NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

THE NATIONAL SOLID WASTE MANAGEMENT STRATEGY

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FOWARD

Accumulated waste deposits are an indication of societal lifestyles, waste management practices and production technology. Some societies at the peak of their development have stagnated due to inadequate management of their waste leading to proliferation of disease; environmental degradation and ultimate impact on livelihoods. Improper management of waste poses a threat to Climate Change and eventually in the achievement of sustainable development. Waste being one of the contributors of greenhouse gases, affects climate change and it is for this reason that as a country, we should develop sustainable waste management technologies and initiatives to cub this growing global challenge.

Through our commitment to sustainable development, Kenya aims to balance the broader economic and social challenges of development and environmental protection. For this reason the country subscribe to the vision of a prosperous and equitable society living in harmony with our natural resources. This is also reinforced in the constitution under the fundamental right to a clean and health environment. Sound environmental management entails use of waste reduction technologies in production, sustainable product design, resource efficiency and waste prevention, re-using products where possible; recovering value from products. Although, elimination of waste entirely may not be feasible, systematic application of modern waste management systems should be explored and implemented.

The challenge of waste management affects every person and institution in society. The measures set out in this strategy cannot be undertaken without a collective approach to waste challenges, and the involvement of a broad range of stakeholders in their implementation. This National Solid Waste Management Strategy (NSWMS) seeks to establish a common platform for action between stakeholders to systematically improve waste management in Kenya. It is for this reason that NEMA with other stakeholders undertook an assessment of waste management practices in five municipalities namely; Kisumu, Eldoret, Thika, Mombasa and Nakuru to form a basis on which this strategy was developed. The strategy lays the framework for improved waste management in the country.

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PREFACE

Every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the Environment. The Environment Management and Co-ordination Act 1999 is guided with among others the following principles of public participation in the development of policies, plans and processes for the management of the environment, the principle of intergenerational and intra-generational equity, the polluter-pays principle and the precautionary principle.

It is in this context that the vision 2030 recognized that efficient and sustainable waste management systems are required as the country develops into a newly industrialized state by 2030.In this regard, the vision 2030 set flagship projects for the five cities namely; Mombasa, Kisumu, Eldoret, Nakuru and Thika to have fully functional and compliant waste management system by developing strategies towards achieving sustainable waste management and a clean healthy environment for all.

Although only the county governments of these five municipalities were engaged in developing the strategy, it was observed that the waste challenges were similar in all other counties. Thus; these systems can be replicated in other counties countrywide.

It is with this spirit that the National Environmental Management Authority strived to develop this strategy which will assist the public and institutions involved to be a **7R** oriented society, by **R**educing; **R**ethinking; **R**efusing; **R**ecycling; **R**eusing; **R**epairing and **R**efilling their waste.

All the efforts were driven towards compliance with the Environmental Management and Coordination Act of 1999 and Environmental Management and Coordination (Waste Management) Regulations of 2006 in order to ensure a clean and healthy environment for all, keeping in line with the Article 42, of the Constitution of Kenya 2010.

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ACKNOWLEDGEMENT

The main guiding principle on the National Waste Management Strategy is **ZERO WASTE PRINCIPLE** whereby waste is a resource that can be harnessed to create wealth, employment and reduce pollution of the environment. Due to the poor state of affairs regarding the existing waste management facilities within the 47 Counties, NEMA developed minimum requirement points for management of the existing waste management facilities so as to continuously promote compliance with the waste management regulations within the counties. This initiative will lead the country to the preferred state having moved from the current situation which is wanting.

These minimum requirement points are on waste collection, transportation, disposal and licensing and were developed through a participatory process by five counties being Mombasa, Kisumu, Eldoret, Nakuru and Thika to help County Governments move towards full compliance of embracing sanitary landfills and other environmentally friendly waste management practices.

In achieving the aforementioned, the following taskforce members have managed to develop and harness the strategy into deliverable actions for the country so as to achieve a clean and healthy environment for all. Sincere gratitude goes to Mr. Benjamin Langwen – Former Director Compliance & Enforcement; Mr. Zephaniah Ouma-Ag. Director Compliance & Enforcement; Ms. Salome Machua-Deputy Director Enforcement; Ms. Margaret Njuki-Chief Compliance Officer; Mr. Samuel Munene (late)- Principal Compliance and Enforcement Officer; Mr. Dickson Njora- Principal Compliance and Enforcement Officer; Mr. Mwai Muitungu- Principal Compliance and Enforcement Officer, Ms. Jane Nyandika – Principle Compliance & Enforcement Officer; Ms. Immaculate Simiyu-Senior Compliance and Enforcement Officer; Ms. Maureen Njeri-Compliance and Enforcement Officer; Mr. Gideon Rotich-Compliance and Enforcement Officer; Ms. Elizabeth Ndungu, Ms. Peninah Nyasani and Ms. Salome Kiseve - Administrative Secretaries. Special thanks go to Felix Mugambi for his layout and Computer Graphic Design (DTP).

I want to also appreciate the NEMA management for their substantive guidance, advice and managerial assistance throughout the process.

PROF. GEOFFREY WAHUNGU
DIRECTOR GENERAL

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

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Acronyms

NEMA	National Environment Management Authority
EMCA	Environmental Management and Coordination Act 1999
CBD	Central business district
SWOT	Strength Weakness Opportunities Threats
NWMS	National Waste Management Strategy
JICA	Japan International Cooperation
HCW	Health Care Waste
POPs	Persistent Organic Pollutants
WEEE	Waste Electrical and Electronic Equipment
ICT	Information Communication Strategy
SWM	Solid Waste Management
SMEs	Small &Medium Enterprises
CSO	Civil Society Organizations
CBO's	Community Based Organizations
UNEP	United Nations Environment Programme
UN Habitat	United Nations Human Settlements Programme
PPEs	Personal Protective Equipments

CHAPTER 1

1.0 Introduction

All human activities generate waste which requires to be properly managed to protect human health and environment while enhancing aesthetics. This scenario is particularly evident in urban settlements which generate large quantities of solid waste due to high human population. The impacts of poor solid waste management within the urban settlements, particularly cities and big municipalities can be disastrous. As such there is need for proper and efficient waste management.

Kenya Vision 2030 recognizes the need for efficient and sustainable waste management systems to be established as the country develops into a newly industrialized state by 2030. In this regard the Vision 2030 identified Solid waste management for five cities and towns namely; Mombasa, Kisumu, Eldoret, Nakuru and Thika as one of the flagship projects. The National Environment Management Authority is expected to deliver this flagship project which falls within its mandate.

In implementing this flagship project, the Authority will be guided by the Environmental Management and Coordination (Waste Management) regulations of 2006, other relevant legislative frameworks and this National Solid Waste Management Strategy. In addition, the Authority in collaboration with the County Governments and the relevant stakeholders will develop modalities for achieving sustainable waste management systems. Although this Strategy will be piloted in the above five cities and towns, it shall be applied countrywide.

1.1 Purpose of the Strategy

The purpose of this National Solid Waste Management Strategy is to guide sustainable solid waste management in Kenya to ensure a healthy, safe and secure environment for all. The Strategy is a deliberate and visionary commitment for the country in the management of solid waste.

The guiding principle of this Strategy is to address the following:

- ***The Current situation (Where are we now?)***
- ***The Preferred state (Where do we want to go?) and***
- ***Implementation of the Strategy (How do we get there?)***

1.2 Legal Framework relevant to Solid Waste Management in Kenya

The legal frameworks highlighted below are relevant to solid waste management in Kenya;

Constitution of Kenya:

In the Constitution of Kenya, Article 42 on the 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 70."

Article 69 on Obligations to the Environment, the Constitution provides that –

(1) The State shall—

(d) encourage public participation in the management, protection and conservation of the environment;

(f) establish systems of environmental impact assessment, environmental audit and monitoring of the environment;

(g) eliminate processes and activities that are likely to endanger the environment; and

(h) utilise 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 shall be responsible for; refuse removal, refuse dumps and solid waste disposal.

Vision 2030

In Vision 2030, one of the flagship projects is the Solid waste management initiative which calls for relocation of the Dandora dumpsite and the development of solid waste management systems in five (5) leading municipalities and in the economic zones planned under vision 2030.

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 9 of EMCA, 1999 further states that –

"(1) The object and purpose for which the Authority is established is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment.

(2) Without prejudice to the generality of the foregoing, the Authority shall –
(a) co-ordinate the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plans, programmes and projects with a view to ensuring the proper management and rational utilization of environmental resources on a sustainable yield basis for the improvement of the quality of human life in Kenya;''

Section 86 of EMCA, 1999 provides that – ''The Standards and Enforcement Review Committee shall, in consultation with the relevant lead agencies, recommend to the Authority measures necessary to:-

(2) prescribe standards for waste, their classification and analysis, and formulate and advise on standards of disposal methods and means for such wastes; or
(3) issue regulations for the handling, storage, transportation, segregation and destruction of any waste.''

Section 87 of EMCA 1999 states that – ''(1) 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.
(2) No person shall transport any waste other than –
(a) in accordance with a valid licence to transport wastes issued by the Authority; and
(b)to a wastes disposal site established in accordance with a licence issued by the Authority.
(4) No person shall operate a wastes disposal site or plant without a licence issued by the Authority.
(5) 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 – ''Any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off such waste in the manner provided for under these Regulations.''

Regulation 5 on the Segregation of waste by a generator states that – ''(1) Any person whose activities generate waste, shall segregate such waste by separating hazardous waste from non-hazardous waste and shall dispose of such wastes in such facility as is provided for by the relevant Local Authority.''

The Occupational Safety and Health Act, 2007

The Occupational Safety And Health Act, 2007 Part IX, Chemical Safety, Section 83 Subsection IV states that at every workplace where chemicals or other toxic substances are manipulated, the employer shall develop a suitable system for the safe collection, recycling and disposal of

chemical wastes, obsolete chemicals and empty containers of chemicals to avoid the risks to safety, health of employees and to the environment.

The Public Health Act, 2012

The Public Health Act Revised Edition 2012, **Part 126. Rules under Part,** The Minister, on the advice of the board, may make rules and may confer powers and impose duties in connation with the carrying out and enforcement thereof on local authorities, magistrates, owners and others as to—(d) the drainage of land, streets or premises, the disposal of offensive liquids and the removal and disposal of rubbish, refuse, manure and waste matters

Section 134 - Rules for protection of food, The Minister, on the advice of the board, may make rules regarding all or any of the following matters—(h)the establishment, locality, supervision, equipment, maintenance and management of slaughterhouses and the disposal of the waste.

Section 118 - What constitutes nuisance-1. The following shall be deemed to be nuisances liable to be dealt with in the manner provided in this;

Part—(c) any street, road or any part thereof, any stream, pool, ditch, gutter, watercourse, sink, water-tank, cistern, water-closet, earth-closet, privy, urinal, cesspool, soak-away pit, septic tank, cesspit, soil-pipe, waste-pipe, drain, sewer, garbage receptacle, dust-bin, dung-pit, refuse-pit, slop-tank, ash-pit or manure heap so foul or in such a state or so situated or constructed as in the opinion of the medical officer of health to be offensive or to be injurious or dangerous to health.

Part (e) states that any noxious matter, or waste water, flowing or discharged from any premises, wherever situated, into any public street, or into the gutter or side channel of any street, or into any or watercourse, irrigation channel or bed thereof not approved for the reception of such discharge constitutes to be a nuisance.

Section 126 - Rules under Part, The Minister, on the advice of the board, may make rules and may confer powers and impose duties in connection with the carrying out and enforcement thereof on local authorities, magistrates, owners and others as to—**part (d)** the drainage of land, streets or premises, the disposal of offensive liquids and the removal and disposal of rubbish, refuse, manure and waste matters.

The County Governments Act, 2012

Section 120, Tariffs and pricing of public services, subsection (3) A tariff policy adopted under subsection (1) shall reflect following guidelines — **part (h)** promotion of the economic, efficient, effective and sustainable use of resources, the recycling of waste, and other appropriate environmental objectives.

The Environmental Management and Co-ordination (Water Quality) Regulations, 2006.

Part III – Water for Industrial Use and Effluent Discharge,
Sub section 11. No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit any person to dump or discharge such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards set out in the Third Schedule to these Regulations.

Part IV - Water for Agricultural Use

Sub section 19. No person shall be permitted to use wastewater for irrigation purposes unless such water complies with the quality guidelines set out in the Eight Schedule to these Regulations.

Part V – Water for Any Other Uses

Sub section 24 states that no person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive wastes, or other pollutants or permit any person to dump or discharge any such matter into water meant for fisheries, wildlife, recreational purposes or any other uses.

The Environmental (Impact Assessment and Audit) Regulations, 2003
This regulation defines "waste" includes any matter prescribed to waste and any matter whether liquid, solid, gaseous or radioactive, which is discharged, emitted or deposited in the environment in such volume composition or manner likely to cause an alteration of the environment.

