KWARA STATE POLYTECHNIC, ILORIN

SUSTAINABLE MANAGEMENT AND CHARACTERIZATION OF SOLID WASTE

(A CASE STUDY OF WASTE AT MANDATE MARKET ILORIN, KWARA STATE)

BY

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CERTIFICATION

This is to certify that this research study was conducted by ABDULFATAI ABDULMALIK AMAO (HND/23/CEC/FT/0222) and had been read and approved as meeting the requirement for the Higher National Diploma (HND) in Civil Engineering of the Department of Civil Engineering, Institute Of Technology, Kwara State Polytechnic Ilorin.

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DEDICATION

This report is dedicated to Almighty Allah, who has been protecting my life and also the provider of providence and to my parents/siblings and guardian for their assistance both morally and spiritually to see that the programmed is successfully completed.

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ABSTRACT

This study investigates the impact of sustainable management and characterization of solid waste at the mandate market in Ilorin, Kwara State. Using a survey research methodology, the study employed the Taro Yamane formula to determine an appropriate sample size, collecting data through a structured questionnaire. Analysis revealed that 85% of respondents identified organic waste as the primary type of waste generated, highlighting significant challenges related to its management, including reliance on open dumping practices. Despite the presence of designated waste collection points, inadequate waste bin availability and inefficient transportation methods hinder effective waste disposal. The study also found that over half of the respondents dispose of their waste daily, underscoring the need for a more consistent waste management system. Moreover, challenges such as insufficient water for waste flushing and only moderately effective penalties for improper disposal were identified. Interestingly, 63% of respondents expressed support for government-operated waste collection services, and many indicated a willingness to engage in waste management initiatives. Based on these findings, the study recommends enhancing organic waste management, increasing the number of waste bins, establishing regular waste collection services, and fostering community engagement through educational campaigns. By addressing these issues and promoting active participation, the mandate market can move towards a healthier

and more sustainable waste management system. This study provides a foundational understanding for future research on waste management practices in similar markets.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

In the contemporary global landscape, the intricate balance between human activities and environmental health has become a paramount concern (World Bank, 2020). Rapid urbanization, population growth, and industrialization have led to a surge in waste generation, posing significant challenges to sustainable development and environmental preservation (UNEP, 2019). As the world grapples with the consequences of inadequate waste management, there is an increasing recognition of the urgent need for comprehensive strategies that integrate environmental protection and sustainable waste management practices (Hoornweg, Bhada-Tata, & Kennedy, 2023). The significance of waste management extends beyond the local scale, resonating globally as nations strive to fulfil their commitments to environmental sustainability and climate action.

The management of solid waste in Nigeria represents a complex and multifaceted environmental challenge characterized by rapid urbanization, population growth, and inadequate infrastructural development (Abdulrasaq, 2023). Nigeria, as the most populous African nation, generates approximately 32 million tons of municipal solid waste annually, with urban centers like Lagos, Abuja, and Port Harcourt experiencing exponential waste generation rates that significantly outpace existing

waste management capacities. The escalating waste generation patterns are intrinsically linked to increasing economic activities, changing consumption behaviours, and limited sustainable waste management strategies.

According to Ogunrinola and Adepegba (2024), the current solid waste management landscape in Nigeria is predominantly characterized by inefficient collection mechanisms, inadequate disposal practices, and minimal recycling interventions. Informal waste collection sectors predominantly operate without standardized protocols, resulting in environmental degradation, public health risks, and substantial economic inefficiencies. The absence of comprehensive waste segregation systems and limited technological interventions exacerbate the challenges of sustainable waste management, creating significant environmental burdens across urban and rural landscapes.

Technological innovations and integrated waste management approaches emerge as critical strategies for addressing Nigeria's solid waste challenges. Chukwu, (2023) highlight the potential of implementing decentralized waste processing technologies, including composting, waste-toenergy conversion, and advanced recycling techniques. These technological interventions not only mitigate environmental risks but also create potential economic opportunities through resource recovery and circular economy principles.

Environmental and public health implications of inadequate solid waste management remain profound in Nigeria. Uncontrolled waste disposal practices contribute significantly to soil and water contamination, greenhouse gas emissions, and potential disease transmission (Babatunde, 2024). The proliferation of open dumpsites, particularly in urban peripheral regions, presents substantial ecological risks, undermining sustainable development objectives and compromising community health standards.

In addition, the implications of poor waste management stretch beyond unsightly landfills; they encompass environmental degradation, ecosystem disruption, and potential threats to human health (UNEP, 2021).

Policy and regulatory frameworks represent another critical dimension in addressing solid waste management challenges. Despite existing environmental regulations, implementation and enforcement mechanisms remain fragmented and inconsistent across different governmental jurisdictions. The National Environmental Standards and Regulations Enforcement Agency (NESREA) has attempted to establish comprehensive waste management guidelines, but practical implementation continues to face substantial institutional and infrastructural constraints (NESREA, 2023).

Additionally, NESREA (2023), affirmed that the socio-economic dimensions significantly influence waste management dynamics in Nigeria. Limited public

awareness, insufficient financial investments, and weak institutional capacities collectively impede sustainable waste management strategies. Community engagement, participatory approaches, and economic incentivization emerge as potential transformative mechanisms for enhancing waste management effectiveness and promoting circular economy principles.

Therefore, the sustainable management and characterization of solid waste at markets, such as Mandate Market in Ilorin, Nigeria, is a critical issue that reflects the broader challenges of urban waste management in developing countries. The Mandate Market, being a bustling commercial hub, generates substantial amounts of waste daily, including organic materials, plastics, and other refuses. However, the existing waste management systems are often inadequate, leading to environmental degradation and public health risks associated with improper waste disposal practices (NAMM, 2024). Therefore, this study aims to address these gaps by exploring how various market men and women managed their waste disposals in the market. The findings of this research will formed strategies to improve the effectiveness of waste management and avert the negative impact of ineffective waste management system in the market.

1.2 Statement of the Problem

The central role played by quality environment in the life of humans and even animals cannot be over-emphasized. However, its health implication and the

uncoordinated policy thrusts governing it at different levels of government leaves much to be desired. It is taken that qualitative environmental practices engender good health. These put into question, policy initiatives towards ensuring sustainable waste management (Amin, Moshood, and Abdulrasheed, 2023). Improper collection and disposal of wastes have resulted in various environmental challenges, including the obstruction of sewers, and drain networks, and the pollution of water bodies. These demand a critical ameliorating actions (Okoji, et al., 2023).

Characterization of solid waste is essential for understanding the composition and volume of waste generated, specifically at Mandate Market. Ibrahim, (2023) indicate that organic waste typically constitutes 45-60% of the total waste stream in urban areas, followed by plastics (15-25%) and paper products (8-12%. This characterization is crucial for developing effective waste management strategies, as it informs decisions regarding recycling, composting, and energy recovery options. The institutional framework governing waste management in Nigeria faces significant challenges, particularly in urban areas like Ilorin. Adekunle, (2023) highlight that only 35% of state environmental protection agencies possess the necessary technical capacity and resources for effective waste management. This lack of capacity often results in inadequate waste collection services, leading to the accumulation of waste in and around markets. The absence of a robust regulatory

framework further complicates the situation, as enforcement of waste management policies is often weak.

