County Government of Lamu

Lamu Municipality

Lamu County Sessional Paper No 39 of 2022

On

Solid Waste Management

LAMU MUNICIPALITY SOLID WASTE MANAGEMENT POLICY

June 2022

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FOREWORD

Environment and natural resources are valuable national assets that must be sustainably managed for present and future generations. They offer a range of benefits and opportunities for local and national economic development, improved livelihoods, and provision of environmental goods and services.

The Kenya Constitution under Article 42 states that every person is entitled to a clean and healthy environment while requiring each person to safeguard and enhance the environment. This is given further impetus by Article 69 & 70 of the Kenyan Constitution on Environment and Natural Resources, which emphasizes the obligations with respect to the environment and enforcement of the rights, respectively. This policy set out to establish the actual state of waste management in Lamu Municipality, outline success areas and possible barriers to waste management, and ultimately propose measures to be undertaken to enhance sustainable waste management. The work focuses on types and methods of solid waste management and looks at the impacts of haphazard waste management on land and water.

This solid waste management policy is based on views and expert opinions collected and collated through a structured, all-inclusive, and consultative process that brought together stakeholders drawn from the County Government of Lamu, Lamu Municipality, Residents of Lamu municipality, Community based organizations, and Youth groups with a particular interest in solid waste recovery and management. The broad-based process of consultations was conducted through workshops, administering questionnaires to the residents of Lamu Municipality, and interview schedules. Therefore this policy presents concerns and policy measures that have been identified, analyzed, and agreed upon by the stakeholders.

It is also essential to state that this policy will require commitment and goodwill from everyone to ensure smooth implementation. In this regard, participation of all stakeholders will continue to be sought. Lamu County government will create an enabling environment by strengthening the partnership between Donors, volunteer groups, and other community organizations with a particular interest in waste recovery and management and by providing sufficient financial support.

In this way, I am confident that we will collectively achieve the vision of a zero-waste, clean Municipality.

H.E Hon. Issa Abdallah Timamy, EGH, OGW
Governor - Lamu County

ACKNOWLEDGEMENTS

Maintaining the environment is critical to Lamu as a UNESCO Heritage site. Special acknowledgment goes to the following for their crucial role and contributions toward the development of this policy: His Excellency the Governor of Lamu County Issa Abdallah Timamy for his robust and sustained leadership and invaluable guidance in the development of this solid waste management policy, Lamu County Executive Committee Member Incharge of Lands, Physical Planning, Housing and Urban Development for his strategic support, goodwill and for spearheading the development of this policy.

Special thanks go to the Consultant Spatial Milestone (K) Ltd for leading the task of preparing this policy and to the office of the manager and Chief Officer Lamu Municipality for sustained steering of the technical processes.

I recognize the technical support from Municipality staff in the department of environment and those in the Department of Lands and Physical Planning. I am also most grateful to the key players for their contributions to the public participation forums. Special recognition goes to the Flip Flopi project team, Taka Taka Heroes, The Island Children Fund, Subira House, and the Lamu Tourist Association, among other critical stakeholders, for their tireless efforts in policy review and comments.

Special mention goes to the Committee for Environment in the County Assembly of Lamu, who worked tirelessly and diligently to invalidate the policy document.

We hope that this policy will provide practical actions for integrated solid waste management through support from various stakeholders. The policy will also form the basis for formulating relevant county regulations to facilitate the enforcement of standards and procedures stipulated for the appropriate management of solid waste.

We are convinced that our concerted efforts will collectively enhance the quality of the environment in Lamu Municipality.

Mr.Abdallah Fadhil

Ag. Chairperson Municipal Board

EXECUTIVE SUMMARY

Solid waste management remains one of the development challenges globally, nationally, and at the municipality level. Solid waste is inevitable due to ordinary human activities such as industrial production, consumption at the household level, construction, and commercial processes, among others. To address this problem, Lamu Municipality has embarked on formulating this solid waste management policy through a broad consultative process to produce a policy whose vision is to guide towards achieving a zero-waste clean Municipality. Stakeholders drawn from the County Government of Lamu, Lamu Municipality, Residents of Lamu municipality, Community based organizations, and Youth groups with a particular interest in solid waste recovery and management participated in the formulation of this policy.

Lamu municipality is critical in delivering on Kenya's constitutional right to a clean and healthy environment for all, advancing the circular economy to create green jobs and wealth from the waste sector, and protecting Lamu as a UNESCO World Heritage site.

The policy provides the guiding framework for solid waste management in Lamu municipality. It shall guide the municipality's solid waste management actors to provide effective, efficient, and sustainable services while utilizing solid waste as an economic resource. This policy will move Lamu Municipality towards realizing the Zero Waste principle, whereby waste generation is minimized or prevented. It will help ensure that waste is collected, separated at the source, reused, and recycled and that the remaining waste stream is destined for a secure, sanitary landfill.

This solid waste management policy consists of the following seven chapters;

Chapter 1: It underscores the importance of solid waste management in Lamu Municipality and the purpose and objectives of preparing this solid waste management policy.

Chapter 2 highlights the policy and legislative framework for solid waste management.

Chapter 3: This chapter outlines the existing situation of solid waste management in Lamu Municipality.

Chapter 4: It describes best practices and approaches in solid waste management.

Chapter 5: It summarizes solid waste challenges, opportunities, weaknesses, and strengths of an effective solid waste management policy for Lamu Municipality.

Chapter 6: Contains the policy framework to be pursued by Lamu Municipality to ensure effective solid waste management. In addition, the chapter outlines the vision and policy principles.

Chapter 7: Outlines the monitoring and evaluation and the implementation plan.

The policy formulation process consisted of a thorough situation analysis that pointed to the weakness and strengths in solid waste management in Lamu Municipality. Effective data collection and analysis have been done to understand the unique dynamics in the management loop of solid waste within the municipality. Throughout the process, thorough public participation was done with the adequate engagement of critical stakeholders in solid waste management. The insightful comments from the public and private sectors have profoundly added value to the policy document. Robust policy measures have been developed that speak to the municipality's needs and guide the integrated solid waste management system with a vision of a zero-waste Municipality. The Implementation Plan shows the different actors responsible for the implementation of the policy

Abdulswamadu A. Ali
Municipal Manager

LIST OF ACRONYMS

CBC : Competency Based Curriculum

CBD : Central Business District

CBO : Community Based Organization

CSDP : County Spatial Development Plan

CS : Civil Society

EIA : Environmental Impact Assessment

EMCA : Environmental Management and Coordination Act

GIS : Geographic Information System

ISWM : Integrated Solid Waste Management

KUSP : Kenya Urban Support Program

LAPSSET : Lamu Port and Lamu-Southern Sudan-Ethiopia Transport Corridor

PPE : Personal Protective Equipment

PPP : Public Private Partnership

NGOs : Non-Governmental Organizations

NERA : Nyayo Estate Resident Association

NLC : National Land Commission

NUA : New Urban Agenda

MSW : Municipal Solid Waste

SAGA : Semi-Autonomous Government Agencies

SDG : Sustainable Development Goals

SERG : Shella Environmental Residents Group

SWM : Solid Waste Management

SOP : Standard Operating Procedures

SPSS : Statistical Package for social sciences

UN : United Nation

UNESCO : United Nation Educational, Scientific and Cultural Organization

3Rs : Reduce, Recycle, Reuse

DEFINITION OF TERMS

Biomedical waste: Any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological and including categories.

Composting: This is the controlled biological decomposition of organic solid waste under aerobic conditions. Decomposition refers to the breaking down into component parts or basic elements. The material form from the composting process is called compost or humus.

Construction and demolition waste: This is waste that is generated as a result of new construction works, remodeling or demolition. Construction waste comprises debris, steel, timber, iron sheets, tiles and ceramics among others. These wastes may end up in the disposal sites or are used for backfilling in our road networks.

Disposal site: Any area of land on which waste disposal facilities are physically located or final discharge point without the intention of retrieval but does not mean a re-use or re-cycling plant or site.

Domestic Waste/ Household Waste: Waste generated from residences.

E-waste: A term encompassing various forms of electrical and electronic equipment that are old, end-of-life electronic appliances that have ceased to be of any value to their owners.

Hazardous waste: Waste with properties that make it dangerous, or capable of having a harmful effect on human health and the environment. These wastes require special measures in handling and disposal due to their hazardous properties

Medical Waste: Any cultures or stocks of infectious agents, human pathological wastes, human blood and blood products, used and unused sharps, certain animal wastes, certain isolation wastes and solid waste contaminated by any of the above biological wastes.

Incineration: A waste treatment process that involves the combustion of organic substances contained in waste materials. Incineration and other high-temperature waste treatment systems are described as "thermal treatment". Incineration of waste materials converts the waste into ash, flue gas, and heat.

Integrated Solid Waste Management: A practice of using several hierarchies of options (Source reduction, recycling, combustion and landfill) of waste management techniques to manage and dispose of specific components of municipal solid waste materials.

Public-Private Partnership (PPP): is a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies.

Recycling of waste: Refers to the processing of waste material into a new product of similar chemical composition.

Reuse: Means waste reused with or without cleaning and/or repairing.

Sanitary Landfill: A method of disposing of refuse on land without creating nuisance or hazards to public health or safety, by utilizing the principles of engineering to confine the refuse to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of earth or soil at the conclusion of each days operation or at such more frequent intervals as may be necessary.

Solid waste: Any solid or semi-solid garbage, refuse, or rubbish, sludge (from any facility involved in the treatment of air, wastewater, or water supply), and other discarded material, including any contained liquid or gaseous material, remaining from industrial, commercial, institutional, activities and residential or community activities.

Solid Waste Management: Refers to the activities, administrative and operational, that are used in storage, collection, transportation, recovery, treatment and disposal of solid wastes.

Source Reduction/ Minimization: The reduction, to the extent feasible, in the amount of solid waste generated prior to any treatment, storage, or disposal of the waste.

Storage: The temporary placement of waste in a suitable location or facility where isolation, environmental and health protection and human control are provided in order to ensure that waste is subsequently retrieved for treatment and conditioning and/or disposal.

Treatment: Any method, technique or process for altering the biological, chemical or physical characteristics of wastes to reduce the hazards it presents.

Waste Generator: Any person whose activities or activities under his or her direction produces waste or if that person is not known, the person who is in possession or control of that waste.

CHAPTER 1

INTRODUCTION

1.1 Background

Solid waste refers to materials arising from human and animal activities that are discarded as useless. It includes refusing from households, nonhazardous solid waste from industries, offices, commercial and institutions (including health facilities), market waste, and street sweeping. Solid waste may be categorized based on material such as plastic, paper, glass, and metal; or according to hazard potential, including radioactive, infectious, flammable, toxic, and non-toxic.

Solid Waste Management (SWM), in turn, refers to the collection, treatment, and disposal of solid material that has served its purpose and is thus no longer useful. The primary goal of solid waste management is to reduce and eliminate adverse impacts of waste materials on human health and the environment to support economic development and superior quality of life. This is to be done in the most efficient manner possible to keep costs low and prevent waste buildup.

As a result of globalization and the increased urban population, waste management has become a big challenge in Kenya. It has become a major public health and environmental concern in many urban centers in Kenya. Lamu, like many other urban areas in Kenya, is grappling with increased waste generation, pollution, and uncoordinated solid waste collection and disposal. To make matters worse, the Municipality does not have a sewage system. This problem is likely to be compounded by the implementation of the LAPSSET Project, which is expected to attract massive immigration of people into the County. It is worth noting that with growing urbanization, Municipal services that seem to fail most strikingly are solid waste management. It is in this context and in line with Kenya vision 2030 that Lamu Municipality has decided to put in place mechanisms to ensure there is a fully functional and compliant waste management system.

The County Government of Lamu, with the support of the World Bank-funded Kenya Urban Support Program (KUSP), has prioritized the preparation of a solid waste management Policy for Lamu Municipality to provide guidance for proper solid waste management.

1.2 Need for a Policy

A policy is a deliberate principle to guide decision-making in order to achieve rational outcomes. It is a statement of intent and is implemented as a procedure or protocol. Generally, policymaking involves setti ng an agenda or identifying a problem and exploring ways of addressing the same, making a decision on a specific course of action in solving the problem, and implementing the decision or chosen course of action. Finally, evaluating the result with respect to having effective it is in bringing about the objective/desired end state.

A policy provides guidance, consistency, and efficiency on how an organization operates. It also identifies key activities to be undertaken. Policies make it clear about what needs to be done, how it needs to be done, and those responsible and therefore keeps the management accountable. Therefore, a solid waste management policy is an important element in environmental protection.

1.2.1 Policy Development Process

This policy was formulated in a consultative manner. The actors in solid waste management in Lamu municipality were engaged during data collection, analysis, formulation of strategies, and validation. Specifically, National and County governments departments involved in solid waste management, which include County departments in charge of public health, the National Environmental Management Authority (NEMA), and Municipal Officers, were consulted. Other actors like Community-Based Organizations (CBO), private actors, and residents participated in the policy formulation process.

1.3 Problem Statement

Lamu is one of the top tourist destinations in Kenya. It prides itself on some of the richest marine ecology, terrestrial wildlife, pristine beaches, and one of the oldest cultural heritages in Kenya, dating back to the 14th century. This advantage has been a major immigration factor over the years hence, increased consumption, solid waste generation, and affluence. Despite the existence of laws guiding solid waste management, weak implementation and poor practices have led to Lamu Municipality being overwhelmed by their own waste, consequently affecting public health and the environment. Over the years, solid waste management was the mandate of the local authorities, which did not prioritize the establishment of proper solid waste management systems due to a lack of enough technical and institutional capacities.

1.4 Purpose

The main purpose was to prepare a solid waste management policy, to be used as a tool to guide solid waste management in Lamu Municipality. The policy should also recognize solid waste as a resource that should be managed to promote economic vitality, ecological integrity, and improved quality of life to foster sustainability in Lamu Municipality.

To achieve this, the assignment purposes to:

1. Formulate a solid waste management policy for the improvement of collection, transfer, recycling, and disposal of solid waste.
2. Generate a report on the legal, regulatory, and organizational framework for solid waste management, including recommendations for strengthening the Municipality's capacity to manage solid wastes.
3. Build the capacity of the county government staff responsible for oversight, technical assistance, policy support, and regulatory guidance of solid waste management.

1.5 Objectives

The main objective was to design a solid waste management policy that guides sustainable solid waste management in Lamu Municipality.

Specific objectives:

a) To promote a clean and healthy environment for all.

b) To facilitate the adoption of an integrated solid waste management approach in the management of all waste streams.

c) To facilitate implementation of the minimum requirements for solid waste management, namely collection, transportation, and disposal.

d) To promote the establishment of environmentally sound infrastructure and systems for solid waste management.

e) To promote waste as an income-generating venture.

f) Promote resource recovery through energy generation.

g) Enhance responsive community participation in solid waste management.

CHAPTER 2

LEGAL AND POLICY FRAMEWORK

2.1 Legal Framework

2.1.1 The Constitution of Kenya, 2010

This is the supreme law of Kenya, and in actual fact, it is dedicated to issues of land and environment.

Article 42 states that every person has a right to a clean and healthy environment.

Article 69 provides for public participation, indicating that the state shall encourage public participation in the management, protection, and conservation of the environment and that it shall eliminate processes and activities that are likely to endanger the environment.