Part II - The Project Report, 7. (1) A proponent shall prepare a project report stating –
(e) The materials to be used, products and by-products, including waste to be generated by the project and the methods of their disposal.
(f) The products, by-products and waste generated project.

Part IV - The Environmental Impact Assessment Study Report, 18. (1)A proponent shall submit to the Authority, an environmental contents of impact assessment study report incorporating but not limited to the environmental following information - (f) the products, by-products and waste generated project;

Part V - Environmental Audit and Monitoring 36, (2) an environmental audit report compiled under these Regulations shall contain - (b) an indication of the various materials, including non-manufactured materials, the final products, and by products, and waste generated.

Relevant MEAs:

Basel Convention on the ccontrol of transboundary movements of hazardous wastes and their disposal

Ban Amendment to the Convention on the Control of transboundary movements of hazardous wastes and their disposal

Convention on persistent organic pollutants

1.3 Scope of the Strategy

Solid waste management remains a major challenge in all the 47 counties in the country. Over the years most local authorities did not prioritize the establishment of proper waste management systems and hence the County Governments have inherited this state of affairs. This has led to the current poor waste management situation across the country. Although Vision 2030 has prioritized on the five cities and towns for implementation of sustainable solid waste management systems, this Strategy shall be applied countrywide

In an effort to address poor solid waste management, NEMA developed some minimum requirements as a baseline for implementation by the Counties. These included designation, securing and manning of the disposal sites, promotion of efficient collection and transportation of waste (see table 1). The basic requirements were expected to ensure continuous promotion of efficient solid waste management. This Strategy will therefore build on these on-going waste management efforts towards the attainment of full compliance and ensuring a clean and healthy environment.

It is proposed that this Strategy will cover a period of fifteen (15) years within the Vision 2030 framework and be reviewed every five (5) years in accordance with the medium term plans. With the full implementation of the Strategy, it is expected that the Country will have embraced environmentally sound waste management technologies and best practices.

Minimum requirements for Solid Waste Management

The County Governments are expected to implement the minimum requirements across the waste management cycle;

Waste collection

1. Ensure that the waste collection areas are zoned;
2. Ensure timely and regular collection of all solid wastes either through door to door collection or from centralized collection points;
3. Ensure waste collection facilities such as skips, bulk containers and waste cubicles are regularly emptied and do not become eye-sores;

Waste transportation

4. Ensure that all the collected waste is transported using NEMA licensed vehicles to designated disposal sites.

Waste disposal site

5. Ensure there is a designated site(s) for waste disposal
6. Ensure that the disposal site is secured with a fence and a gate manned by a county government official to control dumping and spread of waste outside the disposal site.
7. Ensure all incoming waste is weighed or estimated and the quantities recorded in tonnes
8. Develop and maintain motorable roads inside the site to ensure ease of access during disposal;
9. Ensure the waste is spread, covered and compacted at regular intervals
10. Put in place appropriate control measures for the management of dumpsite fires
11. Enhance security and control of the disposal sites so that illegal activities are contained.

Requirement for licensing

12. Ensure waste transportation vehicles have NEMA licences;
13. Obtain licences to operate waste disposal sites.

The County Governments will strive to ensure continuous improvement of collection methods, transportation and disposal facilities. Effective waste management systems will deliver a clean and healthy environment for all as granted by the Constitution of Kenya, 2010.

CHAPTER 2

2.0 CURRENT STATUS OF WASTE MANAGEMENT IN KENYA

2.1 Overview of current waste management

Kenya has a growing human population and an increase in urbanization. The urban centers have attracted a large population of informal settlements dwellers and the middle class. This urbanization and increased affluence has led to increased waste generation and complexity of the waste streams. This trend is compounded by growing industrialization of the Kenyan economy. Despite the existence of laws and policies guiding waste management, weak implementation and poor practices have led to towns and cities being overwhelmed by their own waste, consequently affecting public health and the environment.

Over the years waste management has been the mandate of the local Authorities. However, most local authorities did not prioritize the establishment of proper waste management systems and hence allocated meager resources for its management. Further the councils lacked technical and institutional capacities to manage waste. This has led to the current poor state of waste management which includes indiscriminate dumping, uncollected waste and lack of waste segregation across the country.

***Plate 13: Illegal d**umping on a road reserve -a common feature*

***Plate 14: poorly** managed disposal site*

Most towns and cities have inefficient waste collection and disposal systems. For instance, a study done for Nairobi indicates that about 30-40% of the waste generated is not collected and less than 50% of the population is served. (Habitat s). In Nakuru, it's estimated that 45% of the waste generated is collected and disposed at Giotto Dumpsite, 18% is recovered and the rest accumulate in the environmental.

Table 2: Summary of wastes generation, collection and recovery status in major towns

Name of town	Estimated Waste generated (tons/day)	% Waste collected	% waste Recovery	Uncollected waste
Nairobi	2400	80%	45%	20%
Nakuru	250	45 %	18%	37%
kisumu	400	20%	Unknown	Unknown
Thika	140	60%	30%	40%
Mombasa	2200	65%	40%	35%
Eldoret	600	55%	15%	45%

Waste transportation is largely rudimentary using open trucks, hand carts, donkey carts among others. These poor transportation modes have led to littering, making waste an eye-sore, particularly plastics in the environment. However, some counties have adopted appropriate transportation trucks as stipulated by the Waste Management Regulations. In addition County Governments have privatized waste transportation through Private Public Partnership arrangements.

Disposal of waste in the country remains a major challenge as most of the counties lack proper and adequate disposal sites. The few towns that have designated sites practice open dumping of mixed waste as they lack appropriate technologies and disposal facilities. In an effort to address this situation NEMA directed all county governments to designate areas of waste disposal and undertake basic actions to manage the sites including fencing, manning and weighing of the waste.

2.2 Types of waste streams and their management

There are various waste streams generated in Kenya, that can be categorized as domestic, municipal, industrial and hazardous wastes. Other emerging waste streams, such as e-waste, waste tyres are as a result of growing industrialization and growth of ICT. The composition of general waste varies considerably between households, businesses and industries.

2.2.1 Domestic waste:

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

2.2.2 Waste Tyres:

Waste tyres is an emerging waste stream that has reached their end of life due to wear or damage and cannot be recycled or reused. There are no established formal systems for collection and recycling of tyres with the exception of retreading. As such the bulk of the tyres are informally collected and often illegally burnt in the open to recover steel for recycling. This emits harmful gases causing air pollution and soil contamination arising from the residues.

Currently only two facilities in the country are using waste tyres as fuel and for producing industrial diesel oil (IDO). To address the management of waste tyres, NEMA has developed relevant regulations which are awaiting gazettement.

2.2.3 Construction and demolition waste:

This is waste that is generated as a result of new construction works, remodeling or demolition. Construction waste comprises debris, steel, timber, iron sheets, tiles and ceramics among others. Although construction and demolition waste is not classified as hazardous, it is a mixed waste source that requires separation into component parts for the purposes of recycling. These wastes currently end up in the disposal sites or are used for backfilling in our road networks.

Asbestos Waste

Demolition wastes may include asbestos which is hazardous and can present a significant health risk when improperly disposed or reused. NEMA has developed guidelines on safe management and disposal of Asbestos.

2.2.4 Industrial waste:

Industrial waste is the waste produced by industrial activity which includes any material that is rendered useless during a manufacturing process. Industries produce both hazardous and non-hazardous waste. These wastes include chemical solvents, paints, sand paper, paper products, industrial by products, metals, municipal solid waste and radio-active waste.

Currently, most of the hazardous industrial waste is not pretreated before reuse, recycling or disposal. This poses health risks to the handlers and causing damage to the environment. Disposal of hazardous industrial waste illegally occurs at the municipal dumpsites.

However some industries have embraced best practices in disposing industrial waste by seeking guidance from NEMA on appropriate disposal methods.

2.2.5 Biomedical Waste

Biomedical waste also referred to as medical waste refers to waste generated in health facilities, research institutions or during immunization of human beings and animals. It's classified into; Infectious waste, sharps, pharmaceutical wastes, chemical waste and pathological waste. Biomedical wastes pose risks to human health due to its pathogenic characteristics and hence require prior treatment before disposal.

Currently, segregation is fully embraced in most hospitals and clinics based on the guidelines issued by the Ministry of Health. Although the biomedical waste is expected to be disposed through incineration, some find its way to the municipal dumpsites while some is handled through rudimentary facilities such as kilns. While big hospitals have embraced proper biomedical waste management, the major challenge remains the small clinics which practice illegal disposal of these wastes.

So far, NEMA has licenced 15 incinerators countrywide both in government institutions and private which have complied with the provisions of the Third schedule of the Waste Management Regulations of 2006. Although the licenced incinerators are few they are not operating at optimal capacity and hence other medical facilities are encouraged to share.

2.2.6 E-waste:

E-waste is an emerging waste stream arising from Electrical and Electronic Equipments (EEEs) becoming obsolete at the end of life. Kenya has experienced a rapid increase of e-waste due to adoption of ICT across all sectors and an influx of low quality EEEs. E-waste comprises of heavy metal components and materials used in the manufacture of electronic goods. Some of these include mercury, brominated flame retardants, and cadmium which are considered hazardous if not well handled during dismantling or recycling can become harmful to human health and the environment.

As a country, limited infrastructure has been put in place to deal with e-waste. NEMA has developed E-waste Regulations which will assist the country in regulating e-waste by registering producers, licensing of recyclers and preventing entry of sub-standard EEEs. In addition the Regulation has extended responsibility to producers to bare cost of recycling of the products commonly known as *extended producer responsibility*. Currently there are two licenced facilities in the Country which are undertaking e-waste management.

Batteries:

Batteries can either be alkaline (dry cells) or acid based which support domestic and industrial applications. The acid based (rechargeable and silver oxide) batteries contain heavy metals such as mercury and cadmium which are classified as hazardous substances. This hazardous material if not properly handled and disposed presents a risk the human health and the environment.

Currently, there are no recycling or disposal facilities for alkaline, rechargeable and silver oxide batteries. As such the batteries are disposed in the open dumpsites alongside domestic waste. On the other hand, lead-acid batteries which are also considered hazardous waste are recyclable and by February 2015 NEMA had licenced two facilities for their recycling.

2.2.8 Fluorescent Lamps:

Fluorescent lamps are used for illumination and contain a small amount of mercury. The mercury is a neurotoxin and can be harmful even in small quantities. Fluorescent lamps can be successfully recycled and the mercury recovered. However, if poorly handled at any stage this releases the mercury which is hazardous. Increasingly people are adopting florescent lamps as energy saving devices across the country which is likely to compound the challenge of their disposal. So far NEMA has licenced one facility for recycling florescent lamps.

2.2.9 Pesticide Waste:

Pesticides are chemicals used to control pests. Pesticide waste consists of expired and contaminated pesticides as well as the used containers. Due to their toxicity, potential to pollute and threat to human health, pesticide wastes are extremely hazardous and must be transported, treated and disposed off accordingly. These pesticides can contain persistent organic pollutants (POPs), which can accumulate in the food chain if not well managed. Larger scale generators of pesticides waste incinerate or export the waste to developed countries for treatment or disposal. However small scale generators dispose in their farms.

2.2.10 Used Oil and Sludge:

Used Oil and Sludge arises from the use of petroleum products. This contains potentially hazardous compounds such as poly-aromatic hydrocarbons that have carcinogenic and mutagenic properties. Used oil and sludge have a slow rate of decomposition and hence any spillage can accumulate in the environment causing soil and water pollution. This waste is currently recycled to produce lubricants and industrial oil used in furnaces and boilers. Though illegal, used oil is also largely applied in the treatment of timber and dust suppression.

NEMA has developed guidelines for the management of used oil and sludge and has licenced a few used oil and sludge handlers.

2.2.11 Sewage Sludge:

Sewage sludge is a sediment material that accumulates over time in the sewage treatment plants and ponds. The widespread disposal of industrial effluent via sewage treatment works results in contamination of sewage sludge with hazardous chemicals, thereby posing particular challenges for its disposal. Sewage sludge that is contaminated by heavy metals from industrial effluent can severely contaminate agricultural land to which it is applied. However, a high proportion of the contaminated sewage sludge continues to be disposed in dumpsites. In this regard there is need to pre-treat contaminated sewage sludge before disposal. Uncontaminated sewage sludge has a variety of commercial uses and can be recycled.