The role of informal waste management practices is also significant in the context of Mandate Market. Mohammed and Peters, (2024) added that informal waste collectors contribute to the recovery of recyclable materials, yet their efforts are frequently unrecognized and unsupported by formal waste management systems. Integrating these informal activities into a more structured waste management framework could enhance overall efficiency and sustainability. Having realized from the above studies that there are various practical waste management constraints associated with the study, including limited research on the topic known to the researcher, it is imperative to delve further in the study by exploring the sustainable management approach to waste management and to characterize the solid waste generated at Mandate market in Ilorin, Kwara State.

1.3 Objective of the Study

The following objectives were formulated for the study:

1. To know the characterized solid waste available at Mandate Market in Ilorin.
2. To investigate the sustainable waste management approach using at Mandate Market in

   Ilorin.
3. To assess the level of the effectiveness of sustainable waste management approach using at Mandate Market in Ilorin.

4. To ascertain the challenges confronting solid waste management at Mandate Market, Ilorin.

1.4 Research Questions

1. What is the characterized solid waste available at Mandate Market in Ilorin?
2. What is the sustainable waste management approach using at Mandate Market in Ilorin?
3. What is the level of the effectiveness of sustainable waste management approach using at Mandate Market in Ilorin?
4. What are the challenges confronting solid waste management at Mandate Market, Ilorin?

1.5 Significance of the Study

The study will provides insights into the waste stream composition and exploring sustainable management strategies that will form the development of more effective and environmentally friendly waste handling practices within the market. This, in turn, will lead to improved sanitation, reduced environmental pollution, and enhanced overall quality of life for the market vendors, workers, and surrounding residential areas.

The findings of this research will also benefit policymakers and waste management authorities in Ilorin and other similar urban centers in Nigeria. The characterization of the solid waste and the evaluation of sustainable management approaches will

help inform the design and implementation of integrated solid waste management programmes that are tailored to the unique challenges faced by urban marketplaces. This knowledge will guide the development of appropriate infrastructure, policies, and educational campaigns to promote sustainable waste management practices, ultimately contributing to the overall improvement of municipal solid waste management in Ilorin and potentially other Nigerian cities.

Furthermore, the academic and research community will also benefit from this study, because it will adds to the growing body of knowledge on sustainable waste management practices in developing countries. The insights gained from the Mandate Market case study will inform future research and contribute to the development of more holistic waste management strategies that address the specific needs and challenges of marketplaces.

1.6 Scope of the Study

This refers to its size and boundaries, as well as the specific aspects and parameters that will be investigated. The scope assists researchers to define the boundaries within which data will be collected, analysed, and interpreted, ensuring that the study remains manageable and feasible (Creswell, 2014; Sekaran & Bougie, 2016) In lieu of the above, the scope of this study is focused on the market men and women at mandate market in Ilorin, Kwara State. According to the Chairman of the Association of Mandate Marketers, there are various sections and businesses in the

market. Some are into livestock, pepper and tomatoes, food stuffs and provisions, the abattoirs etc. Therefore, these categories of marketers formed the population of this study.

1.7 Operational Definitions of Terms

Sustainable Management: this refers to the implementation of waste management practices that are environmentally-friendly, socially responsible, and economically viable in the long-term to minimize the negative environmental impact, conserve natural resources, and create a more circular economy within the Mandate Market in Ilorin rather than relying on unsustainable waste disposal methods.

Characterization: it is the first step in developing a sustainable waste management plan and deals with the process of analyzing and describing the physical, chemical, and biological properties of the solid waste generated within the Mandate Market such as organic, plastic, paper etc. and it provides the necessary data and insights to select appropriate waste treatment, recycling, and disposal methods that are tailored to the specific waste stream of the Mandate Market.

Solid Waste: refers to the discarded materials and items that are generated as a result of the various commercial and human activities within the Mandate Market. This includes organic waste (such as food scraps and market produce), recyclable materials (like paper, plastic, metal, and glass), and non-recyclable waste (such as contaminated packaging and mixed materials).

Mandate Market: it is a large, urban marketplace in Ilorin Kwara State, that serves as a central hub for commercial activities and economic exchange within the city and it generates significant amounts of solid waste from the various vendors, businesses, and customers that operate in the market on a daily basis.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature review for this study will be focused on the following: overview of Waste Management in Nigeria, Concept of Waste Management in the Market and the concept of solid waste.

Also, emphasis was also raised on the Characterization of Solid Waste, Strategy for Waste Management Nigeria Market and Challenges Confronting Waste Management in the Market. In addition, perception and agenda setting theories were adopted as the applicable theory for the study.

2.2 Overview of Waste Management in Nigeria

Waste management is a critical issue in Nigeria, a country with a rapidly growing population and an ever-increasing demand for resources (Adebola, 2020). The improper disposal and management of waste have led to significant

environmental and public health concerns, posing a significant challenge for the country's sustainable development.

Nigeria generates a substantial amount of municipal solid waste, estimated at over 32 million tonnes per year (Babayemi & Dauda, 2009). The composition of this waste is diverse, consisting of organic matter, plastics, paper, metals, and other materials. The majority of this waste is disposed of through open dumping and burning, with only a small fraction being properly managed (Ogwueleka, 2009). The lack of reliable waste management infrastructure and services in Nigeria has resulted in the proliferation of informal waste collection and disposal methods (Adewumi et al., 2005). This has led to the emergence of illegal dumpsites and the burning of waste, which have severe consequences for the environment and public health, including air pollution, soil and water contamination, and the spread of diseases (Imam et al., 2008).

The government of Nigeria has recognized the importance of addressing the waste management crisis and has implemented various policies and initiatives to improve the situation. The National

Environmental Standards and Regulations Enforcement Agency (NESREA) was established in 2007 to enforce environmental laws and regulations, including those related to waste management (NESREA, 2007).

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Despite these efforts, the implementation and enforcement of waste management policies in Nigeria have been hampered by a range of challenges, including limited financial resources, lack of infrastructure, and the inadequate involvement of local communities (Ogwueleka, 2009). The absence of effective waste segregation, recycling, and recovery systems has also contributed to the ongoing waste management crisis.

In recent years, there has been a growing recognition of the need for a more holistic and sustainable approach to waste management in Nigeria. This includes the promotion of the circular economy, which aims to reduce waste and maximize the reuse and recycling of materials (Nzeadibe & Anyadike, 2015). Initiatives such as community-based waste management and the involvement of the informal sector have also shown promise in improving waste management outcomes.