Article 69 (2) states that every person has a duty to cooperate with state organs and other persons to protect and oversee the environment and ensure ecologically sustainable development and use of natural resources. In addition, in spelling out the functions of County Governments, the constitution in the Fourth Schedule expressly provides that they shall be responsible for refuse removal, refuse dumps, and solid waste disposal.

2.1.2 The Environmental Management and Coordination Act, Cap. 387

The Environmental Management and Coordination Act (EMCA) is the main Act of Parliament that legislates on matters of the Environment in Kenya. Section 3 stipulates that every person in Kenya is entitled to a clean and healthy environment and has a duty to safeguard and enhance the environment.

Section 87; states that no person shall discharge or dispose of any wastes in such manner as to cause pollution to the environment or ill health to any person and that every person whose activities generate waste shall employ measures to minimize waste through treatment, reclamation, and recycling.

The Act establishes the National Environmental Management Authority (NEMA) to exercise supervision and coordination over all matters relating to the environment and to be the principal instrument of government in the implementation of all policies relating to the environment. Additionally, the Authority is tasked with prescribing standards for wastes and their classification and to advise on standards of disposal methods for such wastes, as well as issuing regulations for handling, storage, transportation, segregation, and destruction of waste.

2.1.3 The Environment and Land Court Act, No. 19, 2011

This is an Act of Parliament that gives effect to Article 162(2) (b) of the constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land and to make provision for its jurisdiction functions and powers, and for connected purposes.

This Act also ensures that the environment shall have the meaning assigned to it under the Environmental Management and Co-ordination Act, 1999 (No. 8 of 1999). The principal objective of this Act is to enable the Court to facilitate the just, expeditious, proportionate, and accessible resolution of disputes governed by this Act.

2.1.4 The Physical and Land Use Planning Act No. 13, 2019

The Physical and Land Use Planning Act is the principal legislation with respect to planning in Kenya. It provides for the planning, use, regulation, and development of land and for connected purposes. Part II establishes offices and institutions for the purposes of planning in the country at both national and county levels and spells out their functions with respect to land use planning. Part III outlines the type of plans that are to be prepared in the country and their approval/implementation. This Act is very central because plans or during planning, solid waste management should be mainstreamed in the Act by designating solid waste infrastructure (designated transfer stations and disposal sights)

2.1.5 The Public Health Act, Cap. 242

The Public Health Act provides secondary legislation on environmental matters and solid waste management as far as they may affect people's health. It states under Section 126 that the minister (cabinet secretary) for health may make rules and/or confer powers on local authorities as to the disposal of rubbish, refuse, manure, and waste matter.

2.1.6 The Urban Areas and Cities Act, No. 13 of 2011

It's an act of parliament to give effect to Article 184 of the Constitution. It provides for the classification, governance, and management of urban areas and cities. Section 12 of the Act states that the management of a Municipality shall be vested in the County Government and administered on its behalf by a board and a manager appointed as per the provisions of the Act. The board of a municipality is responsible for developing and adopting policies for the delivery of services and undertaking infrastructural development within the municipality. It is also responsible for promoting a safe and healthy environment. These functions will

necessarily be exercised in the course of the preparation and execution of this solid waste management policy.

2.1.7 The County Governments Act, No. 17 of 2012

These are the Act of government that creates the county government and its assigned function. Solid waste management is a devolved function that is covered by the municipalities. It also creates the institution of the county assembly that approves laws and policies. It also advocates for public participation. Section 87, which provides for citizen participation, states that timely access to information, data, documents, and other information relevant to policy formulation and implementation will be one of the core principles of participation. It also provides for the protection and promotion of the interests and rights of minorities and marginalized groups. It is noted that these principles are central in the approach to this exercise.

2.1.8 The National Museum and Heritage Act, Cap 216.

It is an Act of parliament to consolidate the law relating to National museums and heritage; to provide for the establishment, control, management, and development of national museums and the identification, protection, conservation, and transmission of the cultural and natural heritage of Kenya. Lamu old town is a UNESCO Heritage site. This Act provides for the protection and management of the people's culture and heritage.

The old town has a gazetted buffer zone that includes; the Manda and Ras Kitau mangrove skyline and the Shella sand dunes, also protected by the Forest and the Water Act. There is a conservation plan for Lamu Old Town, which is used as a guide in balancing the community needs for development and sustaining the architectural values of the town.

2.1.9 United Nations Convention on the Law of the Sea, 2015

The UN Convention on the Law of the Sea (UNCLOS) is considered the constitution for oceans and interrelated resources that covers not only delimitation but also the protection and preservation of the marine environment. UNCLOS provides an overarching framework, a constitution, for the use and the protection of the seas. Commitments in regard to the protection and preservation of the marine environment are detailed, especially in Part XII, while provisions for compliance are found throughout the Convention.

General duties;

Article 192 - Protect and preserve the marine environment.

Article 194 - Prevent, reduce and control pollution of the marine environment from any source.

Ensure activities within the territory do not cause damage by pollution.

Minimize pollution from dumping, vessels, and installations.

Article 195 - Refrain from the transfer of damage or hazards from one area to another.

Article 196 - Prevent, reduce and control pollution from the use of technologies.

2.2 Policy Framework

2.2.1 Sustainable Development Goals

SDGs consist of 17 global goals set by the United Nations General Assembly in 2015, outlining the targets and aspirations of global development efforts up to the year 2030. They are committed to achieving sustainable development in its three dimensions, namely economic, social and environmental, and have been in effect since 1st January 2016.

The goals pertinent to environmental matters include SDG-15, which aims to protect, restore and promote the sustainable use of terrestrial ecosystems and halt/reverse land degradation and the loss of biodiversity, as well as SDG-14, which aims to conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Although these two are the main goals addressing environmental issues, there are nonetheless others, such as SDG-3 on promoting healthy lives and well-being for all and SDG-11 on promoting safe, resilient, and sustainable cities, which are virtually unattainable without environmental action, which includes the proper management of solid waste.

2.2.2 New Urban Agenda

The New Urban Agenda (NUA) was adopted at the United Nations Conference on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador, in 2016. It is a vision for a better and more sustainable future, particularly one in which all people have equal rights and access to the benefits and opportunities that cities can offer.

Specifically, the NUA envisages cities and human settlements that protect, conserve and promote their ecosystems, water, natural habitats, and biodiversity, minimize their environmental impact, and change to sustainable consumption and production patterns. In addition to this, it promotes participatory cities/human settlements that engender civic engagement as well as a sense of belonging and ownership among all their inhabitants.

2.2.3 The Kenya Vision 2030

The Kenya Vision 2030 is the country's development blueprint covering the period from 2008 to 2030. It aims to transform Kenya into a newly industrializing middle-income country, providing a high quality of life to all citizens and anchored on three pillars, namely economic, social and political. Notably, the social pillar seeks to build a just and cohesive society with social equity in a clean and secure environment.

Importantly, the Solid Waste Management System Initiative was one of the flagship projects in the environmental sector, which called for the development of solid waste management systems in five leading municipalities in the country, namely Mombasa, Kisumu, Eldoret, Nakuru, and Thika. It is in line with this that the County Government of Lamu commissioned a similar project for Lamu Municipality.

2.2.4 National Marine Litter Management Action Plan 2021-2030

This Action Plan is both a fulfillment and an enabler towards the achievement of the national strategies goals and sectoral policies on the environment and natural resources. It is anchored on scientific evidence, multi-stakeholder and participatory approaches as catalysts for preventing and reducing marine litter along the Kenyan coast to realize the potential of blue economy and protection of the marine environment. This will be achieved by preventing and reduction of litter at the source, improving litter monitoring, enhancing awareness and information sharing, and continuous removal of litter from the marine environment.

The development of this action plan is a reflection of the Kenyan government's resolve to take a steadfast journey culminating in the realization of the Kenya Vision 2030 of becoming a middle developing country in a clean environment. Kenya has made tremendous steps that have seen a total ban on plastic carrier bags and single-use plastics in protected areas. In addition, Kenya is developing this Action Plan to lay a roadmap for addressing the marine litter problem in Kenya's marine and coastal environment. It leverages strong institutional capacity and partnerships to build synergies for driving strategic actions on product innovation, knowledge sharing, market-based mechanisms, and life cycle approaches to reverse business as usual scenarios.

2.2.5 National Sustainable waste management policy

Article 42 of the constitution of Kenya 2010 states that every person in Kenya is entitled to a clean and healthy environment and has a duty to safeguard and enhance the environment. According to Vision 2030, Kenya aims to be a nation living in a clean, secure and sustainable environment hence lessening by half all environment-related diseases.

It is in this context that vision 2030 recognizes that efficient and sustainable waste management systems are required as the country develops into a newly industrialized state by 2030.

This has triggered the need to have a robust waste management system by developing policy, bills, and strategies for achieving sustainable waste management and a clean, healthy environment for all.

2.2.6 National environment policy, 2012

The promulgation of the Kenya Constitution 2010 marked an important chapter in Kenya's environmental policy development. Hailed as a green Constitution, it embodies elaborate provisions with considerable implications for sustainable development. These range from Environmental principles and implications of multilateral environmental agreements (MEAs) to the right to a clean and healthy environment enshrined in the Bill of Rights. Its Chapter V is entirely dedicated to land and the environment. It also embodies a host of social and economic rights of an environmental character, such as the right to water, food, and shelter – among others. This National Environment Policy aims to provide a holistic framework to guide the management of the environment and natural resources in Kenya. It further ensures that the linkage between the environment and poverty reduction is integrated into all government processes and institutions in order to facilitate and realize sustainable development.

Levels.

2.2.7 Integrated Coastal Zone Management (ICZM) Policy

This policy provides for the development of coastal zones. The framework is intended to guide actions and policies related to the use and management of Kenya's coastal zone resources, including their protection and restoration. The Integrated Coastal Zone Management (ICZM) Policy, Sessional Paper No. 14 of 2014, provides for pollution control and waste management practices. The policy seeks to improve the management of municipal solid waste through empowerment, promotion of public-private partnership in waste management, strengthening of the municipality to enforce laws for regulating municipal waste, and enforcement of Environmental Management and Coordination (Waste Management) Regulations, 2006.

This policy gives guidance on the protection of marine protected areas, species of special concern, water resources, and shorelines. It also recommends strategies for land use and

management access and benefit-sharing, research and monitoring, and education and awareness.

2.2.8 The Waste Management Regulations, 2006 Legal Notice No. 121

These regulations define rules for the management of waste in general and for the management of solid waste, industrial waste, hazardous waste, pesticides, toxic substances, biomedical waste, and radioactive substances in particular. It states that;

1) No person shall dispose of any waste on the public highway, street, road, recreation area, or in any place except in a designated waste receptacle.

2) A waste generator shall collect, segregate and dispose of such waste in a manner provided for under this regulation.

2.2.9 The National Solid Waste Management Strategy, 2015

The National Solid, Waste Management Strategy, aims to protect human health and the environment in a manner that is affordable, environmentally friendly, and socially acceptable. To achieve this, it proposes the adoption of the principle of integrated solid waste management. This approach establishes the preferred order/hierarchy of solid waste management as follows: waste reduction, reuse, recycling, resource recovery, incineration, and landfilling. The strategy provides for, among others, the following-

1. Definitions and classification of solid waste.
2. The national context and status of solid waste management.
3. The common waste management practices in Kenya.
4. The challenges facing solid waste management in Kenya.
5. Integrated solid waste management.
6. The waste management cycle and ideal approaches applicable to Kenya.

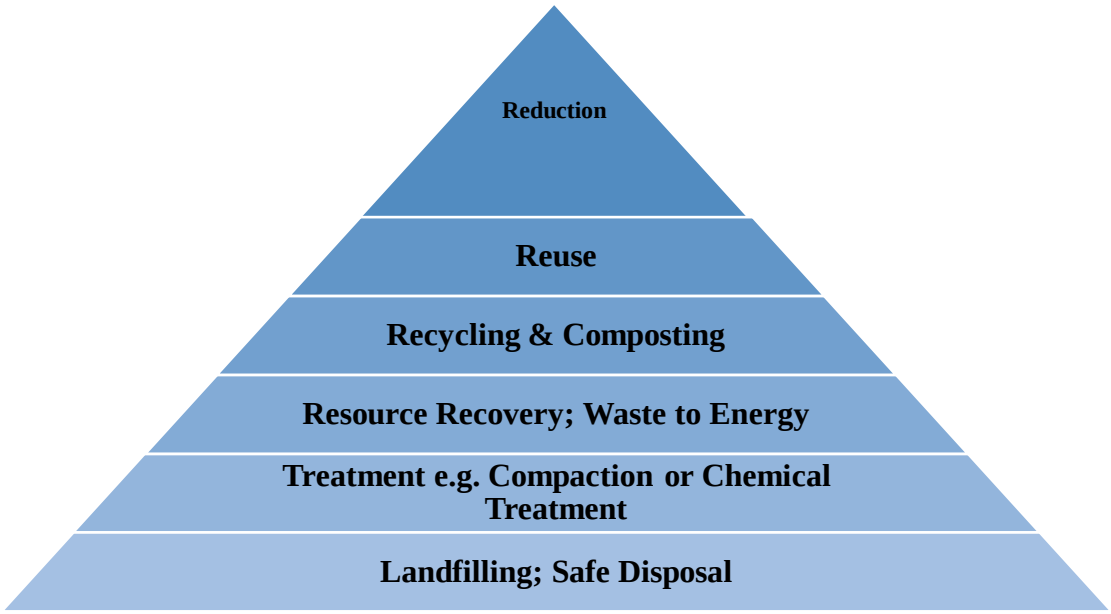

Figure 1: The Integrated Waste Management Hierarchy

Source: *UNEP, 2011*

The integrated solid waste management hierarchy of zero waste approach It conceptualize a framework that gives priority to waste prevention, followed by re-use, recycling, recovery and finally disposal. These zero waste hierarchy help us rethink our relationship

Figure 2: Zero waste hierarchy

Source: *UNEP, 2011*

2.2.10 Lamu County Spatial Development Plan (2016-2026)

The proposals of this policy conform to the provisions and strategies of the Lamu County Spatial Development Plan (CSDP) in respect to the conservation of the environment, natural resources and biodiversity.

CHAPTER 3

SITUATION ANALYSIS

3.1 Geographical Location and Size

Lamu Municipality is located in Lamu County and measures approximately 2,660 square kilometers (Land-1,860, Sea-800). It covers the entire extent of Hindi, Mkomani and Shella Wards and a part of Basuba Ward (Kiangwe and Milimani) as shown in the map below.

