



COUNTY GOVERNMENT OF MERU

**DEPARTMENT OF LANDS HOUSING, PHYSICAL
PLANNING AND URBAN DEVELOPMENT**

MERU MUNICIPALITY

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MERU

SOLID WASTE MANAGEMENT PLAN

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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.

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 (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, so as to mobilize all available experiences, talent and resources to solve the household waste management problem.

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 day's 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.

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 produces waste or if that person is not known, the person who is in possession or control of that waste.

Introduction

Meru Municipality is a vibrant urban center that has been experiencing rapid growth in both population and economic activity. As the municipality expands, so does the challenge of managing the increasing amounts of solid waste generated by its residents, businesses, and industries. Inefficient waste management can lead to serious environmental, public health, and aesthetic problems, which negatively impact the quality of life for residents of Meru Municipality.

The **Solid Waste Management (SWM) Plan for Meru Municipality** has been developed to address these challenges by outlining sustainable and effective strategies for waste collection, transportation, disposal, and recycling. The goal of the plan is to create a comprehensive framework that will improve waste management practices, reduce the environmental impact of waste, promote public participation, and contribute to the overall cleanliness and health of the municipality.

This plan emphasizes the importance of **waste segregation, recycling, and public education** as key components of a successful waste management system. It also highlights the municipality's commitment to creating a circular economy through resource recovery and the minimization of waste sent to landfills. Through strategic partnerships with residents, businesses, local authorities, and the private sector, the plan aims to develop a waste management system that is not only efficient and cost-effective but also environmentally sustainable.

Ultimately, the SWM plan for Meru Municipality is designed to ensure that waste is managed in a manner that enhances the well-being of its citizens, conserves natural resources, and promotes a cleaner and more sustainable environment for current and future generations.

The Municipality is currently generating an average of 50 tons of solid waste per day. The World Bank Report for African countries the Annual growth rate of waste generation is 2.09 %. Currently, it is estimated that the Municipality only about 60% of waste generated is collected and disposed. The Solid Waste Management (SWM) in the Municipality involve three stages and includes; Storage and Collection, Transportation and Final Disposal.

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 has a duty to 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 has a duty to 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 wastes disposal site or plant without a license issued by the Authority.
- d) Every person whose activities generate wastes shall employ measures essential to minimize wastes 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 wastes in such facility as is provided for by the relevant Local Authority.

SITUATIONAL ANALYSIS

Waste Generation Patterns

Meru Municipality is experiencing rapid urbanization, leading to increased waste generation. The types of waste generated can be broadly categorized as follows:

- **Household Waste:** Organic waste (e.g., food scraps, garden waste), recyclables (e.g., plastics, glass, paper), and non-recyclables (e.g., textiles, broken items).
- **Commercial Waste:** Packaging materials, food waste from restaurants, e-waste from businesses, and general office waste.
- **Industrial Waste:** Waste generated by industries, including manufacturing by-products, scrap metal, packaging materials, and hazardous waste.
- **Public Space Waste:** Waste generated from public areas, including streets, parks, and other communal spaces.

The amount of waste generated in the municipality is increasing in line with the growing population, urban expansion, and industrial development.

Current Waste Management Practices

Meru Municipality currently uses a combination of formal and informal waste management systems to handle the increasing waste load. Key aspects of the current system include:

- **Waste Collection:** The municipality provides waste collection services, although the frequency and coverage are inconsistent. While residential areas are serviced on a weekly basis, collection services for commercial and industrial zones are less reliable.
 - **Waste Segregation:** Currently, waste segregation at the source is not widely practiced, and most waste is mixed before collection. This limits the efficiency of recycling and increases the volume of waste directed to landfills.
 - **Waste Disposal:** The municipality primarily relies on Nkunga Dumpsite for waste disposal. There is limited capacity to manage waste in an environmentally sustainable manner, and the dumpsite is often overburdened. The lack of modern landfill technology and insufficient waste treatment facilities further compounds this issue.
 - **Recycling:** There are few recycling initiatives in Meru Municipality. Some informal recyclers collect specific materials such as plastics, metals, and paper, but there is no formalized or large-scale recycling infrastructure in place.
 - **Public Awareness:** Public awareness on proper waste disposal, segregation, and recycling is low. Many residents and businesses are unaware of the importance of waste management and the environmental implications of improper disposal.
-

Challenges Facing Waste Management

Meru Municipality faces several challenges in managing its solid waste effectively:

- **Inadequate Infrastructure:** The municipality lacks sufficient waste management infrastructure, including trucks for transportation, waste collection bins, and sorting facilities.
- **Poor Waste Segregation:** There is minimal separation of waste at the source, which increases contamination and reduces the effectiveness of recycling efforts. Most residents and businesses do not practice waste segregation due to a lack of education and infrastructure.
- **Overburdened Nkunga Dumpsite:** The municipality relies heavily on Nkunga Dumpsite, which is often overfilled.
- **Limited Recycling Programs:** There are limited formal recycling programs in Meru, and most recyclable materials are either discarded with general waste or collected by informal recyclers with minimal efficiency.
- **Lack of Public Awareness:** There is a significant gap in public understanding of the importance of waste segregation, recycling, and the environmental impacts of poor waste management.
- **Insufficient Budget and Funding:** The municipality struggles to allocate sufficient resources for waste management due to budgetary constraints. This affects the quality and frequency of waste collection, as well as the development of waste processing and recycling facilities.
- **Unregulated Informal Waste Management:** A significant portion of waste management in Meru is handled by the informal sector, which operates outside of the formal regulatory framework. This results in inconsistent waste collection services and limited accountability.

Opportunities for Improvement

Despite the challenges, there are several opportunities for improving waste management in Meru Municipality:

- **Community Engagement and Education:** Increasing public awareness and promoting waste segregation at the source could significantly reduce the amount of waste directed to landfills and improve recycling rates.
- **Public-Private Partnerships:** The municipality can collaborate with private companies to develop waste collection, recycling, and disposal services. There is potential for private sector investment in waste-to-energy projects and modern landfill management.
- **Recycling Infrastructure:** Establishing formal recycling programs, including the construction of recycling centers, could help reduce the environmental impact of waste and create new economic opportunities.
- **Waste-to-Energy Solutions:** Meru Municipality can explore the use of waste-to-energy technologies, such as incineration or anaerobic digestion, to reduce waste volumes and generate renewable energy.
- **Policy and Regulatory Strengthening:** The municipality can strengthen waste management regulations and ensure better enforcement of laws related to waste segregation, collection, and disposal.

Population of Meru Municipality

Meru municipality is located in the Eastern region of Kenya, Meru County, Imenti North Sub County. It is located in the northeastern slopes of Mount Kenya. Meru town was founded in 1911 and it is the current headquarters on Meru County. It is the seventh largest urban centre in Kenya forming a municipality with a population of 240,900 inhabitants (KNBS, 2021) this population is distributed across various urban, peri-urban, and suburban areas, with waste generation varying depending on the density, lifestyle, and economic activity in each area.

The Solid Waste Management Plan for Meru Municipality identifies the entire population within the municipal boundaries as the target for waste management services, ensuring that no group is left behind. Through a tailored approach that includes door-to-door collection for households, specialized services for businesses and industries, and waste management solutions for public spaces, the municipality aims to provide comprehensive and effective waste management services. As the population continues to grow, the SWM plan will adapt to meet the needs of all residents, businesses, and institutions within the municipality.

Current Land Uses within the Service Area

Meru Municipality's land uses are diverse and span across several categories, each contributing differently to waste generation. The current land use patterns within the service area include:

- **Residential Areas:** The largest portion of Meru Municipality's land is used for residential purposes. This includes formal housing estates, informal settlements, and rural areas within the municipality. Residential areas generate primarily **household waste**, including food scraps, packaging materials, paper, plastics, and organic waste.
- **Commercial Areas:** These include central business districts (CBDs), shopping malls, markets, restaurants, hotels, and office spaces. Commercial establishments tend to generate **higher volumes of waste** per unit area compared to residential areas, including packaging materials, food waste, and office waste such as paper and plastics. Markets also contribute significant amounts of organic waste.
- **Industrial Zones:** Meru Municipality is home to several industries that produce substantial amounts of waste. Industrial waste includes **manufacturing by-products**, scrap materials, packaging waste, and occasionally hazardous waste (depending on the industry). These areas require specialized waste management strategies to handle both non-hazardous and hazardous materials.
- **Public and Recreational Areas:** Parks, streets, bus stations, and other public spaces generate a significant volume of waste, particularly litter and packaging waste from commuters and visitors. These spaces require frequent waste collection services to maintain cleanliness.
- **Institutional Areas:** Public institutions like schools, hospitals, government offices, and religious centers also contribute to waste generation. Educational institutions may generate paper waste, food waste, and other general refuse, while hospitals may generate medical waste (which requires special handling).