The private sector has also played an increasingly important role in addressing the waste management challenge in Nigeria. Several companies have invested in waste-to-energy projects, waste collection and sorting services, and the development of recycling infrastructure (Aliyu et al., 2015). These efforts have the potential to create jobs, generate revenue, and reduce the environmental impact of waste.

In conclusion, the waste management crisis in Nigeria is a complex and multifaceted challenge that requires a comprehensive and collaborative approach involving the

government, private sector, and local communities. By investing in infrastructure, promoting sustainable waste management practices, and fostering community engagement, Nigeria can work towards a more sustainable and environmentally-friendly waste management system that benefits both the economy and the well-being of its citizens.

2.3 The Concept of Waste Management in the Market

The management of waste within the market context is a critical component of sustainable urban development, particularly in rapidly growing cities in developing countries like Nigeria. Markets serve as hubs of economic activity, attracting a large number of vendors, customers, and various stakeholders, all of whom contribute to the generation of substantial amounts of waste (Adewole, 2019; Ogwueleka, 2023). Effective waste management in these settings is essential to maintain environmental cleanliness, public health, and the overall functionality of the market.

In Nigeria, market waste typically comprises a diverse mix of organic matter, plastics, paper, metals, and other materials, reflecting the range of goods and services traded in these commercial spaces (Ogwueleka, 2023; Imam et al., 2018). The improper handling and disposal of this waste can lead to numerous environmental and public health concerns, such as the contamination of soil and water resources, the spread of diseases, and the proliferation of pests and vectors (Adebola, 2020;

Imam et al., 2018). Sustainable waste management strategies in the market context are, therefore, imperative to address these challenges.

One of the key approaches to effective waste management in markets is the implementation of efficient waste collection and transportation systems. This may involve the deployment of dedicated waste collection vehicles, the establishment of strategic collection points, and the coordination of waste handlers to ensure the timely and proper disposal of waste (Adewole, 2019; Aliyu et al., 2015). Additionally, the promotion of waste segregation at the source, with the separation of recyclable and organic materials, can enhance the overall efficiency of the waste management system and facilitate the recovery and reuse of valuable resources (Nzeadibe & Anyadike, 2015).

The involvement of market associations, community-based organizations, and local authorities is crucial in the implementation of sustainable waste management practices in the market context (Nzeadibe & Anyadike, 2015; Adewumi et al., 2015). These stakeholders can work collaboratively to raise awareness among vendors and customers, promote behavioral changes towards responsible waste disposal, and establish mechanisms for the enforcement of waste management regulations. Furthermore, the integration of the informal waste sector, which often plays a significant role in waste collection and recycling in markets, can contribute to the overall effectiveness of the waste management system (Nzeadibe &

Anyadike, 2015).

In recent years, there has been a growing recognition of the need for a more holistic and sustainable approach to waste management in the market context. This includes the promotion of the circular economy, which aims to reduce waste and maximize the reuse and recycling of materials (Nzeadibe & Anyadike, 2015; Aliyu et al., 2015). Initiatives such as community-based waste management and the involvement of the private sector have also shown promise in improving waste management outcomes in markets (Aliyu et al., 2015; Babayemi & Dauda, 2019). Ultimately, the success of waste management in the market context relies on a holistic and multifaceted approach that addresses the unique challenges and dynamics of these commercial spaces. By investing in infrastructure, fostering stakeholder collaboration, and promoting sustainable waste management practices, Nigeria can work towards creating cleaner, healthier, and more livable market environments that support the broader goals of urban sustainability and environmental protection (Adebola, 2020; Ogwueleka, 2023).

2.4 The Concept of Solid Waste

Solid waste management is a pressing challenge in Nigeria, a country with a rapidly growing population and an ever-increasing demand for resources (Adebola, 2020). The improper handling and disposal of solid waste have led to significant

environmental and public health concerns, posing a significant threat to the country's sustainable development.

Nigeria generates a substantial amount of municipal solid waste, estimated at over 32 million tonnes per year (Babayemi & Dauda, 2009). The composition of this waste is diverse, consisting of organic matter, plastics, paper, metals, and other materials (Ogwueleka, 2013). The majority of this waste is disposed of through open dumping and burning, with only a small fraction being properly managed (Ogwueleka, 2009).

The lack of reliable solid waste management infrastructure and services in Nigeria has resulted in the proliferation of informal waste collection and disposal methods (Adewumi et al., 2005). This has led to the emergence of illegal dumpsites and the burning of waste, which have severe consequences for the environment and public health, including air pollution, soil and water contamination, and the spread of diseases (Imam et al., 2008; Aliyu et al., 2015).

The government of Nigeria has recognized the importance of addressing the solid waste management crisis and has implemented various policies and initiatives to improve the situation. The National Environmental Standards and Regulations Enforcement Agency (NESREA) was established in 2007 to enforce environmental laws and regulations, including those related to waste management (NESREA, 2007).

Despite these efforts, the implementation and enforcement of solid waste management policies in Nigeria have been hampered by a range of challenges, including limited financial resources, lack of infrastructure, and the inadequate involvement of local communities (Ogwueleka, 2009). The absence of effective waste segregation, recycling, and recovery systems has also contributed to the ongoing solid waste management crisis (Nzeadibe & Anyadike, 2015).

In recent years, there has been a growing recognition of the need for a more holistic and sustainable approach to solid waste management in Nigeria. This includes the promotion of the circular economy, which aims to reduce waste and maximize the reuse and recycling of materials (Aliyu et al., 2015). Initiatives such as community-based waste management and the involvement of the informal sector have also shown promise in improving solid waste management outcomes (Nzeadibe & Anyadike, 2015).

The private sector has also played an increasingly important role in addressing the solid waste management challenge in Nigeria. Several companies have invested in waste-to-energy projects, waste collection and sorting services, and the development of recycling infrastructure (Aliyu et al., 2015). These efforts have the potential to create jobs, generate revenue, and reduce the environmental impact of solid waste.

In conclusion, the solid waste management crisis in Nigeria is a complex and multifaceted challenge that requires a comprehensive and collaborative approach involving the government, private sector, and local communities. By investing in infrastructure, promoting sustainable solid waste management practices, and fostering community engagement, Nigeria can work towards a more sustainable and environmentally-friendly solid waste management system that benefits both the economy and the well-being of its citizens (Adebola, 2020; Ogwueleka, 2013).

2.4 Characterization of Solid Waste

The characterization of solid waste is a critical component of effective waste management in Nigeria, a country facing a growing challenge in addressing its waste stream (Adebola, 2020; Ogwueleka, 2023). Understanding the composition and properties of solid waste is essential for developing appropriate waste management strategies and technologies that cater to the unique needs and circumstances of different regions and communities.

Studies have shown that the dominant component of solid waste in Nigeria is organic matter, accounting for up to 50-70% of the total waste stream (Ogwueleka, 2023; Imam et al., 2018). This high organic fraction is reflective of the country's predominantly agricultural-based economy and the reliance on fresh produce in daily consumption patterns (Adewumi et al., 2015). The organic waste consists of food

scraps, yard waste, and other biodegradable materials, which can be effectively managed through composting and anaerobic digestion.

