Integrated Solid Waste Management Plan

For the City of Nairobi, Kenya

2010 - 2020

Developed by
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Abbreviations

4R	Reduce, reuse, recover, recycle
BAU	Business As Usual
CBO	Community-Based Organization
CCN	City Council of Nairobi
DoE	City Council of Nairobi
ISWM	Integrated Solid Waste Management
ISWMP	Integrated Solid Waste Management Plan
JICA	Japan International Cooperation Agency
KARA	Kenya Alliance of Residential Associations
KNBS	Kenya National Bureau of Statistics
KNCPC	Kenya National Cleaner Production Centre
MEMR	Ministry of Environment and Mineral Resources
MoLG	Ministry of Local Government
MoNMD	Ministry of Nairobi Metropolitan Development
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
OF	Organic Fraction (organic waste)
PPP	Public-Private Partnerships
RA	Resident Association
SWM	Solid Waste Management

1. Introduction

Modern urban living generates a wide variety of solid wastes that cannot be assimilated in the city environment. ***Nairobi is no exception, with each of its estimated 3.5 million residents generating between 200 and 800 gram of solid waste every day.***

Large improvements in urban cleanliness and health were realized when organized collection of solid waste and its disposal outside of city limits were introduced in European cities in the late 19th century. ***In Nairobi, only half of the estimated 3000 tons of waste generated every day is collected.***

To prevent environmental degradation arising from large dumpsites, the practice of sanitary landfilling was invented. More recently, it has been realized that state-of-the-art incinerators, whilst much more costly to operate, offer an even lower environmental footprint. ***Nairobi has no means of safe disposal, and only 400-600 tons of its waste reaches the Dandora dumpsite every day. It has been documented that this dumpsite is negatively affecting the health of thousands of Nairobi residents. Two thirds of the waste generated in Nairobi cannot be accounted for.***

It has always been true that one person's waste can be another person's resource. Modern approaches to solid waste management incorporate strategies to reduce waste generation, to encourage re-use, and to enable recycling of materials and recovery of energy on an industrial scale. ***In Nairobi, more than 2000 people earn a living through their engagement in resource recovery, but at 250-300 ton per day of recyclable/reusable material recovered, they account for only about 8-10% of the waste stream.*** Recycling rates of the order of 20% are achieved in many other contemporary cities.

2. Origins of this ISWM Plan

In response to this malaise, the Kenyan government has agreed to collaborate with the United Nations Environment Program to develop an Integrated Solid Waste Management Plan for Nairobi. The project was initiated in March 2009 and a National Task Team was formed. Local university teams took hundreds of samples of wastes during 2009 to determine waste origins, compositions and to estimate amounts. Several training sessions were also run and stakeholders were consulted on matters of concern in early December 2009, and a strategic approach to the integrated waste management plan was work-shopped by the National Task Team. A first draft of the ISWM plan was developed and further work-shopped with stakeholders in February 2010. A second draft was reviewed by the National Task Team and by UNEP in March 2010.

This document presents an overview of the ISWM plan, and should be read in conjunction with the technical support document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***, which presents the details of the proposed action plans, rooted in a situation analysis.

3. Vision and Strategy for Solid Waste Management in Nairobi

3.1 Vision

The vision underpinning this integrated solid waste management plan is one of ***a healthy, safe, secure and sustainable solid waste management system fit for a world-class city***, in a time of increasing resource scarcity. Clean, healthy city environments form as much part of this vision as resource-efficient processes of production and consumption.

3.2 Mission

The mission of those involved with solid waste management in Nairobi is ***to improve and protect the public health*** of Nairobi residents and visitors, ***to protect ecological health, diversity and productivity***, and to ***maximise resource recovery*** through a participatory approach. Delivery strategies should be inclusive, financially sustainable and based on sound policies and institutions.

