

COUNTY GOVERNMENT OF MERU

**DEPARTMENT OF LANDS, HOUSING, PHYSICAL
PLANNING AND URBAN DEVELOPMENT &
PUBLIC WORKS**

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MERU

SOLID WASTE MANAGEMENT PLAN

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Definition of Terms

Biomedical waste: Any waste that 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 formed from the composting process is called compost or humus.

Disposal site: Any area of land on which waste disposal facilities are physically located or *the* 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 harming human health and the environment. These wastes require special measures in handling and disposal due to their hazardous properties (e.g. toxicity, ecotoxicity, carcinogenicity, infectiousness, flammability, chemical reactivity) and are generally not suitable for direct disposal into a landfill.

Medical/Healthcare 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.

Industrial Waste: Waste arising from processing and manufacturing industries or trade undertakings and can take the form of liquid, non-liquid, solid, and gaseous substances.

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

Privatization: A form of partnership between public, private, community-based, and non-governmental organizations, to mobilize all available experiences, talent, and resources to solve the household waste management problem.

Public–Public-private partnership (PPP): a government service or private business venture that 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: This means waste is 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 after each day's operation or 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 the 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 before any treatment, storage, or disposal of the waste.

Source Separation: Refers to any activity that separates waste materials at the point of generation for processing.

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.

SWM infrastructure: All facilities (e.g. landfills, transfer stations, workshops), equipment (e.g. vehicles, rubbish bins, crushers), and public infrastructure (e.g. roads, electrical substations, SWM education programs) necessary for SWM.

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

Waste exchange: This is where the waste product of one process becomes the raw material for a second process.

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

LEGAL FRAMEWORK RELEVANT TO SOLID WASTE MANAGEMENT IN KENYA

In the Constitution of Kenya, Article 42 on Environment provides that- —Every person has the right to a clean and healthy environment, which includes the right.

- a) To have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and
- b) To have obligations relating to the environment fulfilled. Under Article 69 on Obligations to the Environment, the Constitution provides that —
 - 1) The State shall—
 - i. encourage public participation in the management, protection and conservation of the environment;
 - ii. Establish systems of environmental impact assessment, environmental audit, and monitoring of the environment;
 - iii. Eliminate processes and activities that are likely to endanger the environment; and
 - iv. Utilize the environment and natural resources for the benefit of the people of Kenya.
 - 2) Every person must cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

Part 2 of the fourth Schedule in the Constitution of Kenya also explicitly provides that the County Governments through relevant departments shall be responsible for;

- a) Refuse removal,
- b) Refuse dumps and
- c) Solid waste disposal.

The Environmental Management and Coordination Act (EMCA), 1999 Section 3 of EMCA, 1999 stipulates that - —Every person in Kenya is entitled to a clean and healthy environment and must safeguard and enhance the environment.

Section 87 of EMCA 1999 states that —

- a) No person shall discharge or dispose of any wastes, whether generated within or outside Kenya, in such manner as to cause pollution to the environment or ill health to any person.
- b) No person shall transport any waste other than —

- (1) in accordance with a valid license to transport wastes issued by the Authority; and
- (2) to a wastes disposal site established in accordance with a license issued by the Authority.
- c) No person shall operate a waste disposal site or plant without a license issued by the Authority.
- d) Every person whose activities generate waste shall employ measures essential to minimize waste through treatment, reclamation, and recycling.

Environmental Management and Coordination (Waste Management) Regulations of 2006, In the Responsibility of the Generator, Regulation 2 states that:

- a) (a) Any person whose activities generate waste shall collect, segregate, and dispose or cause to be disposed of such waste in the manner provided for under these Regulations.

Regulation 5 on the Segregation of waste by a generator states that:

- b) Any person, whose activities generate waste, shall segregate such waste by separating hazardous waste from nonhazardous waste and shall dispose of such waste in such facility as is provided for by the relevant Local Authority.

SITUATIONAL ANALYSIS

The population of Maua Municipality is rapidly growing and inhabited by the low and middle classes. This status has led to an increase in waste generation and complexity of the waste streams. Maua Municipality is the center of the Khat trade in Kenya and the world. As a result, most of the solid waste generated is from Miraa.