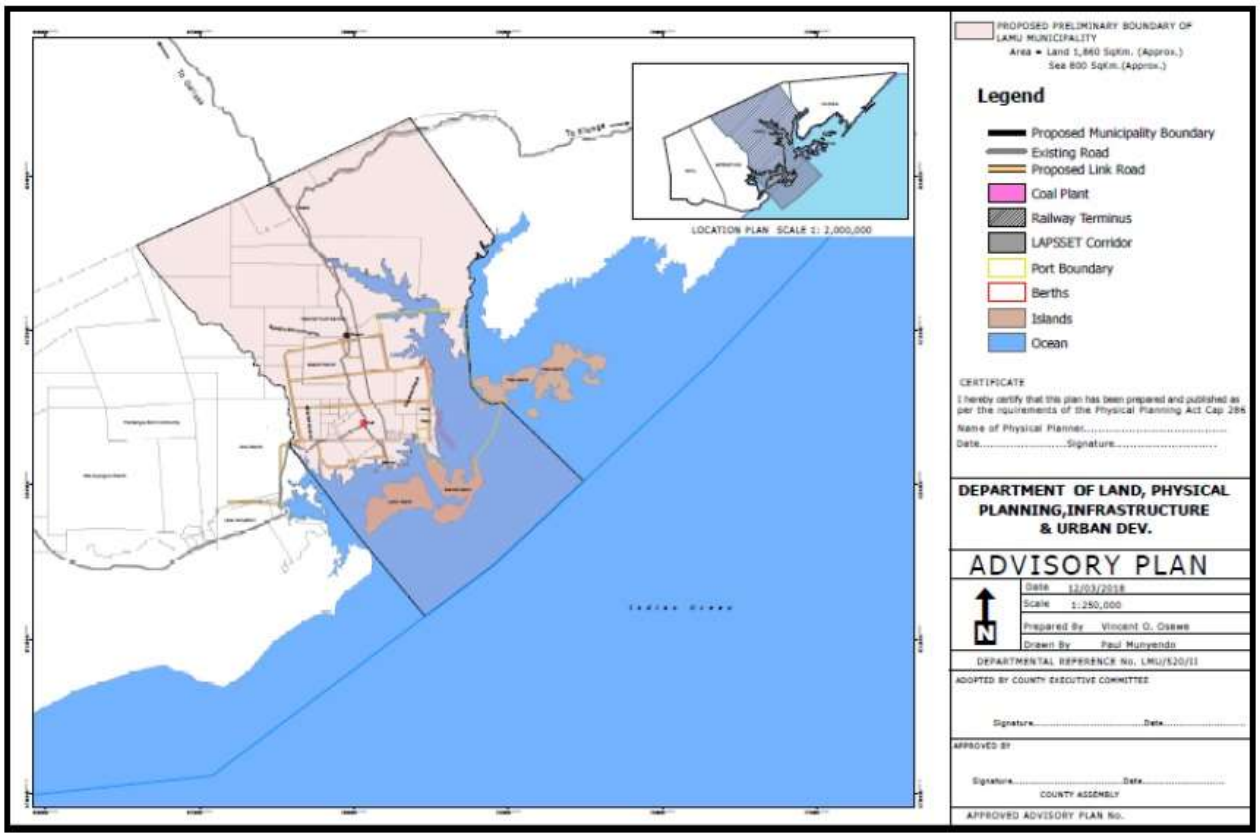

Figure 3: Location of Lamu Municipality

Source: *Lamu County Physical Planning Department, 2021*

3.2 Organization Structure of Lamu Municipality

Below is the existing organizational structure of Lamu Municipality.

Figure 4: Existing Lamu Municipality organization structure

3.2.1 Lamu Municipality Staff Establishment

Table 1: Lamu Municipality Staff Establishment

Staff Establishment	**Number of Employees**
Municipal Board	9
Chief Officer	1
Municipal Administrator	1
Building Inspectors	2
Physical planner	1
Surveyor	1
Engineer	1
Environmentalist	1
Accountant	1
Enforcement Officer	1
Assistant Administrator	1

Supervisors	4
Security Officers	16
Cleaners	53
Drivers	2
Loaders	5
Total	**100**

Source: *Lamu Municipality, 2021*

3.2.2 Distribution of Cleaners within the Municipality

For ease of solid waste management, cleaning is organized into zones. Old town produce the largest amount of waste produced hence the need for more cleaners. Cleaners are distributed in various zones within the municipality as follows;

Table 2: Distribution of Cleaners per zone

Zone	**Number of Cleaners**
Mokowe and Hindi	4
Old Town	35 cleaners ; 4 Supervisors
Manda Airport	2
Shella (Ras Kitau)	12
Total	57

Source: *Lamu Municipality, 2021*

3.2.3 Equipment

Even distribution of equipment is organized in the same manner as cleaners.

Name	**Number**
Tractors	2 – (1 not Serviceable)
Wheelbarrows	Hindi – 4 Shella – 6 Old Town -15 **Total -25**

Source: *Lamu Municipality, 2021*

3.3 Demographic Context

Lamu Municipality is made of cosmopolitan population composed of indigenous communities made of Swahilis, Arabs, Boni and Ormas and migrant communities from the

rest of the country. According to 2019 population census, Lamu County had a population of 143,920 people while Lamu Municipality has a population of 61,376. The table below shows a breakdown of population in the various Locations covering the Municipality. (2019 population and housing census).

Table 3: Population Demographics of Lamu Municipality

LAMU MUNICIPALITY						
Sub-Location	Total	Male	Female	House Holds	Land Area Sq Km	Density Persons Per Sq Km
AMU	**28,032**	**14,432**	**13,599**	**7,079**	**99.5**	**282**
Langoni	13,386	6,617	6,769	3,343	11.5	1,167
Kipungani	540	330	210	111	11.9	45
Matondoni	2,001	996	1,005	465	19.7	102
Mkomani	8,401	4,406	3,994	2,065	3.5	2388
SHELLA/MANDA	**3,704**	**2,083**	**1,621**	**1,095**	**52.9**	**70**
Shella	2,485	1,321	1,164	647	14.9	166
Manda	1,219	762	457	448	38	32
HINDI	**19,193**	**11,348**	**7,845**	**6,895**	**1149.2**	**17**
Hindi/Magogoni	11,336	6,750	4,586	4,036	1073.7	11
Bargoni	1,963	1,238	725	742	584.6	3
Bodhei Junction	422	323	99	248	79.9	5
Hindi	8,951	5,189	3,762	3,046	409.1	22
MOKOWE	**7,857**	**4,598**	**3,259**	**2,859**	**75.6**	**104**
Kilimani	2,076	1,128	948	560	32.2	64
Mokowe	5,781	3,470	2,311	2,299	43.3	133
BASUBA	**857**	**497**	**360**	**267**	**884**	**1**
Kiangwe	494	292	202	135	270.4	2
Milimani	363	205	158	132	613.6	1

Source: *KNBS, 2019*

Relationship between Population and Waste Management.

Solid waste needs to be collected on a daily basis, therefore there is need for more solid waste management initiatives such as provision of more disposal sites. The municipality needs to plan for collection and management of approximately 17.1 tonnes per day.

3.3.1 Population/volume of waste projection

Table 4: Population/volume of waste projection

Population/ volume of waste (2019 National census)	**Population/volume of waste projection as at 2021**	**Population/ volume of waste projection as at 2031**	**Population/ volume of waste projection as at 2041**
56,191	59,072	75,850	97,393
28 Tonnes	29.5 Tonnes	37.9 Tonnes	48.6 Tonnes

Source: *KNBS, 2019*

The population of households as per the 2019 national census was 56,191. It is anticipated that the population will grow to 75,850 and 97,393 by the years 2031 and 2041 respectively.

3.3.2 Sample size

A sample size of 400 households was used in order to appreciate how solid waste was handled at household level. Using the Cochran formulae as shown below;

$n = N/ 1+N (e)^2$

Where;

- N is the total population
- n is the sample size
- e is the error term (assuming known stated confidence level 95% = 0.05)

$n = 56191/1+56191(0.05)^2$

$n = 56191/56192(0.002)$

$n = 56191/140.48$

$n = 400$

3.3.3 Sampling technique

Both stratified and systematic sampling techniques were used for administering the questionnaires. The municipality was divided into six zones where the 400 questionnaires

were administered i.e., Old town 100 questionnaires, Shella, Matondoni, Mokowe, Kipungani, Kashmir and Hindi 50 questionnaires each. Data was analyzed using statistical package for social sciences (SPSS).

Table 5: Type of solid waste generated

Type of waste	**Percentage**
Food/ kitchen refuse	24%
Paper/ plastic/ can	59%
Green waste	9%
Glass bottles	4%
Metals	4%

Source: *Field Survey, 2021*

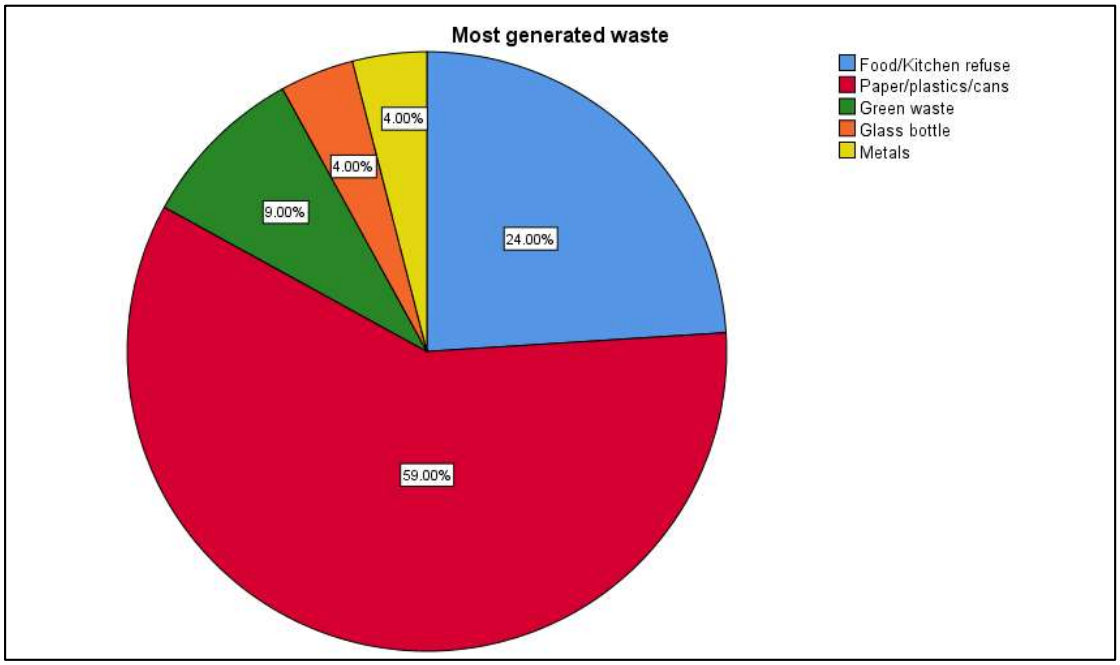

Figure 5 Type of solid waste generated

Source: *Field Survey, 2021*

3.4 Social and Economic Context

3.4.1 Social Context

3.4.2 Education and literacy

According to Lamu CIDP 2018-2028, the education skills, literacy, and infrastructure in the County population with the ability to read stands at 69.8%, with 69.85% having the ability to write. The population with the ability to both reading and write was 67.3 percent. Preschools, primary and secondary schools in the municipality have adequate physical facilities and enrolment. The challenge is poor performance.

3.4.3 Economic Context

Lamu municipality has rich natural capital, which includes agricultural land, Mangrove Forest, solar and wind energy, sand, coral stone, beaches and sand dunes, ocean, and seagrass. The primary economic activities in Lamu municipality include Fishing, Hotel, Tourism, Livestock Keeping, Mining, Weaving, Shipping, Honey Harvesting, wholesale and retail outlets. The construction of Lamu Port is expected to scale up the economic activities in Lamu Municipality and will equally increase the volumes of solid waste generated.

3.4.4 Urbanization

The main urban areas in the Municipality are Mkomani, Mokowe, and Hindi. The rising urbanization in the municipality results in to increase in the quantities of solid waste produced. This has resulted in an increase in demand for solid waste management services. Consequently, the municipality has to strategically plan for the development of sustainable solid waste management.

3.5 Overview of current solid waste management

The challenges of urbanization often outpace its associated development gains due to the lack of supporting policies and frameworks that can direct it towards increased development gains and sustainable patterns (UN-Habitat, 2015). The municipality of Lamu has limited capacity to collect and dispose of waste.

Due to the rise in urbanization, municipal services, especially those dealing with solid management, are likely to be a big challenge. The increasing amount of solid waste has decreased the ability of the natural environment to assimilate them and the municipality to manage them.

Plate 1: Illegal dumping on a road reserve

Source: *Field Survey, 2021*

Plate 2: Poorly managed disposal site

Source: *Field Survey, 2021*

Lamu municipality houses Lamu old town, a UNESCO heritage site that is managed by the National Museums of Kenya. The heritage site is characterized with narrow streets that makes transport and disposal of solid waste generated inefficient.

Waste transportation in Lamu is largely rudimentary using open trucks, handcarts, donkey carts among others. These poor transportation modes have led to littering, making waste an eyesore, particularly plastics in the environment.

Plate 3: Open truck and donkey transporting solid waste

Source: *Field Survey, 2021*

3.6 Types of waste streams and their Management

There are various waste streams generated in Lamu Municipality that can be categorized as domestic, commercial, and industrial, construction and demolition, agricultural, hazardous waste, donkey and boat wastes.

3.6.1 Domestic waste:

Domestic waste is also referred to as household waste. It consists mainly of biodegradable waste, which is food, and kitchen waste, green waste, paper and non-biodegradable such as plastics, glass bottles, cans, metals and wrapping materials. The composition of the domestic waste streams is a function of income, consumption patterns and recycling opportunities. In Lamu, domestic waste is not adequately managed and is disposed off with minimal sorting/segregation.

Plate 4: Inappropriate dumping of domestic wastes

Source: *Field Survey, 2021*

3.6.2 Commercial waste

Commercial waste consists of waste from premises (Stores, Hotels, Restaurants, markets, Banks, office building etc.) used mainly for the purposes of trade or business or for the purpose of recreation or entertainment. It consists mainly of Paper, Plastics, wood, food

waste, textiles, glass, metals, cardboard, special waste (e.g., bulky items, electronics, batteries, oil, and florescent bulbs).

Plate 5: Illegal dumping of solid wastes at Mokowe Jetty

Source: *Field Survey, 2021*

Plate 6: Indiscriminate dumping of wastes at Matondoni Jetty

Source: *Field Survey, 2021*

3.6.3 Construction and demolition waste

This waste is generated because of new construction works, remodeling or demolition. Construction waste comprises debris, steel, timber, iron sheets, tiles and ceramics among others. Demolition wastes may include asbestos, which is hazardous and can present a significant health risk when improperly disposed or reused.

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Source: *Field Survey, 2021*

3.6.4 Industrial waste

Industrial waste is the waste produced by industrial activity, which includes any material that is rendered useless during processing or manufacturing. Most of the industrial wastes in Lamu municipality come from fisheries. Fish waste management has been one of the problems having the greatest impact on the environment. Most of the fish wastes (byproducts of fish processing) include scales, meat bones and cartilages.

3.6.5 Biomedical waste

Biomedical waste also referred to as medical waste is waste generated in health facilities, research institutions or during immunization of human beings and animals. It is classified into; Infectious waste, sharps, pharmaceutical wastes, chemical waste and pathological waste. Biomedical wastes pose risks to human health due to its pathogenic characteristics and hence require prior treatment before disposal. Currently, segregation is embraced at King Fahd hospital and some clinics in Lamu based on the guidelines issued by the Ministry of Health.

