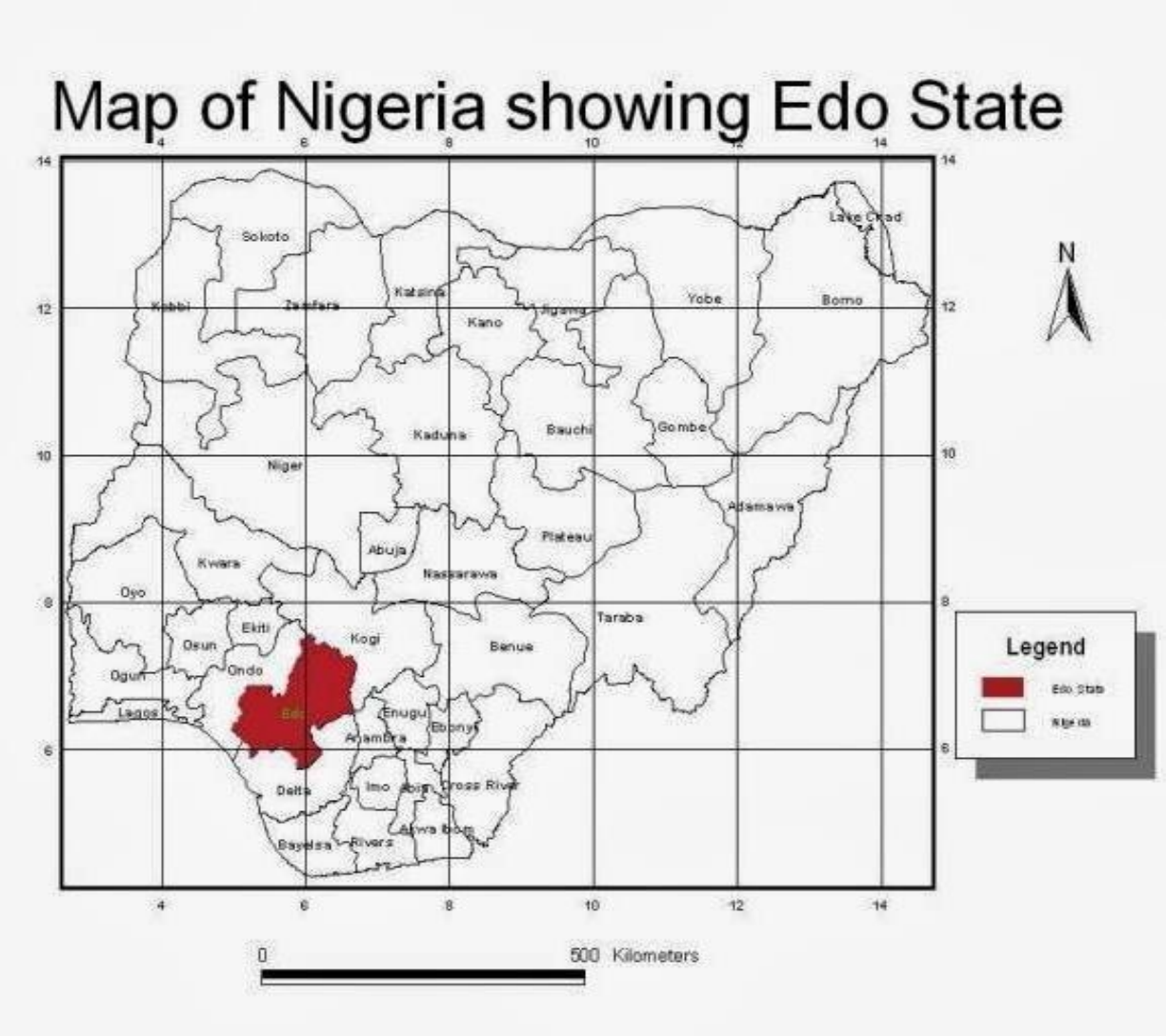

Figure 1.1: Map of Nigeria showing Edo stateSource:

Google maps, 2022

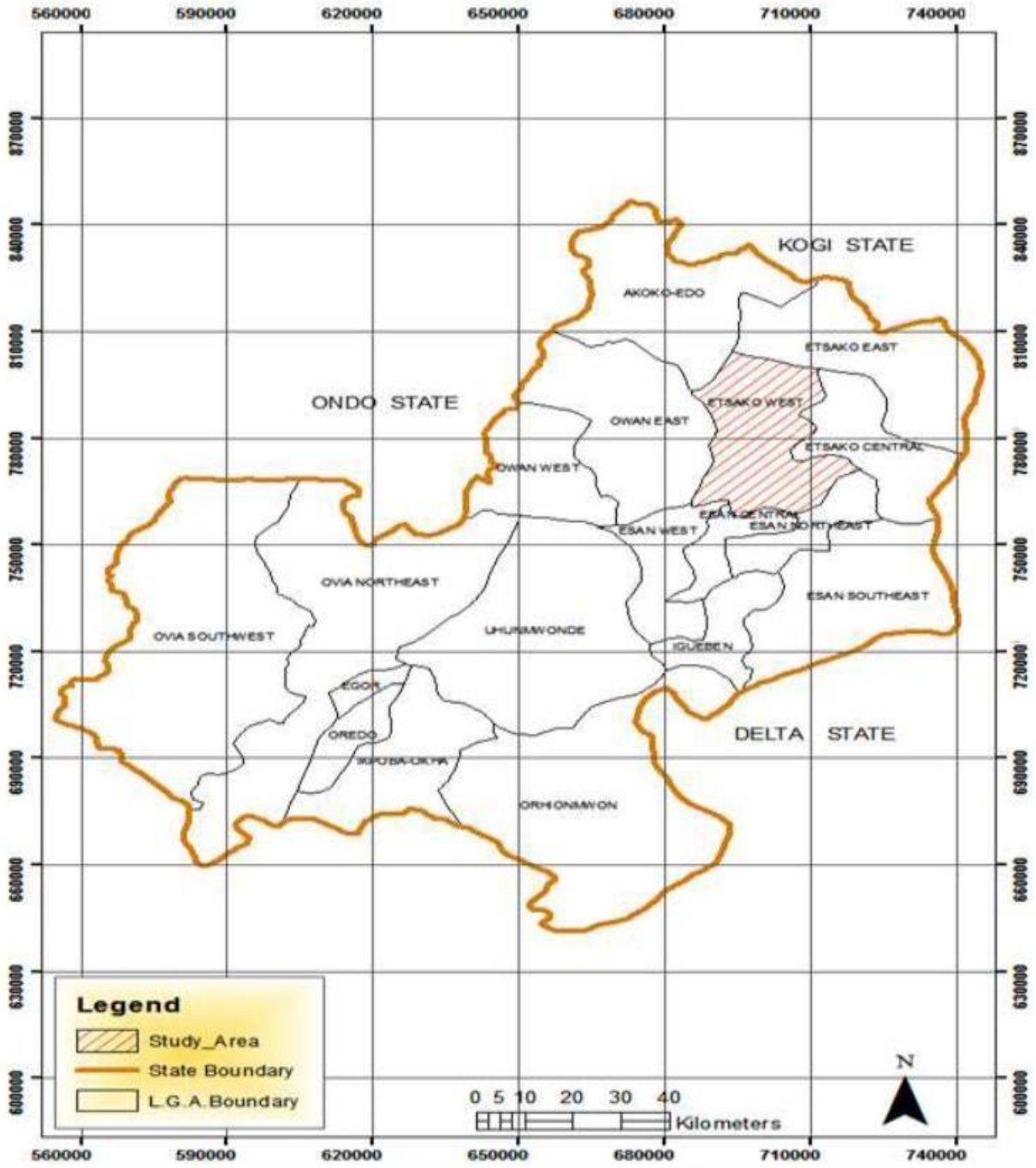

Figure 1.2: Map of Edo state showing Etsako West
Source: Google Maps 2022

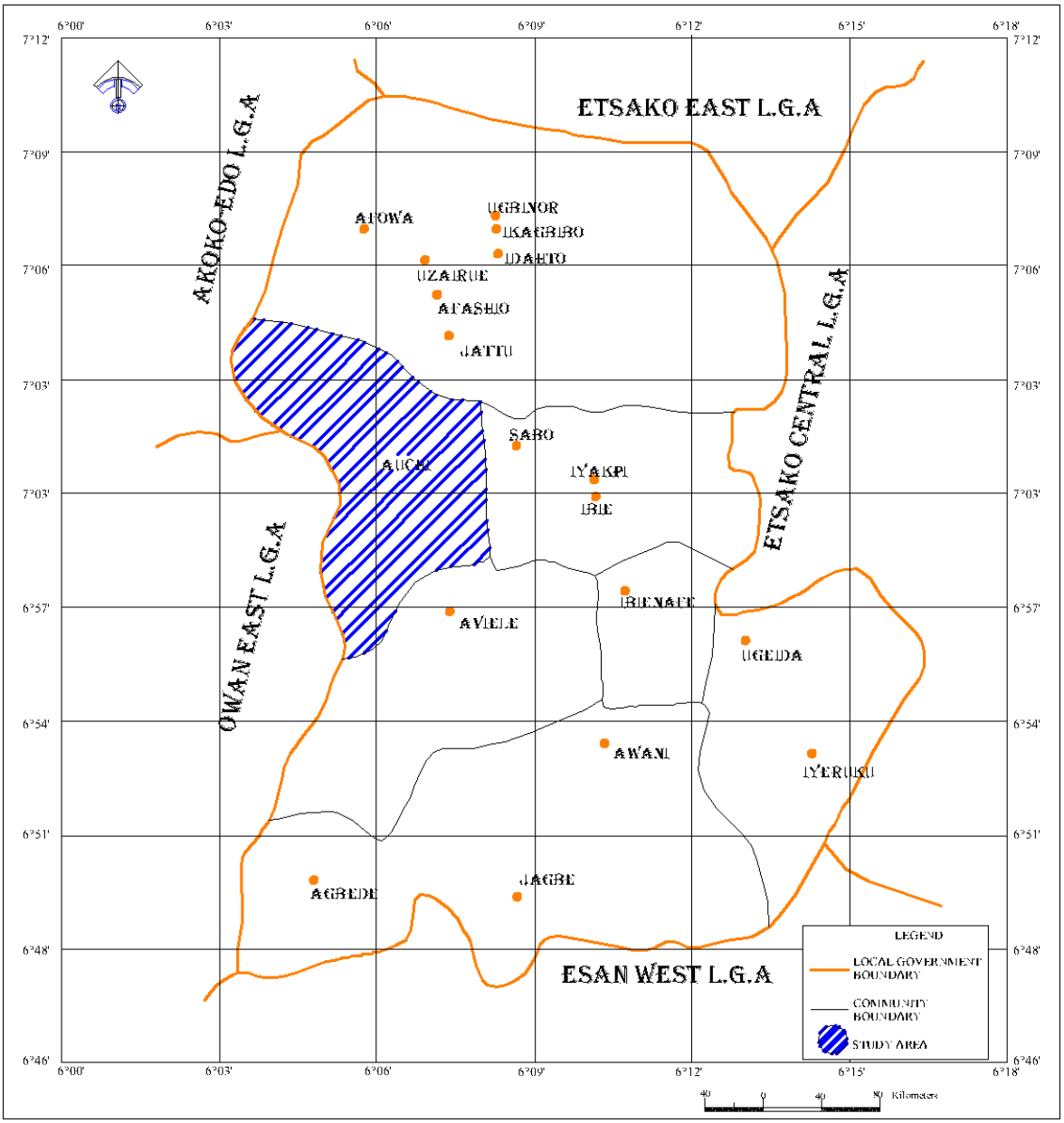

Figure 1.3: Map of Etsako West showing Auchi

Source: Department of Urban and Regional Planning, Auchi Polytechnic, Auchi, 2022

