COUNTY GOVERNMENT OF KIAMBU

KIAMBU MUNICIPALITY

DEPARTMENT OF MUNICIPAL ADMINSTRATION AND URBAN DEVELOPMENT

SOLID WASTE MANAGEMENT PLAN

Prepared By

Municipal Environment Officer

and Social Development Officer

FEBRUARY, 2025

FOREWARD

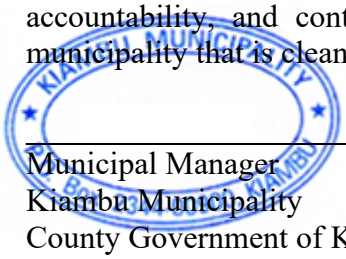
Kiambu Municipality stands at a critical point in its urban development journey. As one of the fastest-growing municipalities within Kiambu County and part of the greater metropolitan region influenced by Nairobi, our town continues to experience rapid population growth, commercial expansion, and increased infrastructure development. While this growth presents significant economic opportunities, it also brings pressing environmental challenges — particularly in the management of solid waste.

Effective solid waste management is not merely a municipal function; it is a public health imperative, an environmental responsibility, and a foundation for sustainable urban development. Uncollected and poorly managed waste contributes to environmental degradation, blocked drainage systems, flooding, air and water pollution, and increased disease burden. It also undermines the aesthetic value and investment potential of our municipality.

This Solid Waste Management Plan sets out a clear, practical, and forward-looking framework to transform waste management in Kiambu Municipality. The Plan emphasizes waste reduction at source, segregation, recycling, composting of organic waste, strengthened collection systems, private sector collaboration, and the development of environmentally sound disposal facilities. It aligns with national environmental policies and Kiambu County regulations while embracing innovation, community participation, and financial sustainability.

Successful implementation of this Plan will require collective effort. I call upon residents, businesses, community groups, private waste service providers, development partners, and all stakeholders to actively participate in making Kiambu cleaner and greener. Environmental stewardship is a shared responsibility.

As Municipal Manager, I reaffirm our commitment to strong leadership, transparency, accountability, and continuous improvement in service delivery. Together, we can build a municipality that is clean, healthy, resilient, and worthy of future generations.



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Municipal Manager
Kiambu Municipality
County Government of Kiambu

ACRONYMS

CBOs	**–**	**Community Based Organizations**
EIA	**–**	**Environment Impact Assessment**
EMCA	**–**	**Environment Management Cordination Act**
EPR	**–**	**Extender Producer Responsibility**
GIS	**–**	**Geographical Information System**
JICA	**–**	**Japan International Cooperation Agency**
Km	**–**	**Kilometres**
KPI	**–**	**Key Performing Indicators**
KUSP 2	**–**	**Kenya Urban Support Program 2**
M&E	**–**	**Monitoring & Evaluation**
MRF	**–**	**Material Recovery Facility**
NEMA	**–**	**National EnvironmentManagement Authority**
NGOs	**–**	**Non Governmental Organizations**
PPPP	**–**	**Public-Private-People Partnership**
SWM	**–**	**Solid Waste Management**
UNEP	**–**	**United Nations Environment Programme**

Executive Summary

Kiambu Municipality is a rapidly growing urban area with a diverse economy including education, light manufacturing, agriculture, trade, and services. The municipality faces increasing solid waste generation due to population growth, urbanization, and economic activities. Current waste management practices are constrained by limited collection coverage, inadequate disposal infrastructure, low recycling rates, and minimal public awareness. This Solid Waste Management (SWM) Plan provides a strategic framework for the sustainable management of municipal solid waste, aiming to improve collection, transportation, treatment, recycling, and disposal in line with national policies, county regulations, and environmental standards.

The plan seeks to establish an inclusive, efficient, and financially sustainable waste management system. Key objectives include expanding collection coverage, promoting segregation at source, enhancing recycling and composting, strengthening public-private-people partnerships, and raising community awareness on proper waste handling. By implementing short- and long-term goals, the SWM Plan aims to reduce environmental pollution, minimize waste sent to disposal sites, and support a circular economy approach, ensuring that Kiambu Municipality can sustainably manage its waste while protecting public health and the environment.

Contents

1. Introduction

1.1 Overview of Kiambu Municipality

Kiambu municipality is within the Nairobi metropolitan region and Kiambu town is the capital of Kiambu County and is about 16 km from Nairobi City, Kenya's capital. Kiambu municipality covers an area of 104.8 km² and according to the 2019 population and housing census had a population of 145,903 and is estimated to have a population of 180,919 by the year 2030 as shown in table 1.

Table 1: Population Projections for Kiambu Municipality

Ward	2019 Census	2030 (Projections)
Riabai	26,854	33,298
Township	60,973	75,606
Ndumberi	31,359	38,885
Ting'ang'a	26,717	33,129
Total	**145,903**	**180,918**