Although the biomedical waste is expected to be disposed through incineration, some find its way to the municipal dumpsites (seven aside) while some is handled through rudimentary facilities such as kilns.

Plate 8: Receptacles at King Fahd Referral Hospital

Source: *Field Survey, 2021*

Plate 9: King Fahd Referral Hospital Incinerator

Source: *Field Survey, 2021*

3.6.6 Donkey waste

Lamu old town being the oldest and best-preserved Swahili settlement in East Africa retains it's traditional functions. Lamu is a no-vehicle town and therefore some people board donkeys or carts for their daily commute. This has led to an increase in the population of donkeys in the island, which is estimated to be more than 1000 donkeys. These donkeys have exacerbated littering along the streets with their droppings.

Source: *Field Survey, 2021*

3.6.8 Electronic waste.

Computer equipment and mobile phones are the principal electronic waste within Lamu Municipality. Some of these equipment once discarded are not recycled hence presenting a new waste regime which may not be handled sustainably. There is need to come up with a strategy to handle E-waste within the municipality.

Plate 10: Donkey littering the streets with droppings

Plate 11: Electronic waste

Source: *https://www.wikiwand.com/en/Electronic_waste*

3.7 Current waste management practice

The Ministry of Environment and Forestry is rooting for a paradigm shift on the management of waste from a linear to circular economy, which is more sustainable in creating a clean, safe and healthy environment. It is estimated that Kenyans generate over 22,000 metric tons of waste daily. The most effective way to deal with such huge volumes of wastes is to segregate it at source into organic, plastics and paper for ease of collection for re-cycling and re-use. 60% of the total waste collected is organic, 30% is plastics and paper that can be recycled for various purposes. This means that only about 10% of the waste will find its way into the landfills.

According to United Nations report, waste production rates in third world countries is half a kilogram per person a day.

Table 6: Waste generated in tonnes per day (Population by half a kilogram per head)

Ward	**Population**	**Estimated amount of waste**
Amu	28,032	14 tonnes
Hindi	19,193	9.6 tonnes
Mokowe	7,857	3.9 tonnes
Shella	3,704	1.8 tonnes
Basuba	857	0.4 tonnes.

Source: *Field Study, 2021*

3.7.1 Waste segregation

Waste segregation is the sorting and separation of waste types to facilitate recycling and correct onward disposal.

During the analysis, it was found that;

- Very few households segregate waste at the household level.
- There is minimal waste segregation at the source within the municipality.
- There is considerable segregation of biomedical waste at King Fahd Hospital.
- Informal groups like Takataka Heroes make the recovery of recyclable items such as plastics, papers, glass, and metals.

3.7.2 Community Based waste management case studies

In 2017, using traditional knowledge and techniques, the Flipflopi built the world's first recycled plastic sailing dhow in Lamu. They are building on the success of this to establish a Heritage Boat Building Training Centre to design and construct recycled plastic sailing vessels with local boatbuilders based on indigenous heritage, knowledge, and skills. A fully operational recycling facility has now been opened on Amu Island and a material recovery center for all plastic waste in partnership with Takataka Heroes. To make this happen, Flipflopi and Takataka Heroes are bolstering existing community waste management outreach programs to establish a sustainable 'closed-loop' post-consumer waste management practice in partnership with key stakeholders. The plastics material recovery center will serve the entire archipelago, connecting communities and creating networks to build a supply chain consisting of community waste sellers, segregation, transporters, and site staff who will collect, sort, wash and shred the plastic waste. The goal is to develop this network through skill-sharing workshops and educational outreach and create a local economy for post-consumer plastic waste products that are made in Lamu.

Objectives of the FlipFlopi Project

Core objectives for tackling plastic pollution in Lamu by the Flipflopi Project include:

Accelerate Research & Design (R&D) to improve the structural integrity of the dhow prototype - this will comprise scaling up design and engineering to build different types of vessels and exploring complementary products that can be developed and sold using existing knowledge, infrastructure, and market reach.

Establish a heritage boat building training center to teach traditional techniques for boat building and modern techniques for working with recycled plastic. The center will be a hub for incubating indigenous knowledge and design systems that are inherently circular in order to build the talent pool that can provide technical support to the increasing number of circular economy initiatives around the region, such as the Flipflopi.

Establish a centralized Material Recovery Centre for plastics - the first of its kind in the Lamu archipelago, serving a population of 140,000+. This center will work closely with a community-led network to extract existing plastic waste to use as feedstock for the training center, prevent additional plastic from reaching the ocean, and create a sustainable closed-loop economy for waste management, creating appropriate waste management system for discarded plastics across the archipelago.

Plate 12: Takataka Heroes solid waste sorting site
Source: *Field Survey, 2021*

Plate 13: The FlipFlopi fully Operational Plastic Recycling Plant in Lamu Island

Source: FlipFlopi

Plate 13: Sorting of solid waste Kijitoni dumpsite in Shella

Source: *Field Survey, 2021*

Plate 14: *Boat made from recycled plastics by the Flip-flopi*
Source: *Field Survey, 2021*

Eco Hotels and Houses in the management of solid waste in Lamu Municipality

Lamu municipality lies within the county tourism hub with considerate number of hotels, restaurants and guest/Private houses**.** Tourism industry contributes significant amount of solid waste. Hotels and houses are significant in the generation of solid waste in the Municipality, However some hotels have gone green with considerable efforts in refusing, reducing, reusing and recycling of solid waste with the following attributes:

a) Use of organic Food and materials
b) Use of eco-friendly cleaning products
c) Recycling over 80% of solid waste
d) Recovery & reuse of solid waste.

The hotels include Diamond beach village hotel in Ras Kitau, Baobab treehouse hotel, Band, Peponi, and subira house among others.

Plate 25: Wall made of Glass bottles in Shella, Lamu Island

3.7.3 Solid waste collection and transportation

The municipality has two tractors and three trailers for waste collection.

The frequency of waste collection depends on priority. Waste collections in Municipalities that are near to the CBD like Sokoni is done at least once per day. There is no organized solid waste collection in other parts of the Municipality.

Table 7: Solid waste collection in Amu Island

S/N	Days	Name of Collection Sites
1	Monday	Sokoni & Kanu
2	Tuesday	Sokoni & Jua Kali
3	Wednesday	Sokoni & Twaifu
4	Thursday	Sokoni & Peace Villa
5	Friday	Sokoni & Bridge I
6	Saturday	Sokoni
7	Sunday	Sokoni
1	Monday	Sokoni &Kashmir bodaboda stage
2	Tuesday	Sokoni & Swafaa
3	Wednesday	Sokoni & Gadeni new town
4	Thursday	Sokoni & Jambo
5	Friday	Sokoni & Kandahari dispensary

Source: *Lamu Municipality, 2021*

3.7.4 Waste segregation

This is the first step towards a zero waste lifestyle policy. It advocates that its our collective and individual responsibility to preserve and tend to the environment in which we all live. In

order to achieve a zero-waste lifestyle, Lamu residents should take actions on segregating waste at their homes and at personal level.

The residents of Lamu Municipality should be sensitized and trained on how to segregate their waste into different types, that is, wet waste, dry waste, hazardous waste and biomedical waste.

Plate 15: A collection receptacle along sea frontage in Lamu Island

Source: Shuwari Foods

3.6.5 Waste treatment

Waste treatment technologies have not been fully embraced in the Municipality; however there are on-going efforts to enhance waste treatment practices.

3.6.6 Waste disposal

Most of the domestic and commercial waste generated is stored in informal holding grounds mainly located on road reserves and private land.

Biomedical waste is largely disposed through incineration and rudimentary kilns;

Municipal workers operating on these sites have minimal or no training on how to manage solid waste. There is a 5 acre piece of land set aside for solid waste disposal near Kashmir.

Plate 16: A poorly maintained open dumpsite (Seven aside) in Lamu Island

Source: *Field Survey, 2021*

CHAPTER 4

SOLID WASTE BEST PRACTICES

4.1 Introduction

This involves appreciation of best practices in management of solid waste.

4.2 Cebu City in the Philippines

Rapid urbanization in Philippines, has strained the country's ability to properly dispose of solid waste. In Cebu City, the responsibility of solid waste collection falls under the city government and Barangay (the smallest administrative districts in the Philippines). Cebu City collects solid waste from commercial establishments, institutions, and households on main roads. Barangays are responsible for waste collection within their administrative unit using their own vehicles or those provided by the city. From 2010, Cebu City began implementing legislation for organized waste collection and management. To increase the effectiveness and participation in such legislation, Cebu City established partnerships with a number of local groups and institutions, which have led to various achievements namely: -

a) **Annual competitions through partnerships with businesses and the local media**.

Best Environmental Barangay Award given to communities with high participation in solid waste management activities.

Plate 17: Environmental Barangay Award given to communities in Philippines

Source: *ncr.emb.gov.ph*

b) **Municipal-wide awareness raising campaigns**

These campaigns involve locals, NGOs, homeowner's associations, informal sector workers, academic institutions, local enterprises, and the media.

Plate 18: Municipal-wide awareness raising campaigns in Philippines

Source:*https://www.worldbank.org/en/news/feature/2020/06/28/awareness-campaigns-in solid waste management.*

a) **Solid waste management through public-private partnerships**.

Two private ventures have established treatment facilities near the City of Cebu's landfill. One handles **plastics recycling**, and the other handle **organic waste,** reducing the amount of each that enters the landfill.

b) **Increased recycling through partnerships with environmental institutions**.

Local communities gather and transport recyclable items to a designated collection site. Each barangay is assigned a respective buyer for the recyclable materials.

4.3. Experiences from Nyayo estate-Nairobi on solid waste management

Nyayo Estate, through various initiatives by its occupants, has proven over time that individual responsibility leads up to community responsibility in waste management. Through **waste segregation**, Nyayo estate is providing ground for a circular economy by collaborating with Coca-Cola Beverages Africa. The company has come in to help residents turn waste into wealth through recycling, which provides jobs for the youth. Nyayo Estate was awarded a circularity plaque for the only gated community in East Africa to have

successfully segregated material waste by Africa Red Estate Finance Academy (AREFA) in 2012.

They have come up with initiatives that include;

Taka Fit

The residents have embraced a concept known as the 'Taka Fit' initiative that was started in the year 2020 in collaboration with Nyayo Estate Residents Association (NERA). What used to be an eyesore is the pride of occupants who say they had to clean up and adopt a culture of responsibility from how they dispense their waste in their houses to dumping at collection centers constructed around the estates.

Through the use of social media platforms, WhatsApp, Facebook, Twitter, and Instagram, among others, they began sensitizing other residents on the importance of proper and sustainable waste management. Sensitization moved from virtual to physical, and they began holding meetings to educate house help members and owners on the proper disposal of waste. In addition, they had to make residents understand how they can turn waste into wealth.

b) Tenga

This means to sort. Residents carry out sorting in their houses, where they separate organic waste, plastic, and general waste before taking it to the dumping area. By separating them, the leaking of watery stuff is controlled from house level and what is put into trash papers is adequately dry. Waste segregation also makes it easier to recycle waste, and this means less waste goes to landfills.

c) Funga

Meaning tying and, in this sense, tightly and decently to avoid pouring waste en route to the dumping site and at the site. When all residents mind how they enclose their waste in provided bags and those they self-improvise, the dumping site will not have waste scattered or leaked components.

d) Beba

Meaning 'carry,' this part is crucial for residents to avoid littering the compound with waste, either intentionally or unintentionally. This means that the responsibility is only given to able members of the House who will ensure environmental safety.

e) Komeo

This means 'close .'After effectively following the simple process and getting the waste into the dumping area, persons are obliged to close the door after themselves to keep away children, cats, rats, birds, and other pests that may tamper with the waste awaiting collection by garbage tracks.

4.4 Best solid waste management approaches

4.4.1 Zero waste approach

Zero waste management means the holistic concept of waste management, which recognizes waste as a resource produced during the interim phase of the process of resource consumption. Zero waste strategies may be applied to companies, communities, industrial sectors, schools, and homes. Sustainability is strongly supported by environmental protection, cost reduction, and employment opportunities in solid waste management and handling back into the industrial cycle.

The zero-waste approach is a philosophy that tries to encourage a lifestyle that assures the reuse of products and materials rather than ending up in landfills. The zero-waste approach points to the conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health.

Community education and public debate are requisite for the success of any intention to go toward the zero-waste approach. Citizens must be invited to take care of waste-free practices and take active participation in the management system thinking towards waste reduction. Public education campaigns to boost public participation must be engaged, and they need to be well resourced and sustained over time.

Plate 19: Zero waste approach in solid waste management

Source:*https://parenting.firstcry.com/articles/magazine-best-methods-to-manage-your-household-waste*

4.4.2 Zero waste to landfill

Zero waste to landfill is an overall waste reduction strategy with the ultimate goal to eliminate the volume of waste and material ending up in landfill. Zero waste is more useful as a philosophy than as a realistic goal, zero waste to landfill is a relatively established initiative that signifies a business diverting 99 percent of its generated waste away from landfills.

The waste produced is either reused, recycled, composted, or converted to energy. It is a practical step towards the idea of a circular economy. Encompassing the entire life cycle of an organization's products or services, zero waste to landfill takes into consideration ethical, economic, environmental, and efficient decision making.

Zero waste is a classification that refers to the ***conservation of all resources*** through responsible and sustainable production, consumption, reuse, and recovery of products, packaging, and associated materials without incineration or environmental discharges.

4.4.3 Awareness creation

There is need to include environmental management in CBC so as to raise early awareness to kids in schools. Solid waste management activities encourage the use of collection services and participation in recycling and organic waste diversion programs. Emerging with local and national policy makers can lead to adoption of solid waste management regulations and increased funding for programs. The awareness raising programs can include; media campaigns, door-to-door visits to discuss solid waste management activities with stakeholders, and community clean up events. Competitions among neighborhoods and communities will help raise awareness for solid waste management and encourage behavior change. Education campaigns can be integrated into school and university curriculums to reach the youth population and encourage good solid waste management practices.

Plate 20: Grade 3 pupils clean Ruaka Market as part of their CBC exams

Source: *kenyanews.go.ke*

4.4.4 Circular economy approach

A circular economy is one that exchanges the typical cycle of make, use, dispose in favor of as much re-use and recycling as possible. The longer materials and resources are in use, the more value is extracted from them. Extending the life of products and materials prevents the over-generation of waste and recovers the full value of products. This would create new business opportunities and revenue streams, while minimizing the environmental impact of mining, resource extraction, refining and manufacture.

The circular economy approach vision is usually to empower communities, organizations, and product manufacturers to reach their sustainability goals so as together we can build a sustainable world. Lamu Municipality should therefore seek to inspire positive environmental change through actions and products that foster a more sustainable future. They should develop innovative alternatives to conventional plastics.