3.3 Goals

The goals of this integrated solid waste management plan are:

1. To reduce waste quantities by introducing policies and instruments that regulate wasteful behaviour;
2. To significantly extend resource recovery, both in terms of materials and energy, recognizing that this will require source separation as an essential component of sustainable waste management ;
3. To restructure and extend efficient and equitable collection of source separated resources and wastes, with a view to protecting public health and the environment;
4. To build environmentally sound infrastructure and systems for safe disposal of residual waste, replacing current disposal sites which must be rehabilitated.

3.4 Targets

Ten high-level targets were developed by the national task team after soliciting stakeholder input in December 2009. They were fine-tuned after obtaining further stakeholder input in February 2010. The planning period adopted is 2010 – 2020.

1. Adoption of this ISWM plan by the City Council of Nairobi, confirming the multi-actor approach and signaling investment certainty, by 30th June 2010; approval by MoLG and acknowledgement by MoNMR and other relevant government agencies by the end of 2010.
2. Introduction of 4R principles in the educational Curricula at all levels and relevant education material available by the year 2013.
3. Attain a three-way waste stream separation at source in all zones by 2013 (hazardous, wet and dry); awareness among the general public about the 4Rs at 75% by 2015.
4. Streamline solid waste collection systems, collection fees, collection vehicle types, and identify complementary roles of CBOs, NGOs, private sector, NEMA, CCN and other government agencies as regards licensing and regulation by end 2010.
5. A publicly accessible waste information system in place by end 2012.
6. Increase the level of collection from current 50% to 75% by 2013 for all zones and to better than 95% by 2020.
7. All zones served by appropriate collection systems by mid 2013, and all zones to have access to a material recovery center and transfer station by 2020; at least one such center to be in place by 2015.
8. An active recycling economy supported by a green procurement policy and the abolishment of bylaws that counteract valorisation; and a financing plan, to grow the recovery rate of recyclables from ~8% in 2009 to 20% by 2020, and the rate of valorisation of organic materials from ~2% in 2009 to 14% in 2015 and 30% in 2020.
9. Increase level of transportation of waste from all zones to designated waste disposal sites from 18% to 36% in 2015. (Appropriate transport systems to be utilized, including the railway).
10. For establishment of a sanitary landfill for the city, agreement to be reached by end 2010 between CCN, MoLG, MEMR and MoNMD for CCN to take on the role of developing a safe disposal facility for residuals arising from the ISWM system. CCN to lead a project to bring such a facility on stream by 2015, decommission and rehabilitate Dandora, while closing all illegal dumpsites between 2015 and 2020.

The targets for the ISWM plan translate into different scenarios for the tonnages of different types of waste generated and how these are managed. The possible futures for solid waste volumes in Nairobi are illustrated in Figure 1and Figure 2 below for Business As Usual, and under the ISWM targets. Table 1 summarises an estimate of waste volumes in 2009 and predictions with and without the ISWM plan for 2015 and 2020.