Source: Kenya National Bureau of Statistics

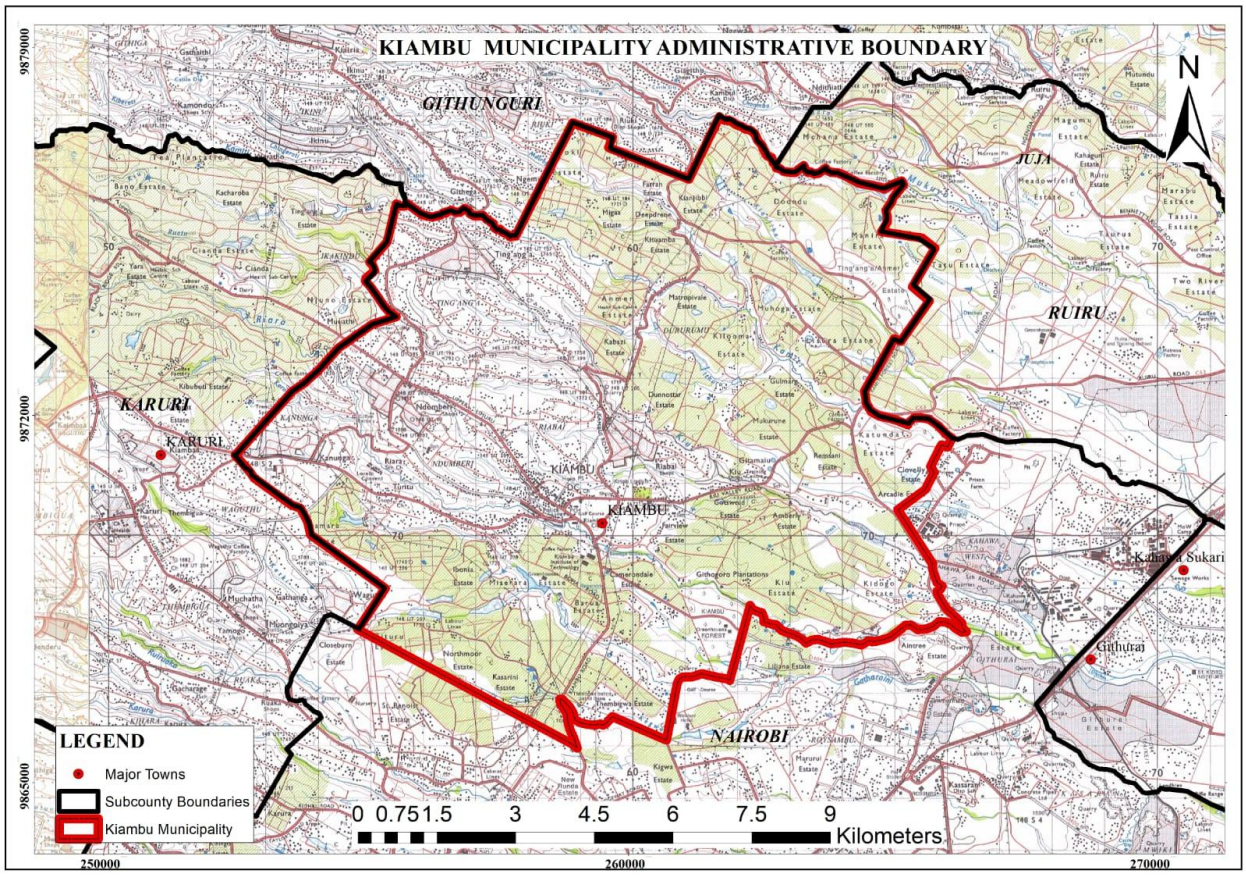

Figure 1: Map for Kiambu Municipality

Kiambu is seen as an alternative for the rapidly expanding Nairobi City as it is surrounded by farmlands and has space for development. These farmlands have slowly been taken over by urbanization as real estates are coming up as the need for housing increases.

The main economic activity of the municipality is agriculture with farm products like tea, coffee, potatoes, tomatoes, cabbage among other vegetables as well as dairy farming. Agriculture thrives due to its favorable equatorial climatic conditions with two seasons that is long rains between March to May and short rains between October and December and the annual mean rainfall ranges from 1070 – 1750 mm per annum with temperatures ranging from 17ºC and 25ºC. The topography is characterized by steep slopes and deep valleys with tertiary volcanic soils which allow for infiltration thus proper drainage. The Kamiti and Riara Rivers are the main water sources for the people of Kiambu, and they both drain into Nairobi River downstream.

1.2 Purpose of the Solid Waste Management Plan

The purpose of the Kiambu Municipality Solid Waste Management (SWM) Plan is to provide a comprehensive and strategic framework for the development, coordination, and implementation of sustainable solid waste management systems that effectively respond to the Municipality's current and future needs. The Plan seeks to promote environmentally sound practices across the entire waste management chain—generation, segregation at source, collection, transportation, recycling, treatment, and final disposal—while minimizing public health risks and environmental degradation.

The Plan is designed to be inclusive by integrating the roles of households, businesses, community-based organizations, informal waste pickers, private sector service providers, and municipal departments. It emphasizes equitable service delivery across all wards, including high-density, peri-urban, and underserved areas, ensuring that no segment of the population is excluded from access to reliable waste management services. Through structured stakeholder engagement, public awareness programs, and capacity building, the Plan aims to foster shared responsibility and behavioral change toward waste reduction and resource recovery.

In alignment with the objectives of the Kenya Urban Support Program II (KUSP2), the Plan prioritizes institutional strengthening, improved service delivery, climate resilience, environmental sustainability, and enhanced municipal performance. It further ensures compliance with relevant county legislation, national policies, and environmental regulations governing solid waste management, public health, climate action, and sustainable urban development. By integrating policy alignment with practical implementation strategies, the Plan establishes clear targets, performance indicators, financing mechanisms, and monitoring frameworks to guide continuous improvement and long-term sustainability of solid waste management services within Kiambu Municipality.

1.3 Key Objectives

- Ensure timely and efficient collection, transportation, and disposal of solid waste.
- Improve public-private-people partnerships in collection, waste segregation and recycling practices/activities.
- Promote education, public participation and awareness.
- Reduce environmental impact by improving on waste disposal sites and pollution control.

- Ensure financial sustainability of the SWM system.

2. Waste Generation and Composition Assessment

2.1 Current Waste Generation

Municipal solid waste generation is continuously increasing due to rapid population growth in urban areas. This can be linked with increased economic activity and rural urban migration which further leads to continued rise in number of waste generators. Data on the amount of waste generated and solid waste composition is important to ensure that waste is managed effectively. Most municipalities rely on the amount of waste collected to estimate the waste generated in a municipality, which may underestimate the actual information.

There are various sources of waste generated in a municipality which include hotels, industries, markets, retail and wholesale outlets, supermarkets, institutions, petrol stations, households and medical facilities.

According to the Japan International Cooperation Agency (JICA) 2015 report, it is estimated that rate of generation of solid waste is 0.53 to 0.65 Kg per Person per Day and that it is likely to increase up to 150 tons per day in the future (JICA 2015). Using an average of 0.6 Kg/ Person/ Day, in Kiambu municipality it is estimated that the tonnage of waste to be generated by year 2030 per day in just township ward only will be 117 tons from 93 tons estimated to have been generated in the year 2019.

2.2 Current Waste Generation

Kiambu Municipality generates a significant amount of waste originating primarily from residential areas, commercial establishments, industrial activities, and institutional facilities. Residential waste constitutes the largest share of total waste generated, followed by commercial and industrial sources, while institutional waste contributes a smaller but more complex waste stream. These estimates provide a baseline for planning waste collection, treatment, and disposal infrastructure.