2.3 Current Waste Management Practices

2.3.1 Waste Segregation

Most of the waste is generated at household, market places, cities, towns, institutions and industrial zones

- Very few households segregate waste at the household level
- There is minimal waste segregation at source within the CBD areas, industries, institutions in most towns/cities
- There is considerable segregation of biomedical waste
- Recovery of recyclable items like plastics, papers, glass and metals is done by a increasing number of informal groups

2.3.2 Collection and Transportation

- Waste in the CBDs is largely collected by the County Governments while private operators dominate collection in residential areas at a fee
- Waste collection in low income and informal settlements is mainly done by organized groups and CBOs
- Waste collectors obtain permits from the County Governments to collect waste from designated areas

Plate 15: An example of a Non-compliant waste transportation truck in a Section of Nairobi

- NEMA issues annual licences to waste transporters in accordance with the provisions of the waste management regulations of 2006. However some waste transportation vehicles operate illegally as they do not meet NEMA requirements.

2.3.3 Waste Treatment

- Waste treatment technologies have not been fully embraced in the country however there are on-going efforts to enhance waste treatment practices.
- Recyclable materials comprise 50 – 80% of the general waste stream;

- Several industries exist that receive recovered materials such as paper, polythene, plastics, glass, scrap metals, used oil, e-waste and waste tyres for recycling. There is low public awareness of these facilities and hence majority have not achieved optimal operations;
- A few composting facilities exist especially in horticultural farms;
- Thermal treatment of waste by use of incinerators and cement kilns is increasingly being adopted. However, most incinerators do not comply with the requirements of the Third Schedule of the waste management regulations of 2006;

2.3.4 Waste Disposal

- Most of the municipal and domestic waste generated is disposed off in open dumpsites across the country. Although this is not a recommended practice it is the most common practice
- Biomedical waste is largely disposed through incineration and rudimentary kilns;
- Condemned, damaged or expired goods are disposed through incineration or in the cement kilns
- The existing incineration facilities have been largely burners and kilns and do not meet the requirements stipulated the Third schedule of the waste management regulations of 2006
- Most of workforce operating these disposal sites have minimal or no training on how to manage these facilities.

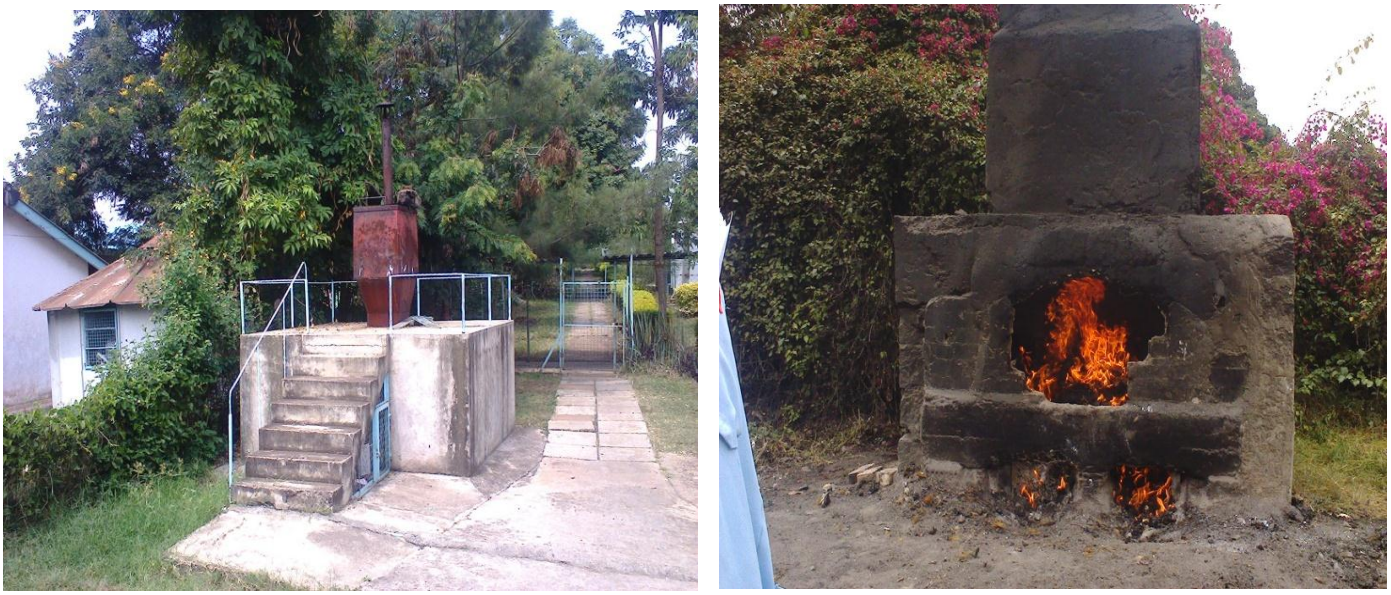


Plate 16: Examples of non-compliant burners or kilns in use in the Country

Plate 17: A poorly maintained open dumpsite

2.4 Challenges in Waste Management

Waste management in Kenya has remained a major challenge due to diverse factors. This range from problems associated with waste management systems, limited knowledge, attitude and practices, political will, technical and financial resources.

Lack of awareness and knowledge: There is limited awareness and knowledge on the importance of a clean and healthy environment. This has led to poor practices by the Public towards waste management which has led to environmental pollution. As such there is poor handling of waste at the household level including lack of segregation, reuse, reduce and recycling. In addition, negative attitude towards waste management and failure to take individual responsibility has contributed to poor practices such as littering, illegal dumping and open burning.

Political influence and lack of good will: Political good will is key to the ultimate success of proper waste management in the country. Unfortunately, the waste management agenda has not been prioritized , leading to poor investments and funding.

Disposal sites: Availability, siting and management.

The county governments are expected to designate waste disposal sites/facilities within their areas of jurisdiction. However, the availability of public land for the purpose of a disposal site remains a challenge. In situations where the land is available, the neighboring communities are opposed to it being in their backyard. This is as a result of poor management of the existing sites. This has culminated in dumpsites being sited on environmentally sensitive areas such as river banks, forests and wetlands.

Funding: Lack of prioritization for waste management in the counties has led to inadequate budgetary allocation. As a result management of the entire waste management cycle (collection, transportation and disposal) is hampered. Low funding has also affected investment in waste management facilities and equipments.

High poverty levels: High poverty level especially in informal and low income settlements has compromised the ability to pay for waste management services. This has led to lack of collection leading to illegal waste dumping in undesignated areas sites, streams, rivers and highways. The situation is further compounded by lack of access and waste management infrastructure.

Lack of segregation: There is lack of waste segregation at source leading to mixed wastes which are collectively disposed off in the dumpsites. Where sorting is done, the problem is compounded by the lack of compartmentalized vehicles for transportation of the sorted waste leading to the remixing. This hampers material recovery, reuse, and recycling. The sorting has largely been relegated to the lowly in society such as the waste pickers and street urchins.

Limited technical competencies: As a Country, we are faced by limited technical competencies in waste management. This has led to poor management of our waste management facilities and equipment and their failure to attain optimal operating capacities.

Slow adoption of modern technological options: Although there are many waste management technologies in the country, there has been low adoption of the same by the relevant practitioners. This as a result of diverse factors including inadequate financial resources to purchase the equipments, lack of incentives including tax waivers, resistance to change, lack awareness, unavailability of land and weak enforcement.

Table 4: Challenges associated with waste management systems

Aspect	Challenge	Root cause
Waste generation	Increased generation of waste	Increase population, change of consumption patterns.
Collection and transportation	Low coverage of waste collection services	Inaccessible roads, lack of payment for waste services, lack of zoning of waste collection areas
	Irregular collection	Inadequate transportation trucks, poor scheduling of waste collection and transportation, low budgetary allocation for operations
	Inappropriate transportation trucks	Low investment in acquisition of compliant waste trucks
	Un-regulated waste collection fees	Lack of a clear policy on waste management services.
Disposal method	Open dumping	Lack of appropriate waste disposal infrastructure Irregular or lack of collection service Long distances to the existing dump-sites
	Inappropriate siting of a dumpsite	Proximity to environmentally sensitive areas, conflict with standards of existing establishments (airports, designated wildlife corridors), Lack of acceptability by the host communities, unavailability of land
Waste recovery	Lack of segregation	Lack awareness and negative attitude towards waste segregation, lack of proper waste management systems to support segregation, lack of linkage between the waste pickers and the formal recycling facilities
	Poor quality of recovered materials	Contamination due to mixing of waste

	Lack of appropriate technologies	Lack of intermediate technologies (cleaning, pelleting etc.)
Legal requirements and enforcement	low compliance to Environmental legislation	Weak enforcement and lack of awareness on the legislations

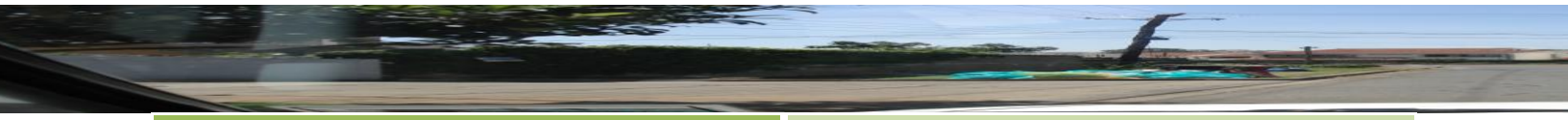
2.4 SWOT Analysis:

This section analysis the full scope of the situational analysis of waste management in Kenya by identifying the strengths, weaknesses, opportunities and threats (SWOT) in order to form a basis for our way forward.

The table below provides this detailed analysis;

Table ...: SWOT Analysis

STRENGTHS:	WEAKNESSES:
• County Governments are aware of their obligations on waste management • County Governments have established Environmental units headed by a County Executive Committee Member (CECs) • Most County Governments have designated waste disposal sites • County Governments are increasingly investing in waste management systems and equipments • County Governments are aware of the role of NEMA and the existing environmental laws • There are by-laws governing waste management in the counties • To date, NEMA has licenced several waste management facilities to address diverse waste streams • The public is increasingly becoming aware of their rights to a clean and healthy environment and hence agitating for environmental services by the County Governments • The County Governments and the general public are increasingly embracing waste management systems (segregation, collection, transportation, recovery and disposal) • There is a growing public-private-partnership in waste management investments and initiatives	• Low priority to waste management leading to low budgetary allocations • Inadequate trained personnel • Inadequate political good-will at National and County levels • Waste disposal not recognized as a land use hence is limited or no land set aside for waste management • Poorly managed disposal sites • Inadequate/ poor maintenance of machinery and equipments • Inappropriate location of disposal sites • Poor public perceptions/ attitude on individual responsibility towards waste management • Tolerance to living in a dirty environment • Intolerance to the establishment of new waste management facilities by potential host communities • Political patronage against siting of waste management facilities • Poor infrastructure in informal settlements hindering waste collection • Land grabbing of land set aside for dumpsites • No modern waste management facility developed to date e.g. Sanitary landfill
OPPORTUNITIES:	**THREATS:**



• **Increase involvement of the private sector** • **Employment opportunities in waste management through diverse waste based enterprises (waste as a resource by recovery)** • **External financial resources from development partners and investors** • **Investment opportunities in recycling, energy recovery, composting, incineration** • **Adoption of emerging technologies in waste management** • **Increased public awareness on waste management and related opportunities** • **Opportunity to implement the existing environmental regulations**	• Grabbing of disposal sites • Vandalism of security fences and equipments on dumpsites • Civil strife damaging waste management structures • Insecurity at disposal sites due to existence of illegal gangs • Land use conflicts between waste management and other competing uses • Political interference and patronage