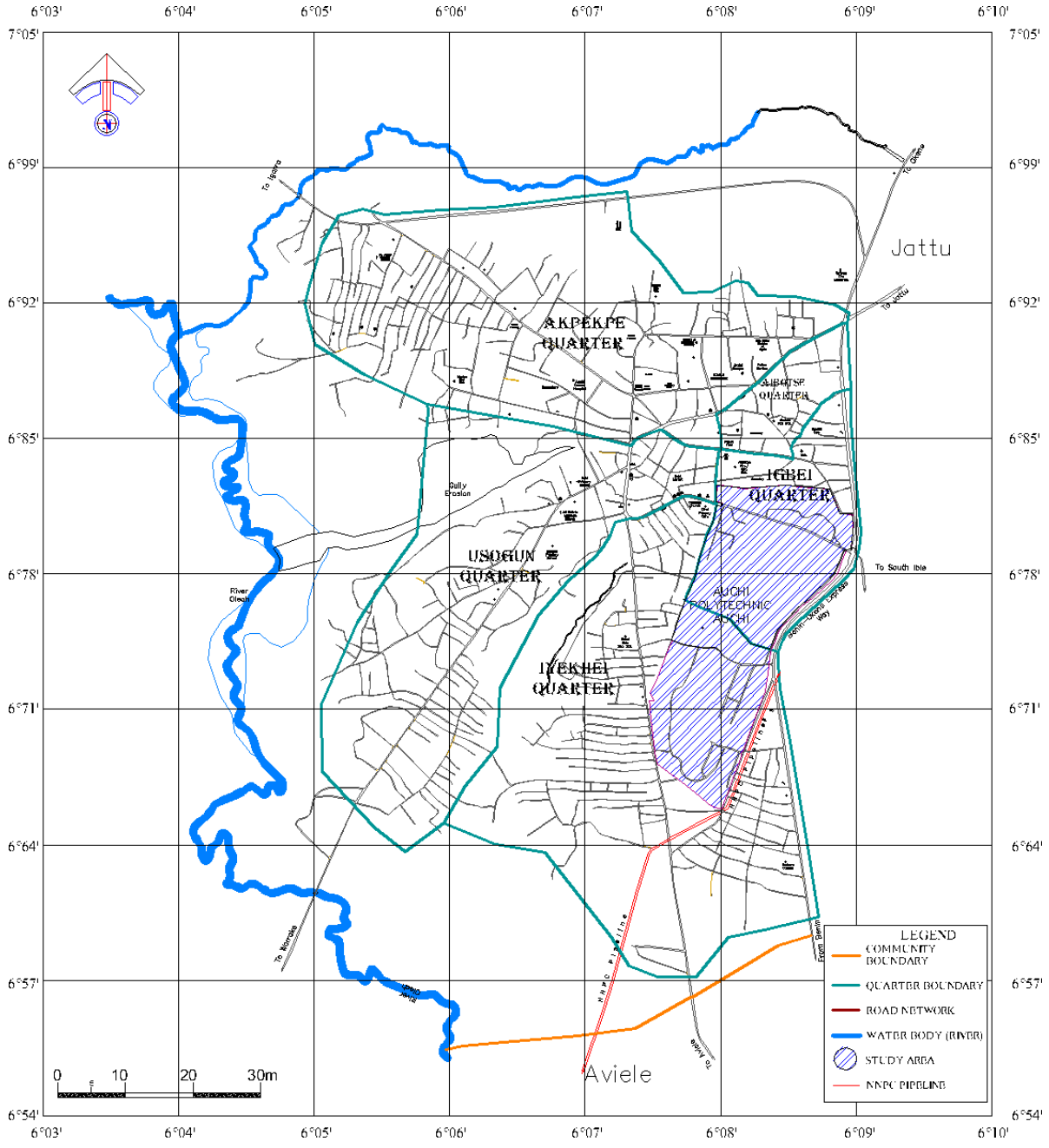

Figure 1.4: Map of Auchi showing Auchi Polytechnic

Source: Department of Urban and Regional Planning, Auchi Polytechnic, Auchi, 2022

1.7.2 Population of the Study Area

The school comprises of eight major schools. These schools include the school of applied science, the school of arts and design, the school of business studies, the school of engineering technology, school of evening studies, environmental studies, the school of information and communication technology and school of languages. The total number of registered students of the polytechnic as at August 2021 is put at 46,498 students, while the total number of staff in the institution as given by Adeniyi, Ezekiel, & Aliyu, (2018) is put at 2336 including the academic and the non-academic staff. This brings the total population 48,834.

1.7.3 Historical Background of the Study

As given by the School of Environmental Prospectus (2018), the Polytechnic emerged in 1973 under the name Midwestern State of Nigeria Polytechnic and was a direct offshoot of the former Midwest Technical College which was established in 1964 as a gift of the British Government. The Midwest Technical College, the first of its kind and indeed the highest post- secondary institution in the state at that time, was founded to produce middle-level technical manpower for the economy. Midwest Technical College offered courses at the Ordinary Diploma level in a limited range of Engineering and Business subjects from its inception in 1964 until the beginning of the seventies when the increasing need not only to offer courses in a much wider range of technical subjects but also at higher levels, reiterated in the Igiehon's Commission Reporton the status of the College, necessitated a change. This need for change led to edict no. 12 of 1973which formally converted the Technical College to a full-fledge Polytechnic, the Midwest Polytechnic with effect from April 1973.

The new Polytechnic started off as a multi-campus institution with its headquarters in Benin City. The Department of Accountancy and Company Administration moved from Auchi to join the Government Commercial Academy, Benin City, which had been absorbed to form the School of Business Studies in the Benin Campus of the Polytechnic while the Engineering Department remained in Auchi to become the School of Engineering of the Polytechnic. The firstBoard of Governors of the Polytechnic was inaugurated in January 1974 under the chairmanship of Mr. Rex Akpofure with Mr. Francis I. Ekhaese as the first Chief Executive and Academic Headof the Polytechnic. From that time until 1976, the institution set out to introduce a wider range of technological courses including a Department of Fine Art and Design in its School of Business Studies.

Meanwhile, in 1974, the name of the institution was changed to Auchi Polytechnic and in1975, the Headquarters was moved back to Auchi. In 1976, following a study of the problems of the institution, Government decided on a restructuring of the Polytechnic into a one campus institution

based on an expanded campus at Auchi. A new Board of Governors was constituted in January 1976 under the chairmanship of Professor A.M.A. Imevbore with Dr. P. O. Igharo as the Principal. This Board consolidated all existing courses in the Polytechnic and strengthened the academic staff both in quality and number and improved and expanded the academic and residential facilities on the campus. During the 1977/78 session, as a result of a directive by the Federal Government that Polytechnics/Colleges of Technology in the country should up-grade their existing 2-years OND courses to 4 years HND programmes, all the former two-year OND courses were so up-graded and these were inclusive of the minimum of twelve months of supervised industrial attachment.

However, by yet another directive from government sequel to students' agitations and subsequent to consultations with heads of institutions and various professional bodies, during the 1979/80 session, these courses were reverted to the two tiers system of ND and HND.

However, following the take-over of the Polytechnic by the Federal authorities in 1994, the NBTE insisted that the school of Vocational Technical Education be phased out or alternative sources of funding be found for it. The school of Vocational and Technical Education had since, been phased out. Meanwhile, the Polytechnic, in the year 1995, founded the School of Applied Science and Technology. The School now comprises the departments of Polymer Technology, Science Laboratory Technology, Catering and Hotel Management and Food Science and Technology. In 2010, the Polytechnic founded the School of Information and Communication Technology. The School comprises the departments of Mass Communication, Statistics, Computer Science and Office Technology and Management. In the same year, the department of Chemical Engineering was founded and added to the School of Engineering while the department of Public Administration was added to the School of Business Studies. In 2014, a new school was added which is now the School of Education, although not fully operational yet.

1.7.4 Climate and Vegetation

The study area lies within the savannah region. Auchi experiences uniform temperature throughout the year. The annual temperature lies between 70°f to 85°f all the year round. It has two seasons, the wet and dry seasons but the dry season is dominant. Auchi is characterized by intermittent rain fall in the rainy season, which comes between the month of April and October and it is accompanied by stunning wind (Emoabino, 2018).

The study area is located in the guinea savannah region. Such vegetation indicates an area with tall grass and short scattered tress. The area is mainly found to have elephant grasses, the appearance of the bushes or vegetation changes with the season from green in rainy season to pale yellowish in the dry

season (Emoabino, 2018).

1.7.5 Physical features (Relief and Drainage)

Auchi is situated on a depression almost surrounded by hills. The landscape is divided intolow land and high land. The land is further divided into parts for easy and more effective description. One of it is located in the northeast while the other part is made up of these in the south; the higher land to the north is higher and has a height of one 300meters (Emoabino, 2018).

1.7.6 Socio Economic Background of the Study Area

Trading activities is the main function of the people aside academic activities within the school precinct. At the market of the school, traders engage in various forms of trading activities ranging from books, provisions, food shops and computer stores where the students' carryout their typing, photocopying and other computer related jobs and a lot of these activities generate wastes in various forms.

1.7.7 Definition of Terms

Analysis: a form of literary criticism in which the structure of a piece of writing is analyzed. **Campus:** A campus is traditionally the land on which a college or university and relatedinstitutional buildings are situated. Usually a campus includes libraries, lecture halls, residencehalls, students' centers or dining halls, and park-like settings. This includes the buildings of a university, polytechnic or college and the land around them.

Polytechnic: It is an institution of higher learning offering courses in many subjects, especially vocational or technical subjects

Practices: knowledge of how something is usually done.

Recycling: This makes use of materials that becomes waste by turning them into valuable resources. Scrap dealers directly from households and business, waste pickers or scavengers collect material from waste bin and waste collectors' separate materials that can be sold as they load their truck.

Tertiary Institution: a higher degree of learning where you acquire a degree.

Waste Management: waste management can be associated with the control of generation, storage, collections, transfer, processing and disposal of waste in a manner that is in accordance with the best principles of health, economics, engineering, conservation, aesthetics and other environmental consideration that are also responsive to public attitudes.