Over the years waste management was the preserve of the local government authorities. However, these entities did not develop adequate waste management systems. Furthermore, the resources allocated for these operations were meager. Consequently, the current state of waste management has not improved significantly translating into indiscriminate dumping, uncollected waste, and a lack of waste segregation across the Municipality.

An analysis of existing practices provides information that forms the basis for administrative and technical considerations leading to the development of this plan.

. SWM Service Area

Maua Municipality's SWM service area includes:

- **Residential Areas:** All urban neighborhoods within the municipality.
- **Commercial Areas:** Markets, shops, offices, restaurants, and entertainment establishments.
- **Industrial Zones:** Factories and processing units within the municipality limits.
- **Public Spaces:** Roads, parks, and other publicly accessible locations.

2.1 Waste Streams

The waste streams within Maua Municipality can be categorized as domestic, agricultural, industrial, and hazardous wastes; in addition to e-waste, waste/used oil, and waste tyres attributed to growing agricultural, commercial, and industrial activities. The composition of general waste varies considerably between households, businesses, and industries.

Waste Generation and Characterization

Maua Municipality generates various types of waste, which can be broadly classified into:

- **Household Waste:** Organic waste (food scraps), recyclables (paper, plastic, glass), non-recyclables (textiles, broken items), and hazardous waste (batteries, electronics).

- **Commercial Waste:** Packaging materials, food waste, office waste, and electronic waste (e-waste).
- **Industrial Waste:** Manufacturing by-products, scrap metal, hazardous chemicals, and packaging waste.
- **Agricultural waste:** Waste 24 from Khat Trade
- **Public Space Waste:** Litter from streets, parks, and public areas.

The Municipality will conduct regular waste audits to identify the composition and amount of waste generated to target waste reduction, recycling, and diversion initiatives.

2.2 Environmental Problems of Poor Waste Management

The key environmental problems that are a consequence of poor waste management recorded in Maua Municipality are:

- Surface water contamination:** Waste from commercial and residential areas ends up in the Mboone River, negatively changing the water quality. It affects wetlands and other riparian ecosystems. It also causes harm to people and animals that use the water downstream.
- Soil contamination:** Hazardous chemicals that get into the soil (contaminants) can harm plants when they are taken up through their roots. If humans eat affected plants and animals that have consumed such plants as pasture, then there is a high possibility of the occurrence of negative impacts on human health.
- Pollution:** Bad waste management practices in the Municipality have resulted in land and air pollution which can cause respiratory problems and other adverse health effects to humans as contaminants are inhaled and absorbed into the lungs proceeding to other parts of the body.
- Leachate:** The liquid that forms water trickles through contaminated areas is called leachate. It forms a harmful mixture of chemicals that may result in hazardous substances entering surface water, groundwater, or soil.
- Municipal well-being:** Most trading centers within the municipality have poor sanitation, smelly, and waste matter all over the place, an indication of poor living standards in urbanized areas of the municipality.
- Recycling revenue:** The municipality has inadequately invested in recycling and proper waste control thus missing out on revenue from the circular economy, green job opportunities that come from recycling, and the potential for the establishment of organic fertilizer ventures and even a factory.

STRATEGIC AREAS AND PROPOSED ACTIONS

Based on the baseline surveys; existing literature, community, and stakeholder consultations, and existing county development plans, policies, and laws, below are some of SWM's prioritized strategic areas.

3.1 Waste Reduction at Source

Waste reduction at source is the priority in the ISWM hierarchy. In this strategic plan, source reduction implies reducing the volume of waste at the source/ point of generation by changing the material-generating process. It includes incorporating a reduction in the design, manufacture, sale, purchase, and use of products and packaging.

Source reduction strategy objective is to reduce the number of materials the municipality will produce and the harmful environmental effects associated with their production and disposal. It includes: reduced material use in product manufacture, increased useful life of a product through durability and ease-to-repair, material reuse, reduced/ more efficient consumer use of materials, and increased production efficiency resulting in less production of waste. Source reduction will offer several opportunities for cost savings for the Municipality management which include direct savings on waste collection, transportation, and disposal costs.

3.2 Waste Recycling and Composting

Recycling is the process by which materials otherwise destined for disposal are separated at the source, collected, processed, and remanufactured or reused. This is increasingly being adopted by urban communities as a method of managing municipal waste and a source of income for the urban poor.