CHAPTER 3

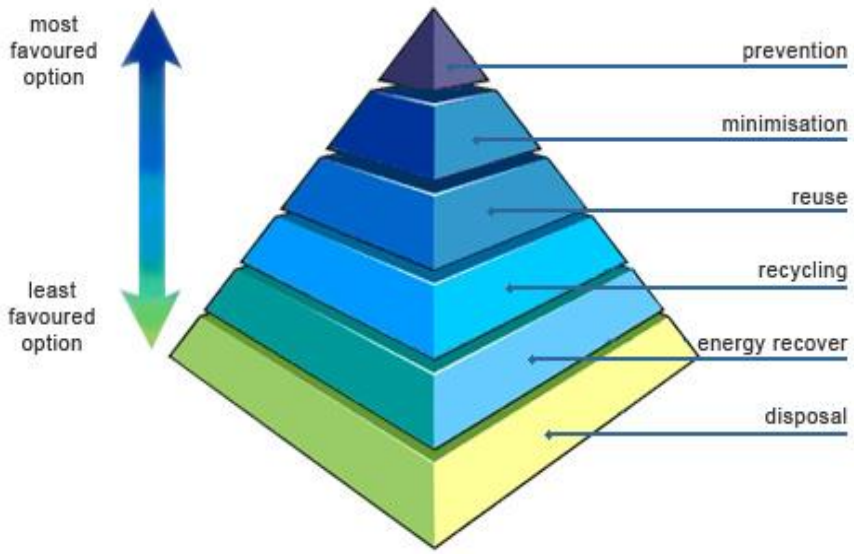
3.0 THE PREFERRED STATE OF WASTE MANAGEMENT IN THE COUNTRY

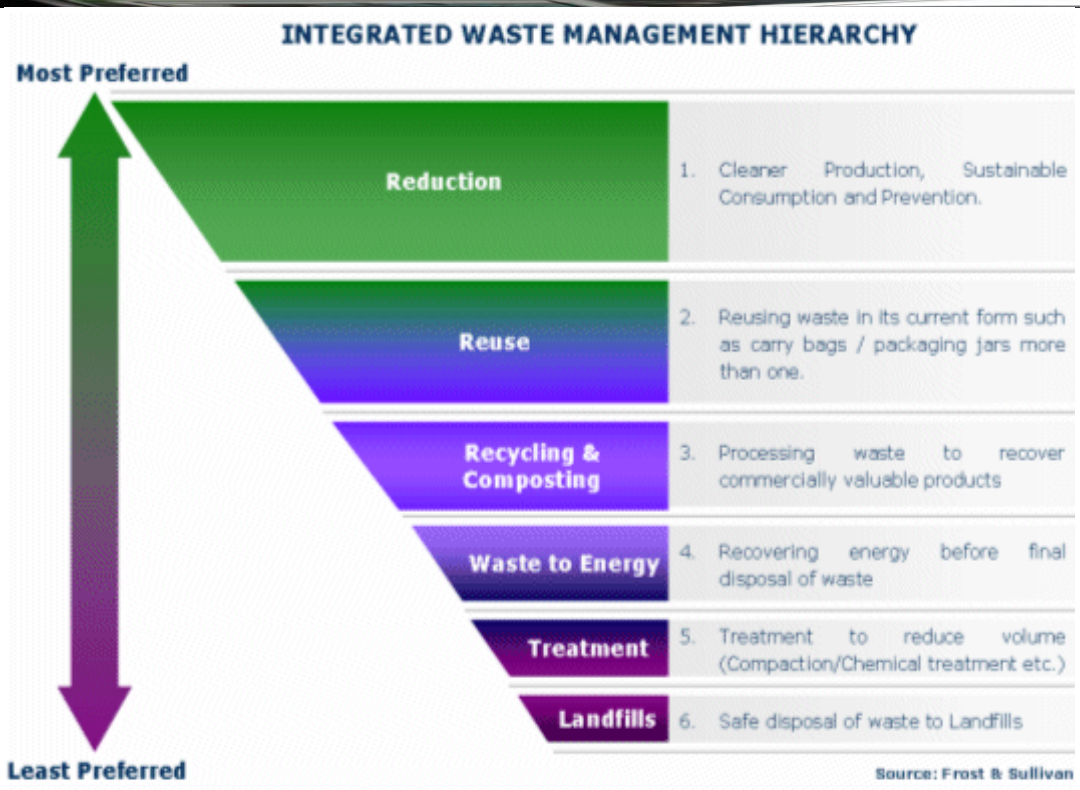
The overall aim for solid waste management is protection of human health and the environment in a manner that is affordable, environmentally friendly and socially acceptable. To achieve this there is need to adopt the principle of integrated solid waste management. In the current dispensation, county governments are charged with the management of waste in their jurisdictions.

3.1 Integrated Solid Waste Management

The solid waste management hierarchy is an integrated approach to protecting and conserving the environment through implementation of various approaches of sustainable waste management. It establishes the preferred order of solid waste management alternatives as follows: waste reduction, reuse, recycling, resource recovery, incineration, and landfilling.

Figure 3: The Solid Waste Management Hierarchy





Adopted from various sources by NEMA, 2014

3.2.1 Waste avoidance and reduction

Waste avoidance and reduction is the foundation of the waste hierarchy and is the preferred choice for waste management measures. The aim of waste avoidance and reduction is to achieve waste minimization and therefore reduce the amount of waste entering the waste stream.

3.2.2 Recovery, re-use and recycling

Recovery, re-use and recycling comprise the second step in the waste hierarchy. Recovery, reuse and recycling are very different physical processes, but have the same aim of reclaiming material from the waste stream and reducing the volume of waste generated that moves down the waste hierarchy.

3.2.3 Disposal

Disposal is any operation that involves the dumping and incineration of waste without energy recovery. Before final disposal, a considerable amount of pretreatment may be necessary to change the characteristics of the waste in order to reduce the quantity or harmfulness of the waste. Landfills are the most common form of waste disposal but the least preferred option in the waste hierarchy.

3.3 The Waste Management Cycle and the ideal approaches:

The waste management cycle comprises ;

- Waste generation
- Waste collection
- Waste transportation
- Waste treatment
- Waste disposal

3.3.1 Waste Generation

Most of the waste is generated at household, market places, cities, towns, institutions and industrial zones. Ideally;

- The waste generator should endeavor to minimize waste by reducing, reusing, refusing, returning waste or by adopting cleaner production technologies;
- All waste generated should be segregated at source;
- The County Governments and the licenced service providers should provide colour coded bags or bins as per the NEMA guidance for the segregated waste;

3.3.2 Waste Collection

- Waste collection is the main point of interface between the public and waste service providers who are either the Government or the private sector.

- Collection centers/transfer stations should be established at strategic areas within a town .They should be fully equipped with waste receptacles which should either be colour coded or labeled with the specific waste stream to promote waste segregation.
- All waste collection centers should be zoned/ designated by the County Governments.
- These collection areas should be properly managed and maintained with frequent and timely collection of waste to avoid scattering into undesignated areas.

- Adequate measures should be put in place to manage any leachate from the waste receptacles and collection areas;
- The County Governments should embrace Public-Private-Partnerships with organized groups to enhance waste collection within the informal settlements and low income areas.

Plate 18: A modern waste collection center in a site in Northern Ireland

3.3.3 Waste Transportation

- The County Governments should provide adequate transport for the various segregated waste streams;
- The waste transportation trucks should be closed and suitable for the transportation of the various waste streams to the waste treatment facilities and landfills;
- The trucks waste trucks should be regularly serviced and maintained to avoid littering of waste;
- All waste transportation vehicles should be licenced to operate by NEMA.

Plate 19: A well designed waste transportation vehicle in use in Denmark

3.3.2 Waste Treatment

The following waste treatment technologies are highly recommended to enable the Country achieve reduction of waste directed to landfills and other disposal facilities.

3.3.2.1 Material recovery technologies

3.3.2.1.1 Recycling

Recycling is the processing of waste material into a new product of similar chemical composition.

- Recycling prevents wastage of potentially useful materials, reduces the consumption of fresh raw materials and energy usage in addition to reducing pollution.
- Kenyans should embrace full recycling of all recyclable materials to reduce the amount of waste being disposed at the landfill.

3.3.2.1.2 Composting

Composting is the biological decomposition of biodegradable solid waste under controlled aerobic conditions to produce compost

- Compost is used as an organic fertilizer in agricultural production
- Kenyans should strive to compost all their organic wastes to reduce on organic waste ending at the landfill.

3.3.2.2 Waste to energy/ Energy recovery technologies

3.3.2.2.1 Thermal treatment of waste:

Thermal treatment is the combustion of waste at specific temperatures with or with no air-supply as part of the process and includes waste incineration, gasification and pyrolysis. The unreusable and unrecyclable wastes can be subjected to thermal treatment which is an environmentally sound technology that reduces the volume of waste and inerts any hazardous components. At the same time energy can be recovered as an end product.

a) Waste Incineration:

Incineration is controlled burning of solids, liquids and gaseous waste.

- The technology is applicable in the management of both hazardous waste streams as well as municipal solid waste.
- Incineration should be undertaken in facilities that meet the requirements in the Third schedule of the Environmental Management and Coordination (Waste management) Regulations of 2006.

b) Gasification:

c) Gasification is a process of reacting waste at high temperatures greater than (>700 °C), without combustion, with a controlled amount of oxygen and/or steam to generate useful products such as electricity, chemicals, fertilizers and natural gas. This could be an important option in landfills. ***Pyrolysis:***

- Pyrolysis is a form of treatment that chemically decomposes organic materials by heat in the absence of oxygen. Pyrolysis typically occurs under pressure and at operating temperatures above 400-500 degrees Celsius. It is affordable??

Recommendation: This National Solid Waste Management Strategy highly recommends thermal treatment of waste as it leads to the generation of useful products besides waste treatment.

3.3.2.2.2 Biological treatment of waste:

This is a natural process that occurs where plant and animal materials (biomass) are broken down in the presence of micro-organisms. Biological treatment of waste can either be anaerobic or aerobic. In anaerobic treatment, waste is broken down in the presence of micro-organisms and in the absence of air while in the aerobic treatment, biological degradation of organic waste take place in the presence of oxygen. Useful products are derived from these two processes mainly biogas which produces electricity and organic fertilizer;

Recommendation: This National Solid Waste Management Strategy highly recommends biological treatment of organic waste which is an environmentally sound technology and leads to the generation of useful products.

3.3.3 Waste Disposal

- Disposal refers to the depositing or burial of waste on land.
- The Sanitary landfills should be lined with systems to collect leachate and methane gas.
- There should be frequent spreading, compacting and covering of waste with soil or any other appropriate covering material so as to avoid environmental pollution and scavenging birds.

This National Solid Waste Management Strategy highly recommends minimal disposal of waste and establishment of properly engineered Sanitary landfills with systems to collect leachate and methane gas.

Plate 20: A well managed sanitary landfill in the City of Dublin

Plate 21: A standardized modern weighbridge at a landfill in Dublin

Plate 22: Properly managed waste - Compacted and covered in a modern sanitary landfill, Dublin.

Plate 23: A leachate collection system in a modern sanitary landfill, Dublin

CHAPTER 4

4.0 THE WASTE MANAGEMENT STRATEGY

(How to get there?)

This National Solid Waste Management Strategy has been formulated with an aim of gearing the Country towards achieving sustainable solid waste management with Zero Waste as a guiding principle by ?? which period? .

The Strategy has been developed by NEMA to enable the Country meet the;

1. Kenya Vision 2030 flagship project,
2. Medium term Plans II and performance contracting guidelines and;
3. The goals for solid waste management as summarized below:

Table 5: Summary of Goals for Solid Waste Management

Overall Strategy Goals	i. Protection of public health ii. Reduction of poverty iii. Reduction of waste management costs iv. Protection of environment
Guiding principles	Zero Waste Principle (Waste is a resource that can be harnessed to create wealth, employment and reduce pollution of the environment)
Long-term-goals	achieve approximately 80% waste recovery (recycling, composting and waste to energy) and 20% landfilling in a Sanitary landfill (inert material)by 2030
Medium-term goals	achieve 50% waste recovery (recycling, composting and waste to energy) and 50% semi-landfilling by 2025
Short-term goals	Achieve 30% waste recovery (recycling, composting) and 70% controlled dumping (tipping, compacting and covering) in key urban areas by 2020
Key priority areas	• Preparation of County based waste management action plans that are consistent with national solid waste management strategy and other relevant policies. • Capacity building at all levels of planning and decision making (national and the county government levels) to

promote transformative leadership.

- Enactment of county laws to regulate waste recovery and disposal to serve as a regulatory regime for the use of waste as a resource.

Instruments	Specific action/ programs
Legal instruments	Solid waste recovery and disposal laws (emphasis for SWM should be on reuse and recycling), enactment/ enforcement of regulatory and supervisory statutes.
Financial instruments	Levying taxes as disincentives for landfilling to encourage source reduction, provide incentives for waste recyclers, preferential use of recovered materials over virgin materials.
Communication instruments	Advocacy for behavioral change through media campaigns, communication and technology, dissemination of waste management information.
Institutional instruments	Decentralized SWM, public-private partnerships (e.g. voluntary agreements), strengthened entrepreneurial activities (e.g. for SMEs) training of SWM managers, demonstrations, promotion of research and development in SWM.

4.1 Objectives of the Strategy

This strategy is to be implemented through five (5) key objectives.