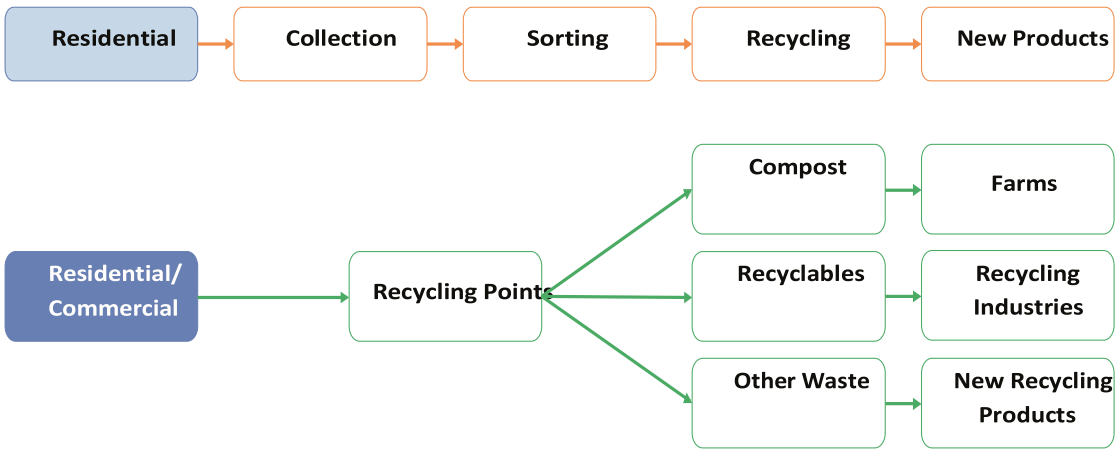

Figure 6: Circular economy model

4.4.5 Recycling and organic waste management

Recycling is a series of activities that includes collecting used, reused, or unused items that would otherwise be considered waste, sorting and processing the recyclable products into raw materials and re-manufacturing the recycled raw materials into new products. The Recycling section explains the benefits and challenges of recycling, and best practices in setting up a recycling program, including engaging with the informal sector.

Organic waste management deals with the diversion and treatment of organic waste through composting and anaerobic digestion. Compost is any organic material that can be added to soil to help plants grow. The Organic waste management section covers different options from small-scale composting and best practices for separating this waste from the general waste stream.

Plate 21: Solid waste collection bins

Source:*https://www.change.org/p/https-www-facebook-com-proper-waste-management-247377809258806-promote-proper-waste-segregation*

4.4.5 Treatment and disposal

Prior to disposal, treatment can help reduce the volume and toxicity of waste. Treatments can be physical (e.g., shredding), chemical (e.g., Incineration), or biological. Landfills are an important component of an integrated solid waste management system. Waste that cannot be prevented or recycled should be disposed of in properly designed, constructed, and managed landfills, where it is safely contained to limit it's environmental impacts.

Plate 22: Solid waste garbage skip loader truck

Source: *Waste360.com*

Plate 23: Solid waste garbage truck ideal for collection of waste in Mokowe and Hindi

CHAPTER 5

SYNTHESIS

5.1 Introduction

Synthesis involves a summary of solid waste challenges, opportunities, weaknesses, and strengths toward an effective solid waste management policy for Lamu Municipality.

5.2 Requirements for effective solid waste management

Lamu municipality and individuals within the municipality are expected to implement the following functional components of the waste management system.

Waste generation

This encompasses any activities involved in identifying materials that are no longer usable and are either gathered for systematic disposal or thrown away. The zero-waste objective and other sustainable solid waste management practices require the waste refusal principle as the best fundamental approach to reduce the amount of waste generation. People are to rethink their priorities, choices, and needs to ensure that they take every slightest opportunity of refusing waste generation.

On-site handling, storage, and processing

This relates to activities at the point of waste generation, which facilitates easier collection. For instance, waste bins are placed at sites that generate sufficient waste. The methods used to handle waste at the site create either barriers or opportunities to resource recoveries in the later stages of the integrated management. Therefore, it is an essential fundamental step in the effective management of solid waste. When solid waste is well segregated and managed on-site, the resource recovery process can become easier, less costly, and manageable. Nonetheless, if done wrongly through a general mix-up, it can completely render the solid waste useless by diminishing the value for resource recovery.

Waste collection

· Ensure that the waste collection areas are zoned.

· Ensure that waste is segregated at consumer or production points.

· Ensure timely and regular collection of all solid wastes either through the door-to-door collection or from centralized collection points;

· Ensure waste collection facilities such as skips, bulk containers, and waste cubicles are regularly emptied and do not become eye-sores.

Waste transfer and transportation

The proximity principle requires that solid waste transfer stations be accessible by neighborhoods without traveling long distances to promote better waste disposal. Therefore,

enough waste transfer stations require to be established among the neighborhoods within the settlement areas and well partitioned to ensure that waste is not mixed up. Where necessary, solid waste transfer stations require to be manned to ensure that proper waste segregation is achieved as much as possible. The design of the transfer stations should be in conformity with the NEMA guidelines for waste transfers to avoid littering the environment. Registered solid waste trailers with proper segregation sections can also be considered as alternatives where the construction of solid waste transfer receptacles is unachievable. These trailers are placed at strategic places within the neighborhoods and well manned to ensure that segregation is achieved at all steps of generation, collection, and transportation.

All the collected waste is transported using NEMA licensed vehicles and donkeys to designated disposal sites. The means of transportation must ensure that solid waste segregation is maintained all through for better resource recovery. Waste handlers in every step of the management must ensure that solid waste is not mixed up at all to offer better resource recovery opportunities for the recyclers and re-users.

Waste processing and recovery

This refers to the facilities, equipment, and techniques employed to recover reusable or recyclable materials from the waste stream and to improve the effectiveness of other functional elements of waste management.

Waste disposal site

· Ensure there are designated site(s) for waste disposal.

· Ensure that the disposal site is secured with a fence and a gate manned by Lamu municipal officials to control the dumping and spread of waste outside the disposal site.

· Ensure all incoming waste is weighed and the quantities recorded.

· Develop and maintain motorable roads inside the site to ensure ease of access during disposal.

· Ensure the waste is spread, covered, and compacted at regular intervals.

· Put in place appropriate control measures for the management of dumpsite fires.

Requirement for licensing

Ensure waste transportation vehicles and donkeys have NEMA licenses.

5.3 Challenges associated with waste management systems

Lamu Municipality will strive to ensure continuous improvement of waste generation, collection methods, and transportation and disposal facilities. An effective solid waste management plan will deliver a clean and healthy environment for all, as granted by the Constitution of Kenya, 2010.

Aspect	Challenge	Cause
Waste generation	Increased generation of waste	Increased population, change of consumption patterns.
Collection and transportation	Low coverage of waste collection services Irregular collection Inappropriate transportation trucks Un-regulated waste collection fees	Inaccessible roads, lack of payment for waste services, lack of zoning of waste collection areas. Inadequate transportation trucks, poor scheduling of waste collection and transportation, low budgetary allocation for operations. Low investment in acquisition of compliant waste trucks Lack of a clear policy on waste management services.
Disposal method	Open dumping Inappropriate siting of the disposal site	Lack of appropriate waste disposal infrastructure Irregular or lack of collection service long distances to the existing dump-sites. Proximity to environmentally sensitive areas, conflict with standards of existing establishments (airports, designated wildlife corridors), Lack of acceptability by the host communities, unavailability of land.

Source: *Field Survey, 2021*

5.3.1 Solid waste management financing

The funds are limited to recurrent expenditure with little or no development vote. Only for allocated resources approximately 4.7 million for procurement of solid waste truck.

5.4 SWOT Analysis

This section identifying the strengths, weaknesses, opportunities and threats (SWOT) available in the municipality. The table below provides this detailed analysis;

Strengths	Weaknesses
• Existing Community Based Organization and youth group especially in Shella and	• Pollution from donkey droppings in Shella and Old town Lamu.

Matondoni dealing with solid waste management (Takataka Foundation and Matondoni Youth Initiative respectively). • The religious culture advocates for cleanliness. • Availability of institutions such as NEMA, Municipality, the Museum, KEFRI and County Government. • Private initiative in solid waste management funded programs in Ras Kitau and Hindi. The public is increasingly becoming aware of their rights to a clean and healthy environment and hence agitating for environmental services by the municipality.	• Inappropriate solid waste collection points/transfer station in Lamu municipality. • Lack of access for effective solid waste collection and transportation No ring road to connect all municipalities for effective solid waste collection and transportation. • There are two functional trucks for solid waste collection and transportation. • Undesignated Land for solid waste disposal facilities and sites. • Lack of disposal sites in Ras Kitau, Hindi and Mokowe. • Weak institutional framework. • Weak and uncoordinated partnerships with the private actors, CBOs, youth initiatives and the government. • Inadequate personnel and equipment for solid waste management.

Source: *Field Survey, 2021*

Opportunities	**Threats**
• Organic manure for agricultural purpose generated from compost from donkey droppings. • Employment opportunities in waste management through diverse waste-based enterprises. • Opportunities for involvement of the private sector e.g., Shella environmental resident group and Lamu youth alliance. • Investment opportunities in recycling, composting and incineration. • Plastic recycling industry e.g. boat made from	• Land use conflicts between waste management and the locals.

plastic in Shella	

Source: *Field Survey, 2021*

5.5 Roles of collaborating agencies in solid waste management

Successful implementation of these policies requires the involvement of several actors whose roles are outlined below;

NEMA

· Develop and disseminate public information on the regulatory requirements for waste management in Lamu County Municipality.

· Build the capacity of the county governments on waste management systems and approaches applicable in their respective counties.

· Promote the use of social media to attract wider stakeholder participation and change attitudes towards waste management at a national level.

· Hold public awareness sessions (for example, school workshops, public consultation exhibitions, and public events) on waste management initiatives

· Support the dissemination of waste management research and development findings.

· Enforcement of the laws developed on solid waste management and surveillance exercises on illegal waste-related activities.

· Assist the municipality in preparation of the Municipality'sMunicipality's annual state report of the environment.

Lamu County Government and Municipality:

· Responsible for drawing up action plans for implementation of applicable solid waste management systems.

· Source adequate funding for the development of sustainable waste management initiatives in the entire cycle.

· Put in place measures for enhanced Public-Private-Partnerships (PPP);

· Benchmark on best practices of appropriate technologies

· Undertake periodic clean-up activities within the municipality

· Provision of equipment for waste segregation and transport systems;

· Zone the operational waste areas (transfer stations & disposal sites) using GIS technology.

· Establish door to door solid waste collection system and facilitate segregation at the household level in Lamu Island.

· Enforcement of development control regulations

· Establish waste segregation bins areas along the sea frontage

· Continuous management of activities/facilities to ensure all the waste is transported to the designated waste disposal sites in a timely manner.

· Ensure wide coverage and no littering of waste through improved collection methods and facilities.

· Progressively improve the current designated disposal site to a sanitary landfill.

· Enforcement of laws on the management of plastic waste.

· Provide incentives to groups with high participation in solid waste management

· Undertake community civic education and Capacity building on sustainable solid waste management practices.

· Empower youth groups, CBOs, and the private sector in dealing with solid waste management in the municipality.

· Strengthen partnerships between Donors, volunteer groups, and other community organizations with a special interest in waste recovery and management, for example, the Farmers Training Centers.

· Enforce the polluter pay principle

· The County Government of Lamu and Lamu municipality to enforce regulations on burning single-use plastics in protected areas within Lamu Municipality.

· Establishment of ward unit/community-based/Nyumba Kumi residents association system.

· Engage key tourist associations in managing solid waste emanating from tourism.

· Increase the technical capacity in the solid waste management department.

· Enforce the burn on single-use plastic in Lamu Island as provided in the legal framework.

· Designate key solid waste stakeholders for proper coordination and partnerships within Lamu Municipality.

· Acquisition of disposal sites in Ras gitau, Manda, Matondoni and Shella

· Market end products from community recycling plants

· Partition disposal sites to include recycling facilities.

· Registration of Municipal waste transportation vehicles with NEMA.

· Promote prevention of waste generation among product users through awareness creation on behavior change and consumer choices, and consumption practices to reduce excessive consumption or use and waste of diverse products.

Private Sector

· Through Public-Private-Partnerships (PPP), involvement in the development of effective and efficient solid waste management facilities;

· Prioritize corporate social responsibility (CSR) in waste management

· Empower communities and other stakeholders in understanding waste management-related issues and in finding solutions for the same.

The Citizens/Public

· Change in attitude and practice to embrace the concept of a waste generator's responsibility by ensuring waste is appropriately managed at source and/or in all phases of the waste management cycle;

· Adopt the 7R (Reuse, Recycle, Reduce, Rethink, Refuse, Refill, Repairing) and/or an integrated solid waste management approach in the management of all waste streams;

· Collaborate with other government entities, CBOs, NGOs, and other informal groups in waste management through the PPP approach.

CHAPTER 6

THE POLICY FRAMEWORK

6.1 Introduction

In order to comprehensively address solid waste management, a framework setting the policy direction to be pursued by the Lamu Municipal board, County Government, and other stakeholders is essential. This chapter describes the policy framework consisting of the core policy interventions to be pursued. In addition, the chapter lays out the policy vision and guiding principles.

6.2 Policy vision

The Vision of the Municipality is to achieve a world-class Cultural and Sustainable City.

6.3 Policy principles

The following are the guiding principles for the solid waste management policy-

1. **Sustainable development** is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
2. **The proximity principle** implies that waste should be managed close to where it is generated.
3. **The self-sufficiency principle** implies that each urban area or zone should manage its waste where possible and practical.
4. **Polluter pays the principle** whereby those who generate waste should bear the cost of managing the waste to minimize risk to human health and the environment.
5. **The precautionary principle** whereby appropriate policy measures may be taken in order to safeguard human health and the environment. Even if scientific evidence is not conclusive, it would be essential to adopt a precautionary approach.
6. **Inter-generational equity** implies that waste should not be managed in a way that bequeaths legacy problems to subsequent generations.
7. **Intra-generational equity** implies that waste management resources and services should be equitably accessible to all citizens or residents in the same generation. All interested parties should have equitable possibilities to provide services and equitable burden-sharing in waste management facilities.

6.4 Policy measures

The Municipal Board shall adopt an integrated approach to solid waste management and the principles of solid waste management that form the foundation of this policy. The policy measures shall be based on a combination and integration of the functional elements in solid waste management, solid waste management hierarchy, and the two-triangle framework, forming the integrated solid waste management system. This part shall prescribe the policy measures that the municipality shall pursue. The policy measures shall be in the form of policy statements, which prescribe the appropriate policy instruments in solid waste management.

6.4.1 Solid waste generation

Context

Waste generation happens throughout the product lifecycle. It is an essential and critical part of the sustainable solid waste management system. Any effective management system should discourage the possible generation of any waste. Though the Lamu Municipality cannot regulate the vast generation of waste in the households, it can impose regulations on products banned in a protected area, resulting in the majority of their solid waste. Plastic leads the generation of 59% of the municipal waste in Lamu. However, with the enforcement of the existing national and international legislative and policy framework, plastic waste generation can be drastically reduced. The Lamu Municipality has a high potential for reusing and recycling most of the other types of waste, including organic. Nonetheless, the special waste, including diapers, pads, glass fiber, and medical waste, requires special infrastructure for effective disposal and management. Nonetheless, the incinerator at the major government hospital serves the waste from other private clinics providing a sustainable disposal method.

Vision

To create awareness for the reduction of solid waste generation.

Challenges

1. Increase in population and change of consumption patterns which has led to increasing in solid waste generation in Lamu Municipality
2. Poor sensitization/awareness on solid waste management
3. Pollution from donkey droppings
4. Poor access roads that limit easy collection.
5. Unsustainable consumption patterns that lead to excessive generation of solid waste.