Recycling programs will divert a significant percentage of municipal, institutional, and business waste from disposal and can help control waste management costs by generating revenue through the sale of recyclable materials.

Municipality management shall aim at continually providing a consistent stream of high-quality (free of contaminants) recovered waste materials that meet the standards of the marketplace and limit health risks to workers involved in the sector and therefore consider an upstream sorting of the recyclable waste.

3.3 Incineration and Waste to Energy Recovery

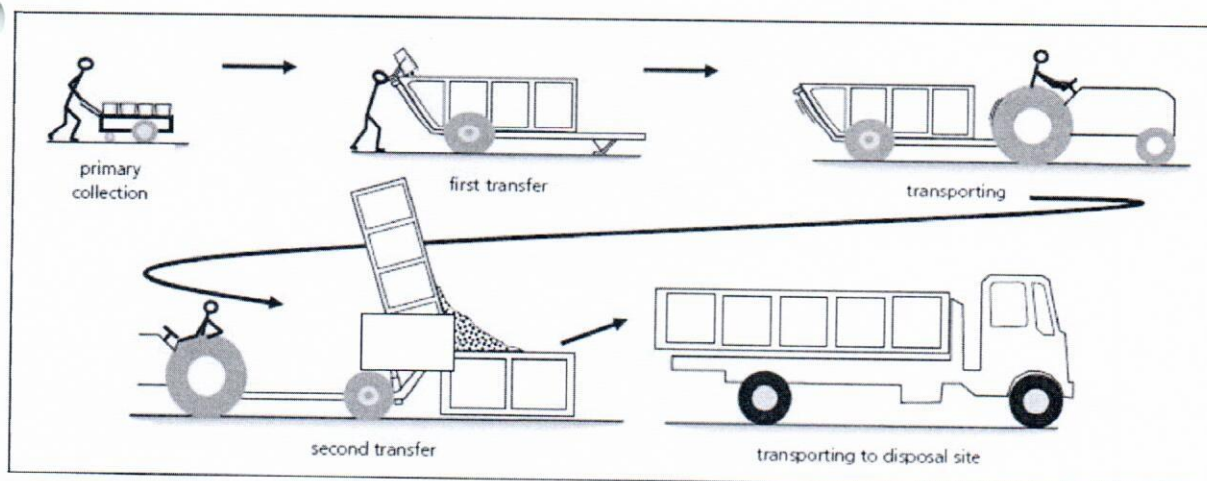
Incineration is a waste treatment process that involves the combustion of organic substances contained in waste materials. Incineration and other high-temperature waste treatment systems are described as "thermal treatment". Incineration of waste materials converts the waste into ash, flue gas, and heat.

It significantly reduces the necessary volume for disposal. Furthermore, incineration has particularly strong benefits for the treatment of certain waste types such as clinical wastes and certain hazardous wastes where pathogens and toxins can be destroyed by high temperatures.

Incinerators may emit fine particulate, heavy metals; trace dioxin, and acid gas, even though these emissions are relatively low from modern incinerators. Other concerns include proper management of residues: toxic fly ash, which must be handled in hazardous waste disposal installation as well as incinerator bottom ash, which must be reused properly. Incineration is recommended for Maua Municipality since the global warming potential of the landfill gas emitted to the atmosphere is approximately 30% higher than the amount of Carbon dioxide (CO₂) that would be emitted by the combustion process.

3.4 Planning For a Sustainable Solid Waste Management System

This strategy focuses on the planning of sustainable storage, collection, transportation, and disposal systems. Storage, collection, transport, and disposal are the four essential elements of any solid waste management system. Compatibility between each of the three stages of storage, collection, and transport is essential to ensure economic operation. The objective of this strategy is to partly containerize the storage, collection, and transport system, which does not allow the waste material to come in contact with the ground at any stage of the collection system.



The first part of the report discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the success of any business or organization. The report then outlines the various methods used to collect and analyze data, including interviews, surveys, and focus groups. It also describes the challenges faced during the data collection process and how they were overcome. The final part of the report presents the findings of the study and discusses their implications for future research and practice.

The second part of the report focuses on the analysis of the data collected. It describes the various statistical techniques used to analyze the data, including descriptive statistics, inferential statistics, and regression analysis. It also discusses the results of the analysis and how they relate to the research objectives. The report concludes by summarizing the key findings and providing recommendations for future research and practice.