Another significant component of Nigerian solid waste is plastics, which can make up 10-20% of the total waste stream (Ogwueleka, 2023; Adebola, 2020). The proliferation of single-use plastics, such as sachets, bags, and packaging materials, has contributed to the growing plastic waste problem in the country. These nonbiodegradable materials pose a significant challenge for waste management and environmental protection, and require targeted interventions such as extended producer responsibility and the promotion of alternative packaging solutions.

Paper and cardboard waste, which can comprise 5-15% of the total solid waste, are also common in the Nigerian waste stream (Ogwueleka, 2023; Aliyu et al., 2015). This waste stream includes materials such as newspaper, office paper, and packaging. The proper management and recycling of paper and cardboard waste can contribute to resource recovery and the development of a more circular economy, which has been recognized as a priority in recent years (Nzeadibe & Anyadike, 2015; Aliyu et al., 2015).

The composition of solid waste in Nigeria also includes smaller fractions of metals, glass, and textiles, each typically accounting for less than 5% of the total waste stream (Ogwueleka, 2023; Nzeadibe & Anyadike, 2015). These materials have the potential for recycling and reuse, but their recovery is often hindered by the lack of

efficient waste segregation and collection systems, as well as the informality of the waste management sector (Nzeadibe & Anyadike, 2015).

Emerging trends in the characterization of Nigerian solid waste include the increasing presence of e-waste, which consists of discarded electronic devices and equipment (Osibanjo & Nnorom, 2017; Nnorom & Osibanjo, 2018). The improper disposal of e-waste can lead to the release of hazardous substances, posing significant environmental and health risks. The management of ewaste requires specialized handling and treatment processes, which are not yet widely implemented in the country.

Accurate characterization of solid waste in Nigeria is essential for the development of sustainable waste management systems. By understanding the composition, properties, and trends in solid waste, policymakers, waste management authorities, And other stakeholders can make informed decisions, allocate resources effectively, and implement tailored solutions to address the country's solid waste challenges (Aliyu et al., 2015; Nzeadibe & Anyadike, 2015). Ongoing research and data collection efforts are crucial to continuously improve the understanding of solid waste characteristics and inform the design of more effective waste management strategies.

2.5 Strategy for Waste Management Nigeria Market

Developing a comprehensive and multifaceted strategy for waste management in the market is essential to address the environmental, public health, and operational challenges associated with the improper handling and disposal of waste.

One of the key elements of a successful waste management strategy for Nigerian markets is the establishment of efficient waste collection and transportation systems. This may involve the deployment of dedicated waste collection vehicles, the designation of strategic collection points, and the coordination of waste handlers to ensure the timely and proper disposal of waste (Adewole, 2019; Aliyu et al., 2015). The provision of these essential waste management services can greatly improve the cleanliness and functionality of the market environment. Promoting waste segregation at the source is another crucial component of an effective waste management strategy in the market context. By encouraging vendors and customers to separate recyclable, organic, and non-recyclable materials, the overall efficiency of the waste management system can be enhanced, facilitating the recovery and reuse of valuable resources (Nzeadibe & Anyadike, 2015; Adebola, 2020). This approach can be supported by the placement of clearly labeled waste bins and the implementation of educational campaigns.

The involvement and collaboration of various stakeholders, including market associations, community-based organizations, and local authorities, is essential for

the successful implementation of a waste management strategy in the market (Nzeadibe & Anyadike, 2015; Adewumi et al., 2015). These stakeholders can work together to raise awareness, promote behavioral changes, and establish mechanisms for the enforcement of waste management regulations, ensuring the sustained engagement and participation of market actors.

Integrating the informal waste sector, which often plays a significant role in waste collection and recycling in Nigerian markets, can be a valuable component of a comprehensive waste management strategy (Nzeadibe & Anyadike, 2015; Aliyu et al., 2015). By recognizing and formalizing the contributions of informal waste pickers and recyclers, the overall efficiency and inclusiveness of the waste management system can be improved.

In recent years, there has been a growing emphasis on the adoption of a more holistic and sustainable approach to waste management in the Nigerian market context. This includes the promotion of the circular economy, which aims to reduce waste and maximize the reuse and recycling of materials (Aliyu et al., 2015; Nzeadibe & Anyadike, 2015). Initiatives such as community-based waste management and the involvement of the private sector have also shown promise in improving waste management outcomes in markets.

The implementation of a successful waste management strategy in the Nigerian market context requires a multifaceted and collaborative approach that addresses the

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unique challenges and dynamics of these commercial spaces. By investing in infrastructure, fostering stakeholder engagement, and promoting sustainable waste management practices, market managers and local authorities can work towards creating cleaner, healthier, and more functional market environments that contribute to the overall sustainability of urban areas (Adebola, 2020; Ogwueleka, 2023).

2.6 Challenges Confronting Waste Management in the Market

Waste management in markets across Nigeria faces numerous challenges that hinder effective and sustainable practices. These challenges are multifaceted and stem from various socio-economic, infrastructural, and regulatory issues. Below are some of the key challenges confronting waste management in the market;

Inadequate Infrastructure

Many markets lack the necessary waste management infrastructure, such as waste collection points, disposal facilities, and recycling centers. This inadequacy leads to improper waste disposal practices, including open dumping and burning, which exacerbate environmental pollution and health risks (Braimah, 2023).

High Waste Generation

Markets are significant sources of waste, generating large volumes of solid waste daily. In Nigeria, it is estimated that urban areas produce about 32 million tons of solid waste annually, with markets contributing a substantial portion. However, only 20-30% of this waste is collected and managed properly (Braimah, 2023).

Poor Waste Segregation

There is often a lack of awareness and education among market vendors and consumers regarding the importance of waste segregation. This results in mixed waste streams, making recycling and composting efforts more challenging and less effective (Mafara & Magami, 2019)

Limited Funding and Resources

Waste management initiatives in Nigeria are often underfunded, which limits the ability of local governments and waste management agencies to implement effective waste management systems. This financial constraint affects the procurement of necessary equipment and the hiring of skilled personnel (Braimah, 2023).

Weak Regulatory Framework

The regulatory framework governing waste management in Nigeria is often weak and poorly enforced. Although there are laws in place, compliance is low, and penalties for violations are rarely enforced, leading to continued poor waste management practices (Braimah, 2023).

Lack of Public Awareness

There is a general lack of public awareness regarding the environmental and health impacts of poor waste management. Many market participants are unaware of the benefits of recycling and proper waste disposal, which hampers community participation in waste management initiatives (Braimah, 2023).

Cultural Attitudes towards Waste

Cultural perceptions of waste and disposal practices can significantly influence waste management efforts. In some communities, there is a tendency to view waste as a nuisance rather than a resource, which affects the willingness to engage in recycling and waste reduction practices (Braimah, 2023).