. Projected Land Uses and Growth Trends

As Meru Municipality continues to grow, changes in land use are anticipated due to **urbanization, population growth, and economic development**. These changes will influence the volume and composition of waste generated in the municipality. Key projected land use changes include:

- **Urbanization and Residential Expansion:** The population of Meru is expected to increase, resulting in more residential developments. Both **formal housing estates** and **informal settlements** are likely to expand, leading to an increase in household waste generation. This trend will require the municipality to enhance waste collection services to meet the demands of the growing population.
- **Commercial Development:** As the local economy expands, there will be an increase in **commercial properties**, including shopping malls, office buildings, and service industries. These commercial establishments are expected to generate more waste, including packaging, food waste, and electronic waste (e-waste). Planning for increased waste collection and specialized services for these areas will be necessary.
- **Industrial Growth:** With economic growth, more industrial zones are expected to develop, leading to higher waste generation. This could include **construction debris, manufacturing waste, and hazardous waste**. Adequate infrastructure will be needed to manage these specialized waste streams.
- **Public Infrastructure and Recreational Spaces:** As the municipality grows, there will be further development of **public spaces**, including parks, recreational areas, and transport hubs. These spaces will increase waste generation from visitors and commuters, requiring improved waste management solutions, such as additional waste bins and frequent collections.
- **Commercial and Retail Centers:** The expansion of commercial centers and markets, especially in peri-urban areas, will increase the amount of organic waste, packaging, and consumer goods waste. These centers will require dedicated waste management services.

Projected Waste Volumes

To effectively plan for future waste management needs, the **SWM Plan** has estimated the **projected waste volumes** based on current land uses and future growth. These estimates are based on factors such as population size, land use density, economic activities, and waste generation rates.

- **Residential Waste:** As the population grows, residential waste is projected to increase. considering the growing population, the total waste from residential areas is expected to rise by **50% over the next 5-10 years**.
- **Commercial Waste:** With the projected expansion of commercial and retail areas, the amount of waste generated in these zones is expected to grow significantly. Commercial waste generation is often linked to the **size of the establishment** and the **nature of the business**. For instance, restaurants and markets generate more organic waste, while office spaces produce more paper waste.

- **Industrial Waste:** Industrial waste is anticipated to increase proportionally with the growth of industrial zones. The projected waste from these areas includes **manufacturing waste, scrap metal, and packaging materials**. Specific industries may also generate **hazardous waste**, which will require special handling and disposal methods.
 - **Public Spaces and Institutional Areas:** As public spaces expand to accommodate a growing population, waste generation from these areas will also rise. Waste volumes are expected to increase, particularly **litter and packaging waste**. Institutions such as hospitals will also contribute to waste, including **medical waste**, which will need specialized treatment.
-

Waste Management Infrastructure Requirements

Based on the anticipated waste volumes from current and projected land uses, the SWM Plan includes strategies for scaling up the waste management infrastructure. Key infrastructure needs include:

- **Waste Collection and Transportation:** The municipality will need to expand its fleet of waste collection vehicles and ensure more frequent collections, especially in high-density areas and emerging commercial zones.
 - **Waste Sorting and Recycling Facilities:** New sorting centers and recycling facilities will be needed to handle the increased volumes of recyclable materials, including plastics, paper, and metals.
 - **Landfill and Disposal Capacity:** As waste volumes increase, it will be crucial to expand landfill capacity and ensure that disposal methods are environmentally sustainable. Additionally, exploring alternatives like **waste-to-energy** technologies will help reduce reliance on landfills.
 - **Public Awareness and Engagement:** Public outreach programs will be important to educate residents and businesses on waste reduction, segregation, and recycling to reduce waste sent to landfills and enhance resource recovery.
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Conclusion

The **SWM Plan for Meru Municipality** effectively accounts for both current and projected land uses, recognizing the evolving needs of the municipality as it grows. By assessing waste generation patterns from different land uses, and projecting future growth and waste volumes, the plan ensures that waste management services will be able to meet the demands of a growing population and economy. The development of appropriate infrastructure, waste segregation programs, and waste disposal strategies will be critical to maintaining a clean and sustainable environment for all residents, businesses, and industries within the municipality.

SWM Service Area

The Municipality is zoned into 6 zones which consist of Zone 1&2 covering Meru Town Central Business District (CBD). Zone 3, 4, 5 and 6 covers all areas of Gitimbine, Gikumene, Milimani, Makutano towards Meru National Polytechnic, Makutano towards Kaaga and KEMU areas.

In terms of frequency, daily collection and transportation services are provided daily in zones 1&2 and at least twice a week on the other zones. Garbage collection services in Zone 1&2 is carried out by Town Administration whereas the other zones are served once weekly. The street cleaning services which account for much of the municipal wastes is also provided within the Meru CBD, Gakoromone and Makutano markets.