Table 2 highlights the main sources of waste generated in Kiambu Municipality and the approximate amounts recorded in tons.

Table 2: Waste generated in Kiambu Municipality and approximate tonnage.

Waste Generator	Approx. daily amount of waste generated (Tons)
Residential	119
Commercial	10
Industrial	7
Institutional	5
Total	**141**

2.3 Waste Composition

1. Household waste

This consists of wastes that are generated by household from activities like sweeping, food preparation, clearing of unwanted clothing, shoes, utensils, furniture or other household material. Other activities also include from gardening, animal rearing and disposal of packaging and reading materials.

2. Commercial waste

This is waste generated by all commercial premises that is shops, retail stores, banks, service stations, entertainment centers, offices, restaurants and hotels. The waste comprises of packaging materials, office supplies, food waste, glass, plastics, metal, rubber, used oil, e-waste among others.

3. Municipal waste

This category includes waste from open public spaces and mainly is collected from street sweeping such as ash, dirt and leaves. Street waste may also comprise both commercial and domestic waste, especially where waste collection from these two sources is poor.

4. Institutional waste

This category covers wastes from schools, churches, government offices, hospitals and police station. Waste composition is mostly paper, plastics and when the institutions involve residents,

most of the wastes are similar to those of households. The waste from hospital constitutes of infectious and hazardous materials and is managed within the medical facility by incineration.

5. Industrial waste

They come from processing and non-processing industries. Industrial waste constitutes of by-products of manufacturing wastes, construction and demolition wastes. The composition of industrial wastes is site specific and depends on the raw resources and product which provide the base for a given industrial activity.

6. Agricultural waste

This is waste from animal and crop husbandry such as manure and crop remains. This waste is mostly generated in the market, from traders selling farm products.

The table 3 below summarizes the various waste categories, source and type of solid waste.

Table 3: Category, Source and Type of solid waste

NO	CATEGORY OF WASTE	SOURCE	TYPE OF WASTE
1.	Organic	Market, hotel industry	Food remains, rotten vegetables and fruits
2.	Recyclables	Institutions, Households, Retail and wholesale outlets,	glass, plastics, metal, rubber, wood
3.	Non-Recyclables	Petrol Stations, Construction sites, Commercial premises	Rubber, E – waste
4.	Hazardous waste	Medical facilities, Industries	paints, used batteries, used oil, solvents, cleaning agents,

			pesticides, medical waste

2.4 Waste Generation Trends

Waste generation in Kiambu Municipality is projected to increase steadily over the medium to long term, driven primarily by rapid urbanization, population growth, and rising household incomes. Continued expansion of residential developments, commercial activities, and small-scale industries is expected to result in higher per capita waste generation and more complex waste streams, including increased plastic, packaging, and organic waste. Without corresponding investments in waste reduction, segregation, and recycling systems, the total volume of municipal solid waste is likely to place growing pressure on existing collection, transportation, and disposal infrastructure.

Table 4 shows a comparison of population increase against expected increase in amounts of waste generated in the municipality.

Table 4: Population growth and projected of solid waste generation

Ward	2019 Census	Amount of waste generated (Tons)	2030 (Projections)	Amount of waste generated (Tons)
Riabai	26,854	17,455	33,298	21,643
Township	60,973	38,632	75,606	49,143
Ndumberi	31,359	20,383	38,885	25,275
Ting'ang'a	26,717	17,366	33,129	21,533
Total	**145,903**	**93,836**	**180,918**	**117,594**

3. Existing Solid Waste Management System

3.1 Collection Systems

Collection of solid waste is a very crucial part in the solid waste streams especially in municipality to avoid littered streets, piled up waste in markets which lead to unsanitary conditions and a breeding ground for vector-borne diseases (UNEP 2015). For effective collection of solid waste, it is determined by an inclusive waste collection schedule and the availability and capacity of garbage trucks. For effective collection, more attention is accorded to areas characterized with a large human population and rate of waste generation considered high. It helps ensure that there is less pile up of waste and all areas within the municipality get access to waste collection services.

With only a collection of 75% of the total solid waste generated in the municipality, there is need for an efficient and consistent collection system to allow for 100% collection rate and further avoid overwhelming storage facilities.

For this to be achieved, it is necessary to classify various areas in the municipality into red zones; those with high generation rate of waste, orange zones; average rate of generation and waste generators and green zones with lesser amounts of waste generated.

3.2 Waste Treatment and Disposal

In the Municipality, waste management currently combines a range of disposal and treatment practices shaped by local infrastructure, urban growth, and county-level strategies. A significant portion of municipal waste is still handled through open disposal sites and dumpsites, where refuse from households and businesses is deposited without advanced environmental control. For example, the main disposal facilities is in Thika Municipality which operates largely as traditional dumpsites, lacking full sanitary landfill features such as engineered liners, leachate treatment, and gas management systems. This site serves as the primary final disposal points for collected waste but pose long-term risks to soil, water, and public health due to leachate seepage and uncontrolled emissions.

To address these issues, the county has been advancing improved landfill technologies. The Kang'oki landfill in Thika, employing the semi-aerobic Fukuoka method introduced with support from JICA, serves as a pilot for more sustainable waste decomposition with reduced methane emissions and better waste breakdown compared to conventional open dumping. Such approaches

aim to gradually transform disposal sites into more controlled and efficient facilities that support environmental protection and reduce health impacts.

The Municipality is also expanding the scope of source segregation, reuse, and recycling. Efforts to introduce waste sorting bins and to encourage separation of organic, recyclable, and residual waste have been piloted with stakeholders, including private sector partners, to increase materials recovery and reduce the volume sent to disposal sites. These initiatives support informal recycling markets and promote local reuse of materials like plastics, metals, and paper, though comprehensive material recovery infrastructure is still limited.

Composting and biological treatment of organic fractions has been identified in County Intergrated Development Plan as a key opportunity for diverting organics from landfill, but at present composting hubs and material recovery facilities are only beginning to be developed.

Despite these efforts, collection coverage and formal treatment access remain uneven, with only a portion of households served by formal collection and many areas still resorting to burning, open dumping, or unmanaged disposal. This underscores the need for continued investment in infrastructure, awareness raising, and enforcement of waste management regulations to improve treatment outcomes and environmental health indicators across Kiambu Municipality.