1. To formulate policies, legislations and economic instruments to reduce waste quantities
2. To inculcate responsible public behaviour on waste management
3. To promote waste segregation at source
4. To promote resource recovery for materials and energy generation
5. To establish environmentally sound infrastructure and systems for waste management

Table 6: Logframe

Overall Goal: Sustainable solid waste management with Zero Waste in Kenya by the year 2013

No.	Objectives	Key Result Areas	Outcomes	Activities
1.	**To formulate policies, legislations and economic instruments on solid waste management**	Policies and economic instruments on waste management	Sustainable management of solid waste	Develop and harmonize county legislations on waste management Develop policies on economic instruments Implement policies and economic instruments
		Uptake of efficient technologies		Benchmark on appropriate technologies
		Compliance and Enforcement of waste management legislations		Enforcement of waste management standards and legislations
2.	**To inculcate responsible public behaviour on waste management**	Capacity building in waste management Informed public on waste management	Public behaviour changed on waste management	Sensitize the public on responsible waste management Create awareness on suitable waste management options Educate the public on integrated waste management Undertake monthly clean-ups Develop sensitization materials
4	**To promote waste as an income generating venture**	Market for the recovered and recycled products More entrepreneurship in	Enhanced income from waste management activities	Explore market opportunities for the recovered and recycling materials

		waste management activities Increased uptake of modern technology		Promote the use of recycled and recovered materials Promote modern technologies on recovery and recycling Promote Public Private Partnership in waste management
3.	**To promote waste segregation at source**	Improvement in Knowledge, Attitude and Practice towards SWM Segregated waste services	Segregated wastes	Intensified waste segregation campaigns Pilot waste segregation Provision of equipments for waste segregation Provision of segregated waste transport systems Promote Public Private Partnership in waste management
4.	**To promote resource recovery for materials**	Recycling and composting facilities Market availability for recovered materials Acceptance of recovered materials Collaborations in recycling	Enhanced materials recovery and use	Enhance modern technologies for recycling and composting of waste Explore market opportunities for recovered materials Develop promotion programs for use of recovered materials Enhance collaboration with stakeholders on recycling
5.	**To promote resource recovery through energy generation**	Waste to energy generation plants		Promote energy recovery plants

		Energy generated Collaborations in waste to energy recovery initiatives		Enhance waste to energy resources Enhance collaboration with stakeholders on energy recovery
5.	**To establish environmentally sound infrastructure and systems for waste management**	Improvement on existing waste management facilities, collection and transportation systems, transfer stations, treatment and disposal facilities	Existence of environmentally sound waste management collection, transportation, transfer stations, treatment and disposal facilities	Improve existing waste management facilities, Provision of adequate and appropriate collection facilities and services Provision of adequate and appropriate transport systems for segregated waste Build and operate transfer stations Develop standard incinerators with energy recovery facilities Establish composting facilities Establish recycling facilities Develop sanitary landfills

Key approaches to implementing the strategy

Depending on the situational analysis of the waste management practices in a county, the strategy will be implemented using the following approaches;

- Strategic alignment and recognition of partners through a public private partnership
- Introduction of incentives in the waste management cycle(generation, segregation, collection, transportation, treatment and disposal)
- Introduction of extended producer responsibility and public awareness campaigns and education;
- Establishment of efficiency and value addition in the waste management cycle
- Compliment the input from CBO's and other private public activities.
- Phase out waste burning
- Establish waste operational zones
- Upscale the activities of the informal sector to link up with the existing formal recycling industries.
- Establishment of infrastructure and systems for residual waste through a stepwise phasing out of illegal dumpsites to establishment of sanitary landfills

4.2 Roles of Collaborating Agencies:

Successful implementation of this strategy requires the involvement of several actors whose roles are outlined below

Ministry of Environment, Water and Natural Resources:

a) Give policy direction on solid waste management initiatives country-wide;

b) Channel funding to NEMA, for benchmarking and for capacity building and technology transfer.

NEMA:

a) Formulate policies, legislations and economic instruments relevant to achieving sustainable waste management;
b) Develop and disseminate public information on the regulatory requirements for waste management in Kenya;
c) Undertake benchmarking regionally and internationally on appropriate waste management technologies;
d) Enhance the capacity of the county governments on waste management systems and approaches applicable in their respective counties;
e) Employ social media to attract wider stakeholder participation and change attitudes towards waste management at a national level;
f) Hold public awareness sessions (for example, school workshops, public consultation exhibitions and public events) on waste management initiatives;
g) Support the dissemination of waste management research and development findings
h) Involve mass media dissemination techniques, such as the publication of news articles and press releases, in addition to ensure coverage in both print and media outlets.
a) Undertake enforcement activities of the laws developed on solid waste management and surveillance exercises on illegal waste related activities. Monitoring and evaluation of the strategy

County Governments:

b) Responsible for drawing up action plans for implementation of applicable solid waste management systems within their counties;
c) Source adequate funding for development of sustainable waste management initiatives in the entire cycle;
d) Put in place measures for enhanced Public-Private-Partnerships (PPP);
e) Benchmark on best practices of appropriate technologies;
f) Undertake periodic clean-up activities within their counties;
g) Provision of equipments for waste segregation and transport systems;
h) Zone the waste operational areas;
i) Continuous management of activities/facilities to ensure all the waste is transported to the designated waste disposal sites in a timely manner;

j) Monitoring and evaluation of the strategy
k) Ensure wide coverage and no littering of waste through improved collection methods and facilities ;
l) Progressively improve the designated official county disposal site towards a sanitary landfill;

The National Treasury:

(a) Channel funding to the respective government agencies and institutions for development of waste management initiatives and facilities

Civil Society Organizations (CSOs) and NGOs:

a. Promote and /or undertake income generating ventures in waste management initiatives;
b. Represent the public's interest in the solid waste management agenda, nationwide and in support in identification of illegal waste related activities.
c. Advocate for change in the public's knowledge, attitude and practice towards sustainable waste management.

Private Sector

(a) Through PPP, Involvement in the development of effective and efficient solid waste management facilities;
(b) Prioritize on corporate social responsibility (CSR) on waste management
(c) Empower communities and other stakeholders in understanding waste management related issues and in finding solutions for the same.

The Citizens/Public

(a) Change in attitude and practice to embrace the concept of a waste generator's responsibility by ensuring waste is appropriately managed at source and/or in all phases of the waste management cycle;
(b) Adopt the 7R (Reuse, Recycle, Reduce, Rethink, Refuse, Refill, Repairing) and/or an integrated solid waste management approach in the management of all waste streams;
(c) Collaborate with other government entities, CSOs, NGOs and other informal groups in waste management through the PPP approach.

CHAPTER 5

ANNEX 1: 5.0 IMPLEMENTATION MATRIX

Table 7: The Waste Management Strategy Implementation Matrix

Strategic Objective 1: To formulate policies, legislations and economic instruments to reduce waste quantities

	Activity	*Key performance Targets*	*Key performance Indicators*	*Time frame (years)*					*outcomes*	*Actors*	*Budget – Kshs. (M)*
				1st	2nd	3rd	4th	5th			
Policies and economic instruments on waste reduction	Develop and harmonies policies and economic instruments	harmonized polices and economic instrument	Policies and economic instruments						Reduced quantities of waste	MEWNR, NEMA, County Governments & other relevant lead agencies	30 M
	Implement policies and economic instruments	Implementation of policies and economic instruments	Policies and economic instruments implemented								
Uptake of efficient technologies	Undertake benchmarking on best practices of appropriate technologies	Best practices of appropriate technologies benchmarked	Appropriate technologies adopted							NEMA, County Governments	10 M
Compliance and Enforcement of waste	Compliance and enforcement of waste	Compliance and enforcement to set standards	Level of compliance and enforcement							NEMA with other relevant lead	20 M

management legislations	management standards and legislations									agencies	

Strategic Objective 2: To inculcate responsible public behavior on waste management

	Activity	*Key performance Targets*	*Key performance Indicators*	*Time frame (years)*					*outcomes*	*Actors*	*Approx. Budget (M)*
				1st	2nd	3rd	4th	5th			
Capacity building in waste management	Sensitize the public on responsible waste management	A sensitized public on responsible waste management	No of people sensitized						Public behavior changed on waste management	NEMA, County Governments & other relevant lead agencies	100 M
Informed public on waste management	Create awareness on suitable waste management options	Awareness created on suitable waste management options	No of campaigns							NEMA, Media houses & other relevant institutions, CSOs, NGOs, the public/citizenry	
	Educate the public on integrated waste management	Educated public on integrated waste management	No of people educated							NEMA, CSOs, NGOs, the public/citizenry	
	Undertake monthly clean-ups	Monthly cleans-ups undertaken	No of clean-ups							NEMA, County Governments & other relevant lead agencies, CSOs, NGOs, the	100 M

										public/citizenry	
	Develop sensitization materials	Sensitization materials developed	No of Sensitization materials developed							NEMA,	5 M

Strategic Objective 3: To promote waste segregation at source

	Activity	*Key performance Targets*	*Key performance Indicators*	*Time frame (years)*					*outcomes*	*Actors*	*Approx. Budget (M)*
				1st	2nd	3rd	4th	5th			
Segregated waste services	Provision of equipment for waste segregation	Equipment for waste segregation provided	No of equipments provided						Segregated wastes	County Governments	(Dependent on County needs and the implementation plans developed for the same specific to each county)
	Provision of segregated waste transport systems	Segregated waste transport systems provided	No of transport system provided							County Governments	(Dependent on County needs and the implementation plans developed for the same specific to each county)
	Intensified waste segregation	Campaigns on Segregation undertaken	No of campaigns							NEMA, County Governments CSOs, NGOs, the	80 M

	campaigns									public/citizenry	
	Initiate pilot waste segregation	Waste segregation pilot schemes	No of pilot schemes initiated							NEMA, County Governments, CSOs, NGOs, the public/citizenry	100 M

Strategic Objective 4: To promote resource recovery for materials and energy generation

	Activity	*Key performance Targets*	*Key performance Indicators*	*Time frame (years)*					*outcomes*	*Actors*	*Approx. Budget (M)*
				1st	2nd	3rd	4th	5th			
Recycling facilities	Enhance recycling of waste	Enhanced recycling of waste	Percentage of waste recycled						Materials recovered, recycled and energy generated	Local and international investors, County Governments	(Dependent on investor potential as well as type of facility)
Energy generation plants	Enhance waste to energy resources	Energy generated from waste	Percentage of energy generated								
Recovered materials	Recovery of materials	Recovered materials	Amount of materials recovered								
Collaboration on recycling and energy recovery	Enhance collaboration	Mechanisms of collaborations	No of Collaborations							Relevant agencies	5 M

Strategic Objective 5: To establish environmentally sound infrastructure and systems for waste management

	Activity	*Key performance Targets*	*Key performance Indicators*	*Time frame (years)*					*outcomes*	*Actors*	*Approx. Budget (M)*
				1st	2nd	3rd	4th	5th			
Improvement of existing waste management facilities	Upgrade existing waste management facilities	Upgraded waste management facilities	No. of upgraded waste management facilities						Existence of environmentally sound waste management collection, transportation, transfer station, treatment and disposal facilities	County Governments with support from various funding bodies	1 billion
Waste collection and transportation systems	Provision of adequate and appropriate collection facilities and services	Adequate and appropriate collection facilities provided	No of appropriate facilities provided							Local and international investors, County Governments with support from various funding bodies	300 M
	Provision of adequate and appropriate transport systems for segregated waste	Appropriate transport systems provided	No of appropriate transport systems provided							County Governments with support from various funding bodies	
Waste transfer stations	Build and operate transfer stations	Transfer stations built and operational	No of transfer station built and operational							Local and international investors, County Governments	100 M

										with support from various funding bodies	
Waste treatment facilities	Establish recycling facilities	Recycling facilities established	No of recycling facilities established							Local and international investors	(Dependent on investor potential)
	Establish composting facilities	Composting facilities established	No of composting facilities established								
Waste disposal facilities	Develop sanitary landfills	Sanitary landfills developed	No of Sanitary landfills developed							County Governments with support from various funding bodies	1 billion
	Develop standard incinerators	Standard incinerators developed	No of Standard incinerators with energy recovery facilities developed							Local and international investors, County Governments with support from various funding bodies	

CHAPTER 6

6.0 FUNDING MECHANISM

The implementation of the NWMS will result in a number of clear socio-economic benefits, saving the country considerable resources in terms of public health and environmental degradation. The NWMS has to address the issue of the sheer volume of wastes produced by our society, at the same time ensuring that waste management measures targeting the increasingly complex waste flows are environmentally sustainable and protect the health and well-being of the people. Accordingly, the NWMS seeks to integrate the objectives of environmental sustainability and achievement of the waste hierarchy with the broader transformation and development objectives of improved public health outcomes, economic development, poverty alleviation and improved access for all.

The sources of funding for the implementation plan will be from the Government of Kenya, Public Private Partnerships, waste generators and the development partners. The funding must be self sustaining in the long run and strategically integrated in all facets of the waste management system. These facets include initiatives to minimize generation of waste at source, improve collection and transportation systems as well as managing the disposal of waste that cannot be recycled or reused.

CHAPTER 7

7.0 MONITORING AND EVALUATION

Environmental monitoring will be a key component of this strategy. This is because poor solid waste management has direct and indirect effects to the public health and the environment and must be monitored. There are essential parameters to monitor the quality of the environment and does provide basic information on the levels of deviation on the set standards of environmental quality.

There is need for regular collection of information of waste generation and disposal rates in each municipality. This information will then be linked to the population trends, economic growth and other social monitoring parameters. This undertaking will provide basis for planning of future waste management needs for example the need for additional landfills and material recovery facilities. The information will also inform on the effectiveness of strategies earlier put in place e.g. public awareness and education programmes.