CHAPTER TWO

2.0 Conceptual Framework and Literature Review

2.1 Introduction

This chapter discusses the conceptual framework and the literature on the subject matter. In it, the issues such as concept of solid waste management, sustainable solid waste management and the review of relevant literature is given attention.

2.2 Conceptual Framework

2.2.1 Concept of Sustainable Solid Waste Management

Sustainable waste management system is an organized waste management system which tends to meet with the requirements of human development goals, which sustaining the ability of the natural systems to provide the natural resources and ecosystem on which the economy and society depends (Wikipedia, 2022). It is a waste management system which involve an integrated solid waste management system aims at reducing waste especially at the source and to keep materials in use for as long as possible and minimize the amount of solid waste that is disposed ofthrough landfill or through incineration (What is sustainable waste management, 2020). This focuses on using various waste management option ranging from avoidance and reduction, reuse and recycling, energy recovery and treatment or disposal. Consequently, the social, environmental and economic aspects are impacted as shown in Figure 2.1.

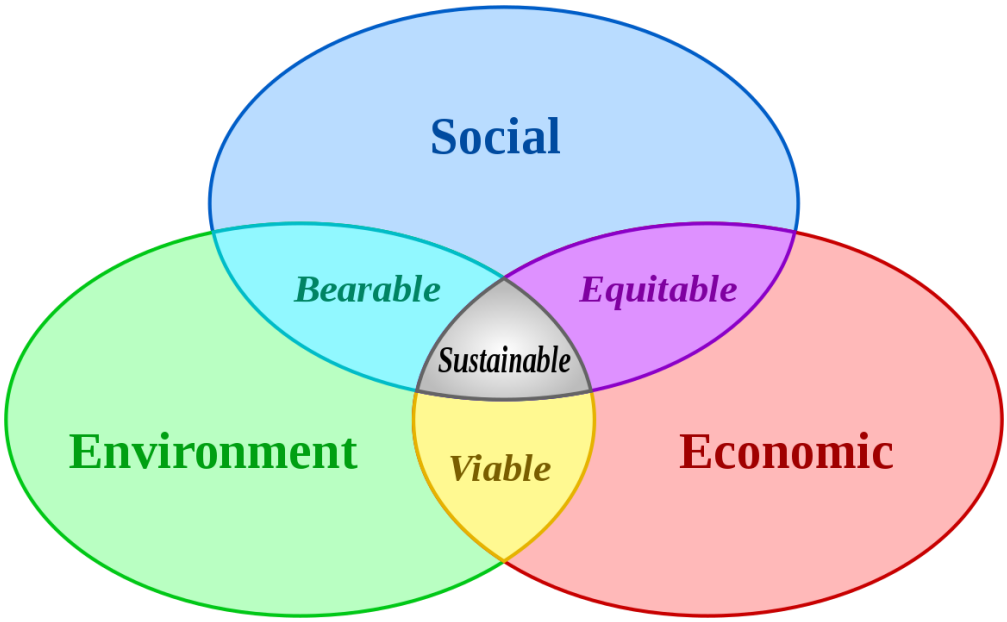

Figure 2.1: Sustainable development goals
Source: Wikipedia, 2022

The term sustainable waste management strategy includes having a strategy in place that is appropriate to the local conditions and has a balance between technical, environmental, social, economic, financial, administrative and political aspects, and is capable of maintaining itself overtime without exhausting the resources it needs (Van de Klundert, 2000; Joseph, 2006; Ijeoma, Ache, & Choji, 2014). To evaluate waste management systems sustainably, the issue of measure of sustainable development arises - this requires transparent and reliable measurement element that must be agreed upon by stakeholders (Murthy, 2002; Joseph, 2006; Lang et al., 2007). While the generic principles of sustainable development consist of social, environmental and economic aspects, the administrative aspect has been evaluated in many studies involving waste management(Van de Klundert, 2000). These aspects cover the range of issues associated with the management of solid waste and taken together, predict or influence the sustainability of the entire system (Ijeoma, Ache, & Choji, 2014). This strategy is adopted for the study, since the study is an academic institution where sustainable waste management can easily be cultivated and such practices if fully effective can influence the behavioural attitude of the users which can in turn affect the waste management practices of the institution in general.

2.3 Literature Review

2.3.1 Nature of Solid wastes in Higher Institutions

Solid wastes generated on campus are classified into different types depending on their sources namely, household generated waste, known as municipal waste. Industrial waste is described as hazardous waste, while waste generated in the hospital is termed infectious waste. Oreyomi (2005) classified solid waste as combustible items such as cartons, boxes, plastic, clothing etc. And non-combustible articles such as cans, ashes, glass, metals, furniture and bathtubs etc. Oreyomi (2005) further observed that garbage denotes waste resulting from growing, handling, preparation and consumption of food. It attracts and breeds flies and other insects, tats and it emits odour. Rubbish comprises of combustible and non-combustible items such as papers, plastic, cans and glass, while industrial wastes are sawdust, paper and iron. Agricultural wastes are wastes originating from agricultural products such as corncob, banana stub, skin and leaves etc (Oreyomi, 2005; Mgbajuo, 2021).

2.3.2 Challenges Encountered with Solid Waste Management in Tertiary Institutions

Human interactions with the environment (human activities) have always resulted in waste

production (Ebikapade & Jim, 2016). However, Giusti (2009) reported that waste production and management was not a major issue until people began living together in communities and the school environment is no different. Vergara & Tchobanoglous (2012) reported that as population and of people increases in schools, more goods are produced to meet increasing demand, thereby leading to the production of more waste. Marchettini et al. (2007) pointed out that, these continuous flows of waste resulting from human activities, overburdened the environment.

The lack of knowledge of proper planning and control of wastes in general is a major problem affecting most educational institutions especially in third world countries. Vergara & Tchobanoglous (2012) reported that proper planning and control is required in other to prevent the negative impact of waste on the environment. As a result, Ghiani et al. (2014) added that, a proper organisation of solid waste management has become an essential task needed to safeguard the environment.

Another major challenge affecting solid waste management on campuses is the lack of efficient solid waste management systems in these campuses. Beranek (1992) argues that the provision of an efficient solid waste management system is now as important as other essential amenities such as electricity, airports, and highways. Basu (2009) pointed out that due to the increasing volume of waste. The continuous disposal of waste to landfill is not sustainable. Hence, Basu argues that the processing of waste is a necessary step needed to safeguard public health.

Demirbas (2011) describes waste management as a process by which wastes are gathered, transported and processed before disposal of any remaining residues. The method of treatment and disposal of solid waste is another major problem affecting solid waste management practices. Tchobanoglous et al (1993) added that, solid waste management utilizes skills and knowledge from various discipline such as legal, financial, administration among others in the day to day running of waste management issues. Demirbas (2011) suggested that the main reason for managing waste is to ensure a safe environment.

Troschinetz & Mihelcic (2009) pointed out that some solid waste management methods are often preferred than others. For instance, reuse, recycling, composting and energy generation from incineration are often preferred to landfills but the technology for these operations are usually not present in most tertiary institutions of learning. However, Dijkema et al. (2000) argued that even some of the preferred management methods, often produce some hazardous materials such as incineration residues. Landfilling is the final destination of most waste produced from waste treatment and processing facilities though other technologies merely serve the purpose of volume reduction or

treatment before final disposal (Strange, 2002; Ebikapade & Jim, 2016).

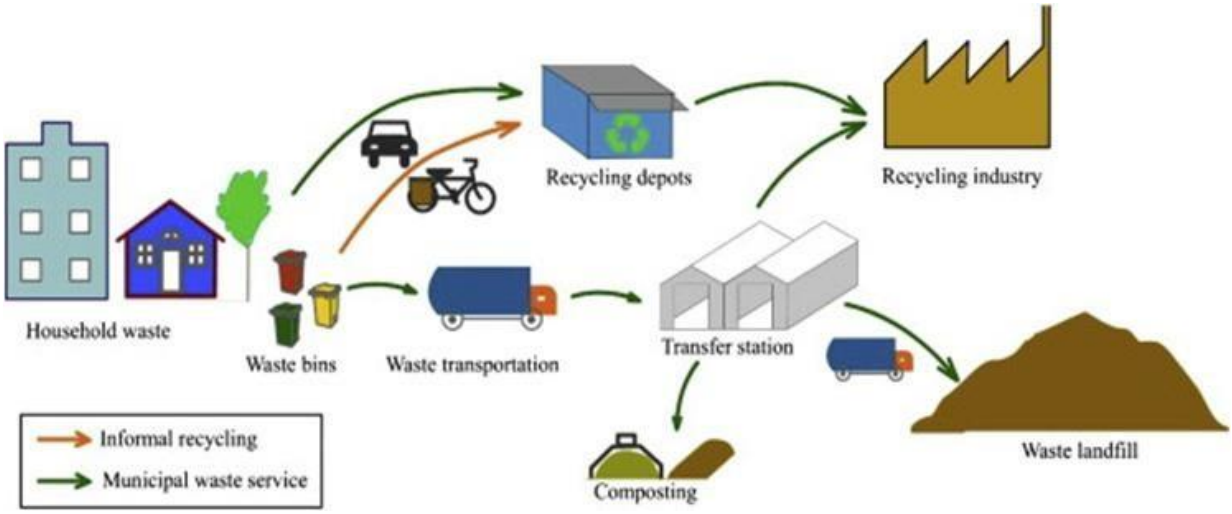

Figure 2.2: The Solid Waste Management cycleSource: Ebikapade & Jim, (2016)

Cheremisinoff (2003) reported that, there are different forms of approach to waste management. He added that, wastes streams with different characteristics may require different management approach. For instance, industrial waste might contain more hazardous materials than municipal waste streams. Hence, the management of these two waste streams might differ. Vergara & Tchobanoglous, (2012) found that, although waste management might differ between institutions, states and countries, there are some basic processes or paths that waste management needs to follows.

These paths are illustrated in Figure 2.3.1, the study reported that, wastes generated must be gathered and stored by the generator in a place. The municipal authorities or their agents collect the waste from the point of storage, for transportation to processing or disposal sites. The study added that, in some instances, the waste generators separate the solid waste into various materials fromwhere they are collected for recycling by the recycling industries.

2.3.3 Solid Waste Management Practices and their effectiveness in Tertiary Institutions in Other Countries of the World

Since school is one of the avenues that will provide education and will disseminate information about solid waste management, several studies were conducted in determining its impact in the student's level of awareness and practices. However, these are conducted in tertiaryeducation (Molina & Catan, 2021). In Maigo, Paghasian (2017) revealed that college students havea high level of awareness on solid waste management and their solid waste management practicesin terms of segregation, reduce and recycle were good; while their practices in terms on recycle and disposal were fair. The awareness

on solid waste management of the students had no influence on their practices in disposal however had affected their practices specifically on segregation, reduce, reuse, and recycle (Molina & Catan, 2021). In the study of Gequinto (2016), the extent on solid waste management practices among college students from different state universities and colleges in Calabarzon were determined. Of which, waste collection got the highest composite mean particularly on the promotion of 3Rs (reduce, reuse, recycle) while waste recycling and wastetreatment obtained the lowest composite mean.