3.3 Recycling and Resource Recovery

Recycling involves collecting and processing materials that would otherwise become waste and transforming them into new products. Resource recovery is a broader concept that encompasses recycling as well as composting, energy recovery, and the extraction of valuable materials from waste streams. Together, these practices help reduce the volume of waste sent to landfills, conserve natural resources, and minimize environmental impacts. Within a solid waste management (SWM) plan, recycling and resource recovery aim to divert waste from landfills and incineration, conserve energy and raw materials, reduce greenhouse gas emissions, and promote sustainable consumption and production patterns.

Current recycling practices begin with source separation, where waste is separated at the point of generation, including households, commercial establishments, and industrial sites. Commonly segregated streams include dry recyclables such as plastics, metals, paper, and glass; organic waste like food scraps and garden waste; and e-waste, including electronics and batteries. Source

separation offers the advantage of producing higher-quality recyclables that are easier to process, though challenges persist in terms of public awareness, participation, and compliance with segregation guidelines.

Once segregated, waste is collected through various systems, including curbside collection by municipal trucks, drop-off centers where residents can deposit recyclables, and centralized Material Recovery Facilities (MRFs) where materials are sorted, cleaned, and baled for sale. Recycling methods include mechanical recycling, which physically processes materials into raw materials for manufacturing—such as melting plastics into pellets or pulping paper for new products—and chemical recycling, which breaks down polymers into monomers for new plastic production and is particularly useful for mixed or contaminated plastics. Organic waste is treated biologically through composting or anaerobic digestion to produce compost or biogas, reducing landfill load and recovering valuable nutrients. Non-recyclable waste can also be used in energy recovery processes such as waste-to-energy incineration, pyrolysis, or gasification, providing energy while minimizing landfill volumes.

The main materials commonly recovered include paper and cardboard, which are collected, sorted, and pulped to produce new paper products; plastics, processed mechanically or chemically into pellets, packaging, or textiles; metals, which are sorted and smelted into steel, aluminum, or electronic components; and glass, which is crushed and remelted for bottles, containers, or construction aggregate. Organic waste is converted into compost or biogas, e-waste is dismantled to recover metals and refurbishable components, and construction waste is crushed and reused as road base or concrete aggregate.

Despite these advances, challenges remain in current practices. Contamination of recyclable streams reduces the quality of recovered materials, infrastructure for recycling is limited in smaller towns or rural areas, formal recycling markets are lacking for some materials such as mixed plastics, and advanced technologies like chemical recycling or anaerobic digestion involve high initial investment costs.

3.4 Institutional Framework

a) Municipality

This is the government body responsible for monitoring the waste generated through the waste stream (from point of generation to safe disposal). The Municipality charges the commercial waste generators a solid waste management fee which is included in the business permits issued annually. Municipality is also tasked to render municipal services of street sweeping and collecting waste. For household waste, municipalities have licensed private garbage collectors (organized groups or private companies) to properly handle and manage.

b) National Government

This includes government ministries and agencies that have a mandate to enhance environmental protection. This includes the Ministry of Environment and National Environment Management Authority (NEMA). They promote effective solid waste management through formulation and implementation of environmental laws and policies, for example the ban of single use plastic bags in Kenya (Gazette Notice published on 28th February 2017), has tremendously improved the state of the environment and overall reduction of waste collected within the municipality.

c) Waste Generators

This includes anyone who generates waste from commercial, industrial, institutional or domestic activities. The number of waste generators is continually increasing in the municipalities due to rural – urban migration. Almost all socio-economic activities result in generation of waste as the products made available in the market have a life span after which, waste is generated.

d) Private Service Providers

Private sector actors play a significant role in solid waste management in Kiambu County, handling the majority of waste generated—particularly household waste, which they are estimated to collect and manage at around 70 % of the total waste stream. These service providers operate under county licensing, with permits to collect either domestic or industrial waste, and the flexibility to offer services throughout the county. As part of their operational obligations, licensed waste collectors are required to recover recyclable materials during collection and sorting before transporting residual waste to designated disposal sites. This requirement not only supports resource recovery but also reduces the volume of waste reaching dumpsites, contributing to more sustainable waste management outcomes.

3.5 Financial Management

Kiambu Municipality receives funding for its solid waste management and environmental services from a mix of local revenue streams and intergovernmental transfers. Below is a refined and expanded overview of the key funding sources:

- **Solid Waste Management (SWM) Fees**

Business Permit Waste Fees – The primary revenue source, where waste management charges are embedded in Single Business Permits issued to commercial entities.

- **Private Garbage Collectors**

a) Licensing & Registration Fees – Annual fees paid by private waste collection companies to operate within the county.
b) Tipping Fees (Gate Fees) – Charges paid by private waste trucks when disposing of waste at designated county dumpsites or transfer stations.

- **Environmental & Regulatory Charges**

Environmental Impact Assessment (EIA) Related Fees – in coordination with National Environment Management Authority (NEMA), where applicable.

- **Development Partner and Donor Financing**

Municipal solid waste management is a priority area for many development partners due to its strong links to public health, climate change mitigation, and urban resilience. Funding may be provided through grants, concessional loans, or blended finance arrangements by institutions such as the World Bank, African Development Bank, and JICA among others. Such funding often supports infrastructure development, institutional strengthening, pilot projects, and capacity building.

4. Waste Management Goals and Objectives

4.1 Short-Term Goals (1–3 Years)

- **Improve waste collection coverage and efficiency**

  Expand service coverage to underserved areas, optimize collection routes, and strengthen supervision to ensure timely and reliable waste collection across all wards.

- **Increase awareness on waste segregation at source**

  Promote segregation of waste at households, institutions, markets, and business premises through structured public education programs, stakeholder forums, and enforcement of source separation guidelines.

- **Develop Waste Transfer and Resource Recovery Infrastructure**

  Establish a Material Recovery Facility (MRF) to enhance sorting and recovery of recyclable materials, and develop a composting facility for green and organic waste, particularly from markets and residential estates.

4.2 Long-Term Goals (5 –10 Years)

- **Reduce waste sent to disposal sites**

  Achieve significant diversion of waste through recycling, composting, and recovery initiatives, targeting a measurable reduction in landfill-bound waste.