In summary, addressing the challenges of waste management in markets in Nigeria requires a comprehensive approach that includes improving infrastructure, enhancing public awareness, strengthening regulatory frameworks, and fostering collaboration among stakeholders.

2.7 Empirical Review

Amin, Ambali and & Isiaq (2024) examines strategies for the implementation of environmental protection regulations towards sustainable waste management in Oyo State. The study investigated the environmental protection policies governing sustainable waste management systems in Oyo state. It found that the Oyo State government treats environmental protection and waste management seriously, addressing them through public awareness campaigns and strict law enforcement Against violators. However, the study noted that some members of the public exhibit resistance to compliance

Okoji, Adeyemi, and Olawuni (2023) studies community perceptions regarding waste management practices in the Ilorin metropolis, Kwara State, Nigeria. The

improper collection and disposal of municipal wastes have resulted in various environmental challenges, including the obstruction of sewers, and drain networks, and the pollution of water bodies. The results shows that there is a statistically significant difference in residents' perceptions of waste management practices based on gender. However, there was no statistically significant difference based on marital status, education, and religion. The study recommends public enlightenment campaigns among residents and urban dwellers to promote proper solid waste practices, management, and disposal. However, the study fails to discuss environmental protection policies.

Amin, Raji and Salawu (2023) the paper examined the impact and challenges of waste management in Kwara State. The study shows that the majority agreed with public policy on waste management helps the officer to create fear in the heart of the people who want to defraud and the majority of the respondents agreed that policy on waste management makes the operation easier for the staff. It concluded that financial handicaps and insecurity are the challenges to the proper implementation of waste management in Kwara State.

Amin, Raji and Salawu (2023) examines the effects and obstacles associated with public policy in waste management for environmental security in Kwara State.

The study shows that public policies on waste management contribute to the efforts of officials to deter fraudulent activities. It further disclosed that most respondents

expressed that waste management regulations streamline staff operations. Financial constraints and security concerns emerged as significant challenges hindering the effective implementation of waste management in Kwara State. The paper recommended that the State Ministry of Environment and Forestry increase the deployment of environmental personnel to the State Environmental Protection Agency and allocate more capital to enhance its capabilities. Providing security for environmentalists is crucial for enabling them to carry out their duties effectively. Strengthening environmental laws across the state is advised to enforce sanctions against those violating environmental sanitation practices.

Samuel and Olamide (2016) evaluated environmental sanitation and solid waste management in Ibadan North Local Government, Oyo State, Nigeria. The findings revealed that effective management of environmental sanitation and solid waste necessitates collaboration among agencies at the state and local government levels, alongside the involvement of private entities. Furthermore, the research illustrated that residents in Ibadan North local government area exhibited positive attitudes toward certain elements of environmental sanitation, while concurrently expressing negative perceptions regarding particular aspects of solid waste management. It is noteworthy that the scope of the article was confined to Ibadan North local government area.

Lishan, Bo, Tong, Liang, and Ouwen (2023) focused on the promotion and sustenance of public participation in waste separation policies within Shanghai, China. The research disclosed that the implementation of these policies resulted in a 5.3% increase in residents' satisfaction with waste management, accompanied by a notable 6.1% rise in willingness to participate. It emphasized that waste generation can stem from environmentally inefficient resource utilization, with potential adverse consequences, underscoring the imperative to establish and advocate for a close alignment between environmental policies and waste management. It is noteworthy that the referenced article, although valuable, but neglected to address environmental protection policies, unlike the current research, which specifically explores the strategies of environmental protection policies in the context of waste management in Oyo State, Nigeria.

Armijo, Ojeda and Ramírez (2018) conducted a study centered on characterizing solid waste and assessing the recycling potential within a university campus. The research disclosed that Campus Mexicali I produces one ton of solid waste daily, with more than 65% of this waste being recyclable or possessing the potential for recycling. These findings suggest the practicality of instituting a segregating and recycling program within the university campus. Furthermore, the study

Highlighted that, considering existing conditions such as the number of recycling companies and their capacities, the local market can absorb all recyclable wastes generated.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This section stated the procedure adopted in investigating the sustainable management and characterization of solid waste at mandate market, Ilorin. It covers the research design, study population, sample size, sampling techniques, data collection instrument, validity and reliability of the instrument, and the method of data analysis.

3.2 Research Design

According to Creswell and Creswell (2018), research design is a framework that directs the research process, techniques and protocols for gathering, analysing, and interpreting data. Therefore, quantitative research design using survey method was adopted. The method entails gathering information from a sample of people or organizations through structured questionnaire (Bryman, 2016). Therefore, it will be used in this study to collect information from the market men and women at mandate market.

3.3 Research Population

Creswell & Creswell (2018) describes population as the entire set of individuals, things, or events that the researcher is interested in examining and to which the research findings will be applied. Therefore, the population of this study includes

the entire market men and human at mandate market. According to the Association of Mandate Marketer, the total population of the marketer registered market is 986. Therefore, the total population of this study will be 986 marketers at mandate market, Ilorin.

3.4 Sample Size

According to Taherdoost (2016), the number of participants or observations included in a research study is known as sample size, and it is critical for ensuring the reliability and validity of the research findings (Taherdoost, 2016).

Therefore, formula-based approach was used and Taro Yamane sampling technique was adopted as the appropriate formula. It is used to know the suitable sample size for assumed population, particularly in the context of survey research and it was developed by the Japanese statistician,

Taro Yamane around 1960 to 1970

The Taro Yamane formula is

expressed as: n = N / (1 + Ne^2)

Where:

- n is the sample size
- N is the total population size
- e is the desired level of precision or margin of error (%)

$$n = \frac{N}{1+N \times (0.0e)^2}$$

$$\frac{986}{1+986 \times (0.05)^2}$$

$$\frac{986}{1+986 \times 0.0025}$$

$$\frac{986}{3.465}$$

n = 284.5 approximately 285 in total.

As a result, the sample size for this study is approximately 285.

3.5 Sampling Technique

To select a subset of participants or observations from the target population for inclusion in a study, sampling techniques are applied (Bryman, 2016). Therefore, the sampling technique adopted was Multi-stage. It is a sophisticated sampling technique that selects a representative sample from a target population using Several

stages of selection (Bryman, 2016; Creswell, 2014). It further utilized stratified random sampling as appropriate technique to group the population into various strata. This method of probability sampling involves first dividing the population according to one or more characteristics into discrete, non-overlapping subgroups or strata, from which a random sample is subsequently taken (Cochran, 1977; Lohr, 2019). In this aspect of the study, the population of interest is the marketers at mandate market in Ilorin, hence, the 986 population was grouped into strata based on the nature of business in the market.