In the study carried out by Molina & Catan, (2021) in a high school in a state college in Zamboanga city in Philippines, it was revealed that students have enough knowledge in terms on definition of solid waste, effect of improper solid waste disposal, solid waste prohibited activities, school initiatives towards solid waste, importance of solid waste management and students' responsibilities. However, students have low knowledge on the different laws relevant to solid waste management. The result also revealed that students have good solid waste management practices in terms on segregation, reduction, reuse, recycle and disposal.

In Barbados, Bailey, Pena, & Tudor (2015) conducted a study at the University of the West Indies, Cave Hill Campus, on strategies for improving waste recycling in the institution, the study showed that although there have been waste management in the institution, there are some major barriers affecting recylcing including lack of motivation, high bin contamination and a lack of knowledfe regarding recycling. The study recommended that increased awareness is necessary especially with the fact that tertiary institutions are important areas for information dissemination.

2.3.4 Solid Waste Management Practices and their effectiveness in Nigeria Tertiary Institutions

A study carried out in the University of Uyo by Ekong and Enefiok (2013) using simple random and purposive sampling method and descriptive analysis for the discussion of findings. The findings showed that in the institution, the highest percentage of solid waste generated in the university environs was food waste with and most of these wastes were carelessly dumped in the surrounding farms and bushes, thereby damaging crops in the farms and causing land pollution. Paper was the second largest waste generated in the area. Solid waste disposal problem in this area was further compounded by lack of public formal waste disposal system. There were no adequate designated public dumping sites; hence some inhabitants preferred burning of their solid wastes, while many resorted to dumping in the surrounding bushes, thus creating an unhealthy environment. In terms of attitude, the university students showed nonchalant attitude towards the routine environmental sanitation practices. On

students' waste disposal habits, it showed the uncooperative attitude of students to disposing of waste at the designated local sites. This was evident of poor waste disposal habits of the University students. The waste disposal habit of the students was traced to values, culture and indigenous knowledge inculcated in them at the familylevel as many of them lacked hygiene education and training. It was not uncommon to see students throw waste on the street, even into the drain channels meant to carry rain water. These practices constitute impediment to achieving healthy urban environments.

In the University of Lagos, the story is quite different from that of the University of Uyo. In a study carried out by Adeniran, Nubi and Adelopo (2017) in the University of Lagos using carried out using the ASTM D5231-92 and Resource Conservation Reservation Authority RCRA Waste Sampling Draft Technical Guidance methods. The ASTM method statistical criteria were used to determine the number of samples while the RCRA method provided basis for field sampling after the vehicles had discharged. The data were analyzed using Spearman correlation and the findings showed that in the Akoka campus an average of 32.2 tons of waste was generated daily during the year. The variation, academic period, the waste generated on campus was influenced by the schedule activities on campus. The volume of waste generated during graduationand matriculation ceremonies, which normally bring a lot of visitors to campus, were high while during period of students' vacation waste generation were relatively low. Leveraging and developing a Zero waste strategic has been the focal point of waste management policy of the University for a Sustainable Environment that is envisaged. The university has various policies which encourage recycling but also eliminate creation of unnecessary waste from source. Such policies include providing color code cycling bags to residents at nominal costs and incentives to and encouragement through the University Environmental and Beautification Committee for the Cleaning Unit, Department, Faculties and Faculties on campus. The University stakeholders' commitment to these policies will be driven by effective communication, performance incentives, sustainable technology and Feedbacks.

In a study carried out by Soluade & Soluade (2019) on the attitude of undergraduates towards waste management in non-residential tertiary institutions in Ogun State, Nigeria, it was seen that the students disposed different forms of solid wastes especially in open spaces which were mainly recyclable in nature, while some of them practiced open burning. The study showed that the solid waste management habits of most of the undergraduates' students were poor in general and thisis mainly due to the lack of enlightenment on the parts of the students.

In Covenant University, Ogun State, Nigeria, the study carried out by Coker, Achi, Sridhar, & Donnett (2016) on solid waste management practices in the institution, simple random sampling was

used for the distribution of questionnaires while Cronbach Alpha was used to determine the reliability coefficient of the instrument and data Collected were coded and analyzed using descriptive statistics showed that there is organic solid waste and non-biodegradables wastes. The major sources of these institutional wastes are halls of residence, cafeteria, residential premises, businesspremises and religious premises. Canaan land operates a flexible system of solid waste management. The management system involves the use of operational vehicles (waste/dump trucks), constructedconcrete dumps, mobile bins, a pay loader (for waste compaction) and a team of physical labour (man power) that carry out the physical activities involved in solid waste transfer. Some of these activities include; moving the bin away from and back to its stationary point, lifting the bin to empty the contents, changing of the bins and in very rare cases, cleaning the bin. Solid Waste collection operation is built around a well-structured programme in a scheduled process that enables timely waste pick-ups at specified disposal points in and around the study area. After the specified disposal points have been visited, the waste collected is taken to its final discharge. Those which are recyclable are taken for recycling, while those which are biodegradable are used for energy sources as well as for farm manure.

In Rufus Giwa Polytechnic, Owo, a study conducted by Mgbajuo (2021) on solid waste management in the institution, the author used simple random sampling method and data analysis was done using descriptive statistics which comprised of tables and explanatory notes. The findings from the study showed that there is poor solid waste management in the institution due to the fact that the present waste disposal method is not effective and it is not environmentally friendly as wastes are not recycled due to the lack of recycling facilities in the area, and also wastes are disposed indiscriminately in the institution. The above therefore shows that there is generally poor waste management culture in the institution.

In Ramat Polytechnic Maiduguri, a study conducted by Akeh and Shehu (2018) using Purposive, Systematic and simple random sampling technique for the administration of questionnaires and descriptive statistics was used for the analysis. The findings showed that in the institution, various types of wastes are generated, however these wastes are not properly managed due to the inadequacy of waste receptables, although solid wastes are regularly collected by the polytechnic sanitation workers and though the people are satisfied with the performance of the polytechnic sanitation unit, the waste management characteristics in the area is generally poor due to numerous challenges in the institution.

Most of the above focused on other tertiary institutions in Nigeria using simple random sampling method for questionnaire administration as well as use of descriptive statistics for analysis, however, evidence of an available work showing the waste management practices in Auchi

polytechnic is not available. Hence, this study contributes to knowledge by describing the waste management practices in Auchi. The study will also adopt the simple random sampling technique and the descriptive statistics for the analysis of the findings.

2.3.5 Promoting Environmental Education in Tertiary Institutions

Nigeria, as a developing nation has put in a lot of effort aimed at managing solid waste, such as establishment of environmental agencies at the three tiers of government. For instance, in response to the serious challenges posed by the ravaging effects of pollution, deforestation, desertification, erosion, solid waste management, and sundry manifest of environmental degradation, the Federal Government of Nigeria enacted the National Environmental Standard and Regulation Enforcement Agency (NESREA) Act of 2157 through the Federal Ministry of Environment to replace the Federal Environmental Protection Agency Act. The agency provides authority to ensure compliance with environmental laws, local and international, on environmental sanitation and pollution prevention and control through monitory and regulatory measures. At the State and Local government levels, State Waste Management Agencies/Boards, and Local Waste Management Boards are responsible for solid waste management (Dung, Mankilik, & Ozoji, 2017).

Moreover, Environmental Education has been infused into basic, secondary schooling as well as tertiary institutions as cross cutting concepts. These efforts by the Nigerian government do not seem to have yielded the much-desired results as solid wastes are still seen in dumps in urban and rural regions.

Furthermore, Environmental Education is not stated clearly in the vision of the Federal Ministry of Education. It is rather seen as a cross cutting theme within the nation's curriculum for both primary and secondary schools and the National Minimum Standards for colleges of education. Moreover, there is a paucity of studies on assessment of the knowledge level and attitudinal dispositions of individuals, particularly prospective teachers in tertiary institutions toward solid waste management in Nigeria. However, the question is whether the content of the National Minimum Standards offered to the students of colleges of education who are prospective teachers, adequately equips them with the knowledge and the right attitudes to carry out effectively the teaching and learning of environmental concepts, such as solid waste management. The tertiary institutions of learning in Nigeria are also entrusted with the task of molding students to be responsible members of the society. It is crucial that teachers are the front liners in establishing and sustaining the culture of environmental consciousness in society (Akinbote, 2007), especially with regard to solid waste management. This agrees with the view of

Ibrahim and Babayemi (2010) who emphasized that education should make young people aware of environmental problems. Particularly, their awareness about environmental problems and attitudes toward the solid waste management activities that are part of their learning process. Hence, the particular knowledge and attitudes gained from the environmental education would help in changing their behavior toward the environment. This is critical since teachers are implementers of government plans and policies(Dung, Mankilik, & Ozoji, 2017).

The importance of teachers' knowledge base in teaching cannot be underestimated. When emphasizing the importance of teachers in the effective implementation of Environmental Education, it is suggested that teachers have to be committed to teaching Environmental Education (Robottom, Malone, & Walker, 2000). Apart from commitment, they also need a good knowledge base in Environmental Education. Knowledge is all about gaining a variety of experiences and acquiring a basic understanding of the environment and its associated problems. Knowledge is

familiarity with someone or something, which can include facts, information, descriptions or skills acquired through experience, or education (Schratz, 2016).

Environmental Education has to do with a change of attitude, norms, values, beliefs, and awareness toward a friendly environment (Dung, Mankilik, & Ozoji, 2017). Lecturers and students, who are future implementers of the curriculum of Environmental Education, need to have a positive attitude toward solid waste management. Attitude refers to acquiring a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection (Momoh & Oladebeye, 2010). Environmental attitude constitutes the provision of a good understanding of the set of beliefs, interest, or rules that influence pro-environmental action (Ballarityne, Connell, & Fien, 2006). This presumes that if schools inculcate in students' positive values and attitudes toward solid waste management, they would take an active role in conserving the environment and its resources and hence preserve themfor the future generation.

2.3.6 Drivers of Good Solid Waste Management Practices in Tertiary Institutions

Vargas and Campos (2020) in their study of solid waste management in higher educational institutions drew from several authors best practices to improve solid waste management in general. The authors approached the importance of financial incentive by sponsors as government, private sector, philanthropic institutions and even the community in sustainability projects to achieve successful in this subject. These drivers are:

- Implementing sustainability in HEIs by adding environmental subjects in undergraduate and

graduate courses;

- Inviting funding arrangements for sustainability projects;
- Enhancing exchange knowledge between the polytechnic managers and the polytechnic community;
- Encourage the polytechnic community to audit solid waste management practices;
- Hiring professionals to work specifically with solid waste management;
- Establishing a green office as a model office to the polytechnic;
- Engaging the community (students, researchers, and staff) in solid waste management activities based on sustainability principles;
- Reporting green initiatives and its achieved goals;
- Disseminating guidelines for proper solid waste discard;
- Carrying out management and final disposal of hazardous waste from research laboratories;
- Reuse in social programs, proper disposal and recycling of obsolete electronic equipment;
- Treating the university as a living lab using its own capabilities to solve environmentalissues.
- Creating database on solid waste management to monitor key performance indicator in higher institutions;
- Allocating different types of bins strategically to enhance recycling waste segregation;
- Awareness of the campus community about solid waste management focusing on recovery, recycling and reuse through campaign, pushing them for a transition to circular economy.