- **Improve waste disposal facilities**

  Upgrade existing disposal sites to meet sanitary landfill standards, incorporating engineered systems for environmental protection.

- **Implement a Zero-Waste Circular Economy Approach**

  Promote sustainable production and consumption patterns by encouraging reuse, recycling, and recovery of materials within the local economy.

- **Increase diversion of recyclable and compostable materials**

  Enhance systems that maximize recovery of plastics, paper, metals, glass, and organic waste for value addition and reuse.

5. Waste Management Strategies

5.1 Waste Minimization

- **Education and Public Awareness Campaigns**

  Conduct continuous sensitization targeting households, schools, institutions, and

businesses on waste reduction practices such as minimizing plastic use, composting organic waste, and promoting reuse.

- **Partnerships with Businesses**
  Encourage adoption of sustainable packaging, extended producer responsibility (EPR) compliance, and waste reduction practices among manufacturers, supermarkets, and service providers.

5.2 Waste Segregation

- **Segregation at Source**
  Institutionalize mandatory segregation at household, institutional, and commercial levels into categories such as organic waste, recyclables, and hazardous waste. NEMA's waste color-coding system in Kenya requires segregation at source under the Sustainable Waste Management Act, 2022. Green bins are for organic waste, blue for recyclables, brown for general/residual waste, yellow for hazardous waste, and red for infectious or medical waste, each ensuring appropriate treatment and disposal.
- **Segregated Collection Systems**
  Introduce and enforce color-coded bin systems in accordance with national standards and county waste management regulations to support separate waste streams.

5.3 Collection Systems

- **Door-to-Door Collection**
  Expand and strengthen door-to-door waste collection services, prioritizing high-density residential areas, informal settlements, markets, and commercial zones.
- **Skip Bins and Litter Bins**
  Install additional skip bins in markets and bus stops, and provide color-coded litter bins in recreational parks, and high-traffic areas, ensuring segregation options are available.
- **Optimized Collection Frequency**
  Establish appropriate collection schedules to prevent overflow, reduce illegal dumping, and maintain cleanliness.

- **Collection Zoning**

  Designate collection zones and prioritize high-waste-generation areas for more frequent service.

5.4 Transportation Infrastructure

5.4.1 Assessment of Transportation Needs

- Conduct a comprehensive survey of the service area to identify waste generation hotspots, population density, commercial activity zones, and seasonal variations in waste volumes.
- Determine the types and volumes of waste generated (organic, recyclable, hazardous, bulky waste) to guide vehicle selection.
- Analyze current fleet capacity, utilization rates, and operational efficiency to identify gaps in service coverage and areas requiring additional resources.
- Establish key performance indicators (KPIs) such as collection frequency, turnaround time, fuel efficiency, and service reliability to monitor fleet performance.

5.4.2 Procurement of Vehicles and Equipment

To strengthen the effectiveness and efficiency of solid waste collection, transportation, and disposal, the Municipality will undertake a targeted procurement of modern vehicles and equipment tailored to the needs of both urban and peri-urban areas in Kiambu. These vehicles and equipment will enhance operational efficiency, improve environmental compliance, and reduce reliance on manual labor.

This will include acquisition of:

- **Compactors** for commercial waste to optimize collection frequency and reduce landfill trips.
- **Skip loaders** for areas that have skip bins majorly small shopping centers and markets.
- **Tipper trucks** for kerb side collection within all wards.
- **Tricycles** for low-access settlements and commercial streets
- **Backhoe** to support waste spreading, trenching, site leveling, excavation of cover material, and clearance of illegal dumpsites.

5.4.3 Strategic Fleet Deployment

This will involve:

- **GIS - Based Service Area Mapping:**

The Municipality will apply Geographic Information Systems (GIS) to map all collection service areas within its jurisdiction, including informal settlements, commercial centers, markets, and institutions. GIS analysis will help identify high-priority zones based on population density, waste generation intensity, illegal dumping hotspots, and accessibility challenges. The system will also support route optimization by analyzing road networks, traffic flow, and proximity to transfer points or disposal facilities, thereby improving efficiency, reducing operational costs, and enhancing service reliability.

- **Zonal Deployment Strategy:**

The Municipality will implement a zonal deployment model in which collection vehicles and staff are assigned to specific wards. Allocation will be guided by waste generation volumes, settlement patterns, road conditions, and infrastructure accessibility. This structured approach will promote accountability, improve supervision, ensure equitable coverage, and enable quicker response to service gaps within each zone.

- **Peak-Time and Density-Based Scheduling:**

Collection schedules will be structured to reflect the varying waste generation patterns across various areas within the municipality. Central business districts, markets, and transport corridors will receive more frequent and strategically timed collections to prevent overflow and safeguard public health.

- **Data-Driven Operational Planning:**

Utilize historical collection data, GPS vehicle tracking, and waste volume records to forecast demand and optimize fleet deployment. Continuous monitoring of key performance indicators—such as collection frequency, turnaround time, fuel consumption, and service complaints—will

inform dynamic adjustments to routes, staffing, and resource allocation. This data-driven approach will enhance efficiency, transparency, and cost-effectiveness in solid waste management operations.

5.4.4 Maintenance and Operational Efficiency

- Establish a preventive maintenance schedule to minimize breakdowns,prolong vehicle lifespan, and reduce operational costs.
- Train drivers and operators on fuel-efficient driving practices, safety protocols, and waste segregation procedures.
- Implement a reporting system for operational issues, route deviations, and equipment malfunction to allow rapid response.

5.4.5 Integration with Waste Management Strategy

The Municipality will strategically coordinate fleet deployment with waste reduction, segregation at source, composting, and recycling programs to enhance overall system efficiency and sustainability. Collection vehicles will be scheduled and configured to support separate waste streams where applicable, ensuring that recyclables and organic waste are efficiently transported to recovery facilities while minimizing contamination and landfill disposal. Routing plans will be aligned with recycling collection days and community initiatives to avoid duplication of services, reduce fuel use, and maximize material recovery.

There will be continuous monitoring of the environmental impact of fleet operations by tracking fuel consumption, greenhouse gas emissions, air pollutants, and operational noise levels, particularly in densely populated or sensitive areas. Performance data will inform measures to improve fuel efficiency, optimize routing, and reduce idling time. Where financially and technically feasible, the Municipality will progressively adopt greener alternatives such as low-emission vehicles, alongside operator training programs that promote eco-driving practices and preventive maintenance to lower environmental footprints.