CHAPTER 8

8.0 CONCLUSION

There is need to introduce service charge to the residents for solid waste collection in order to offer commensurate service provision. It is proposed that a well designed charging system can have a positive effect in reducing waste generation by producers through offering incentives for those who minimize waste by lowering their chargeable tariff. This initiative requires intensive social marketing and public goodwill. Other premises e.g. supermarkets would be encouraged to buy back valuable used items such as bottles hence enabling greater recovery.

Other than the government's annual budgetary allocation, partial funding from various partners can also be explored for the infrastructural components of the strategy. The main aspect in such an arrangement would be the extent to which the government and private sector share the cost.

The development of the NWMS is an important milestone in the process of implementing the strategy and establishing an integrated approach to waste management across government and society more broadly. As stated in the introduction to the NWMS, Kenya faces particular challenges in relation to waste management that require a coordinated effort by government and stakeholders. Addressing these challenges will not be easy, given the capacity and resource constraints we face as a developing country with large income inequalities and competing development priorities. Nevertheless the implementation of the waste hierarchy and achievement of the objectives outlined in this strategy is integral to achieving the vision of a zero waste society, and establishing a sustainable future and a better life for all Kenya. The NWMS provides the framework within which the actions of different stakeholders are located. This strategy is addressed to stakeholders in all spheres of government, industry, labour unions, community based and non-governmental organizations, and the public at large. It sets out the different roles and responsibilities that need to be taken up by each stakeholder and level of government.

CHAPTER 9 ANNEX 2

9.0 CASE STUDIES

Current practices and the proposed preferred state in solid waste management as depicted in the five (5) pilot cities/towns;

a. Kisumu
b. Eldoret
c. Mombasa
d. Thika
e. Nakuru

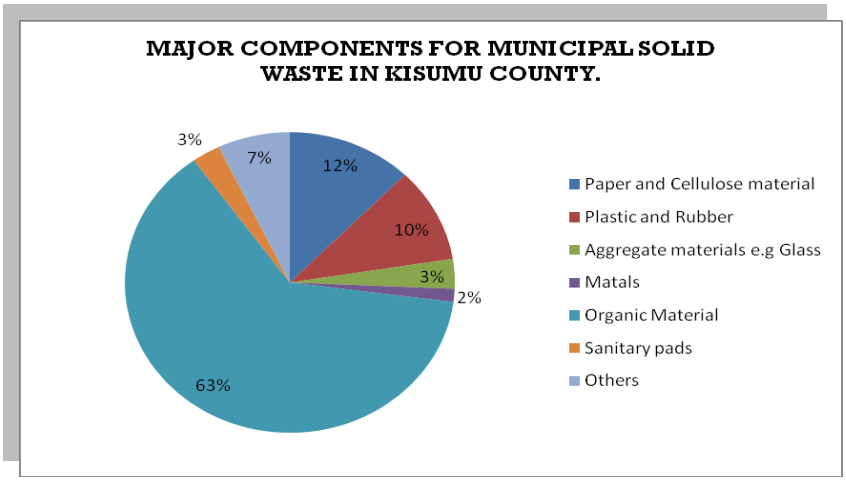
1. Kisumu Town

Baseline Information

Population densities: 560,000 people in 2009 and the growth rate is at 4.74% per annum.

Waste Generation Quantities: Generation is at 250 tonnes/day
The major components of municipal solid waste in Kisumu are Paper and Cellulose material (12.3%), Plastic and Rubber (10.2%), Aggregate material such as glass (3.2%), Metals (1.4%), Organic material (63.1%), sanitary pads (2.8%) and others (7.1 %). Therefore, the highest percentage of waste is organic waste (63.1%) followed by paper material (12.3%) then plastic waste (10.2%) percentage.

The large amount of organic content (63.1%) indicates the necessity for frequent collection and immediate composting. The larger amounts of paper and cellulose material, plastics and rubber, aggregate materials and metals indicates that about 20.69% of the waste can be recycled or re-used. Hence, about 2.35% of the total solid waste needs to be disposed of if an integrated SWM approach can be used in the City of Kisumu. The salvaging of materials (paper, clothing, glass, metals and plastics) is common at all stages of the SWM system but more extensive at the dumping site.



Disposal sites: Kachok disposal site

Current Status Vs. the Minimum and Preferred State in Kisumu

Waste Cycle	Current State	Minimum Required State	The Ideal/Preferred State
Waste Generation		Promote waste segregation at source starting at the household level by providing colour coded bags/bins for the various waste streams generated Increase the No. of waste segregation bins within the CBD and in all the zoned waste operational areas/collection centers.	Promote waste segregation at source by providing colour coded bags/bins for the various waste streams generated Sensitizing members of the public on best waste management practices, behaviors/attitudes (Focus on the 7Rs -
Waste Collection	1. The waste operation/ collection areas which are already are zoned are Kibuye, Nyalenda, Obunga, Central business district, Manyatta and Kondele 2. The county has equipments for handling waste which includes a shovel for loading into a tipping lorry, a 7 tonne lorry and a canter 3. They have a grounded compactor at the dumpsite 4. Within the CBD there are efforts of waste segregation and waste separation bins have provided at various strategic areas of the town.	1. All waste operational areas/collection centers are zoned/designated; 2. Proper management of all the zoned/designated waste operational areas – ensuring they are kept clean and waste is collected frequently and timely to avoid scattering and spread of waste into undesignated areas; 3. Provide adequate skips for waste collection and skip loaders for ease of loading and transportation; 4.The waste receptacles provided should not become an eye-sore or a nuisance to the Public by ensuring they are emptied frequently; 5. Set up and designate transfer stations for sorting of municipal waste prior to transportation to a controlled tipping site,	Provide colour-coded waste bins/bags to all households; Set up collection centers in specific parts of the County with waste segregation bins clearly labeled as per each waste stream for disposal by members of the Public Organise and formalize informal waste collectors/groups

		landfill or incinerator. 6. Organise and formalize informal waste collectors/groups 7. Enhance Private-public-partnership in waste delivery services	
Waste Transportation		1. Provide adequate transport for the transportation of the various segregated waste streams	Have dedicated trucks which can carry segregated waste from various areas of collection to the waste treatment facilities and landfills
Waste treatment **(Material recovery)**		1. Enhance small-medium scale waste composting 2. Provide infrastructure to facilitate material recovery facilities such as jua-kali sheds. 3. Encourage and promote the formation of small and micro waste enterprises at neighborhood level. 4. Enhance Private-public-partnership in waste delivery services	1. Promote recycling and recovery of waste. 2. Promote the establishment of hazardous waste treatment facilities particularly for management of; a) Waste tyres; b) E-waste; c) Used oil; 3. Promote composting of all organic waste streams and initiate establishment of composting facilities within the County. 4. Build focus on waste treatment facilities such as incinerators for combustion of Municipal waste with energy recovery facilities. 5. Provide land for establishment of the required material; recovery facilities
Disposal (Disposal Sites)	**Kachok dumpsite – the state:** 1. The waste disposal site is designated by the County Government of Kisumu; 2. The site has a manned gate	1. Designate all official county government disposal site (s); 2. Secure all disposal	1. Set up Sanitary landfills; 2. Promote incineration as a technology for

	and the area is fenced with iron sheets though not maintained with some areas exposed and the area encroached by the waste collectors and scavenging animals; 3. The site is manned by a county government official during the day only 4. The wastes into the dumpsite are estimated per the tonnes of the offloading tracks 5. The site has motor able roads though not accessible during rainy seasons 6. The waste are not spread and compacted regularly because the compacter is grounded and during rainy season the compacter is not effective 7. There was evidence of open burning of waste by scavengers with smoke seen in various locations 8. There was no evidence of proper systems for fire controls within the dumpsite 9. The dumpsite security is only manned by one county official during the day and its unmanned during the night 10. There was no site office and sanitary facility within the dumpsite 11. The only manning officer is not provided with proper PPEs	sites with a fence and a gate manned by a council official to control dumping and spread of waste outside the disposal sites; 3.Weigh or estimate and record the amount of incoming waste in tonnes; 4. Develop motorable roads inside the sites to ensure vehicles do not get stuck as they go to the tipping phase; 5. Spread the waste at regular intervals, compact and cover with soil; 6. Develop and install proper fire control systems for dumpsite fires and extinguish all fires at the sites; 7. Enhance security and control of the disposal sites so that illegal activities are contained and ensure that hazardous waste streams are not disposed off at the disposal sites; 8. Set up leachate control systems for all the disposal sites and transfer stations and ensure all leachate collected is channeled to a treatment facility; 9. Obtain licences from NEMA to own/operate the disposal sites. 10. Enforce on all illegal dumping sites and instigate clean-ups of these sites, periodically.	combustion of hazardous, industrial waste streams; 3. Establish transfer stations for sorting of all waste prior to transfer to the final disposal site;

Photographs depicting current waste management practices in Kisumu:

Plate 1: *Efforts of waste segregation in Kisumu County*

Plate 2: *A grounded compacter at the Kachok dumpsite*

Plate 3: *Motorable roads at Kachok*

Plate 4: *Unmanned wrecked main entrance at the Kachok dumpsite*

2. Uasin Gishu County

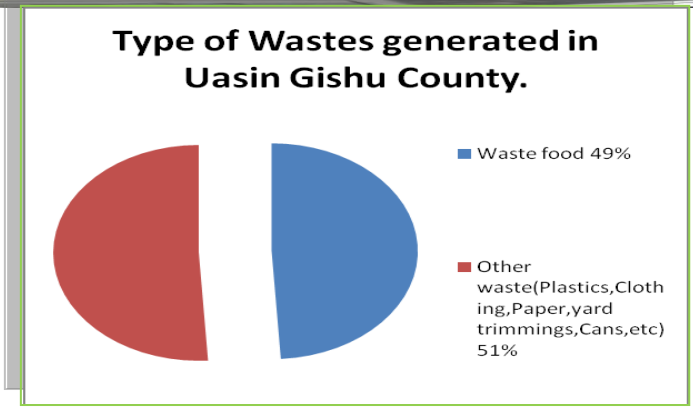
Baseline Information:

Population densities:

Population: 894,179 (2009 Population and Housing Census)

Waste generation quantities:

Quantities of waste generated: 6,795 mt (100%) out of which 49% is waste food and 51% for other wastes (plastics, clothing, paper, yard trimmings, cans etc.)



Waste Generation Quantities in Uasin Gishu County

Current Status Vs. the Minimum and Preferred State in Pilot Town: Eldoret town

Waste Cycle	Current State	Minimum Required state	The Ideal/Preferred State
Waste Generation		Promote waste segregation at source starting at the household level by providing colour coded bags/bins for the various waste streams generated; Provide waste segregation bins within the town centers and in all other designated waste collection areas.	Promote waste segregation at source by providing colour coded bags/bins for the various waste streams generated
Waste Collection	**1.** The waste operation areas are zoned in a way that the private sector are contracted to collect waste within estates while the County Government collects within the Central business district (CBD) 2. Waste collection is done on a daily basis 3. The County Government face challenges in collecting waste within the low income areas because the areas do not attract the private sector waste collectors;	1. All waste operational areas/collection centers are zoned/designated; 2. Proper management of all the zoned/designated waste operational areas – ensuring they are kept clean and waste is collected frequently and timely to avoid scattering and spread of waste	Provide colour-coded waste bins/bags to all households; Set up collection centers in specific parts of the County with waste segregation bins clearly labeled as per each waste stream for disposal by members of the Public Organise and formalize informal