The population of marketers was categorized into 5 strata based on their nature of business. The strata are presented as follows:

Table 3.1: Stratified Sampling Technique Table

S/N	Nature of Business	Nature of Business Population	Population of Marketers	Sample Size	Proportionate by Percentage (%)	Actual Sample Size
1	Livestock sellers	207	986	285	21	60
2	Pepper Sellers	301	986	285	31	87
3	Food stuff/ provision	305	986	285	31	88
4	Abattoir	85	986	285	9	25
5	Meat/fish seller	88	986	285	9	25

3

	Total	**986**	**-**	**-**	**101**	**285**

Source: AMM (2024)

Having determined the required number of participants from each stratum, the final stratified sample size for Livestock sellers - 60, Pepper Sellers - 87, Food stuff/ provision – 88, Abattoir 25, and Meat/fish seller – 25. Therefore, within each stratum, a simple random sampling technique will be adopted to pick the required number of respondents. This ensures that all market members of the mandate market regardless of gender or any factors, have an equal chance of being selected. For example, if 60 members of Livestock sellers in the market are to be selected From their stratum, all 207 members will be given an equal chance to be included in the sample. By using stratified sampling, the study ensures that all the members are proportionally represented in the sample. This method enhances the accuracy and reliability of the findings by reflecting the diverse perspectives and experiences of the study.

In addition, the sampled respondents will be located in their respective point of businesses with the mandate market and the researcher will be guided into their respective locations through their leaders, partner, friends and research assistants.

Before the administration of the questionnaire, the researcher through the support of the research assistants, will ensure that the respondents are the real marketers or sellers in the market and also exposed to waste management in the market. The researcher and the research assistant will also interpret the questionnaire items to the less-educated respondents in their various languages and they will be guided on how to tick it appropriately.

3.6 Research Instrument

The research instrument is adopted to gather data such as questionnaires, interview guides and observation protocols (Kallio, Pietilä, Johnson, & Kangasniemi, 2016). This study will use a survey questionnaire to collect data from a larger sample of market men and women at mandate market in Ilorin. The instrument will be divided into five (5) sections, with Section A will be designed to obtain respondents' demographic data. It includes the Gender, Age, Tribe,

Educational Background and Nature of Business. Section B, C, D and E will be designed with varieties of related questions in a way to elicit appropriate answers to the research questions of the study. It will be a well-structured questionnaire that will be designed through the adoption of literatures that are related to the study and it will consist of various sections, and respondent view will be measured through likert scale such as, Strongly disagree, Disagree, Neutral, Agree and Strongly

Agree. A Likert Scale is a popular psychometric scale that assesses respondents' attitudes or opinions by asking them to rate their level of disagreement or agreement with a set of statements that range from Strongly Disagree to Strongly Agree (Joshi, Kale, Chandel, and Pal, 2021).

3.7 Validity and Reliability of the Instrument

The content validity of the questionnaire will be determined by expert judgment and a comprehensive review of pertinent literature in order to guarantee the validity of the instrument. According to Bryman (2016) and Creswell (2014), validity is the degree to which a research tool accurately measures the instrument constructs. In a bid to enhance this, the questionnaire will be subjected to content and construct validity. A copy of the instrument will be submitted to the supervisor of the project for necessary assessment in a bid to know the extent to which the instrument appears on the surface to measure the intended construct and how well it captures the entirety of the study.

Reliability of the Instrument

Reliability is an important aspect in conducting research. It is concerned with the consistency and dependability of study findings, indicating the degree in which the study will produce similar results if repeated under the same or similar conditions (Creswell & Creswell, 2018). The testretest method will be used to evaluate reliability of the instrument; a sample of respondents at mandate market will be given

the questionnaire twice at a predetermined time interval, and the consistency of their answers will be assessed.

After that, pilot study will then be conducted on 40 market women at Ipata Market to assess their knowledge of the questionnaire items and identify any ambiguities. The internal consistency of the survey items will be assessed using the Cronbach's Alpha Coefficient.

3.8 Method of Data Analysis

Data analysis methods are the definite procedures used by scientists to examine, interpret, and draw meaningful conclusions from data collected during a research study (Creswell & Creswell, 2018). Descriptive statistical techniques will be adopted to analyze quantitative data collected via a closed-ended questionnaire retrieved from the respondents as mandate market in Ilorin, Kwara State. Descriptive statistics like frequencies, percentages, and measures of central tendency were used to summarize the data. This descriptive statistics will give a clear picture of sustainable management and characterization of solid waste by market men and women at mandate market, Ilorin, Kwara State.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

INTRODUCTION

This chapter is concerned with the presentation, analysis, and interpretation of data gathered from the responses to the administered questionnaire. The respondent's demographic data and the analysis of the respondents to the research questions were also explicitly highlighted below

PRESENTATION OF DATA

4.2 Data Analysis

A total of 285 questionnaire copies were self-administered to the respondents at Mandate market. 200 copies were dully filled and adopted for the study while 85 were not returned and dully filled for the study.

Table 4.1: Distribution of respondents by demographic data

The table 4.1 below shows that, 40% of the respondents were male and 60% of the respondent was female. The distribution of the respondents by age indicated that 2% are below 20years, 21% are 20-29years, 30-49years are 28% while 51% are age 50years above.

The analysis on occupation shows that, 54% of the respondents are traders, 5% rare cleaners, Market Management/Official are 22% while others are 20%. It further

shows that, none of the sampled respondents fall into the category of no formal education, 2% have primary education, 41% possession secondary education while 58% batched tertiary education.

Table 4.1 Demographic characteristics of the respondents

Demographic Variable		Frequency	Percentage (%)
Gender	Male	80	40
Female		120	60
Age			
Below 20years		4	2
20-29years		41	21
30-49years		55	28
50years above		102	51
Occupation	Trader	107	54
Cleaner		10	5
Market Management/Official		43	22
Others		40	20
Level of Education	No formal education	0	0
Primary education		4	2
Secondary education		81	41
Tertiary education		115	58

Source: Field Survey, 2025

The table provides a detailed overview of the demographic characteristics of the respondents, highlighting their gender, age, occupation, and educational

background. Women constitute the majority, accounting for 60% of the respondents, while men make up 40%. This indicates a gender distribution that skews slightly more toward females.

In terms of age, the respondents are predominantly older, with more than half (51%) aged 50 years and above. Those in the 30–49 age range comprise 28%, while the younger groups, particularly those under 20 years and those aged 20–29 years, account for 2% and 21% of the respondents, respectively. This suggests that the survey was conducted among a more mature population.

Occupationally, the largest group among the respondents are traders, making up 54%. Market management officials follow, representing 22%, while a smaller proportion are cleaners (5%) and others in unspecified roles (20%). This occupational distribution points to a strong representation of individuals engaged in trade and market activities, which may align with the context of the survey.

Education levels among the respondents are notably high, with no one reporting a lack of formal education. The majority (58%) have tertiary education, and an additional 41% have completed secondary education. Only a small fraction (2%) attained primary education as their highest level. This indicates that the respondents are relatively well-educated, which could influence their perspectives and responses.

Overall, the demographic profile shows a predominance of educated, older women, many of whom are traders, suggesting a specific socioeconomic and cultural backdrop to the survey.