6. Poor product designs that lead to excessive, unnecessary solid waste through wrappings and packaging.

Policy measure

In order to facilitate the prevention and reduction of solid waste generation through sustainable waste management processes, Lamu Municipality, in collaboration with other stakeholders, shall:

1. Implement the regulations spelled out by NEMA in the waste management on the responsibility of every waste generator, the waste generator's responsibility.
2. Promote Civic education and awareness creation on solid waste management practices.
3. Discourage waste burning by promoting solid waste segregation and separation at the source.
4. Enforce the polluter pay principle.
5. Formulate and enforce environmental Legislation regarding solid waste management.
6. Encourage reduction, refuse, and reuse of solid waste.
7. Promote responsible consumption and facilitate the safe disposal of solid waste.
8. Provision of equipment for waste segregation.
9. Establishment of ward unit/community-based/Nyumba Kumi resident's association system for solid waste management.
10. Engage key tourist associations in managing solid waste emanating from tourism.
11. Enforce the burn on single-use plastic in Lamu Island as provided in the legal framework.
12. Promote prevention of waste generation among product users through awareness creation on behavior change, consumer choices, and consumption practices to reduce excessive consumption.
13. Provision of segregation receptacles at the source for special waste like diapers and sanitary pads and subsequent disposal in a sanitary landfill.
14. To sensitize boat makers on alternative materials used for boat making like recycled plastic and facilitate disposal of glass fiber waste in a sanitary landfill.
15. Establish partnerships and collaboration with business owners, manufacturers, and other actors with huge potential for waste generation in adopting appropriate measures and strategies for preventing waste generation within the municipality.
16. Establish inventory for businesses with low waste generation, green and cleaner production, and sustainable solid waste management practices.

6.4.2 Solid Waste Handling, Separation, storage, and Processing at the source

Context

The handling, segregation, and storage of solid waste at the source before transport and disposal determine the ease of resource recovery in the waste. Therefore, if not done right, it deprives recyclers and re-users of the opportunity to extract resource recovery from solid waste. The Lamu municipality has poor waste segregation and handling at the source, with many people mixing waste in single receptacles. Moreover, outdoor dumping waste in the streets and open spaces is rampant. The lack of closed-loop integrated management of solid waste is the main reason for the rampant outdoor dumping. Suppose sustainable and integrated solid waste management is to be achieved. In that case, the Lamu municipality requires other stakeholders to facilitate waste segregation and safe storage at the source with frequent collection and disposal. Existing environmental Community groups require to be empowered and facilitated to improve their capacities of dealing with a variety of recyclable solid waste. Otherwise, without enough interested groups in solid waste, integrated and sustainable management may not be easily achieved.

Vision

To achieve effective solid waste segregation and safe storage at the source.

Challenges

a. Poor solid waste segregation at the source.
b. Lack of safe segregation bins at the household level.
c. Low sensitization and information on the need for proper waste segregation and storage at the source.
d. Poor attitude towards waste and religious barriers to handling some categories of waste like diapers and pads.

Policy Measures

To facilitate proper waste segregation, handling, and storage at the source, the Lamu Municipality, in collaboration with other stakeholders, shall:

1. Require segregation receptacles in every business and other enterprise-based institutions and government office within the municipality to properly handle and store their solid waste.
2. Collaborate with other county licensing offices like the public health, revenue department, NEMA, and development control to have waste segregation and storage spaces as part of requirements for application of new or renewal of licenses for operations.
3. Exploit revenue generation stream from the enterprises that use special materials like fiberglass that lead to hazardous waste and raise funds to facilitate waste segregation bins to households.

4. Collaborate with other stakeholders to capacity build the community on waste management education.
5. Formulate a legislative framework mandating each household to effectively segregate waste in the household.
6. Enforce other environmental Legislation regarding solid waste handling and storage at the source before collection.
7. Facilitate frequent collection of segregated waste at the household to motivate the public to segregate and store their waste at the source.
8. Disposal of waste on open grounds or in non-designated collection points by a waste generator shall be prohibited.
9. In collaboration with religious leaders, carry out public awareness creation and capacity development to waste generators on handling, storage, and processing special solid waste like human waste in diapers and pads at the source.

6.4.3 Solid waste collection and transportation

Content

Solid waste collection is a central part of the sustainable management of waste as it connects the generators with the resource recovery institutions and landfills. Therefore, collection means transporting solid waste to treatment, recovery, and landfill centers. Waste collection methods are determined by the location of waste generation and the type of waste, among other factors. Uncollected garbage leads to public and environmental health hazards such as diseases and health conditions, public nuisance, blockage of the drainage system, and seepage of waste into water and soil. The waste collection process must be efficient and carried out through appropriate means. Waste collection services in the municipality are carried out through municipal services. Solid waste in the municipality is characterized by waste disposal in open areas before collection (open dumping) and inefficient and inadequate waste collection services in both public and private places. Some localities in urban areas lacking organized waste collection services experience environmental and health challenges associated with the open disposal of waste. Other challenges include inadequate waste collection points and containers or bins as appropriate and low funding for waste collection services.

Vision

To integrate solid waste Management in Lamu Municipality

Challenges

1. Waste collection points and transfer stations are not established.
2. Indiscreet solid waste disposal (throwing away culture)
3. Undertake periodic clean-up activities within the municipality
4. Poor sensitization/awareness on solid waste management
5. Insufficient solid waste management tools, machinery, and equipment. (Tractor, rakes, incinerators tools, and equipment
6. High cost of solid waste transportation.
7. Weak institutional framework
8. Weak partnerships with the private actors, CBOs, and youth initiatives.
9. Lack of an integrated solid waste management system

Policy measure

In order to address challenges associated with waste collection and transportation, the following policy measures shall be adopted by Lamu Municipality-

1. Implement the regulations spelled out by NEMA in the waste management regulations on waste transportation. (Waste transportation license)
2. The municipality shall adopt a door-to-door collection of solid waste on Amu island due to the preserved Lamu architecture, characterized by narrow streets that cannot allow passage of solid waste collection trucks.
3. Increase the number of waste trailers to act as transfer stations within Amu Island from the lack of enough transfer stations.
4. Using GIS technology, zone waste operational areas (transfer stations & disposal sites).
5. Establish segregated waste receptacles along the ocean frontage at strategic places to offer an alternative collection of waste from the public during the day-to-day activities along the frontage.
6. Ensure all the waste remaining after resource recovery activities is transported to the designated landfills on time.
7. Registration of Municipal waste vehicles with NEMA conforms to the prescribed standards.
8. In consultation and collaboration with respective residents, the municipality shall install appropriate waste collection containers, receptacles, and bins in strategic public/private places to collect solid waste.
9. In consultation and collaboration with National Environment Management Authority and other stakeholders, the municipality shall designate an appropriate waste transfer station according to the solid waste management spatial map and prescribed standards.

10. The municipality shall develop public-private partnership programs for sustainable solid waste collection services.
11. As prescribed, encouraging and registering solid waste management providers shall be registered by Lamu Municipality and licensed by National Environmental Management Authority.
12. Coordinate solid waste collection activities in the municipality.
13. Plan, and open a ring road to facilitate solid waste management in Lamu Island specifically to connect Wiyoni, Kanu Bajuri, Gardeni Langoni, Mararani and Matondoni.
14. Give incentives to encourage waste collection.
15. Establish an institutional framework for managing the solid waste collection.
16. Enactment of Lamu Municipal solid waste law.

6.4.4 Solid Waste separation, Processing, and transformation

Context

The sustainable solid waste management system cannot be complete without this crucial part of resource recovery and transformation. Specifically, the various methods used in integrated solid waste management prepare the waste for this crucial part of resource recovery. When done right, this step can lead to massive job creation and economic value to the neighborhoods of the resource recovery centers.

Waste can be recycled, reused, or transformed into other important economic products that add value. As a result, minimal waste finds its way into the landfills after pronunciation as useless and irrecoverable. Nonetheless, even when the immediate market for transformed products lacks, stockpiling and storage can create volumes that can attract buyers and complete the sustainable waste management system. Lamu municipality lacks an effective waste recovery and transformation system. However, there are promising opportunities for plastic waste. The agricultural farms and livestock keeping also offer a suitable alternative for organic waste, either composted or fed to the animals directly. Construction waste, a significant polluter of the Municipality environment in Lamu Island, consists of a higher value as it can be used to construct pavements and other new buildings. There is a great need for partnership with the public and private sectors to attract and build capacities of institutions in managing the various waste streams for resource recovery and transformation.

Vision

Attainment of effective resource recovery and transformation system for economic value addition.

Challenges

1. The lack of effective waste separation at the source diminishes resource recovery and transformation opportunities.
2. Inadequate resource recovery centers within the municipality.
3. The weak partnership between the municipality and other stakeholders with an interest in resource recovery.
4. Low funding of the municipality from the county government hinders their capacity to promote resource recovery practices.
5. Heavy taxation and licensing regimes discourage resource recovery investors into the municipality.
6. Inadequate infrastructure and technology for resource recovery and transformation.
7. Weak enforcement of environmental legislation on proper waste segregation and dumping.

Policy Measures

If the resource recovery and transformation steps are disjointed from the rest steps of solid waste management, solid waste integration and sustainable management cannot be achieved. Therefore, to ensure that the loop of solid waste management is completed, the Lamu Municipality, in collaboration with other stakeholders, shall:

1. Mobilize waste generators to achieve effective separation and storage of waste at the source to provide resource recovery and transformation opportunities.
2. Set aside such land as may be appropriate in single or multiple lots for materials recovery and processing.
3. Establish a system for facilitating and promoting solid waste separation and transportation to the resource recovery and transformation centers.
4. Final waste separation shall be undertaken at the transfer stations. Other waste processing and transformation processes may take place at a transfer station.
5. Adopt appropriate economic incentives to promote private sector participation in solid waste separation, processing, and transformation, such as reduced fees, charges, and levies for enterprises involved in waste processing and transformation.
6. Promote investment in solid waste processing and transformation and establish wholesale and retail outlets to sell recycled products or recovered materials.
7. In accordance with the Public Procurement and Disposal Act, undertake the purchase of appropriate products produced from processed and transformed solid waste in order to promote market development in solid waste management.

8. Where there is no capacity to recycle any waste stream or type of waste, the Lamu municipality shall promote and facilitate market linkages between local and external investors for supply chain management purposes.
9. Establish technology and innovation hubs for the development of solid waste management technology.

6.4.5 Solid waste treatment/disposal

Context

Solid waste disposal is the last stage in the management of solid waste. All the other prerequisite steps should ensure full material recovery in the solid waste, so that very little irrecoverable remains go to the landfills. Lamu municipality exercises open dumping in the disposal site and irresponsible street and open places dumping by residents. This, as noted earlier, poses a threat to public and environmental health. The landfills in the municipality do not meet the appropriate standards. The municipality has no sanitary landfill; hence, the waste disposed of in the open grounds directly impacts the environment and water resources. The ultimate goal is to have zero waste in landfills. Therefore, an effective full loop of integrated solid waste management will revert this status ad ensure that little waste goes to the disposal site. There is a need for upgrading the current disposal sites into landfills.

Vision

A zero-waste clean Municipality

Challenges

1. Indiscrete solid waste disposal.
2. Lack of awareness of solid waste management.
3. Weak institutional framework.
4. Lack of an integrated solid waste management system.
5. Undesignated Land for solid waste disposal facilities and sites.
6. Inadequate funding for solid waste management.
7. Weak compliance with environmental legislation and its enforcement.

Policy measure

In order to address challenges associated with solid waste treatment and waste disposal, the following policy measures shall be adopted by Lamu Municipality-

1. Implement the regulations spelled out by NEMA in the waste management regulations on waste treatment/disposal (Waste treatment by operators of disposal sites. Cap 265)
2. Create an enabling environment that encourages Synergy among CBOs, NGOs, and private organizations.
3. Establish a solid waste sanitary landfill for the municipality
4. Acquire and designate land for waste Disposal, especially in Ras Kitau, Shella, Oldtown, and Matondoni.
5. Fencing and Partition disposal sites to include recycling facilities.
6. Encourage sorting and Segregation of solid waste before disposal.
7. Increase technical capacity and equipment at the waste disposal sites.
8. Government officers should consider shredding all their paper waste and making it available to composters and resource recovery groups.
9. Enforce environmental legislation and regulations on solid waste disposal.
10. Reduce, Reuse and Recycle waste as a treatment measure.
11. Give incentives to encourage sustainable disposal of solid waste. E.g., recognize Champions. (Benchmark from Cebu city in Philippines and Nyayo estate in Nairobi)
12. Encourage the production of organic manure through composting for agricultural benefit.
13. Charge a fee to the donkey handlers to facilitate the cleaning of the donkey droppings.
14. Form an association of donkey owners to regulate the handling of donkeys on the streets and in solid waste facilities.
15. Establish incinerators in all health facilities.
16. Promote Clean up exercises and waste collection festivals to create awareness and increase public participation in solid waste management.
17. Support Funding of CBOs, Youth groups, and private actors on solid waste management.

6.4.6 Additional policy measures to be implemented by Lamu Municipality

1. Responsible for drawing up action plans to implement applicable solid waste management systems.

2. Introduce civic education on solid waste management practices targeting learning institutions

3. Source adequate funding to develop sustainable solid waste management initiatives in the entire cycle.

4. Put in place measures for enhanced Public-Private-Partnerships (PPP);

5. Benchmark best practices and approaches.

6. Enforcement of development control regulations.

7. Provide incentives to groups with high participation in solid waste management.

8. Undertake community civic education and Capacity building on sustainable solid waste management practices.

9. Strengthen partnerships between Donors, volunteer groups, and other community organizations for example (Shella Environmental Resident group, Manda Taka project, Lamu Organization for youth and disabled, Weka Lamu Safi, and Flip flop) with a special interest in waste recovery and management, for example, the Farmers Training Centers.

10. Increase the technical capacity in solid waste management from generation to disposal.

11. Designate key solid waste stakeholders for proper coordination and partnerships within Lamu Municipality.

12. Market end products from community recycling plants.

13. In collaboration with the county government of Lamu, develop a county solid waste management Bill that will provide local legal provisions for the enforcement of the policy guidelines at the municipality level.

14. In collaboration with the county government, develop a county sectoral plan on solid waste management that will be part of the county integrated development plan.

6.5 Solid Waste Management and informal sector

Context

Informal settlements are common parts of Kenyan Towns and urban areas. They develop alongside the development of the cities and act as the primary human power sources for the town and cities dwellers. Therefore, it is a special, indispensable part of human settlement in the Kenyan context. Informal settlements are characterized by housing that does not comply with the urban planning structure and mostly in contested land without legal ownership. Municipalities in Kenya are struggling with mushrooming informal settlements, which comes with a considerable burden of solid waste generation. Lamu Municipalities has several areas categorized as informal settlements, among them Wiyoni. Through the Kenya Informal Settlement Improvement Project, the World Bank is supporting municipalities to rehabilitate and improve informal settlements. The resort city in the county spatial plan that lies within the municipality's jurisdiction may create considerate slums and informal settlements in the future. Most informal actors in solid waste management include:

- Waste pickers.
- Community-based organizations.
- Self-help groups.
- Small and micro-enterprises.