The third part of the report discusses the implications of the findings for future research and practice. It highlights the need for further research to explore the relationship between the variables studied and to develop more effective interventions. It also provides recommendations for practitioners who may be interested in applying the findings of the study to their work. The report ends with a conclusion that summarizes the main points and reiterates the importance of the research.

Figure 1: Proposed Waste Collection System

3.5 Institutional, Organizational, Policy and Legal Reforms

After reviewing the strengths and weaknesses (status) in the existing organizational set-ups to manage solid waste in the municipality, reforms are proposed as follows:

- i. Institutional empowerment in handling solid waste
- ii. Capacity building of Maua Municipality residents on Solid Waste Management
- iii. Implementation of the ISWM Policy and Legal Reforms

3.6 Capacity Building, Environmental Planning, Education and Awareness

The municipality has limited capacity and skills in waste management for both the public and the private sector. A high degree of collaboration will be required across various departments of the municipality to raise sufficient capacities for the purpose. There is a need to carry out preliminary waste awareness initiatives among individuals as well as public and private institutions to improve knowledge and skills on waste handling and how to minimize the associated risks. There is also a need to enhance collaboration and partnership with local traders investors and government agencies to ensure that knowledge and skills are transferred and undertake training programs for trainers.

3.7 Management of Hazardous and Special Wastes:

The proposed strategy is to separate waste at source using the 3-color system to maximize the collection of hazardous materials to reduce the environmental and health impacts of any unregulated waste. All hazardous waste should be handled using NEMA national standards, Waste Regulations of 2006, and guidelines during the strategic period.

3.8 Resource Mobilization through Public-Private Partnerships and Financing Reforms

This strategy outlines recommendations for resource mobilization through the application of the Public-Private Partnerships (PPP) approach and undertaking various financing reforms at the Municipality.

IMPLEMENTATION, MONITORING AND EVALUATION

Daily solid waste collection schedule:

This involves daily cleaning of our streets, Bus Park, markets, and the County Government Office compounds. There is also collection of waste from waste bins within the Municipality to receptacles/collection Centers and transportation by tractors/lorry from receptacles to the dumpsite. Streets' cleaning is done by the County Government in partnership with the contractor.

DAY	SWEEPING OF STREETS, MARKETS, BUS PARK, TAXI PARK	COLLECTION TO RECEPTACLES FROM BINS AND STREETS	COLLECTION TO MURERA DUMPSITE
MONDAY	☐	☐	☐
TUESDAY	☐	☐	☐
WEDNESDAY	☐	☐	☐
THURSDAY	☐	☐	☐
FRIDAY	☐	☐	☐
SATURDAY	☐	☐	☐
SUNDAY	NO ACTIVITY		

Implementation Schedule

This strategy will be implemented in phases and the strategies will be categorized into, short- term, mid-term and long-term strategies as indicated in Table below.

Strategic Action	1-2.5 Years	2.5-5 Years	5-7.5 Years	7.5-10 Years
Waste Reduction	✓	✓	✓	✓
Waste Recycling and Composting	✓	✓	✓	✓
Waste to energy/Combustion	✓	✓	✓	✓
Planning of Sustainable Solid waste Management Systems(Sustainable storage, Collection, Transportation and Disposal Systems)	✓	✓	✓	✓
Public Private Partnerships	✓	✓	✓	✓
Management of Special Wastes (e-Waste, Hospital, ELVs, etc)	✓	✓	✓	✓
Capacity Building, Environmental Planning and Environmental Awareness	✓	✓	✓	✓
Fundraising and Financing Reforms	✓	✓	✓	✓
ISWM Policy and Legal Reforms	✓	✓	✓	✓

Monitoring and Evaluation

Monitoring and evaluation is an important aspect of strategy implementation that ensures that actions and projects are implemented in a cost effective and efficient manner according to what is proposed in this policy document. The following are recommended as part of M&E

- i. Monthly Progress Report
- ii. Annual Strategy Report
- iii. Mid-Term Evaluation Report

- iv. Terminal Evaluation Report

References

The Sustainable waste management Act, 2022

The NATIONAL SOLID WASTE MANAGEMENT STRATEGY, 2015 (NEMA)