To ensure seamless service delivery, the Municipality should actively engage key stakeholders, including relevant municipal departments, ward-level administrators, private waste collection

contractors, recycling enterprises, and community-based organizations. Clear service agreements, defined performance standards, and regular coordination meetings will promote accountability and harmonized operations across all zones. This collaborative approach will strengthen integration of collection services, improve responsiveness to service gaps, and support long-term sustainability of the solid waste management system.

5.5 Recycling and Resource Recovery

- Establish community-based and market composting initiatives to manage organic waste and promote production of compost for agricultural and landscaping use.
- Implement Extended Producer Responsibility (EPR) programs to involve manufacturers in the recycling process.
- Conduct public awareness campaigns to encourage proper waste segregation at the source.
- Invest in Material Recovery Facilities (MRFs) and advanced recycling technologies to enhance recovery rates.
- Introduce market incentives for secondary materials to stimulate private sector participation.
- Integrate circular economy principles to ensure waste is recognized as a resource, supporting sustainable and efficient solid waste management.

5.6 Waste Disposal

Disposal Site Management

Develop sanitary landfills that comply with environmental and regulatory standards.

Leachate and Gas Management

Install systems for leachate collection and treatment, and methane gas management to reduce environmental pollution and greenhouse gas emissions.

Advanced Waste Treatment Technologies

Explore environmentally sound technologies such as waste-to-energy facilities for residual waste and anaerobic digestion/biogas systems for organic waste, subject to feasibility studies and environmental safeguards.

6.Institutional Capacity and Regulatory Framework

Effective solid waste management requires a combination of strong institutional structures, clearly defined governance roles, robust regulatory oversight, strategic partnerships, and active community participation. These elements provide the foundation for a comprehensive solid waste management plan that is operationally efficient, environmentally sustainable, and socially inclusive.

a) Urban Governance and Institutional Roles

The Municipal Board is responsible for providing overall policy direction and governance for solid waste management within the municipality. Its role includes developing and adopting policies, plans, strategies, and bylaws; setting targets; entering into contracts and partnerships; and mobilizing resources and investments. The Board also prepares and submits annual budget estimates for approval, monitors budget implementation, collects revenue through taxes and fees, evaluates the effectiveness of waste management policies, promotes public–private sector engagement, and ensures environmentally sound practices. Additionally, it may establish sub-committees and maintain a comprehensive waste management database and information system.

The Municipal Manager is responsible for the implementation and day-to-day administration of the solid waste management function. This includes executing the approved policy, supervising the relevant municipal section, preparing and presenting annual revenue and expenditure estimates to the Board, and making reports and recommendations on waste management within the municipality.

The Municipal Environment Officer shall promote a safe and healthy environment within the Municipality by planning, coordinating, and overseeing waste management services. Their functions include setting collection schedules, designating disposal sites, allocating resources for fleet and infrastructure, monitoring service delivery, and ensuring compliance with environmental standards.

Specialized waste management agencies, both public and quasi-public, are responsible for implementing operational components of the plan. These include waste collection, transportation,

treatment, recycling, and final disposal. A well-structured institutional framework ensures that each entity knows its mandate, reducing duplication of effort and service gaps.

The private sector plays a complementary role, providing waste management services to all residential premises and services such as recycling. Integrating private sector operations into the municipal plan allows for increased efficiency, cost-effectiveness, and scalability of waste management interventions.

b) Regulatory Compliance and Legal Framework

Solid waste management operations must adhere to national policies, environmental laws, and regulatory standards. Key frameworks include the Environment Management Coordination Act (Cap 387) and the Sustainable Waste Management Act, 2022. These laws provide guidelines for waste segregation, collection, transportation, treatment, recycling, and disposal. Compliance mechanisms, such as inspections, audits, reporting, and enforcement of penalties for violations, are critical to ensuring that the solid waste management plan is executed within legal and environmental boundaries. Regulatory alignment ensures that the plan contributes to sustainable environmental outcomes, mitigates pollution risks, and promotes public health through safe handling and disposal of waste.

c) Public-Private-People Partnerships (PPPPs)

A Solid waste management plans is most effective when it integrates a Public-Private-People Partnerships (PPPPs). These collaborations combine the resources, technical expertise, and innovation of private companies with the regulatory oversight and planning authority of public institutions, while engaging communities in participatory roles.

PPPPs can facilitate investments in collection infrastructure, recycling plants, composting units, and waste-to-energy technologies. It also allow for shared responsibilities in service delivery, operational monitoring, and maintenance of facilities.

By integrating PPPPs into the plan, municipalities can leverage efficiency gains, stimulate local economic opportunities, and ensure that innovative solutions are implemented in a cost-effective manner.

d) Community Engagement and Participation

In a solid waste management plan, community involvement is essential for success, particularly in informal settlements and high-density urban areas. Residents must be engaged in waste segregation at source, proper disposal practices, recycling initiatives, and neighborhood cleanup campaigns.

Structured engagement includes education programs, awareness campaigns, participatory planning, and feedback mechanisms. Communities can provide insights on collection challenges, preferred schedules, and operational inefficiencies that may not be visible to municipal authorities.

Fostering a culture of shared responsibility between authorities, service providers, and communities ensures sustainability, accountability, and public ownership of solid waste management initiatives.

e) Integration with Operational Solid Waste Management

Institutional and regulatory frameworks are directly linked to the operational components of a solid waste management plan. Clear governance structures support strategic fleet deployment, route optimization, collection prioritization, and maintenance schedules.

Regulatory compliance guarantees that waste is handled safely and sustainably, from collection through to the final disposal.

PPPPs and community participation complement operational efficiency by enabling broader coverage, fostering behavioral change, and supporting recycling and resource recovery initiative.

7. Public Education, Awareness and Stakeholder Engagement

7.1 Public Education Campaigns

Effective solid waste management includes public education campaigns essentially to mold behavior change, strengthen compliance, reduce operational costs and ensure long-term sustainability of the waste management system.