- Individual actors such as waste pickers and sorters.

They play a significant role in the whole solid waste management value chain. Wiyoni Kids TakaTaka Foundation is one of the critical solid waste pickers in the informal sector.

Lamu Municipality recognizes the informal sector's valuable role in solid waste management and the strategic need to facilitate their role to promote employment creation. Therefore, the policy document addresses the guidelines for solid waste management from these informal settlements.

Policy Measures

In order to recognize and promote the participation of informal settlements' solid waste pickers in the municipality's solid waste management, the following policies will be adopted.

1. The municipality will map the informal settlements and keep a database of the solid waste pickers and interest groups among these settlements for better management and partnership.
2. In collaboration with other stakeholders, Lamu municipality shall develop capacities for the informal groups in the solid waste value chain through education and provision of PEEs.
3. Ensure the informal groups or individuals involved in the solid waste value chain access affordable capital for solid waste management enterprise development.
4. In collaboration with other relevant stakeholders, the municipality facilitates and promotes market linkage between the informal sector and investors in solid waste management.
5. The municipality shall, where appropriate, develop service agency agreements with the informal sector to provide solid waste management services.

6.6 Information, Education, and Communication

Context

A regulatory framework cannot deliver the behavior change that is fundamental to sustainable solid waste management. However, a multi-disciplinary framework is required to facilitate the public's uptake of the policy guidelines and compliance with the legal framework. Sustainable solid waste management depends on a value-based approach by individuals and entities. Strategic communication and messaging on solid waste management are instrumental in shaping public opinion and support. The Lamu municipality lacks effective information, education, and communication systems. There is low awareness of sustainable solid waste management.

Policy Measures

To facilitate behavior change and raise awareness among the community on sustainable solid waste management, the municipality, in collaboration with other relevant stakeholders, shall:

1. Develop and implement the information, education, and communication system and strategies targeting diverse users and providers of solid waste management services and ensure that such information is available to all stakeholders.
2. Develop information, education, and communication materials and initiate dissemination, education, and awareness creation programs targeting children and youth on solid waste management.
3. In collaboration with the department responsible for information technology and relevant stakeholders, establish a solid waste information management system accessible by all residents within the municipality.
4. Establish community campaigns using films, arts, and other educational means to disseminate information on solid waste management.
5. Establish an environmental education section within the environmental department of the municipality with funding to ensure that behavior change is a priority in the management of solid waste.

6.7 Planning, Partnerships, Participation, and multi-sectoral relations

Context

Integrated solid waste management requires proper planning and stakeholder engagement. No policy measure or entity can deliver an effective solid waste management system. Nonetheless, when every relevant partner is engaged, it is easy to take roles and deliver the mandate of sustainable solid waste management. Both the solid waste generators and users of the management services are important in the management process of solid waste. They should be effectively involved in developing, implementing, and monitoring solid waste management policies. There are several actors in the solid waste management in Lamu municipality composed of recyclers, privet waste collectors, and community groups with an interest in resource recovery. However, there is a weak relationship and engagement of the solid waste management actors.

Policy measures

To facilitate better planning and inclusion of actors in the solid waste management process, the Lamu municipality will adopt the following policy measures:

1. Prepare a municipal solid waste management plan that will guide the implementation of this and other relevant and binding solid waste management policies.

2. Prepare programs to mobilize and sensitize the residents within the municipality to participate in sustainable solid waste management.
3. Establish complaint registers to be managed by the municipal administrative department for receiving complaints from the residents within the municipality regarding the solid waste management services.
4. Facilitate village-based forums where residents can deliberate and find solutions to the emerging issues n solid waste management within their areas.
5. Promote and facilitate stakeholder-led initiatives on solid waste management.
6. In collaboration with relevant key stakeholders, consult solid waste management matters within the municipality.
7. Liaise, consult, collaborate, and coordinate with the Lamu county environmental department on solid waste management matters to ensure that transboundary waste flow is taken care of for the wholesome promotion of best practices in the county.

6.8 Solid waste management and land use planning

Context

Land use planning is an essential part of solid waste management. The spatial plan of the area determines the social and public amenities that are zoned for delivery of the essential services. This policy document notes that solid waste management requires efficient urban planning and development control. Population dynamics greatly influence solid waste management as well. The population metrics inform the land planners on where to increase the solid waste management stations and the proximity of the transfer and disposal sites to the neighborhoods in communities. For example, the old town zone in the municipality generates more solid waste from high population densities than the rest of the parts of the Island. Therefore, it is essential to increase the number of waste transfer stations and other infrastructural facilities with an efficient waste management system. Lamu municipality is well served with land use plans and is constantly developing plans for specific areas within the municipal jurisdiction. However, there is a great need to synchronize and harmonize these plans to ensure that solid waste management facilities are well zoned, designated, and distributed to swerve the current populations and projections of future growth.

Policy measures

To ensure that there is effective planning for the solid waste management facilities and infrastructure, the Lamu municipality, in collaboration with the county department of spatial planning, shall:

1. Using GIS technology, add the solid waste management attributes solid into the municipality maps and plans.
2. Upon need, carry out a solid waste management survey using GIS to determine emerging issues in the solid waste management within the municipality.
3. Develop a solid waste management spatial plan which shall include details for each sub-county and ward as the core decentralized spatial units within the municipality area.
4. Designate the location of the collection points, transfer stations, composting sites, waste recovery facility, and landfills in accordance with the solid waste management spatial plan.
5. Regulate solid waste management in accordance with the municipality's solid waste management spatial plan.
6. Map the municipality into solid waste management zones to ensure efficiency in service delivery and coordination of stakeholder participation in solid waste management.
7. Designate resource recovery sites within the disposal and other suitable suits to facilitate efficient use of solid waste and promote a circular economy.

6.9 Research and development

Context

Technological development is changing too quickly and thus continually creating alternative means of service delivery. Trends are always changing, and therefore research and development are indispensable in any plan and policy guideline. Solid waste generation is dynamic and changes as society develop. The form of waste streams changes as production processes change and new products and packaging emerge. Consequently, there is a need for continuous innovation in intervention measures and strategies in solid waste management. In addition, there is a need for evidence-based decision-making on solid waste management. Lamu municipality lies in the LAPSSET corridor that will soon attract massive projects, including industrials parks and resort cities funded by the national government. Therefore, waste streams will increase, and new management methods will be needed. Therefore, research and development is an essential part of urban development that provides science-based solutions to emerging challenges for better decision-making. There are minimal research efforts undertaken by Lamu municipality regarding solid waste management.

Policy measures

In order to address the policy gaps in research and development, the following policy measures shall be adopted by Lamu Municipality.

1. Inculcate research and development issues in the education section of the environmental department.
2. Facilitate a capacity development program for personnel in research and development.
3. Establish a research unit to coordinate, promote and undertake research and development related to environmental management and governance
4. Undertake and collaborate with other relevant research institutions and institutes of higher learning in carrying out research and development in solid waste management
5. Disseminate research findings, encourage information sharing among the stakeholders, and establish a research data management system.
6. The municipal board shall ensure that evidence generated through research informs decisions related to solid management.

6.10 Solid Waste Management Financing

Context

The provision of sustainable solid waste management services requires substantial funding. It requires coordinated financial investment from public, private and voluntary sectors. Solid waste management processes such as processing, transformation, treatment, and disposal are capital intensive. Consequently, for the municipality to achieve its intended objectives for solid waste management, there is a need to adopt diverse funding models and instruments. In addition, cost-sharing through user fees and charges are effective mechanisms for sustainable solid waste management. Currently, there is low funding for solid waste management from the county. There is low private sector investment in solid waste management. In addition, public funding in the sector is below the levels required for financing municipal solid waste management services.

Policy measures

In order to address the policy challenges in financing solid waste management, the following policy measures shall be adopted–

a) There shall be levied appropriate user fees and charges for solid waste management. The fees and charges shall be levied in accordance with the tariff policy stipulated under the County Governments Act.

b) The municipality shall provide incentives for promoting solid waste recycling and waste material recovery. They may include reduced fees, levies, and charges for enterprises engaged in the two processes

c) The municipality shall adopt a public-private partnership model of financing various processes in solid waste management in consultation with the county government. Such

partnership shall be based on efficiency, cost-effectiveness, and sustainability of the model in providing solid waste management services.

d) The municipality shall facilitate its officers to acquire technical skills and develop competencies for public-private partnerships management, especially in initiation, development, negotiation, award, and management of public-private partnerships in solid waste management.

e) Subject to Public Finance Management Act, at least fifty percent of the user fees and charges collected from solid waste management services shall be utilized to defray operational costs associated with the provision of solid waste management services

f) The municipality shall subsidize solid waste management services to low-income areas and informal settlements in accordance with the County Governments Act

g) The county government shall progressively increase budgetary allocations for implementation of this policy and laws related to solid waste management

h) The municipality shall mobilize resources in the form of grants and donations from development partners for financing solid waste management processes.

6.11 The proposed organization structure for Lamu Municipality

As envisaged in the Strategic Plan and implementation matrix, the following proposed organogram and staff establishment should be implemented by the Municipality so that to increase its capacity in solid waste management performance.

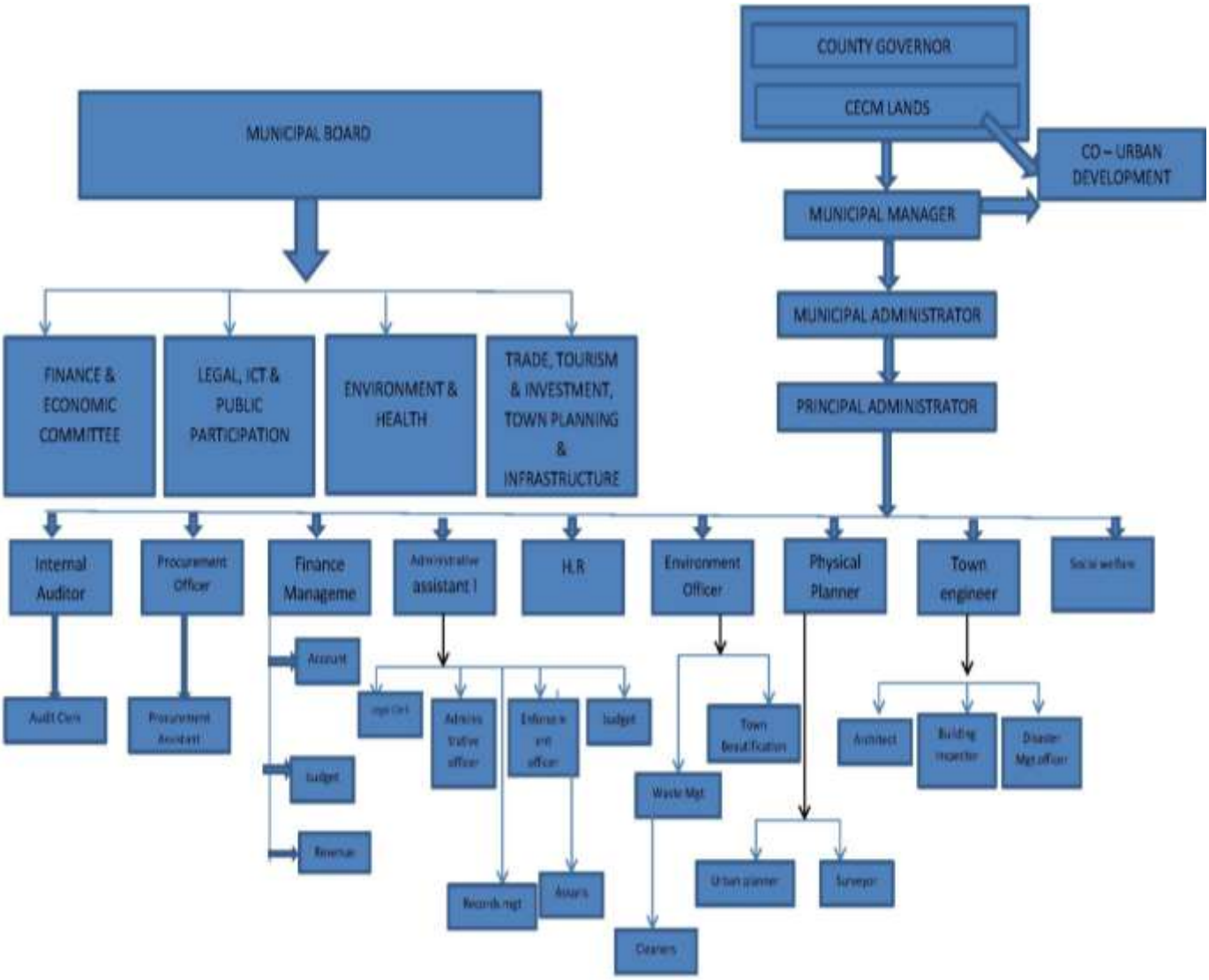

Figure 7: Proposed organization structure for Lamu Municipality

Source: *Lamu Municipality Strategic Plan 2016-2026*

Table 8: Proposed Staff Establishment

	Designation	Job Group	Required Establishment	In Post	Gap
	Municipal Administration				
1	Municipal Manager	Q	1	1	0
2	Municipal Administrator	P	1	1	0
3	Admin Assistant I	K	2	1	1
4	Clerical Officer	F	4	1	3
5	Human resource officer	K	1		1
	Development Control Unit				
1	Public Health Officer	K	2		2
2	Physical Planner	K	2	1	1
3	Civil Engineer	K	2	1	1
4	Building Inspector	H	4	2	2
5	Social Safeguard Officer	J	1		1
6	Environment Officer	J	2	1	1
	Municipal Finance				
1	Principal Economist	P	1	0	1
2	Accountant II	J	1	1	0
3	Supply Chain Assistant	J	1	0	1
4	Revenue Collectors	F	15	0	15
	Enforcement Unit				
1	Disaster Management Officer	J	2	0	2
2	Enforcement Supervisor	F	10	1	9
3	Enforcement Officer	E	50	0	50
4	Firemen	E	5	0	5
5	Cleaners	E	150	60	90
	Total		256	71	186

Source: *Lamu Municipality Strategic Plan*

CHAPTER 7

MONITORING, EVALUTION AND GOVERNANCE

The key goal of solid waste management is to protect the population's health and protect the environment. There is a need for effective continuous monitoring of the set objectives and targets. Monitoring involves checking whether the results produced by the activities are implemented as the expected outputs and whether they are achieved according to the expected performance and timelines. An effective and functional institutional framework should include; strategies for the management policy implementation programs, detailed progress activities beyond schedule, and complete ones. For the policy to have effective monitoring and evaluation, it shall require; monitoring and evaluation should be done annually.

7.1 Implementation Framework

The overall responsibility of implementing the policy rests with the Municipal Board. The municipality's technical staff members shall ensure that the implementation of the solid waste management policy adheres to the vision and mission of the Board. However, it is necessary to form a monitoring and evaluation team to carry out this responsibility in order to ensure the achievement of the policy objectives on time and in line with resource availability. The municipality cannot implement this policy on its own it will have to collaborate and partner with other stakeholders. Stakeholders that will play a key role include:

1. National government departments.
2. Semi-Autonomous Government Agencies (SAGAs).
3. Private sector, which involves environmental CBOs and NGOs.
4. Community-Neighborhood Resident Board Association.