SECTION B: WASTE GENERATION AND HANDLING

Table 4.2: Distribution of respondents view on the type of waste they generate at mandate market

Responses	Frequency	Percentage (%)
Organic waste	170	85
Plastic waste	0	0
Paper waste	20	20
Glass waste	0	0
Metal waste	0	0
Hazardous waste	0	0
Others	10	5
Total	**200**	**100%**

Source: Field Survey, 2025

The above analysis shows that 85% of respondents at the market affirmed that organic waste is the type of waste they generate at mandate market while 5% said other waste that are not specified above. This shows that 85% of the respondents affirmed that the major type of waste they generates at the market is organic waste.

Table 4.3: Distribution of respondents view on how they dispose waste.

Responses	Frequency	Percentage (%)

Dumping in open space	184	92
Using waste bins	14	7
Burning	2	1
Composing	0	0
Others	0	0
Total	**200**	**100%**

Source: Field Survey, 2025

Table 4.3 above shows that 92% of the respondents stated that they are dumping their waste in open spaces while 1% said they are burning their wastes. This shows that 92% which represent majority of the respondents are dumping in wastes in open space.

Table 4.4: Distribution of respondents view on how often they dispose their waste.

Responses	Frequency	Percentage (%)
Daily	101	50.5
Weekly	92	46
Monthly	0	0
Others	7	3.5
Total	**200**	**100**

Source: Field Survey, 2025

Table 4.4 shows that, 50.5% of the respondents said they disposed their wastes daily while 3.5% said others. This shows that majority of the sampled respondents disposed their waste on daily basis.

SECTION C: WASTE MANAGEMENT PRACTICES

Table 4.5: Distribution of respondents view on whether there is a designated waste collection point in the market.

Responses	Frequency	Percentage (%)
Yes	200	100
No	0	0
Total	**200**	**100**

Source: Field Survey, 2025

The data presented in table 4.5 shows that all the sampled respondents said yes that there is a designated waste collection point in the market.

Table 4.6: Distribution of respondents view on who is responsible for waste collection.

Responses	Frequency	Percentage (%)
Individual trader	81	40.5
Market management	70	35
Government agency	49	24.5
Private waste management company	0	0
Others	0	0
Total	**200**	**100**

Source: Field Survey, 2025

The analysis in table 4.6 shows that 40% of the respondents said individual are responsible for waste collection while 24.5% said government agency. This shows that individual is responsible for waste collection

Table 4.7: Distribution of respondents view on whether waste bins are provided in the market.

Responses	Frequency	Percentage (%)
Yes	200	100
No	0	0
Total	**200**	**100**

4

Source: Field Survey, 2025

The analysis shows that, all the sampled respondent stated that waste bins are provided in the market.

Table 4.8: Distribution of respondents view on how adequate are the waste bins

Responses	Frequency	Percentage (%)
Very adequate	2	1
Adequate	28	14
Inadequate	170	85
Total	**200**	**100**

Source: Field Survey, 2025

The analysis shows that 1% of the respondents said waste bin in the market are very adequate while 85% said inadequate. This shows that waste bins in the market are inadequate.

Table 4.9: Distribution of respondents view on how waste are transported from the market to disposal sites.

Responses	Frequency	Percentage (%)
Wheelbarrows	34	17
Trucks	166	83
Carts	0	0
Others	0	0
Total	**200**	**100**

Source: Field Survey, 2025

It was revealed here in table 4.9 that 17% of the sampled respondents said they use wheelbarrows to transport waste from the market to disposal sites while 83% said they are using trucks. This shows that trucks are mostly used to transport waste from the market to disposal sites.

SECTION D: CHALLENGES IN WASTE MANAGEMENT

Table 4.10: Distribution of respondents view on how on the challenges they face while disposing waste

Responses	Frequency	Percentage (%)
Lack of waste bins	54	27
Poor waste collection service	38	19
Inadequate awareness on waste management	24	12
High cost of waste disposal	0	0
Others (lack of waster to flush meat blood and other waste)	84	42
Total	**200**	**100**

Source: Field Survey, 2025

The analysis in 4.10 revealed that 12% of the respondents at mandate market said that there inadequate awareness on waste management while 42% stated that others challenges like lack water to flush meat blood and other wastes are the challenges

they face while disposing waste. This shows that they lack water to flush meat blood and other wastes.

Table 4.11: Distribution of respondents view on whether there are penalties for improper waste disposal in the market

Responses	Frequency	Percentage (%)
Yes	143	71.5
No	57	28.5
Total	**200**	**100**

Source: Field Survey, 2025

The analysis shows that 71.5% of the respondents said yes while 28.5% said no that there are penalties for improper waste disposal in the market. This shows that there are penalties for improper waste disposal in the market.

Table 4.12: Distribution of respondents view on how effective are the penalties for improper waste disposal in the market

Responses	Frequency	Percentage (%)
Very effective	0	0
Moderately effective	136	68
Ineffective	64	32
Total	**200**	**100**

Source: Field Survey, 2025

The analysis in table 4.12 revealed that 68% of the respondents said moderately effective while 32% said ineffective. This shows that, majority of the sampled respondents said the penalties for improper waste disposal in the market are moderately effective.

SECTION E: SUGGESTION FOR IMPROVEMENT

Table 4.13: Distribution of respondents view on measures that can improve waste management in the market.

Responses	Frequency	Percentage (%)
Provision of Government Trucks	126	63
Provision of insulator	74	37
Total	**200**	**100**

Source: Field Survey, 2025

The analysis shows that, 63% of the respondents said provision of Government Trucks while 37% said insulator. This shows that Government Trucks is an effective measure that can improve waste management in the market.

Table 4.14: Distribution of respondents view on whether they will be willing to participate in waste management initiative if introduced.

Responses	Frequency	Percentage (%)
Yes	182	91

No	18	9
Total	**200**	**100**

Source: Field Survey, 2025

The analysis in table 4.14 above shows that, 91% of the respondents said yes while 9% said no. This shows that, majority of the respondents are willing to participate in waste management initiative if introduced in the market.

Table 4.15: Distribution of respondents view on the additional information that can help waste management in mandate market.

Responses	**Frequency**	**Percentage (%)**
Waste bins	88	44
Market environmental officer	89	44.5
Sensitization/ advocacy	23	11.5
Total	**200**	**100**

Source: Field Survey, 2025

The analysis further revealed that 44.5% of the respondents stated that the additional information that can aid waste management in the market is the introduction of market environmental officer while 11.5% said Sensitization/ advocacy are needed to enhance effective waste management in mandate market. This shows that majority

of the respondents suggested the introduction of market environmental officers as additional information relevant to waste management.

WASTE GENERATION AND HANDLING

The above analysis shows that 85% of the respondents affirmed that the major type of waste they generates at the market are organic waste. This aligned with the discuss of Braimah, (2023) that markets are significant sources of waste, generating large volumes of solid waste daily and it is estimated that urban areas produce about 32 million tons of solid waste annually, with markets contributing a substantial portion. However, only 20-30% of this waste is collected and managed properly.