The SWM service area for Meru Municipality covers the entire municipal boundary, which includes:

- **Urban Residential Areas:** This includes all neighborhoods, estates, and suburbs within Meru Municipality, where households generate significant amounts of waste. The service area will ensure regular collection from these areas, ensuring a cleaner living environment.
- **Commercial Areas:** Areas that include retail shops, markets, office spaces, restaurants, hotels, and other businesses. These areas often generate high volumes of waste, including organic, packaging, and electronic waste. The municipality will provide specialized waste collection services tailored to the needs of commercial establishments.
- **Industrial Zones:** Meru Municipality is home to several industries that produce waste, including manufacturing by-products, hazardous materials, and large quantities of packaging waste. These areas require specialized waste collection and disposal methods, often needing separate handling for hazardous or bulky materials.
- **Public Spaces:** This includes parks, streets, roadsides, bus stations, and other public areas within the municipality. Regular waste collection services will be provided to maintain cleanliness and prevent littering in these high-traffic zones.
- **Special Areas:** This category includes public institutions like schools, hospitals, and government offices, as well as informal settlements and agricultural areas within the municipality. Waste management services will be tailored to the specific needs of these areas.

Waste Collection Frequency

The frequency of waste collection in the service area is determined by the volume of waste generated and the population density. The proposed schedule is:

- **Residential Areas:** Waste will be collected at least **once a week**, with potential for more frequent collection in higher-density areas or where there is more waste generation, such as urban estates.
- **Commercial and Industrial Areas:** Waste collection will occur **2 to 3 times per week**, depending on the level of waste generated. Specialized waste management services for industrial and commercial establishments may be required.
- **Public Spaces:** Waste collection in high-traffic areas such as markets, bus stations, and parks will occur daily to prevent litter accumulation.

- **Bulk Waste and Special Collections:** Large waste items like furniture, appliances, or construction debris will be collected upon request or during scheduled bulk waste collection days.

The service area may be expanded as Meru Municipality grows or as new residential, commercial, and industrial zones are developed. Areas currently outside of the SWM service area, such as newly developed neighborhoods, informal settlements, or rural zones within the municipal boundary, may be gradually incorporated into the waste management system as resources allow.

The **SWM service area for Meru Municipality** aims to ensure efficient, sustainable, and equitable waste management across all parts of the municipality. By defining the service area and establishing clear guidelines for waste collection, segregation, and disposal, the municipality will be able to manage waste more effectively, reduce environmental impact, and promote public health and well-being. As the municipality grows and waste generation increases, the SWM service area will evolve to accommodate new areas and improve services for all residents, businesses, and industries

2.2 Environmental Problems of Poor Waste Management

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

- Surface water contamination:** Waste from commercial and residential areas end up in Kathita 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 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 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 wellbeing:** Most trading centers within the municipality have poor sanitation, smelly and with waste matter all over the place, an indication of poor living standards in urbanized areas of the municipality.

- f) **Recycling revenue:** the Municipality has inadequately invested in recycling and proper waste control thus missing out on revenue from circular economy, green job opportunities that come from recycling, and potential for 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 prioritized strategic areas.

3.1 Waste Reduction at Source

Waste reduction at source is the first 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 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 source, collected, processed, and remanufactured or reused. This is increasingly being adopted by urban communities as a method of managing municipal waste and source of income for the urban poor. Recycling program will divert a significant percentage of municipal, institutional, and business waste from disposal and can help to control waste management costs by generating revenue through the sale of recyclable materials.

Municipality management shall aim at continually providing 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 MERU Municipality since the global warming potential of the landfill gas emitted to atmosphere is approximately 30% higher than the amount of Carbon dioxide (CO₂) that would be emitted by 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 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.

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 MERU 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 in order to raise sufficient capacities for the purpose. There is need to carry out preliminary waste awareness initiatives among individuals as well as the public and private institutions to improve on knowledge and skills on waste handling and how to minimize the associated risks. There is also need to enhance collaboration and partnership with local traders and investors and the 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-colour system in order to maximize the collection of hazardous materials with a view to reducing 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 of 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 NKUNGA DUMPSITE |
|------------|--|--|--------------------------------------|
| MONDAY | ✓ | ✓ | ✓ |
| TUESDAY | ✓ | ✓ | ✓ |
| WEDNESDAY | ✓ | ✓ | ✓ |
| THURSDAY | ✓ | ✓ | ✓ |
| FRIDAY | ✓ | ✓ | ✓ |
| SATURDAY | ✓ | ✓ | ✓ |
| SUNDAY | ✓ | ✓ | ✓ |

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 |
|--|-------------|-------------|-------------|--------------|
| Review of solid waste management policy,2019 | ✓ | | | |
| 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)