	4. The county government is planning to engage the youth groups and women in low income areas and induce them with incentives so that they can be encouraged to take up waste collection work within their areas 5. They have 10 skips within the CBD 6. There is a waste transfer station in Burnt forest sub county 1. The county had ordered 40 containers for waste collection and 2 skip trailers	into undesignated areas; 3. Provide adequate skips for waste collection and skip loaders for ease of loading and transportation; 4.The waste receptacles provided should not become an eye-sore or a nuisance to the Public by ensuring they are emptied frequently;	waste collectors/groups
Waste Transportation	**1.** The county has equipments for handling waste which includes 4 side loaders,4 tractors (2 are for the CBD,1 for burnt forest sub county and one for the town outskirts); 2. The county is in the process of procuring more trucks for waste transportation	1. Provide adequate transport for the transportation of the various segregated waste streams	Have dedicated trucks which can carry segregated waste from various areas of collection to the waste treatment facilities and landfills
Waste treatment **(Material recovery)**		1. Enhance small-medium scale waste composting	1. Promote recycling and recovery of waste. 2. Promote the establishment of hazardous waste treatment facilities particularly for management of; a) Waste tyres; b) E-waste; c) Used oil; 3. Promote composting of all organic waste streams and initiate establishment of composting facilities within the County. 4. Build focus on waste treatment facilities such as incinerators

			for combustion of Municipal waste with energy recovery facilities.
Waste Disposal **(Disposal Sites – Incinerators, controlled tipping sites and landfills)**	**Kipkenyo waste disposal site in Eldoret Town – the state:** 1. The waste disposal site is designated by the County Government 2. The waste from the previous decommissioned site was transferred to the current site therefore its becoming a challenge in terms of space 3. The County Government has 300 Acres of land in Kipkenyo which they are planning to annex part of it for a landfill under the municipal program. The feasibility study had been done, KAA had been invited to assess the aviation requirements because the site would impacting on the town air strip 4. The County was in discussion with a private company to come up with a waste to energy program 5. The site is fenced with concrete wall with an unmanned steel gate 6. They frequently use a hired dozer to compact waste 7. The wastes into the dumpsite are not weighed but the county is planning to procure a weighbridge for the exercise 8. The site has motorable roads though not accessible during rainy seasons 9. There was evidence of open burning of waste by scavengers with smoke seen in various locations 10. There was no evidence of proper systems for fire controls within the dumpsite 11. The dumpsite is unmanned for 24hrs 12. There was no site office	1. Designate all official county government disposal site (s); 2. Secure all disposal sites with a fence and a gate manned by a council official to control dumping and spread of waste outside the disposal sites; 3.Weigh or estimate and record the amount of incoming waste in tonnes; 4. Develop motorable roads inside the sites to ensure vehicles do not get stuck as they go to the tipping phase; 5. Spread the waste at regular intervals, compact and cover with soil; 6. Develop and install proper fire control systems for dumpsite fires and extinguish all fires at the sites; 7. Enhance security and control of the disposal sites so that illegal activities are contained and ensure that hazardous waste streams are not disposed off at the disposal sites; 8. Set up leachate control systems for all the disposal sites and transfer stations and	1. Set up Sanitary landfills; 2. Promote incineration as a technology for combustion of hazardous, industrial waste streams; 3. Establish transfer stations for sorting of all waste prior to transfer to the final disposal site;

	and sanitary facilities within the dumpsite 13. There was evidence of dumped waste outside the perimeter wall and near the gate for the dumpsite and that of the waste water treatment plant adjacent to the dumpsite 14. The County face challenges of illegal dumping in un developed plots 15. They also face challenges from unplanned small eateries within the town who have no planned waste collection areas and therefore end up dumping the waste on streets at night. Though the county is trying to engage them and they have assigned them with a loader to ease collection of waste 16. The county is planning to employ enforcement officers to enhance compliance to the environmental by laws	ensure all leachate collected is channeled to a treatment facility; 9. Obtain licences from NEMA to own/operate the disposal sites. 10. Enforce on all illegal dumping sites and instigate clean-ups of these sites, periodically.	

Photographs depicting current waste management practices in Eldoret:

Plate 6: *The Kipkenyo dumpsite in Eldoret, secured with a concrete perimeter wall and a gate*

Plate 7: Waste Collectors collecting recyclables and animals scavenging at the Kipkenyo disposal site in Eldoret

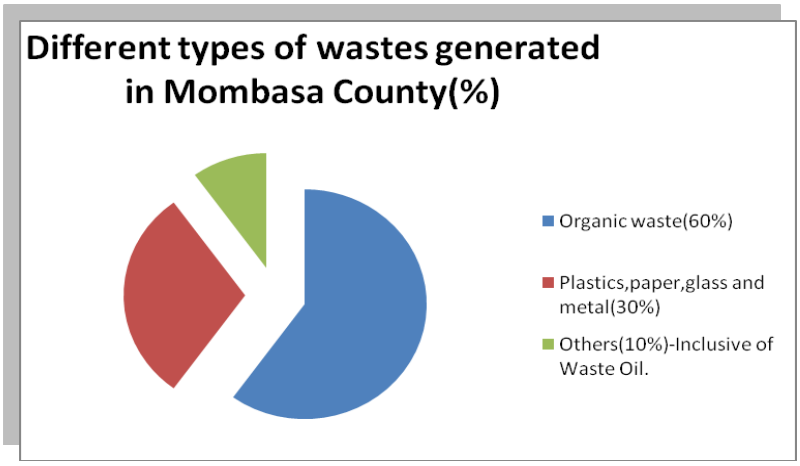
3. Mombasa Town

Baseline Information:

Population densities: 939,370 (2009 Population and Housing Census)

Waste Generation Quantities:

Organic waste (60%)
Plastics, paper, glass and metal (30%)
Others (10%) - Inclusive of Waste Oil.



Waste Generation Rates in Mombasa County

Current Status Vs. the Minimum and Preferred State in Mombasa

Waste Cycle	Current State	Minimum Required state	The Ideal/Preferred State
Waste Generation		Promote waste segregation at source starting at the household level by providing colour coded bags/bins for the various waste streams generated; Provide waste segregation bins within the town centers and in all other designated waste collection areas	Promote waste segregation at source by providing colour coded bags/bins for the various waste streams generated
Waste Collection	1. The County Government operates various collection points/centers within the County, this being in Mwembe-tayari, Ganjoni, Mackinon, Kongowea, makupa Market and Bombolulu. 2. The three operational waste disposal sites (Mwakirunge, Vok transfer station and Kibarani) are in a designated area; 3. There are waste receptacles for waste disposal within the town centers. There are dedicated trucks within these disposal sites which aid in waste collection – case in point VOK transfer station and the Kibarani dumpsite	1. All waste operational areas/collection centers are zoned/designated; 2. Proper management of all the zoned/designated waste operational areas – ensuring they are kept clean and waste is collected frequently and timely to avoid scattering and spread of waste into undesignated areas; 3. Provide adequate skips for waste collection and skip loaders for ease of loading and transportation; 4.The waste receptacles provided should not become an eye-sore or a nuisance to the Public by ensuring they are emptied frequently;	Provide colour-coded waste bins/bags to all households; Set up collection centers in specific parts of the County with waste segregation bins clearly labeled as per each waste stream for disposal by members of the Public Organise and formalize informal waste collectors/groups
Waste	1. The county operates	1. Provide adequate	Have dedicated trucks

Transportation	dedicated vehicles for the transportation of waste. 2. There are also private collectors who are licenced from the NEMA county office in Mombasa to transport waste, the county government vehicles are not licenced.	transport for the transportation of the various segregated waste streams	which can carry segregated waste from various areas of collection to the waste treatment facilities and landfills
Waste treatment **(Material recovery)**		1. Enhance small-medium scale waste composting	1. Promote recycling and recovery of waste. 2. Promote the establishment of hazardous waste treatment (recycling) facilities particularly for management of; a) Waste tyres; b) E-waste; c) Used oil/sludge; 3. Promote composting of all organic waste streams and initiate establishment of composting facilities within the County. 4. Build focus on waste treatment facilities such as incinerators for combustion of Municipal waste with energy recovery facilities.
Waste Disposal **(Disposal Sites – Incinerators, controlled tipping sites and landfills)**	1. The waste disposal sites are designated by the County Government. 2. All the sites are not fenced and have no gates for manning purposes; 3. Waste within the sites is compacted – there was evidence of compaction machines on site. 4. It was also evident that recyclable wastes, hazardous wastes such biomedical waste finds its	1. Designate all official county government disposal site (s); 2. Secure all disposal sites with a fence and a gate manned by a council official to control dumping and spread of waste outside the disposal sites; 3.Weigh or estimate and record the amount	1. Set up Sanitary landfills; 2. Promote incineration as a technology for combustion of hazardous, industrial waste streams; 3. Establish transfer stations for sorting of all waste prior to transfer to the final

way to the dumpsite meaning waste segregation within the county is poor; 5. ONLY Vok transfer station and Mwakirunge have motorable roads which are in a fair condition as opposed to Kibarani whose roads are not very good ; 6. There were scavengers in all the sites. 7. There was no evidence of proper systems for fire controls within the disposal sites; 8. The disposal sites are not manned; 9. There were no site offices and nor sanitary facilities within the disposal sites;	of incoming waste in tonnes; 4. Develop motorable roads inside the sites to ensure vehicles do not get stuck as they go to the tipping phase; 5. Spread the waste at regular intervals, compact and cover with soil; 6. Develop and install proper fire control systems for dumpsite fires and extinguish all fires at the sites; 7. Enhance security and control of the disposal sites so that illegal activities are contained and ensure that hazardous waste streams are not disposed off at the disposal sites; 8. Set up leachate control systems for all the disposal sites and transfer stations and ensure all leachate collected is channeled to a treatment facility; 9. Obtain licences from NEMA to own/operate the disposal sites. 10. Enforce on all illegal dumping sites and instigate clean-ups of these sites, periodically.	disposal site;

4. Kiambu County

Kiambu County is located in central Kenya, it borders Murang'a county to the North and North East, Machakos County to the East, Nairobi and Kajiado counties to the South, Nakuru County to the West, and Nyandarua County to the North West. The main economic activity in the county is agriculture- tea, coffee, dairy, poultry and horticulture. Kiambu's major urban centers are Thika, Ruiru, Gatundu, Limuru, Kabete, Githunguri, Kiambaa, Kikuyu, Kiambu, Lari and Karuri. It is a predominantly rural county, but its population is getting rapidly urbanized relative to Nairobi city's growth. The Agikuyu are the dominant tribe in the area, but in light of its growing urban migrant population, it is slowly beginning to take the face of a cosmopolitan town.

Sub-counties in Kiambu includes; Thika, Ruiru, Juja, Kiambu, Kiambaa, Githunguri, Limuru, Lari, Kikuyu, Kabete, Gatundu South and Gatundu North.

Population Density and Distribution

Kabete Constituency has the highest population density which currently is 2,534 persons/Km^2 followed by Kiambaa Constituency which has 2,153 persons/Km2. This is due to their proximity to the city of Nairobi. The least densely populated constituency is Lari with 307 persons/Km^2, mainly due to the fact that a considerable part of the constituency is covered by forests. High population density exerts pressure on the available land leading to subdivision of land into uneconomical units.

Population Distribution and Density by Constituency/Sub-county

Constituency	2009 (Census)		2012 (Projections)		2015 (Projections)		2017 (Projections)	
	Population	Density (Km^2)	Population	Density (Km^2)	Population	Density (Km^2)	Population	Density (Km^2)
Gatundu South	114,180	593	124,223	645	135,149	702	142,962	742
Gatundu North	100,611	352	109,460	383	119,088	417	125,972	441
Juja	118,793	365	129,241	397	140,609	432	148,737	457
Thika Town	165,342	760	179,885	827	195,706	900	207,020	952
Ruiru	201,986	1,003	219,752	1,091	239,080	1,187	252,901	1,256
Githunguri	147,763	852	160,760	927	174,899	1,008	185,010	1,067
Kiambaa	145,053	1,979	157,811	2,153	171,691	2,342	181,617	2,478
Kiambu	108,698	1,026	118,259	1,116	128,660	1,214	136,098	1,285
Kabete	140,427	2,329	152,778	2,534	166,216	2,757	175,825	2,916
Kikuyu	125,402	713	136,432	776	148,432	844	157,012	893
Limuru	131,132	466	142,666	507	155,214	552	164,187	583
Lari	123,895	282	134,792	307	146,648	334	155,125	353
Total	**1,623,282**	**638**	**1,766,059**	**694**	**1,921,392**	**755**	**2,032,466**	**799**

Waste generation in Kiambu County;

- Municipal waste includes Household waste, Commercial waste, and Demolition waste.
- Hazardous waste includes Industrial waste.
- Biomedical waste includes clinical waste.
- Special Hazardous waste includes Radioactive waste, explosives waste, and Electronic waste (e-waste)

Waste composition in percentage for each waste stream

Waste	Stream	Percentage
Municipal wastes	Household wastes	
	Commercial wastes	
	Demolition wastes	
Hazardous wastes	Industrial wastes	
Biomedical wastes	Clinical wastes	
Special Hazardous wastes	Radioactive waste	
	Explosives wastes	
	Electronics wastes	

Disposal sites include: Kang'oki dumpsite in Thika (Other disposal sites include Kang'oya in Kiambu, Limuru, Lari and Gatundu. Gatuanyaga disposal site in Thika sub-county is used primarily for disposal of asbestos.