Added that, majority of the respondents are dumping in wastes in open space. The study further revealed that 50.5% of the respondents disclosed that they disposed their waste on daily basis.

WASTE MANAGEMENT PRACTICES

The finding on waste management practices states that there is a designated waste collection point in the market and individual are responsible for waste collection. The study further revealed that waste bins are provided in the market but the waste bins are inadequate and trucks are mostly used to transport waste from the market to disposal sites.

CHALLENGES IN WASTE MANAGEMENT

The analysis further disclosed on the challenges that the market lack water to flush meat blood and other wastes and there are penalties for improper waste disposal in the market but the constraints is that the penalties for improper waste disposal in The markets are moderately effective. This relates with the suggestion of Braimah, (2023) that many markets lack the necessary waste management infrastructure, ranging from collection points, disposal facilities, and recycling centers. This inadequacy leads to improper waste disposal practices, including open dumping and burning, which exacerbate environmental pollution and health risks.

SUGGESTION FOR IMPROVEMENT

The analysis at this stage shows that, 63% suggested Government Trucks as effective measures that can improve waste management in the market. This is related to the conclusion of Samuel and Olamide (2016) that effective management of environmental sanitation and solid waste necessitates collaboration among agencies at the state and local government levels, alongside the involvement of private entities.

It was also disclosed that majority of the respondents said they are willing to participate in waste management initiative if introduced in the market and majority of them suggested the introduction of market environmental officers as additional information relevant to waste management. This is in consonance with the study of

Amin, Ambali and & Isiaq (2024) on strategies for the implementation of environmental protection regulations towards sustainable waste management in Oyo State which concluded that the Oyo State government treats environmental protection and waste management seriously it addressed through public awareness campaigns and strict law enforcement against violators

CHAPTER FIVE

Summary, Conclusion and Recommendation

5.1 Summary

The essence of this study is to examine the impact of sustainable management and characterization of solid waste at mandate market Ilorin.

The study has four research objectives that measure the research topic and were later turn to the research questions which contributed significantly in designing the measurable questionnaire that was adopted in data collections from different locations at mandate market in Ilorin, Kwara State.

The study also adopted survey research method as the applicable methodology, Taro Yamane formula was employed to determine the actual sample size of the study and closed-ended questionnaire was adopted to determine the actual responses needed for the study from the respondents in the market.

Some of the analysis conducted in the study are correlated with the extant literatures that are related to the study while others contradicted the extant literatures and they were presented comprehensively the fourth session of the
study.

The analysis reveals that a significant 85% of respondents identify organic waste as the primary type of waste generated at the mandate market. This finding underscores the importance of addressing organic waste management specifically, given its prevalence in the waste stream. Organic waste can pose unique challenges, including odor and pest issues, making effective disposal methods critical for maintaining a clean and healthy market environment.

Despite the acknowledgment of organic waste generation, the study indicates that a majority of respondents resort to dumping waste in open spaces in the market. This practice highlights a concerning gap in proper waste disposal methods. The reliance on open dumping not only contributes to environmental degradation but may also reflect a lack of awareness or access to more appropriate disposal options.

The study further reveals that 50.5% of respondents dispose of their waste on a daily basis. This frequency could be indicative of the volume of waste generated at the market, emphasizing the need for regular waste collection and management systems. Establishing a consistent waste disposal routine could mitigate some of the issues associated with improper disposal practices.

While there is a designated waste collection point in the market, the study notes that individuals are primarily responsible for waste collection. This decentralized approach may contribute to inconsistencies in waste management practices. The

presence of waste bins is acknowledged, but respondents report that these are inadequate in number, suggesting that improving waste bin availability could enhance proper disposal methods.

Transportation of waste from the market to disposal sites is predominantly conducted by trucks. This reliance on trucks for waste transport raises questions about efficiency and effectiveness in waste management within the market. Streamlining waste collection and transport processes could improve overall waste management outcomes, ensuring timely and proper disposal.

Challenges in the market are further compounded by the lack of water for flushing away meat blood and other waste materials. This deficiency not only complicates waste disposal practices but may also pose health risks. Although there are penalties for improper waste disposal, the study reveals that these penalties are only moderately effective, indicating a need for more stringent enforcement and public education on the importance of proper waste disposal.

Interestingly, 63% of respondents suggested that government-operated trucks could serve as effective measures to improve waste management in the market. This input indicates a desire for more structured and reliable waste collection services, which could lead to better overall waste management practices. Implementing such measures could address the current inadequacies in waste disposal.

5

Furthermore, the study highlights a willingness among respondents to participate in waste management initiatives if introduced in the market. Many expressed support for the introduction of market environmental officers, suggesting that additional educational resources and oversight could enhance waste management efforts. Engaging the community in waste management initiatives could foster a sense of responsibility and encourage more sustainable practices among market users.

5.2 Conclusion

In conclusion, the study highlights the serious waste management issues that the mandate market in Ilorin, Kwara State, faces, mostly as a result of the large amount of organic waste and the common open dumping methods. Even though there are specific locations for collecting waste, the issue is made worse by a lack of waste bins and transportation systems, as well as by a shortage of water and other resources needed for appropriate waste disposal. However, the respondents' stated desire to take part in waste management programmes, combined with suggestions for more government participation and the hiring of environmental officers, presents a promising avenue for development. The market can move towards a healthier and more sustainable environment by improving waste management infrastructure and encouraging community involvement.

5.3 Recommendations

The following were recommended based on the findings;

1. **Enhance Organic Waste Management:** Develop targeted programmes like awareness or communication advocacy for the proper disposal and recycling of organic waste. This could include setting up composting facilities within the mandate market to manage organic waste effectively and reduce the reliance on open dumping.
2. **Increase Availability of Waste Bins:** Expand the number and accessibility of waste bins throughout the market. Strategically placing bins in hightraffic areas can encourage proper disposal practices and reduce the incidence of open dumping.
3. **Implement Regular Waste Collection Services:** Establish a structured waste collection schedule using government-operated trucks to ensure timely and efficient removal of waste from the market. This would help address the current inadequacies in waste transportation and improve overall waste management.
4. **Community Engagement:** introduce campaigns to raise awareness about proper waste disposal practices and the importance of sustainable waste management. Involve market users in initiatives and workshops to foster a sense of community responsibility and encourage participation in waste management efforts.

5.4 Limitation of the Study

This study was conducted to examine the impact of sustainable management and characterization of solid waste at mandate market Ilorin. Therefore, this study

only captured the market men and women at mandate market who are exposed to waste management alone. It was limited to four objective are qualitative data using closed-ended questionnaire is adopted.

5.4 Suggestions for further studies

Having successfully executed this study, it will be better and helpful to suggest this for further study. The researchers suggested that, further study should be done to examine the impact of sustainable management and characterization of solid waste at mandate market and Ojaja Tuntun in Ilorin. This will be done as a comparative study and it will widen the scope of the study.

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