Conducting education campaigns to inform the public on need to reduce, reuse and recycle while practicing segregation at source to reduce contamination of recyclable material and encourage generators of organic waste to practice composting. This in the long run reduces the volume of waste reaching Kango'ki Dumpsite. Awareness creation complements a functional collection system as it is characterized by proper sorting and zero contamination of recyclables.

Public education strengthens enforcement and community ownership by making environmental protection a shared responsibility rather than only a government obligation. Even if Kiambu municipality invests in waste infrastructure, its success is achieved by informing people on collection schedules and proper sorting methods.

7.2 Stakeholder Consultation

For Kiambu municipality, stakeholder consultation is essential to ensure the successful implementation of a solid waste management plan because it builds ownership, trust, and shared responsibility among those who generate and manage waste. When residents, businesses, NGOs, CBOs, and the informal sector are actively engaged, the municipality demonstrates transparency and accountability in its decision-making processes. This builds trust, reduces conflict, and increases public acceptance of new policies such as waste segregation requirements, revised collection systems, or the introduction of service fees.

Consultation also enables the municipality to design more practical and cost-effective waste management systems. Stakeholders provide firsthand knowledge of local conditions, service gaps, and operational challenges that may not be fully captured through internal assessments. By incorporating this input, the municipality can improve route planning, infrastructure placement, recycling initiatives, and communication strategies, leading to better service delivery and more efficient use of resources.

Importantly, stakeholder engagement enhances long-term sustainability and compliance. When communities and businesses understand their roles and feel included in the planning process, they are more likely to cooperate with regulations, participate in recycling programs, and support cost recovery mechanisms. Ongoing consultation further supports monitoring and performance improvement, helping the municipality maintain service standards, address emerging issues promptly, and ensure the continued success of the solid waste management system

7.3 Feedback Mechanisms

Establishing effective complaint and feedback mechanisms is essential to the sustainability of a municipal solid waste management plan. These systems provide residents, businesses, and other stakeholders with structured channels to report missed collections, illegal dumping, damaged bins, irregular service schedules, or environmental and health concerns. By enabling two-way communication, the municipality demonstrates responsiveness and accountability, which strengthens public trust and encourages continued cooperation with waste management policies such as segregation of waste at source and timely payment of service fee.

A well-designed feedback system should be accessible, inclusive, and easy to use. This may include a dedicated telephone hotline, online reporting platform, mobile application, suggestion box at municipal office, and community liaison officers and/or at ward level. Clear procedures must be established for logging, categorizing, and responding to complaints within defined timeframes. Tracking data on the number, type, and frequency of complaints allows the municipality to identify recurring operational issues, service gaps, or contractor performance problems and address them systematically.

Beyond resolving individual complaints, feedback mechanisms serve as valuable monitoring and evaluation tools. Regular analysis of community satisfaction levels helps the municipality measure service quality, assess the effectiveness of collection systems, and inform adjustments to routes, infrastructure placement, or public awareness campaigns. Publishing periodic performance reports and sharing improvements made in response to feedback further enhances transparency. Ultimately, a structured and responsive feedback system supports continuous improvement, strengthens community engagement, and contributes significantly to the long-term sustainability and success of the solid waste management plan

7.4 Social Inclusion and Gender Integration

Social inclusion and gender integration are critical components of a sustainable solid waste management plan. A municipality must intentionally identify and engage vulnerable and marginalized groups to ensure that waste services are equitable, accessible, and responsive to different social and economic realities. Failure to consider these groups can result in unequal service delivery, health risks, and exclusion from economic opportunities within the waste value chain.

Key vulnerable groups often include low-income households, particularly those living in informal settlements where access to regular waste collection may be limited. These communities may face higher exposure to illegal dumping, unmanaged waste, and associated health hazards. Women, especially female-headed households, are also an important group to consider, as they are frequently responsible for household waste management and may be disproportionately affected by poor services. Ensuring their participation in consultations and decision-making processes helps design systems that reflect household realities and time burdens.

The informal sector, including waste pickers and recyclers, represents another critical group. Many depend on waste recovery activities for their livelihoods but often operate without formal recognition, social protection, or safe working conditions. Integrating them into the formal waste management system through cooperatives, contracts, or material recovery facilities can improve both social protection and recycling outcomes. Youth and unemployed individuals are also important stakeholders, as waste management initiatives can provide green job opportunities and entrepreneurship pathways.

Persons with disabilities and elderly residents must also be considered in service design. Collection systems, skip bin placement, and communication materials should be accessible and inclusive to ensure that all residents can participate in waste segregation and disposal programs. Language barriers and literacy levels should be addressed through clear, culturally appropriate communication strategies.

By identifying and integrating vulnerable groups into planning, implementation, and monitoring processes, the municipality promotes equity, enhances social acceptance of the waste management

system, and strengthens overall sustainability. Social inclusion and gender integration not only reduce environmental health risks but also create inclusive economic opportunities and foster shared responsibility for maintaining a clean and healthy municipality.

8. Financial Strategy

A strong financial strategy is essential to ensure that the solid waste management (SWM) system in Kiambu Municipality is efficient, reliable, and sustainable over the short, medium, and long term. The strategy should focus on diversified revenue sources, improved cost recovery, strategic partnerships, and realistic financial projections to support infrastructure expansion and service delivery improvements.

8.1 Revenue Sources

Kiambu Municipality should adopt a diversified funding model to reduce reliance on a single income stream. Core funding should come from county government budget allocations to cover essential public services such as street sweeping and municipal waste collection. In addition, user fees charged to commercial establishments, markets, industries, and institutions should form a significant and predictable revenue base. Fee structures may be differentiated according to waste generation levels and property categories.

Private sector investment can be mobilized through service contracts, franchising, and investment in recycling and composting infrastructure. Donor support and climate-related funding mechanisms can also be explored, particularly for projects that promote circular economy principles and environmental protection. Grants or concessional loans from development partners may help finance initial capital-intensive investments.

8.2 Cost Recovery Strategy

To enhance financial sustainability, Kiambu Municipality should implement a structured cost recovery framework. This includes reviewing and rationalizing existing user fees to reflect the actual cost of service delivery while ensuring affordability for vulnerable groups. A tiered tariff system—where large waste generators such as supermarkets, industries, and institutions pay higher fees—can improve equity and revenue adequacy.