CHAPTER THREE

Research Methodology

3.1 Introduction

This section of the project explores the research methods used to gather data. It looks at the research design, data and their sources, the research population, the sample size, sampling technique as well as the methods for data collection and analysis

3.2 Research design

The research design describes the approach used to address the study. The research design includes: observatory, survey, empirical, case study among others. This study adopts the survey approach in analyzing solid waste management practices in Auchi polytechnic. A survey will be carried out in the area to understand solid waste management activities in the area as a result, primary data sources was used in eliciting the needed information for the study and the findings determines the conclusion for the subject area

3.3 Data required and their sources

The data for this research work were collected from both primary and secondary sources.

- **Primary source**: Data were collected with the aid of camera for on-the-spot assessment of the condition of solid waste management in the institution, which also involved personal observation and note taking. The conduct of interview and administration of questionnaire was employed in the process. Specifically, data were obtained from students and staff in the study area. The details of this is shown in Table 3.2
- **Secondary source**: The secondary data for this study were obtained from past research works and libraries, other sources include the use of internet facilities, textbooks, journals, and other relevant publications. The materials used largely dwell on solid waste management in tertiary institutions across the world and its challenges

3.4 Research population

The school comprises of eight major schools. These schools include the school of applied science, the school of arts and design, the school of business studies, the school of engineering technology, school of evening studies, environmental studies, the school of information and communication technology and school of languages. The registered population of the schools as at August 2022 is given below.

Table 3.1: Population of Students in the Polytechnic

School	Total no. of Registered Students
Applied Science	8098
Arts and Design	1326
Business Studies	7692
Engineering	5932
Environmental	3715
I.C.T.	9895
Evening studies	19840
Total	**56,498**

Source: Auchi polytechnic website, October, 2022.

The total number of registered students of the polytechnic as at August 2022 is put at 56,498 students, while the total number of staff in the institution as given by Adeniyi, Ezekiel, &Aliyu, (2018) is put at 2336 including the academic and the non-academic staff. This brings the total population 48,834.

3.5 Sample size

Considering the large number of respondents in the study area, a total of the 232 questionnaires will be administered to the students within school vicinity randomly accounting for 0.5% of the total students; while 58 questionnaires will be administered to the staff of the institution amounting to 2.5% of the total staff population of the area. 1 questionnaire will be administered to the head of the Health department of the institution. Thus, the total number of questionnaires which will be administered in the study area is 291 questionnaires.

3.6 Sampling technique(s)

Sampling techniques are the strategies, processes or methods utilized in the collection of data or evidence for analysis in other to uncover new information or create better understanding of a topic. Simple random sampling technique was used in administering the questionnaire to the staff and students of the institution.

3.7 Method and instruments of data collection

Data was collected for the study using the administration of questionnaires to staff, students as well as the maintenance unit of the institution to find out about solid waste management practices inthe institution. The data was collected using simple random sampling technique. Also, photographs were taken for the study to assess the level of waste management in the institution. The specific method employed for getting each of the required data for the study is shown in Table 3.2.

Table 3.72: Method of data collection

S/N	Objectives	Data Concept	Data Required	Survey Type	Instrument to be used
1.	Examine the socio-economic characteristics of the polytechnic residents	Socio-economic	Sex, age, education, income, religion.	Socio-economic survey	Questionnaire
2.	Identify the nature of the solid waste generated within the polytechnic community	Physical data	Type of waste generated, solid waste disposal location, waste disposal facilities etc.	Physical survey	Questionnaire and Photograph
3.	Examine the challenges encountered with the management of solid waste on campus	Physical data	Impediments to solid waste disposal, attitude, environmental education etc.	Physical and institutional survey	Questionnaire
4.	Identify solid waste management practices and their effectiveness within the study area	Physical data	Waste management habit, use of waste facilities, institution solid waste management system etc.	Physical and institutional survey	Questionnaire and Photograph

Source: Author's field survey, October, 2022.

3.8 Method of data analysis

Descriptive statistics were used for the analysis of data collected from the field. Data from the field survey were collated and processed using descriptive data including; tables, figures, and photographs. The methods of data analysis are shown in Table 3.3.

Table 3.83: Method of data analysis

S/N	Objectives	Data Analysis	Data presentation
1.	Examine the socio-economic characteristics of the polytechnic residents	Descriptive statistics was used in analyzing the data	Results were presented in a table accompanied with explanatory notes
2.	Identify the nature of the solid waste generated within the polytechnic community	Descriptive statistics was used in analyzing the data	Results were presented in a table accompanied with explanatory notes
3.	Examine the challenges encountered with the management of solid waste on campus	Descriptive statistics was used in analyzing the data	Results were presented in a table accompanied with explanatory notes
4.	Identify solid waste management practices and their effectiveness within the study area	Descriptive statistics was used in analyzing the data	Results were presented in a table accompanied with explanatory notes

Source: Author's Field Survey, October, 2022.

CHAPTER FOUR

Data Analysis and Findings

4.1 Introduction

This chapter discusses the analysis of the findings from the survey carried out by the researcher for the study. The data collected were analyzed using frequency count and percentages.

4.2 Questionnaire for Students

This subsection gives an analysis of the questionnaire administration for the students. A total of a total of the 232 questionnaires was administered to the students of which only 215 was recovered completely, amounting to 92.7% of the total students questionnaires, hence the analysis is that of the 215 students.

4.2.1 Bio-Social Information

In this subsection, the study shall undertake to analyze the basic information of respondents.

4.2.1.1 Socio-economic characteristics of respondents

From Table 4.1, male respondents were 45.1% while the female were 54.9% indicating more female were interviewed than the males.

Table 4.1: Sex

S/N	Sex	Respondent	Percentage (%)
1.	Male	97	45.1%
2.	Female	118	54.9%
	Total	**215**	**100%**

Source: Field Survey, October, 2022.

The age of respondents are showed in Table 4.2. From the table, 20.0% of them are less than 20 years of age while 79.1% of them are between the ages of 20-40 years and 0.9% of them are between the ages of 41-60. This indicates that the most of the students within the institution are between the ages of 20-40 years.

Table 4.2: Age of Respondents

S/N	Age of Respondents	Respondent	Percentage (%)
1.	Less than 20	43	20.0%
2.	21-40	170	79.1%
3.	41-60	2	0.9%
4.	61 and above	0	0
	Total	**215**	**100%**

Source: Field Survey, October, 2022.

The educational background of the students as shown in Table 4.3 shows that 53.5% of the respondents are currently carrying out their National Diploma (ND) programs while 36.3% of themare currently carrying their Higher National Diploma (HND) programs. Those who are in the degree affiliated program are 9.8% of them while 0.4% of them are carrying out their Post-HND program.

Table 4.3: Educational degree under pursuit

S/N	Educational pursuit	Respondent	Percentage (%)
1.	ND	115	53.5%
2.	HND	78	36.3%
3.	Degree	21	9.8%
4.	Post-HND	1	0.4%
	Total	**215**	**100%**

Source: Field Survey, October, 2022.

The respondents' religion is shown in Table 4.4. From the table, it shows that 50.2% of the respondents are Christians, 45.5% of them are Muslims while 4.2% of them belong to other religious set. This shows that a larger percentage of the students are Christians and Muslims respectively.

Table 4.4: Respondents' Religion

S/N	Respondents' Religion	Respondent	Percentage (%)
1.	Christian	108	50.2%
2.	Muslim	98	45.6%
3.	Others	9	4.2%
	Total	**215**	**100%**

Source: Field Survey, October, 2022.

Table 4.5 shows the monthly income status of the students' shows that 22.8% of them get below ₦10,000, 20.9% of them get between ₦10,000 – ₦20,000 monthly, 13.5% of them earn between ₦20,001 – ₦30,000, 16.7% between ₦30,001 – ₦40,000 while 11.6% between ₦40,001-₦50,000 and 14.5% earn from ₦50,000 and above.

Table 4.5: Monthly Income

S/N	Monthly Income	Respondent	Percentage (%)
1.	Below ₦10,000	49	22.8%
2.	₦10,000 – ₦20,000	45	20.9%
3.	₦20,001 – ₦30,000	29	13.5%
4.	₦30,001 – ₦40,000	36	16.7%
5.	₦40,001- ₦50,000	25	11.6%
6.	₦50,000 and above	31	14.5%
	Total	**215**	**100%**

Source: Field Survey, October, 2022.

4.2.2 Nature of Solid Waste Generation by Students within the Polytechnic community

This subsection looks at the waste generation, types of wastes, waste disposal habit, waste bin usage, frequency in the use, as well as information on environmental management and courses on environmental management.

4.2.1.2 Waste generation in the community, Type of solid waste, solid waste disposal and use of solid waste bins

The survey carried out shows that the students' are a major generator of waste as 90.7% of

them agreedto the fact that their activities in one way or the other generate wastes.

Solid Waste Generation

The types of solid wastes generated in the area are shown in Table 4.6. From the table, it showsthat 7.5% of the students generate food wastes, 14.4% generate biscuit wrappers, and 28.8% are papers, while 13.5% are plastics. 15.8% of them are cans and bottles while 20.0% generate nylons while no record was gotten for medical and e-waste.

Table 4.6: Types of Waste Generated

S/N	Types of Solid Waste Generated	Respondent	Percentage (%)
1.	Food waste	16	7.5%
2.	Biscuits wrapper	31	14.4%
3.	Paper	62	28.8%
4.	Plastics	29	13.5%
5.	Cans and bottles	34	15.8%
6.	Nylons	43	20.0%
7.	Medical wastes	0	0
8.	e-waste	0	0
	Total	**215**	**100%**

Source: Field Survey, October, 2022.

The waste disposal method of the students is shown in Table 4.8. From the table it showsthat 39.1% of the respondents dispose their refuse in waste bins, 44.7% dispose their refuse anywhere they like while 16.3% dispose theirs on the ground.

Table 4.7: Solid Waste Disposal

S/N	Waste Disposal	Respondent	Percentage (%)
1.	Refuse bin	84	39.1%
2.	Anywhere I feel	96	44.7%
3.	On the ground	35	16.3%
	Total	**215**	**100%**

Source: Field Survey, October, 2022.

For the use of waste bins by the students, most of the students use waste bins for their refuse

disposal though there are no waste bins in most of the classes in the institution, only a few of them do not use waste bins for their waste disposal since they do not have waste bins in their classrooms.