7.1.1 Institutional Framework

Institutions are essential for the devolution of services and responsibilities. The responsibility of managing solid waste does not belong to the municipality singly. However, it requires a multi-sectoral approach and engagement for concerted efforts. Therefore, the following institutions shall be established:

I. **Municipality solid waste management committee**

The municipality solid waste management committee shall consist of the following:

1. The chairperson of the municipal board committee on the environment shall be the chairperson.
2. The municipality environmental officer shall be the secretary.
3. The municipal administrator shall represent the administration department of the municipality.
4. The municipality's Public health officer.
5. The ward administrators within the municipality.
6. The senior public health officer in the municipality
7. The senior trade officer within municipality jurisdiction.
8. The senior public works officer within the municipality jurisdiction.
9. The county commissioner or the representative.
10. A representative of the Tourist Association Groups within municipality jurisdiction.
11. A representative of community-based or non-governmental organizations engaged in solid waste management in the municipality.
12. A representative of the generators of industrial waste.
13. A representative of entities engaged in solid waste recycling, comprising or material recovery in the municipality.
14. A representative of residents or neighborhood associations.
15. A representative of the private waste collectors and transporters.

The municipal manager will periodically revise the above list and nominate any other key players for the committee as deemed necessary to reflect the municipality's development. The persons under (f) (g) (h) (i) shall be appointed by the chairperson of the environment committee of the county executive.

The Municipal solid waste management committee will perform the following functions.

(a) Coordinating public and private sector engagement in solid waste management in the municipality jurisdiction.

(b) Providing a platform for public-private dialogue, consultation, collaboration, and participation in solid waste management in the municipality jurisdiction.

(c) Facilitating mobilization of county residents on solid waste management in the municipality jurisdiction.

(d) Ensuring harmonization of public and private sector plans and programs on solid waste management in the municipality area.

(e) Receiving and considering reports from ward committees and advising the county executive committee on appropriate policies, strategies, and plans to be adopted in the municipality and county on solid waste management;

f) Monitoring and evaluating the implementation of municipality solid waste management policies, strategies, plans, and programs in the county.

g) Adjudicating disputes emanating from solid waste management processes in the municipality jurisdiction.

The committee shall meet once every quarter before the quarterly meeting of the municipal board committee on the environment. The term of office for the persons who are not public officers shall be three years, renewable once for three years.

II. Ward solid waste management committee

There shall be established a ward solid waste management committee in every ward within the municipality jurisdiction consisting of:

1. The ward administrator shall be the chairperson.
2. The municipal environmental officer shall be the secretary.
3. The National government designates the area chief.
4. The public health officer in charge of the ward.
5. The village elder represents Nyumba Kumi's leadership.
6. A representative of community-based or non-governmental organizations engaged in solid waste management in the ward.
7. A representative of entities engaged in solid waste recycling, comprising or material recovery in the ward.
8. A representative of residents or neighborhood associations in the ward.
9. A representative of the private waste collectors and transporters in the ward.

The persons described under (e) (f) (g) (h) (i) shall be appointed by the ward administrator.

The committee shall be responsible for the following:

(a) Coordinating public and private sector provision of solid waste management services in the ward.

(b) Providing a platform for public-private dialogue, consultation, collaboration, and participation in solid waste management in the ward.

(c) Facilitating mobilization of municipal residents on solid waste management in the ward.

(d) Ensuring harmonization of public and private sector strategies and programs on solid waste management in the ward.

(e) Monitoring the implementation of this policy and other solid waste management policies, strategies, plans, and programs at the ward level.

(f) Monitoring the quality and adequacy of providing and delivering solid waste management services in the ward.

(g) Organizing and facilitating ward forums on solid waste management.

(h) Advising the municipal committee on appropriate legislative and policy measures or public services to be adopted in ensuring effective implementation of this policy and any legislation developed for implementation of this policy.

7.2 Designing of monitoring indicators

In order to ensure effective implementation of this policy, there shall be continuous monitoring of the results of programs and activities undertaken to implement this policy. In collaboration with national and county stakeholders, the Lamu municipality shall design the core outcome indicators to be adopted in measuring the results. An annual monitoring and evaluation program should review the indicators and score the performance of the policy in the management of solid waste during the year. The results show to inform the success and failures of the implementation strategies of the policy. Action-based recommendations should be adopted at the end of every evaluation and monitoring exercise to improve the policy performance in the subsequent years. The evaluation will be done to assess the impact of the policy at the end of five years to find out if the intended purpose of having an effective solid waste management strategy has been achieved and the agreed performance indicators and targets.

To conduct the M&E, the following tools will be required:

i. ISO certification with **Standard Operating Procedures** (SOP) on solid waste management.

ii. Purposeful benchmarking of best solid waste management practices in local and international neighborhoods and towns.

iii. Annual reporting - work plans, budgets reports, and contracts performance.

7.3 Staff Capacity Development

In collaboration with the department responsible for human resource management and the County Public Service Board resource department, as well as other county departments responsible for implementing this policy, the Lamu municipality shall recruit highly qualified professional staff in line with respective policy measures. In addition, the human resource management department of the municipality shall develop and facilitate continuous professional and capacity development for all relevant officers in various departments responsible for implementing this policy.

7.4 Monitoring and Evaluation Framework

The county and national government stipulate a performance monitoring and evaluation system for the programs and policies. There, this solid waste management policy will be evaluated in accordance with the overall county monitoring and evaluation framework, standards, and system. The following requirements shall apply in regard to policy monitoring and evaluation. The Lamu municipality shall:

1. Deploy staff with specific duties of coordinating the monitoring and evaluation of this policy.
2. The environmental department, in three months regular timeline, reports to the chief officer on the success of the implementation of this policy. The report shall also be subsequently shared with the county executive committee for the environment for consideration and to guide decision making.
3. Annual targets shall be set in January of each year. They shall be followed with a subsequent annual review every end of the year involving all relevant stakeholders to assess the success of the targets.
4. There shall be a policy review every five years to assess the performance of the policy and implementation status.
5. All reports in each evaluation period shall be shared with the county executive committee and all stakeholders.

7.5 Implementation Matrix

Actor	Role
Municipal Board	1. Oversee the implementation of solid waste management policy. 2. Provide infrastructural services for solid waste management. 3. Monitor and regulate activities that impact/affect the environment. 4. Formulate and implement integrated development plans. 5. Facilitate legislation of county laws on solid waste management 6. Transform the policy into law 7. Budget and finance solid waste management related activities.

National Museum of Kenya	1. It will play the role of preserving the present natural and cultural heritage of Lamu. 2. Manage Lamu Island as a gazetted UNESCO world heritage site. 3. Disseminate information and raise awareness on the importance of complying with heritage conditions.
National Environmental Management Authority	1. Supervise all environmental management issues in the municipality. 2. Implementing and enforcing environmental policies. 3. Issue licence of solid waste management related issues. 4. Auditing environmental management issues in solid waste management. 5. Monitor and assess all activities carried out to ensure that the environment is not degraded. 6. Collaborate in providing environmental education and public awareness.
Kenya Marine Time Authority	1. Collaborate with other institutions to prevent marine time pollution, protection of marine time environment within Lamu Municipality. 2. It will enforce its law, ensure compliance and regulate activities in Indian ocean,
Kenya Ports Authority	1. It will maintain, operate, improve and regulate the sea and waterway in Lamu.
Public Health	1. Implementing and ensuring quality of health. 2. Abating sanitary nuisances promoting hygiene. 3. Identify and investigate health issues and

	health hazards.
Physical Planning	1. Formulate zoning regulations and designate waste disposal sites. 2. Development control
National Land Commission	1. Manage Public land that will be acquired for solid waste in Lamu Municipality. 2. Conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities. 3. Facilitate in monitoring and oversight responsibilities over Land Use Planning in Lamu.
Private Sector e.g., Takataka Heroes, Shella Environmental Group	1. Participate in environmental awareness, education and campaigns. 2. Collaboration and partnership with the municipality and Lamu county government. 3. Reuse, reduce and recycle solid waste management activities for income generation.

7.6 Implementation Plan

Policy Objective	Policy Strategy	Activities	Actors	Timeline	Status
1.Formulate appropriate legislation and regulations	-Develop and implement legislation	-Legislate municipal solid waste management act - Formulate and implementation of regulations	-County executive -Lamu municipal Board -County assembly	2 years	
Physical and Land Use Planning	-Ensure enforcement of waste management legislation and standards -Develop physical environmental and land use plans	-compliance and enforcement of waste management standards and legislations Prepare physical/environmental zoning regulation.	-County executive -Lamu municipal Board -NEMA County assembly	Continuous throughout policy lifespan	
2. Capacity Building.	-Establish an appropriate Organogram	Recruitment of competent trained staff through advertisement of vacancies	County Executive -Lamu municipal Board County public service Board	2 years	
	Educate and sensitize public on integrated waste management	Hold public education through media, town hall and grassroots meetings Publish educational materials	County executive -Lamu Municipal Board Community groups	Continuous and periodic	

	Awareness campaign	Monthly clean up	Private sector		
	-Innovation and new technology	-Benchmarking on best practices	County Executive -Lamu Municipal Board	Continuous	
			NEMA		
	Encourage partnership collaboration, public participation in waste management	Branding and marketing -Lamu Municipal Board Organizing stakeholders' forums	Private sector -Lamu Municipal Board Community groups	3 years	

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APPENDIX

HOUSEHOLD QUESTIONNAIRE

***DECLARATION**: Information generated through this questionnaire will be held professionally and will only be used to identify issues within Lamu Municipality in Lamu County to assist in the formulation of the Solid Waste Management Policy.*

Questionnaire No: …… **Date of Interview:** ……..

Name of Interviewer: …… …… ……

LOCALITY: ***(Sub-Location/Ward)*** **……. Zone……**

1.0 RESPONDENT PROFILE

1.0 Name of the Respondent (Optional)…….

1.1 Age 01**:** 18-24 **02:** 25-29 **03:** 30-39 **04:** 40-49 **05:** 50-59 **06:** 60 & Above

1.2 Are you the household head? **01.** Yes ☐ **02.** No ☐

1.3 If no, what is your relationship with the household head?

1.4 **01.** Spouse ☐ **02.** Son/Daughter ☐ **03.** Father/Mother ☐

04. Others ☐ (Specify*)*……

1.5 Marital status **01.** Married ☐ **02.** Single ☐ **03.**Widowed ☐ **04.**Divorced/Separated ☐

1.5 What is your nationality? **01.** Kenyan ☐ **02.** Foreigner ☐

2.0 HOUSEHOLD DATA

2.0 Household member characteristics.

2.1.1) HOUSEHOLD MEMBERS (*Relation*)	**2.1.2) AGE** (*Yrs.)* **01**: 18-24 **02**: 25-29 **03**: 30-39 **04**: 40-49 05: 50-59 **06**: 60 & Above	**2.1.3) SEX** **01.** *Male* **02.** *Female*	**2.1.4) HIGHEST EDUCATION ATTAINED** **01.** *Completed primary* **02.** *Not completed primary* **03.** *Completed Secondary* **04.** *Not completed secondary* **05.** *Vocational Training institution* **06.** *Completed University/College* **07.** *Not completed Uni/college* **08.** *No formal*	**2.1.5) EMPLOYMENT** **01.***Employed* **02**. *Self-Employed* **03**. *Casual Labor* **04**.*Unemployed*	**2.1.6) RELIGION** *1. Christian 2. Muslim 3. Hindu 4. Pagan 5. Other (specify)….*

			Education		

3.0 MIGRATION TRENDS

3.1 Have all the members of this household lived in this area since birth? **01.** Yes ☐ **0.2** No ☐

If not, where were they living before?

	01. Lamu County **02.** Other Counties **03.** Abroad	**Year of Migration**	**Reasons of Migration** **01.** Employment **02.** Business **03.** School **04.** Marriage **05.** Other(Specify)

3.2 Has any of your family members migrated from this area? **01.** Yes ☐ **02.** No ☐

3.3 If yes, where to?

	04. Lamu County **05.** Other Counties **06.** Abroad	**Year of Migration**	**Reasons of Migration** **06.** Employment **07.** Business **08.** School **09.** Marriage **10.** Other(Specify)

4.0 ECONOMIC ACTIVITIES AND LIVELIHOOD

4.1 Which is the main source of income for the household? **01**. Commerce ☐ **02**.Farming ☐

03. Industry ☐ **04.** Employment ☐ **05.** Fishing/fisheries ☐ Others

Specify……

5.0 SOLID WASTE

5.1 Indicate using numbers the most to the least generated waste in the table below.

	01. Food/Kitchen refuse 02. Paper/plastics/Cans 03. Green Waste 04. Glass Bottle 05.Metals
1	
2	
3	
4	
5	

5.2 Do you sort the waste before disposing? **01**. Yes ☐ **02**. No ☐

5.3 How do you mainly dispose the waste? **01**. Composting ☐ **02**. Indiscriminate dumping ☐ **03**. Burning ☐ **04**. Municipal waste transfer stations ☐ **05**. Through Private Garbage Collection Firms ☐ **06**. Others *(Specify)*……..

5.4 What is the approximate distance to the point of disposal? **01**. <300m **02**. 300m & Above

5.5 If collected by organized groups or institutions, what is the frequency of collection?

01. Daily ☐ **02**. Weekly ☐ **03**. After 2 weeks **04**. Monthly ☐

5.6 If collected, how much in **Kshs**. do you pay for waste collection per month? **01**. <200 **02**. 2001-500 **03**. >500

5.7 What challenges/problems are associated with solid waste management?

.....

.....

.....

5.8 Suggested solutions

.....

.....

.....

6.0 Communication and Awareness

6.1 Have you ever received any awareness in regards to Solid Waste Management? **01**. Yes **02**. ☐

No ☐

6.2 If yes, Through which of the following Communication facilities/Services?

Service	
Mobile phones	
Radio	
Television	
Newspaper	
Internet	
Postal/Courier services	
Public Baraza	

6.3 What are the major challenges you experience on awareness in regards to Solid waste Management

.....

.....

6.4 What recommendations can you suggest that can help to improve awareness in solid waste Management

.....

……

……

7.0 ENVIRONMENTAL CONSERVATION AND MANAGEMENT

7.1 Are you aware of any environmental conservation and management measures?

01. Yes ☐ **02.** No ☐

7.2 What measures has the County Government/Municipality put in place to manage solid waste……..

7.3 In your own opinion, suggested solutions to solid waste.

……

……

8.0 GOVERNANCE AND CIVIC PARTICIPATION ISSUES

8.1 Are you a member of any community based organization/ association dealing with solid waste management?

01. Yes ☐ **02**. No ☐

8.2 If yes, what is the name of the organization/association? ……

8.3 What are the main activities carried out by the organization/association?

……..…

……

8.4 Have you participated in civic decision-making processes e.g. on Solid waste management?

01. Yes ☐ **02**. No ☐

8.5 If yes what is the type/nature of the project

……

……

8.6 In your opinion what hinders citizen participation in the community development processes

.....

.....

8.7 What do you think can be done to improve community participation in this area?

……

Thank You for Your Cooperation