Strengthening billing and collection systems is equally important. Integrating waste fees into property rates or utility bills can increase payment compliance. The municipality should also reduce revenue leakages through digital payment platforms, transparent accounting systems, and strict enforcement measures against non-payment. Public awareness campaigns can help residents understand how their contributions improve service quality.

8.3 Public-Private-People Partnerships (PPPPs)

Kiambu Municipality can leverage Public-Private-People Partnerships to mobilize capital, expertise, and community participation. Under PPPP arrangements, the municipality provides regulatory oversight and enabling infrastructure, private investors finance and operate facilities, and community groups participate in segregation and recycling initiatives.

Potential PPPP projects include the development of material recovery facilities (MRFs), composting plants for organic waste, recycling plants, and waste-to-energy initiatives. Engaging organized waste picker groups and youth enterprises within these partnerships promotes social inclusion while strengthening recycling rates. Clear contractual frameworks, risk-sharing arrangements, and performance-based payment systems are essential for successful partnerships.

8.4 Financial Projections

Short-term (1–3 years) financial planning should focus on priority investments such as waste collection vehicles, bins, transfer stations, route optimization systems, public awareness campaigns, and staff recruitment and training. These investments are critical to improving immediate service coverage and efficiency.

Medium- to long-term projections (5–10 years) should account for infrastructure expansion, including landfill upgrading or rehabilitation, establishment of recycling and composting facilities, fleet replacement programs, and digital monitoring systems. Population growth, urban expansion, inflation, and regulatory requirements must be factored into cost forecasts.

The municipality should prepare detailed capital expenditure and operational expenditure estimates, alongside projected revenues under different tariff and growth scenarios. Scenario analysis can help decision-makers understand funding gaps and identify financing strategies early.

Overall, a well-structured financial strategy for Kiambu Municipality will ensure that solid waste management services are adequately funded, progressively expanded, socially inclusive, and environmentally sustainable over the next decade.

9. Monitoring and Evaluation

A robust monitoring and evaluation (M&E) framework is essential to ensure that the municipality's solid waste management (SWM) plan remains effective, accountable, and responsive to changing conditions. Monitoring enables the municipality to measure operational efficiency, environmental performance, financial sustainability, and service coverage, while evaluation helps determine whether strategic objectives are being achieved. Together, these processes support evidence-based decision-making and continuous improvement.

9.1 Key Performance Indicators (KPIs)

Clearly defined and measurable Key Performance Indicators (KPIs) should be established to assess progress and performance.

a) Operational indicators may include the total amount of waste collected per day, collection coverage rates across all wards, and frequency of collection services.

b) Environmental performance indicators should measure the percentage of waste diverted from landfills, the total volume of waste recycled or composted, and reductions in illegal dumping incidents.

c) Service reliability indicators such as equipment availability, fleet downtime, and response time to complaints are equally important in evaluating operational efficiency.

d) Financial indicators such as cost recovery rates and revenue collection efficiency can also be incorporated to assess sustainability.

All KPIs should have defined baselines, annual targets, and responsible departments to ensure accountability.

9.2 Monitoring Mechanisms

To effectively track performance, Kiambu municipality should establish structured monitoring mechanisms. These may include daily operational logs, weighbridge data at disposal sites, route tracking systems, contractor performance reports, and periodic field inspections. Digital data management systems can enhance accuracy and timeliness of reporting.

Regular reporting frameworks—monthly operational reports, quarterly performance reviews, and annual public reports—should be institutionalized. Community feedback systems and satisfaction surveys can complement technical monitoring by capturing service user experiences. Internal audits and supervisory reviews further ensure data integrity and compliance with established standards.

10. Periodic Reviews and Updates

The SWM Plan should not remain static. Periodic reviews—ideally every 3–5 years—are necessary to respond to population growth, urban expansion, evolving waste composition, policy changes, and technological advancements. These reviews should assess whether targets are being met, identify emerging challenges, and recommend adjustments to infrastructure, service models, or financial strategies.

Stakeholder consultations should form part of the review process to ensure the plan remains inclusive and aligned with community needs. Updating the SWM Plan based on monitoring results and new developments ensures long-term relevance, resilience, and sustainability of the municipality's waste management system.

11. Implementation Timeline

Key Area	Key Activities / Indicators	Target / Benchmark	Data Source / Method	Timeframe	Responsible Entity
Improve Collection Systems	- % of households and businesses covered by collection services - Efficiency of	95% coverage of municipality; reduced	Collection logs, GPS tracking of trucks, field inspections	0-3 years	Private waste collectors / Municipal Environment Dept

Key Area	Key Activities / Indicators	Target / Benchmark	Data Source / Method	Timeframe	Responsible Entity
	waste collection (kg/household/day)	missed collections			
Awareness Campaigns	- Number of campaigns conducted - % increase in community participation in segregation and recycling	4 campaigns per year; 20% increase in participation	Attendance records, surveys, school & market reports	0-3 years	Municipal Manager, Municipal Environment Dept
Initial Infrastructure Upgrades	- Number of transfer stations established - Number of skip bins distributed and functional	1 transfer stations; 15+ skip bins strategically placed	Field inspections, distribution logs	0-3 years	Municipal Manager, Municipal Environment Dept
Expand Treatment Capacity	- Tons of organic waste composted / digested - Tons of dry recyclables processed at MRFs - Functionality of recycling facilities	Composting: 30% of organic waste; MRF: 40% of dry recyclables recovered; 1 operational recycling facility	Facility reports, MRF intake records, audits	3-5 years	Compost Facility Operators / MRF Operators / County SWM Dept
Full Recycling Implementation & Waste Diversion	- % of total waste diverted from landfill through recycling or composting - Types and volume of materials recovered (plastics, metals, paper, glass)	50–60% diversion from landfill	MRF reports, recycling facility records, audits	5 years +	Private collectors / Municipal Environment Dept
Advanced Treatment Technologies	- Adoption of anaerobic digestion, pyrolysis, or waste-to-energy for non-recyclable waste - Efficiency and	Pilot projects operational; energy recovery >10% of non-recyclable waste	Facility reports, energy output logs, technical audits	5 years +	Municipal Environment Dept

Key Area	Key Activities / Indicators	Target / Benchmark	Data Source / Method	Timeframe	Responsible Entity
	output of recovered energy				

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