The frequency in the use of waste bins is shown in Table 4.9. From the table, 12.1% of the students dispose their refuse in the available waste bins often, 67.0% of them do not use it often, while only 20.9% use it once in a while. This coincides with the fact that there most of the students do not have access to waste bins since there are few waste bins within the campus precinct.

Table 4.8: Frequency in the use of Waste Bins

S/N	Frequency in the use of waste bins	Respondent	Percentage (%)
1.	Often	26	12.1%
2.	Not often	144	67.0%
3.	Once in a while	45	20.9%
	Total	**215**	**100%**

Source: Field Survey, October, 2022.

4.2.3 Challenges of Solid Waste Management by Students within the polytechnic community

This subsection looks at the number of existing waste bins and the effectiveness of the waste management strategies in the school.

Table 4.10 shows the challenges of solid waste management in the institution. From the table, the students' are of the opinion that the existing waste bins are not enough to cater for the daily waste management of the institution since they are few within the institution and are not at strategic locations, poor attitude towards waste, low awareness on waste management, lack of signpost as reminder for waste, poor maintenance culture, lack of sanctions for improper waste disposal, lack of legislation against poor waste management, and low staff for waste management

Table 4.9: Challenges to solid waste management

S/N	Challenges	Yes	%	No	%	Total	%
1.	Lack of waste bins at strategic locations	194	90.2%	21	9.8%	**215**	**100%**
2.	Poor attitude towards waste	176	81.9%	39	18.1	**215**	**100%**
3.	Low awareness on waste management	157	73.0%	58	27.0%	**215**	**100%**
4.	Lack of signpost as reminder for waste	148	68.8%	67	31.2%	**215**	**100%**
5.	Poor maintenance culture	180	83.7%	35	16.3%	**215**	**100%**
6.	Lack of sanctions for improper waste disposal	142	66.0%	73	34.0%	**215**	**100%**
7.	Lack of legislation against poor waste management	167	77.7%	48	22.3%	**215**	**100%**
8.	Low staff for waste management	175	81.4%	40	18.6%	**215**	**100%**

Source: Field Survey, October, 2022.

Table 4.11 shows the effectiveness of the school waste management system. From the table, most of the students believes the school waste management system is poor since they hold the opinion that there the solid waste management system is not effective. In general, it can be said that the waste management system in the school is generally poor although the waste management department are working daily to keep the institution in shape.

Table 4.10: Effectiveness of the School waste management system

S/N	Effectiveness	Respondent	Percentage (%)
1.	Highly effectiveness	26	12.1%
2.	Not effective	84	39.1%
3.	Poor	105	48.8%
	Total	**215**	**100%**

Source: Field Survey, October, 2022.

4.3 Questionnaire for Staff

This section gives an analysis on response from the staff of the institution. A total of a total of the 58 questionnaires was administered to the staff of which only 55 was recovered completely, amounting to 94.8% of the total staff questionnaires, hence the analysis is that of the 55 staff.

4.3.1 Bio-Social Information

In this subsection, the study shall undertake to analyze the basic information of the staff.

4.3.1.1 Sex, Age, Educational Background, Religion and Monthly income of respondents

From Table 4.12, 56.4% of the interviewed staff are male while 43.6% of them are females. This does not imply that there are more male than female staff, but due to the interview carried out.

Table 4.11: Sex

S/N	Sex	Respondent	Percentage (%)
1.	Male	31	56.4%
2.	Female	24	43.6%
	Total	**55**	**100%**

Source: Field Survey, October, 2022.

The age of the staff are shown in Table 4.13. From the table, it showed that 32.7% of themare between the ages of 20-40 years, while 61.8% of them are between the ages of 41-60 and only5.5% of them are from 61 and above. This indicates that the most of the staff are between the agesof 41-60 years.

Table 4.12: Age of Respondents

S/N	Age of Respondents	Respondent	Percentage (%)
1.	Less than 20	0	0
2.	20-40	18	32.7%
3.	41-60	34	61.8%
4.	61 and above	3	5.5%
	Total	**55**	**100%**

Source: Field Survey, October, 2022.

The educational background of the staff is shown in Table 4.13. It shows that 7.3% of them have ND, 30.9% have HND/BSc/PGD while 58.2% are having Masters while 3.6% of themhave their PhD.

Table 4.13: Educational Background

S/N	Educational Background	Respondent	Percentage (%)
1.	ND	4	7.3%
2.	HND/BSc/PGD	17	30.9%
3.	Masters	32	58.2%
4.	PhD	2	3.6%
	Total	**55**	**100%**

Source: Field Survey, October, 2022.

The religious background of the staff is shown in Table 4.14. It shows that 41.8% of themare Christians while 58.2% of them are Muslims.

Table 4.14: Respondents' Religion

S/N	Respondents' Religion	Respondent	Percentage (%)
1.	Christian	23	41.8%
2.	Muslim	32	58.2%
3.	Others	0	0
	Total	**55**	**100%**

Source: Field Survey, October, 2022.

The income status of the staff as shown in Table 4.16 shows that, 5.5% of them earn between ₦20,000 – ₦39,999 monthly, 16.4% of them earn between ₦40,000 – ₦59,999, 10.9% between ₦60,000 – ₦79,999 while 27.3% between ₦80,000- ₦99,999 and 40.0% earn from ₦100,000 and above.

Table 4.15: Monthly Income

S/N	Monthly Income	Respondent	Percentage (%)
1.	Below ₦20,000	0	0
2.	₦20,000 – ₦39,999	3	5.5%
3.	₦40,000 – ₦59,999	9	16.4%
4.	₦60,000 – ₦79,999	6	10.9%
5.	₦80,000- ₦99,999	15	27.3%
6.	₦100,000 and above	22	40.0%
	Total	**55**	**100%**

Source: Field Survey, October, 2022.

4.3.2 Nature of Solid Waste Generation by Staff within the polytechnic community

This subsection looks at the waste generation, types of wastes, waste disposal habit, wastebin usage, frequency in the use, as well as information on environmental management and courses on environmental management.

4.2.3.2 Waste generation, Type of waste, Waste disposal, use of waste bins, awareness on environmental management and effectiveness of solid waste management

The staff activities tend to generate wastes Table 4.17 shows the types of waste generatedby them. The types of wastes generated by the staff shows that 9.1% of the students generate foodwastes, 5.5% generate biscuit wrappers, and 38.2% are papers, while 16.4% are plastics. 18.2% of them are cans and bottles while 7.3% generate nylons. 1.8% generates medical waste while 3.5% generate e-waste.

Table 4.16: Types of Waste Generated

S/N	Types of Waste Generated	Respondent	Percentage (%)
1.	Food waste	5	9.1%
2.	Biscuits wrapper	3	5.5%
3.	Paper	21	38.2%
4.	Plastics	9	16.4%
5.	Cans and bottles	10	18.2%
6.	Nylons	4	7.3%
7.	Medical wastes	1	1.8%
8.	e-waste	2	3.5%
	Total	**55**	**100%**

Source: Field Survey, October, 2022.

The waste disposal method of the staff is shown in Table 4.18. From the table, it shows that 81.8% of the staff dispose their refuse in waste bins, 12.7% dispose their refuse anywhere they like while 5.5% on the ground.

Table 4.17: Waste Disposal

S/N	Waste Disposal	Respondent	Percentage (%)
1.	Refuse bin	45	81.8%
2.	Anywhere I feel	7	12.7%
3.	On the ground	3	5.5%
	Total	**55**	**100%**

Source: Field Survey, October, 2022.

Table 4.19 shows the frequency in the use of waste bins. The presence of waste bins in the offices of the staffs shows that most of them have waste bins in their offices. For the use of wastebins by the staffs, the findings showed most of the respondents' use the waste bins while in their offices. The staff deemed it fit to have a clean surrounding always, and they feel it something that should be upheld in the academic environment constantly. Though it is perceived that the solid waste management system of the school as is effective.

Table 4.18: Frequency in the use of Waste Bins

S/N	Frequency in the use of waste bins	Respondent	Percentage (%)
1.	Often	37	67.3%
2.	Not often	5	9.1%
3.	Very often	13	23.6%
	Total	**55**	**100%**

Source: Field Survey, October, 2022.

4.4 Questionnaire for the Health Department of the Institution

The interview with the Head of the Department of Environment Maintenance in the school indicated that the schools have provided waste management facilities for the staffs and students ofthe school. He stated that there are incinerators at strategic points of the school, waste bins of various sizes are found in offices as well as classrooms, though some of these have been mismanaged overtime by the users, as a result, they try to place the blame on the school authorityfor not providing these facilities.

In terms of usage of these facilities, both students and staff of the institution use them, although in the usage, they are not fully effective as not everyone utilizes these facilities. Thoughthe institution have tried to enforce the use of these facilities through environmental awareness aswell as the regular cleaning of the environment through the use of staff (sanitation agents) to maintain the environment always and to remove various trash from the environment. Also environmental awareness is enforced through the various heads of departments within the institution. The common waste disposal method is incineration. Recycling is not fully effective inthe institution due to the lack of recycling facility in the environment. The major challenge affecting effective waste management operation in the institution is attributed to the lack of fundsand resources to employ environmentally viable and friendly approach to effective waste management system in the institution.

Figure 4.1: Roadside indiscriminate refuse dumps along Area III to hostel road

Source: Field Survey, October, 2022.

Figure 4.2: Waste littered close to an incinerator in Area III

Source: Field Survey, October, 2022.

CHAPTER FIVE

Summary of Findings, Conclusion, and Recommendation

5.1 Introduction

This section discusses the summary of findings from the previous section, conclusion as well as recommendations for effective actions to be taken.

5.2 Summary of Findings

The summary of findings for the study is grouped into three sub-sections, students' interview, staff interview and interview with the health department of the institution.

5.2.1 Students Interview

Most of the students in the institution are between the ages of 20-40 years and from the survey a majority of them were in their National Diploma (ND) programs followed by those currently in their Higher National Diploma (HND) programs. The religious affiliation of the students shows that most of them are Christians and Muslims respectively. Although in terms of income status, most of the students earn an average of ₦10,000 – ₦30,000 monthly which can be
ascribe to funds given to them by relations, family, loved ones and from various earning activities carried out by them.

On waste generation, a lot of activities carried out by the students act as waste generation activities and a lot of solid wastes are generated within the institution ranging from food wastes, biscuit wrappers, papers, plastics, cans and bottles. The waste disposal habit of the students showsthat most of them dispose their refuse poorly due to the lack of waste bins in the various classroomsand at strategic locations within the campus precinct. Some of them who have waste bins in their locations especially those in Area II, most times dispose their refuse properly in the available bins.

From the survey, the students deemed it fit to maintain a clean environment, however, some challenges bedeviled the proper waste management in the institution amongst which are lack of waste bins at strategic locations, poor attitude towards waste, low awareness on waste management, lack of signpost as reminder for waste, poor maintenance culture, lack of sanctions for improper waste disposal, lack of legislation against poor waste management, and low staff forwaste management. In general, the students perceive that the waste management practices in the institution is poor since there are no waste bins for carrying out proper waste management practices, although the waste management department are working daily to keep the institution inshape.