Current Status Vs. the Minimum and Preferred State in Thika

Waste Cycle	Current State	Minimum Required state	The Ideal/Preferred State
Waste Generation		Promote waste segregation at source starting at the household level by providing colour coded bags/bins for the various waste streams generated; Provide waste segregation bins within the town centers and in all other designated	Promote waste segregation at source by providing colour coded bags/bins for the various waste streams generated

		waste collection areas	
Waste Collection	1. Waste is not collected daily; specific days have been set for collection per areas; 2. Curbside waste collection has been introduced in some residential areas; 2. The county has introduced (2) skips at Madaraka and Jamuhuri, and two (2) at Ruiru; 3. The County has budgeted for five (5) skips this financial year; 3. Limuru have several skips and a Tractor and a skip loader; 4. There are two youth groups that have currently been licenced to collect and transport waste to the disposal sites. 5. There are alot of illegal dumping sites within the County and efforts are currently underway to educate the people on the need for storage of their waste at the facilities and homes awaiting collection.	1. All waste operational areas/ collection centers are zoned/designated; 2. Proper management of all the zoned/designated waste operational areas – ensuring they are kept clean and waste is collected frequently and timely to avoid scattering and spread of waste into undesignated areas; 3. Provide adequate skips for waste collection and skip loaders for ease of loading and transportation; 4. A budget for skips, skip loaders, machinery for compacting the waste at the disposal sites – bull dozers, compacters and a tractor should be set aside. 6. Provide colour-coded waste bins/bags to all households or provide adequate waste collection receptacles as an initial stop measure for illegal dumping by members of the public in the County; 6. Increase the no. of trucks for waste collection and increase collection rates in the various waste collection areas. 7. Ensure all the uncovered trucks are covered to prevent	Provide colour-coded waste bins/bags to all households; Set up collection centers in specific parts of the County with waste segregation bins clearly labeled as per each waste stream for disposal by members of the Public Organise and formalize informal waste collectors/groups

		scattering of waste on roadsides and in undesignated areas during transportation.	
Waste Transportation	1. Most of the trucks operated by the County Government need repairs and are not covered thus allowing for scattering of waste during transportation 2. The County bought five trucks last year for Kiambu, Kabete, Limuru and Ruiru 3. There are plans underway to repair the trucks which have broken down.	1. Provide adequate transport (trucks) for the transportation of the various segregated waste streams	Have dedicated trucks which can carry segregated waste from various areas of collection to the waste treatment facilities and landfills
Waste treatment **(Material recovery)**		1. Enhance small-medium scale waste composting	1. Promote recycling and recovery of waste. 2. Promote the establishment of hazardous waste treatment facilities particularly for management of; a) Waste tyres; b) E-waste; c) Used oil; 3. Promote composting of all organic waste streams and initiate establishment of composting facilities within the County. 4. Build focus on waste treatment facilities such as incinerators for combustion of Municipal waste with energy recovery facilities.
Waste Disposal **(Disposal Sites – Incinerators, controlled**	**Kang'oki disposal site – Thika sub-county** 1. The waste disposal site is designated by the County	1. Designate all official county government disposal site (s); 2. Secure all disposal sites with a fence and	1. Set up Sanitary landfills – plans in place to set up a Sanitary landfill at Ting'ang'a area on a

tipping sites and landfills)	Government. 2. The site is NOT fenced; 3. The site is NOT manned by a county official at any time of the day; 4. The disposal site is separated by an earth road and waste has been haphazardly dumped on either side of the road – no controlled tipping practiced; 4. The waste is not compacted neither is it covered with a layer of soil; 6. It was also evident that recyclable wastes such as glass end up at the site; 7. Other hazardous wastes such as biomedical, sanitary waste, find their way also to the dumpsite meaning waste segregation within the county from the household level to the commercial and industrial areas is not practiced; 7. The site has a motorable road which are accessible; 8. There is no machinery for compacting of waste or covering it after compaction; 9. No human settlements on site; 10. Waste tyre burning is rampant at adjacent sites to the disposal site; 11. The site is characterized by grazing cattle; 12. There are also residential homes at a near distance to the site; 13. There was no evidence of waste collectors on-site collecting the recyclable wastes; 14. There are no proper systems for fire controls within the dumpsite	a gate manned by a council official to control dumping and spread of waste outside the disposal sites; 3.Weigh or estimate and record the amount of incoming waste in tonnes; 4. Develop motorable roads inside the sites to ensure vehicles do not get stuck as they go to the tipping phase; 5. Spread the waste at regular intervals, compact and cover with soil; 6. Develop and install proper fire control systems for dumpsite fires and extinguish all fires at the sites; 7. Enhance security and control of the disposal sites so that illegal activities are contained and ensure that hazardous waste streams are not disposed off at the disposal sites; 8. Set up leachate control systems for all the disposal sites and transfer stations and ensure all leachate collected is channeled to a treatment facility; 9. Obtain licences from NEMA to own/operate the disposal sites. 10. Enforce on all illegal dumping sites	40 acre piece of land; 2. Promote incineration as a technology for combustion of hazardous, industrial waste streams; 3. Establish transfer stations for sorting of all waste prior to transfer to the final disposal site;

15. There was no site office, nor sanitary facility within the dumpsite. 16. The dumpsite is faced with land disputes – it has already been privately allocated to other individuals for other uses; 17. The matter is currently before the National Land Commission and the Minister for lands 18. The County intends to introduce the Fukuoka waste management technology from Japan as a pilot at the Kang'oki disposal site in Thika; 19. The pilot project will be undertaken this year starting with trainings and resource mobilization; 20. The County has engaged UN habitat on funding the fukuoka technology; 21. The land issue is currently hindering the implementation of the 10 minimum points 22. Currently, the dumpsite is receiving alot of waste from Kiambu area as well due to the closure of the disposal site in Kiambu.	and instigate clean-ups of these sites, periodically.	

5. Nakuru Town

Baseline Information:

1. Population densities:

As expected there are higher population growth rate projections for the major towns, these are Nakuru, Molo and Naivasha. The current population of Nakuru is estimated at 600,000 of whom 190,000 live in the slums of Rhonda and Kaptembwo. Currently, less than 10% of residents here have access to sufficient sanitation facilities of adequate quality.

2. Waste Generation quantities:

Waste generated in the county is composed of different waste materials mainly from household, market, and commercial, institution, building materials, street waste, scrap metals, hospital waste and other waste generated materials. Refuse generated is estimated at an average of 250 tons per day based on population and rate of generation

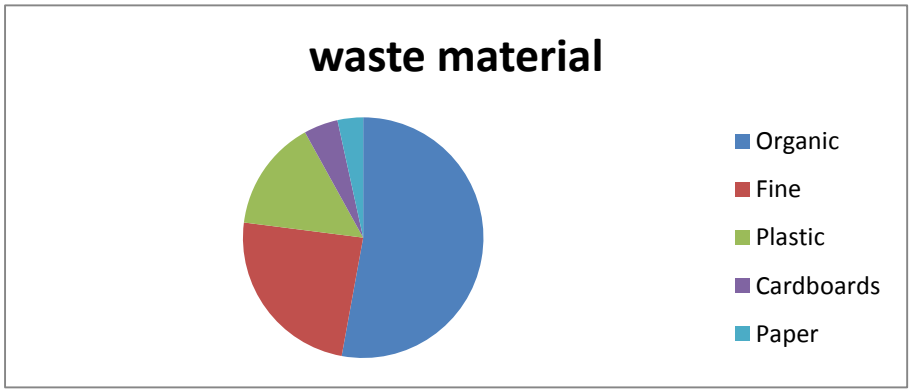
per capital per day is approximately 0.5kg/p/day. About 45% of this is collected and transported to Giotto dump site; 18% is recovered and the rest accumulates in the environment and is eventually deposited into the lake by storm water and wind.
The total amount of wastes collected by the County Government accounts for 15.1% daily MSE (private) and C.B.O accounts for 29.8% which falls in the formal sector. 44.9% of the total wastes collected per day are disposed off to Giotto dumpsite.
Out of the total wastes collected daily, 18.3% is recovered by the informal sector. 36.1% accounts for the total wastes not collected daily which poses pollution in the environment.

Types of wastes in Nakuru County (Source ITDG, 2004)

Material	Average (%)	High income	Low income
Food	51.1	50	57
Paper	17.3	17	16
Textiles	2.7	3	2
Plastics	11.8	14	12
Grass and wood	6.7	8	2
Leather	0.9	1	1
Rubber	1.5	1	2
Glass	2.3	2	2
Cans/tins	1.7	2	1
Other metals	0.9	1	0
Others	2.7	7	4

Studies by the ITDG in 2004 indicate that most of the waste generated within Nakuru municipality is organic in nature. **However, the municipality has implemented various wastes management initiatives and opportunities in the county which include waste collection, privatization efforts designation of disposal site as well as waste recycling among others.**

The MCN waste characterization Report (2010) indicates that top five materials waste generated comprise of organic (46%), fine (from sorting 21%, plastic 13%, cardboards (4%) and paper 3%.Polythe bags are the main nuisance in the county. In the figure 1.4, it is evident that the organic materials is the major pollutant generated and cardboards and papers are the least generated



Types of Waste Materials Generated In Nakuru County

Disposal sites include: Giotto dumpsite in Nakuru and Naivasha disposal site in Naivasha sub-county

Current Status Vs. the Minimum and Preferred State in Nakuru

Waste Cycle	Current State	Minimum Required State	The Ideal/ Preferred State
Waste Generation		Promote waste segregation at source starting at the household level by providing colour coded bags/bins for the various waste streams generated; Provide waste segregation bins within the town centers and in all other designated waste collection areas	Promote waste segregation at source by providing colour coded bags/bins for the various waste streams generated
Waste Collection	1. The waste disposal site is in a designated area; 2. There are waste receptacles for waste disposal within the town centers.	1. All waste operational areas/collection centers are zoned/designated; 2. Proper management of all the zoned/designated waste operational areas – ensuring they are kept clean and	Provide colour-coded waste bins/bags to all households; Set up collection centers in specific parts of the County with waste segregation bins clearly labeled as per each waste stream for disposal by members

		waste is collected frequently and timely to avoid scattering and spread of waste into undesignated areas; 3. Provide adequate skips for waste collection and skip loaders for ease of loading and transportation; 4.The waste receptacles provided should not become an eye-sore or a nuisance to the Public by ensuring they are emptied frequently;	of the Public Organise and formalize informal waste collectors/groups
Waste Transportation	**1.** The county operates dedicated vehicles for the transportation of waste. There are also private collectors who are licenced from the NEMA county office to transport waste, the county government vehicles are not licenced. 2. The private waste collectors transport waste in the mornings and evenings to the disposal site.	1. Provide adequate transport for the transportation of the various segregated waste streams	Have dedicated trucks which can carry segregated waste from various areas of collection to the waste treatment facilities and landfills
Waste treatment **(Material recovery)**		1. Enhance small-medium scale waste composting	1. Promote recycling and recovery of waste. 2. Promote the establishment of hazardous waste treatment facilities particularly for management of; a) Waste tyres; b) E-waste; c) Used oil; 3. Promote composting of all organic waste streams and initiate establishment of

			composting facilities within the County. 4. Build focus on waste treatment facilities such as incinerators for combustion of Municipal waste with energy recovery facilities.
Waste Disposal **(Disposal Sites – Incinerators, controlled tipping sites and landfills)**	**Gioto disposal site in Nakuru County:** 1. The waste disposal site is designated by the County Government. 2. The site has NO gate and the area is NOT fenced; 3. The site is manned by a county government official during the day only; 4. The site is quite large and the waste is not disposed off in a controlled manner as some patches of the land have waste while others are bare depicting that the waste is dumped haphazardly within the site; 5. Some sections of the site had the waste compacted and efforts to cover with a fresh layer of soil were underway; 6. It was also evident that recyclable wastes, hazardous wastes such as biomedical, sanitary waste, batteries find their way to the dumpsite meaning waste segregation within the county from the household level to the commercial and industrial areas is really poor; 7. The site has motorable roads which are accessible; 8. The only equipment or	1. Designate all official county government disposal site (s); 2. Secure all disposal sites with a fence and gates manned by council officials to control dumping and spread of waste outside the disposal sites; 3.Weigh or estimate and record the amount of incoming wastes in tonnes; 4. Develop motorable roads inside the sites to ensure vehicles do not get stuck as they go to the tipping phase; 5. Spread the waste at regular intervals, compact and cover with soil; 6. Controlled tipping of waste at the disposal sites should be practiced and waste should not be scattered haphazardly at the sites; 6. Develop and install proper fire control systems for dumpsite fires and extinguish	1. Set up Sanitary landfills; 2. Promote incineration as a technology for combustion of hazardous, industrial waste streams; 3. Establish transfer stations for sorting of all waste prior to transfer to the final disposal site;

	machinery there is, is a dozer for compacting and covering the waste. 9. There were human settlements within the sites who have habited the land for many years and scavenge from the disposal site. 10. There was no evidence of proper systems for fire controls within the dumpsite 11. There was no site office, nor sanitary facility within the dumpsite.	all fires at the sites; 7. Enhance security and control of the disposal sites so that illegal activities are contained and ensure that hazardous waste streams are not disposed off at the disposal sites; 8. Set up leachate control systems for all the waste disposal sites including all transfer stations and ensure all leachate collected is channeled to a treatment facility; 9. Obtain licences from NEMA to own/operate the disposal sites. 10. Enforce on all illegal dumping sites and instigate clean-ups of these sites, periodically.

Photographs depicting current waste management practices in Nakuru:

Plate 9: *Giotto site in Nakuru County – trucks on site disposing of waste*

Plate 10: Pigs scavenging at the Gioto disposal site **Plate 11:** Sanitary Waste at the Gioto site

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