5.2.2 Questionnaire for Staff

For the staff interview, 56.4% of the interviewed staff were males while 43.6% of them are females and this does not imply that there are more male staff than female staff in the institution. Most of the staff falls within the ages of 41-60 years and the educational background shows that majority of them have their Masters with a few exception that have HND/BSc/PGD and PhD respectively. The religious background of the staff indicates that there are more Muslim faithfuls than their Christian counterparts respectively; and in terms of income, the average salary of the staff lies between ₦80,000 and above.

On waste generation, the staff activities act as a major influencer of waste production. Most of the produced wastes include; food wastes, biscuit wrappers, papers, plastics, cans, bottles nylons, medical waste and e-waste. Since most of the staff has access to waste bins in their offices, they tend to dispose these wastes in their offices and most of them dispose their wastes properly and they use these facilities often. For the staff, cleanliness is an attribute most of them uphold, hence they can be said to be those who practice proper solid waste management.

5.2.3 Questionnaire for the Health Department of the Institution

The school has provided waste management facilities for the staffs and students of the institution, however overtimes some of these facilities have been poorly handled and this has caused poor waste management practices in the area. In trying to achieve proper waste management, the institution have place incinerators at strategic points within the school, also waste management agents (cleaners and other sanitation agents) have been placed to help maintain the school environment daily and to ensure that proper waste management is achieved in the area. Though, recycling is not fully effective in the institution due to the lack of recycling facility in the environment and the major challenge affecting effective waste management operation is the lack of funds and resources to employ environmentally viable and friendly approach to effective waste management system within the campus.

5.3 Conclusion

The study analysis waste management practices in Auchi polytechnic, Auchi, Edo state. The study highlights that though there are a lot of waste generating activities within the institution, and various types of wastes are generated daily, the waste management practices in the area is not viable and sustainable enough, as most of the students in the area have no access to proper waste

management devices whereas the staff of the institution have access to such, as such it is very common to find students littering the environment with solid wastes regularly. The wastes generated in the area are not properly managed and recycled as incineration is the major waste management practice carried out in the area due to the lack of funds and resources to employ better environmentally viable and effective waste management system within the campus.

5.4 Recommendations

To improve solid waste management in the Institution, the following is recommended.

1. To mitigate the problems of poor waste management in the institution, the entire populace (students and staff) needs to by sensitized and integrated into the waste management plans.
2. There is need to ensure strict adherence to guidance and cost analysis of solid waste options in the Institution.
3. Community participation in collection, selection of sites and design of facilities is inherently essential for sustainability; this should be encouraged in the staff and students.
4. Waste reduction should be encouraged so as to reduce the overall volume of waste generated, most of which will eventually end up being burnt. For example, Papers should be reused so as to save resources and investment on the purchase of new materials.
5. There is need to strengthen the work force, by recruiting more personnel in the Waste Management area of the school.
6. Government and the school management should provide adequate funds for waste management personnel for the purchase of more evacuating vehicles and waste disposal containers.
7. The school needs to construct waste recycling plant so that wastes can be recycled in the Institution and this can also serve as a means of income generation to the institution.
8. There is need for environmental and public health education on the danger of indiscriminate waste disposal in the study area and this can be inculcated into the various curriculums in the various departments in the institution and as well practiced. Since the polytechnic community in itself is comprised of learned individuals, the adoption of best practices would be a lot easier and practicable.
9. The school authority should emphasize a ‘zero waste’ society, whereby all the waste generated

is recycled and reused. Organic waste materials, such as food leftovers, animal dung and vegetal wastes should be utilized for bioenergy generation, through anaerobic digestion, and organic fertilizer production through composting.

10. Through an intensive awareness program, the community can be sensitized and educated on the best practices to adopt so as to ensure that everyone is carried along in issues concerning Solid waste management. This can be achieved through mass media programs.The polytechnic authority should also provide training for its staff and students on various waste management programs so that they can become custodians of the environment. Once the good waste management practices are institutionalized, it will definitely trickle down to the society.

REFERENCES

Adeniran, A., Nubi, A., & Adelopo, A. (2017). Solid waste generation and characterization in the University of Lagos for a sustainable waste management. *Waste Management, 67*, 3–10.

Adeniyi, J. O., Ezekiel, U. L., & Aliyu, A.-A. O. (2018, August). The Impact of Landscape on Academic Performance in Nigeria Tertiary Institutions (A Case Study of Auchi Polytechnic). *Course Hero*.

Agunwamba, J. (1998). Solid waste management in Nigeria: Problems and issues. *Environmental management, 22*(6), 849-856.

Akeh, G. I., & Shehu, B. (2018). Solid waste disposal and management problems in ramat polytechnic maiduguri, North-East Nigeria. *MOJ Ecology & Environmental Science, 3*(1),11-14. doi:10.15406/mojes.2018.03.00065

Akinbote, O. (2007). Some Nigerian primary school pupils' knowledge, attitude and practices on water pollution. *The Social Science, 2*(1), 283-286.

Al-Khatib, I., Monou, M., Abu Zahra, A., Shaheen, H., & Kassinos, D. (2010). Solid waste characterisation, quantification and management practices in developing countries. A case study: Nablus district – Palestine. *Journal of Environmental Management, 91*, 1131-1138.

Armijo de vega, C., Benitez, S., & Ramirez-Barreto, M. (2003). Mexican educational institutionsand waste management programmes: a university case study. *Resource Conservation, and Recycling, 39*, 283-296.

Ayuba, I. G., Achuenu, A. .., & Musa, C. .. (2014). Sustainability of Solidwaste Management in Nigerian Urban Areas: Challenges and Solution. *International Journal of Sciences and Energy Research, 3*(3), 522-543.

Bailey, J., Pena, M., & Tudor, T. (2015). Strategies for Improving Recycling at a Higher Education Institution: A Case Study of the University of the West Indies, Cave Hill Campus, Barbados. *The Open Waste Management Journal, 8*, 1-11.

Bakare, T. (2012). Ensuring Sustainable Environment and Development: A Study of Solid Waste Management in the University of Lagos, Nigeria. 1-15.

Ballarityne, R., Connell, S., & Fien, J. (2006). Students as catalysis of environmental change: A framework for researching intergenerational influence through environmental education. *Environment Education Research, 12*(3-4), 413-427.

Basu, R. (2009). Solid Waste Management-A Model Study. *Sies Journal of Management, 6*, 20- 24.

Beranek, W. (1992). Solid Waste Management and Economic Development. *Economic Development Review, 10*(49).

Cheremisinoff, N. P. (2003). *Handbook of solid waste management and waste minimization technologies.* Oxford: Butterworth-Heinemann.

Chung, S., & Lo, C. (2003). Evaluating sustainability in waste management: the case of construction and demolition, chemical and clinical wastes in Hong Kong. *Resources, Conservation and Recycling, 37*(2), 119-145.

Coker, A., Achi, C., Sridhar, M., & Donnett, C. (2016). Solid Waste Management Practices at a Private institution of Higher Learning in Nigeria. *Procedia Environmental Sciences, 35*, 28 – 39.

Crigger, M., Keller, J., & LeNoir, N. (2017). Chapter 1: Waste Management on Campus. Chapman University.

Demirbas, A. (2011). Waste management, waste resource facilities and waste conversion processes. *Energy Conversion & Management, 52*(2), 1280-1287. Retrieved from https://doi.org/10.1016/j.enconman.2010.09.025

Desmond, M. (2006). Municipal solid waste management in Ireland: assessing for sustainability. *Irish Geography, 39*(1), 22-33.

Dijkema, G. P., Reuter, M. A., & Verhoef, E. V. (2000). A new paradigm for waste management. *Waste Management, 20*(8), 633-638. doi:https://doi.org/10.1016/S0956-053X(00)00052-0

Dung, M. D., Mankilik, M., & Ozoji, B. E. (2017). Assessment of College Students' Knowledgeand Attitudes Toward Solid Waste Management in North Central Zone of Nigeria. *Science Education International, 28*(12), 141-146.

Ebikapade, A., & Jim, B. (2016). The Concept of Waste and Waste Management. *Journal of Management and Sustainability, 6*(4), 88-96.

Ekong, E. D., & Enefiok, I. (2013). Solid Waste Disposal Habits of Students in Nigerian Universities: A Case of University of Uyo, Nigeria. *IOSR Journal Of Environmental Science, Toxicology And Food Technology (IOSR-JESTFT)*, 46-50. Retrieved from www.iosrjournals.org

Emoabino, B. O. (2018). *Assessment of the factors influencing students' choice of private residential housing in Nigeria (A case study of Auchi polytechnic).* HND Thesis , Auchi Polytechnic, Auchi, Urban and Regional Planning.

Gequinto, A. (2017). Solid Waste Management Practices of Select State Universities in Calabarzon, Philippines. *Asia Pacific Journal of Multidisciplinary Research, 5*(1), 1-8. Retrieved from http://www.apjmr.com/APJMR-2017.5.1.01

Ghiani, G., Laganà, D., Manni, E., Musmanno, R., & Vigo, D. (2014). Operations research in solid waste management: A survey of strategic and tactical issues. *Computers & Operations Research, 44*(4), 22-32. Retrieved from https://doi.org/10.1016/j.cor.2013.10.006

Giusti, L. (2009). A review of waste management practices and their impact on human health. *Waste Management, 29*(8), 2227-2239. doi:https://doi.org/10.1016/j.wasman.2009.03.028 Guerrero, L., Maas, G., & Hogland, W. (2013). Solid waste management challenges for cities in developing countries. *Waste management, 33*, 220-232.

Hugé, J., Mac-Lean, C., & Vargas, L. (2018). Maturation of sustainability in engineering faculties – From emerging issue to strategy? *Journal of Cleaner Production, 172*, 4277-4285.

Ibrahim, F., & Babayemi, O. (2010). Knowledge and attitude of a group of Nigerian undergraduates towards environmentalism. *Global Journal of Environmental Research, 4*(1), 47-53.

Ijeoma, G. U., Ache, .. A., & Choji, .. M. (2014). Sustainability of solidwaste management in Nigerian urban areas: Challenges and solution. *international journal of sciences and energy research, 3*(3), 522-543.

Jha, R., Murthy, K. V., Pacific, A. N., & Division, A. S. (2003). *A critique of the Environmental Sustainability Index:*. School of Pacific and Asian Studies, Division of Economics Research . Australian National University.

Jibril, D., Ibrahim, B., & Jamilu, L. (2012). 3R's critical success factor for integrated solid waste management in higher educational institutions. *OIDA International Journal of Sustainable Development, 05*(10), 109-120.

Joseph, K. (2006). Stakeholder participation for sustainable waste management. *Habitat International, 30*(4), 863-871.

Kasseva, M., & Mbuligwe, S. (1999). Ramification of solid waste disposal site relocation in urban areas of developing countries: a case study of Tanzania. *Resources, Conservation and Recycle, 28*, 147-161.

Manaf, L., Samah, M., & Zukky, N. (2009). Municipal solid waste management in Malaysia: Practices and challenges. *Waste management, 29*, 2902-2906.

Marchettini, N., Ridolfi, R., & Rustici, M. (2007). An environmental analysis for comparing waste

management options and strategies. *Waste Management, 27*(4), 562-571. Retrieved from https://doi.org/10.1016/j.wasman.2006.04.007

Masood, M., Barlow, C., & Wilson, D. (2014). An Assessment of the Current Municipal Solid Waste Management System in Lahore, Pakistan. *Waste Management and Research, 32*(9), 834-847. Retrieved from https://doi.org/10.1177/0734242X14545373

Mgbajuo, S. P. (2021). *An Appraisal of Solid Waste Management in Rufus Giwa Polytechnic, Owo.* Unpublished HND Project, Rufus Giwa Polytechnic, Department of Urban and Regional Planning, Owo.

Molina, R. A., & Catan, I. (2021). Solid Waste Management Awareness and Practices among Senior High School Students in a State College in Zamboanga City, Philippines. *Aquademia, 5*(1), 1-8. Retrieved from https://doi.org/10.21601/aquademia/9579

Momoh, J., & Oladebeye, D. (2010). Assessment of awareness of attitude and willingness of people to participate in household solid waste recycling programme in Abo-Eketi, Nigeria.*Journal of Applied Science in Environmental Sanitation, 14*, 1-12.

Nelson, L. N., Franklin, J. A., & Joseph, A. S. (2009). Environmental engineering: environmental health and safety for municipal infrastructure, land use and planning, and industry. John Wiley & Sons.

Nongo, C. J., Adejo, M., & Ubagu, M. M. (2021). Waste Disposal Practices Among Students in Tertiary Institutions and Post Covid-19 Preventive Measures: Medical Librarian'S Advocacy for a Succor. *Journal of applied Information Science and Technology, 14*(1), 158-163.

Ogwueleka. (2009). Municipal solid waste characteristics and management in Nigeria. *Iranian Journal of Environmental Health Science and Engineering, 6*(3), 173-180.

Oreyomi, M. (2005). *Principles and Practice of Environmental Health* (2nd ed.). Kingson Press.

Paghasian, M. (2017). Awareness and Practices on Solid Waste Management among College Students in Mindanao State University Maigo School of Arts and Trades. *Advances in Social Science, Education and Humanities Research, 128*, 5-12. Retrieved from https://doi.org/10.2991/icet-17.2017.2

Republic Act No. 9003. (2000). *The Ecological Solid Waste Management Act of 2000.* Retrieved from https://emb.gov. ph/wp-content/uploads/2015/09/RA-9003.pdf

Robottom, I., Malone, K., & Walker, R. (2000). *Case Studies in Environmental Education: Policy and Practice.* Geelong: Deakin University Press.

Saeed, M., Hassan, M., & Mujeeb, M. (2009). Assessment of municipal solid waste generation and recyclable materials potential in Kuala Lumpur, Malaysia. *Waste management, 29*, 2209-2213.

Schratz, M. (2016). Austria: Overcoming a bureaucratic heritage as a trigger for research on leadership in Austria. In H. Anlesing, C. Day, & O. Johansson (Eds.), *A Decade of Research on School Principals: Cases from 24 Countries* (pp. 307-329). Dordrecht, Netherlands: Springer.

Soluade, Z. O., & Soluade, Z. O. (2019). Attitude of Undergraduates towards Waste Managementin Non-Residential Tertiary Institutions in Ogun State, Nigeria. *Social Science Education Journal (SOSCED-J), 4*(1), 84-92.

Strange. (2002). in Ebikapade, A. & Jim, B. (2016) - The Concept of Waste and Waste Management, Journal of Management and Sustainability, 6(4).

Tangwanichagapong, S., Nitivattananon, V., Mohanty, B., & Visvanathan, C. (2017). Greening of a campus through waste management initiatives: Experience from a higher education institution in Thailand. *International Journal of Sustainability in Higher Education, 18*(2), 203-217.

Tchobanoglous, G., Theisen, H., & Vigil, S. (1993). Integrated Solid Waste Management: Engineering Principles and Management Issues. *Water Science & Technology Library, 8*(1), 63-90.

Troschinetz, A. M., & Mihelcic, J. R. (2009). Sustainable recycling of municipal solid waste in developing countries. *Waste Management, 29*(2), 915-923. Retrieved from https://doi.org/10.1016/j.wasman.2008.04.016

Van de Klundert, A. (2000). *The Sustainability of Alliances Between Stakeholders in Waste Management.* Working paper for UWEP/CWG, 30 May 2000 - Draft.

Vargas, D. B., & Campos, L. M. (2020). Waste Management in Higher Education Institutions: A State-of-the-art Overview. *5th NA International Conference on Industrial Engineering and Operations Management August 10 - 14*, (pp. 75-86). Detroit, Michigan, USA.

Vergara, S. E., & Tchobanoglous, G. (2012). Municipal Solid Waste and the Environment: A Global Perspective. *Environment and Resources, 37*(37), 277-309. Retrieved from https://doi.org/10.1146/annurev-environ-050511-122532

What is sustainable waste management. (2020, December 8). *What is sustainable waste management?* Retrieved from rts: rts.com/blog/what-is-sustainable-waste-management/#:~:text+Sustainable%20waste%20management%20is%20a.the%20consumption%20of%20finite%20resources.

White, P., Franke, M., & Hindle, P. (1999). *Integrated Solid Waste Management: A Lifecycle Inventory.* Springer.

Wikipedia. (2022). *Sustainable development* . Retrieved from Wikipedia: en.m.wikipedia.org/wiki/Sustainable_development

World Bank. (2019). *Solid Waste Management.* Retrieved from https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management.

APPENDIX I

Auchi Polytechnic, Auchi, Edo State

Department of Urban and Regional Planning

Questionnaire on an Analysis of Waste Management Practices in Auchi Polytechnic, Auchi

Questionnaire for Students

Dear Respondent,

Your assistant is kindly needed in supplying information on the issues raised in this questionnaire. The exercise is purely for academic purpose and your response will be treated with strict Confidentiality. (Please tick appropriately Thanks).

1. Gender (a) Male (b) Female
2. Age (a) Less than 20 (b) 21-40 (c) 41-60 (d) 61 and above
3. Educational qualification (a) ND (b) HND (c) Degree (d) Post-HND
4. Respondent's religion (a) Christian (b) Muslim (c) Others
5. Monthly income status of respondent (a) Below ₦10,000 (b) ₦10,000 - ₦20,000 (c) ₦20,001 - ₦30,000 (d) ₦30,001 – ₦40,000 (e) ₦40,001- ₦50,000 (f) ₦50,000 and above
6. Do you generate solid waste with your activities? (a) Yes (b) No
7. What type of solid waste do you generate? (a) food waste (b) biscuits wrapper (c) paper (d)plastics (e) cans and bottles (f) nylons (g) medical waste (h) e-waste
8. Where do you dispose your waste? (a) refuse bin (b) anywhere I feel (c) on the ground
9. Are there waste bins in your class for disposal of solid wastes? (a) yes (b) no
10. Are there waste bins within the school precinct for disposal of solid wastes? (a) yes (b) no
11. Do you use these bins for your disposal? (a) yes (b) no
12. How often do you make use of the public waste facilities (a) often (b) not often (c) Once in a while
13. Do you think the waste bins are enough to cater for the wastes generated daily? (a) Yes (b)No
14. Do you have courses relating to environmental education especially relating to waste management? (a) Yes (b) No

15. Do you think courses on environmental education would influence your perception towards the environment? (a) Yes (b) No
16. Do you think it is appropriate for your surroundings to be clean? (a) Yes (b) No
17. Do you think the cleaning unit in the school is very effective in carrying out waste management in the area? (a) Yes (b) No
18. How would you rate the school waste management system? (a) Highly effective (b) Not effective (c) Poor
19. What can you suggest to help make the waste management system effective?

_____

_____

_____

APPENDIX II

Auchi Polytechnic, Auchi, Edo State

Department of Urban and Regional Planning

Questionnaire on an Analysis of Waste Management Practices in Auchi Polytechnic, Auchi

Questionnaire for Staff

Dear Respondent,

Your assistants is kindly needed in supplying information on the issues raised in this questionnaire. The exercise is purely for academic purpose and your response will be treated with strict Confidentiality. (Please tick appropriately Thanks).

1. Gender (a) Male (b) Female
2. Age (a) Less than 20 (b) 21-40 (c) 41-60 (d) 61 and above
3. Educational qualification (a) ND (b) HND/BSc/PGD (c) Masters (d) PhD
4. Respondent's religion (a) Christian (b) Muslim (c) Others
5. Monthly income status of respondent (a) Below ₦20,000 (b) ₦20,000- ₦39,999 (c) ₦40,000- ₦59,999 (d) ₦60,000- ₦79,999 (e) ₦80,000- ₦99,999 (f) ₦100,000 and above
6. Do you generate solid waste with your activities? (a) Yes (b) No
7. What type of solid waste do you generate? (a) food waste (b) biscuits wrapper (c) paper (d) plastics (e) cans and bottles (f) nylons (g) medical waste (h) e-waste
8. Where do you dispose your waste? (a) refuse bin (b) anywhere I feel (c) on the ground
9. Is there waste bin in your office? (a) yes (b) no
10. Do you use this bin for your disposal? (a) yes (b) no
11. How often do you make use of the waste facilities (a) often (b) not often (c) very often
12. Do you think it is appropriate for your surroundings to be clean? (a) Yes (b) No

13. Do you think the school has an effective waste management system (a) Yes (b) No

14. What can you suggest to help make the waste management system effective?

    _____

    _____

    _____

APPENDIX III

Auchi Polytechnic, Auchi, Edo State

Department of Urban and Regional Planning

Questionnaire on an Analysis of Waste Management Practices in Auchi Polytechnic, Auchi

Questionnaire for School Management and Environmental/Health Department of the Institution

Dear Respondent,

Your assistants is kindly needed in supplying information on the issues raised in this questionnaire. The exercise is purely for academic purpose and your response will be treated with strict Confidentiality. (Please tick appropriately Thanks).

1. Gender (a) Male (b) Female
2. Age (a) 0-20 (b) 21-40 (c) 41-60 (d) 61 and above
3. Educational qualification (a) ND (b) HND/BSc/PGD (c) Masters (d) PhD
4. Are they waste management facilities provided for the staff and students? (a) Yes (b) No
5. Specify the facilities provided

   _____

   _____
6. Do the staffs and students use these facilities? (a)Yes (b)No
7. Who are those in charge of carrying waste management in the area?

   _____

   _____
8. What are the waste disposal/management methods been engaged by the institution?

   _____

_____

9. Is/are there (any) institutional policies that ensures that these facilities are been used (a)Yes (b) No

10. If there are please specify them

_____

_____

_____

11. What can you suggest to help make the waste management system effective?

_____

_____

_____

_____