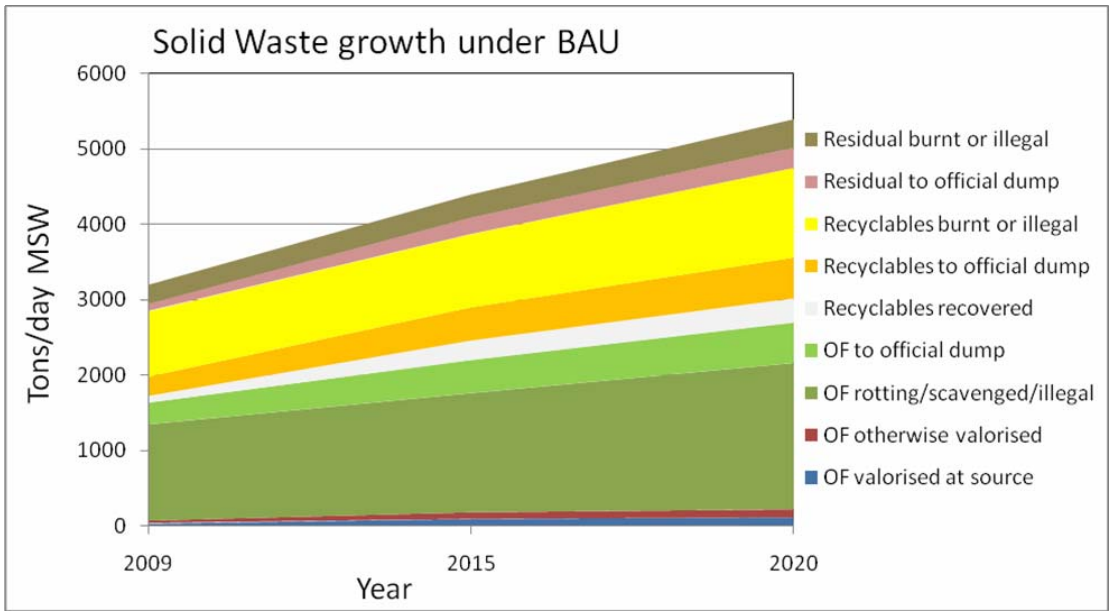

Figure 1: Nairobi Solid Waste Growth under Business As Usual

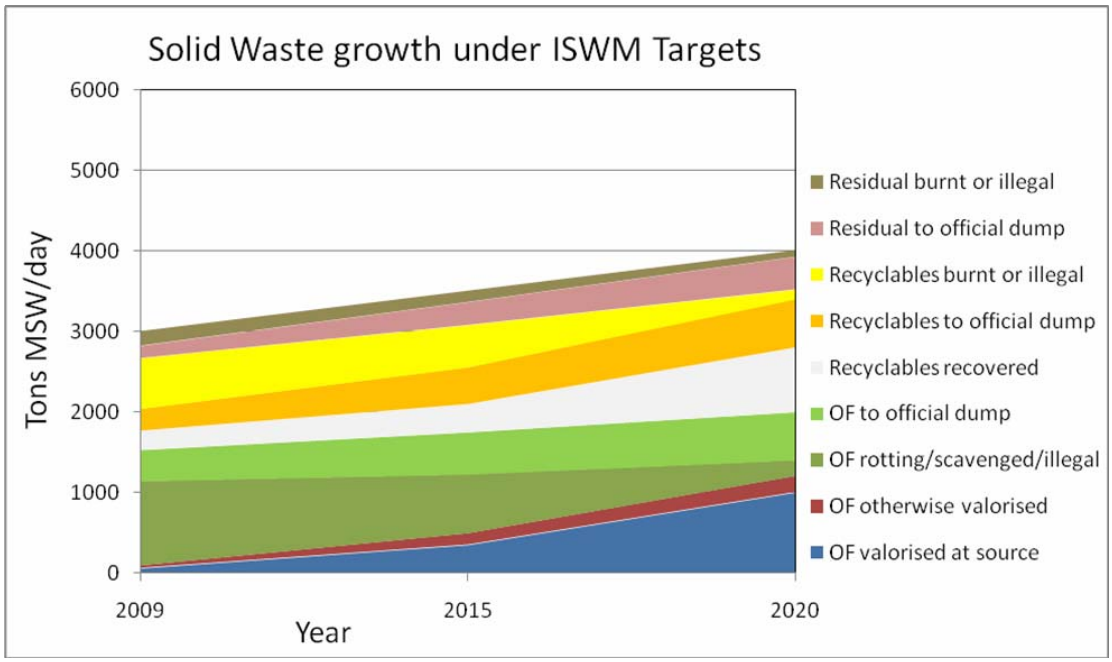

Figure 2: Nairobi Solid Waste Growth under ISWM Plan Targets

Table 1: Status quo and possible futures for solid waste volumes in Nairobi						
	Quantities in tons/day					
Year:	2009		2015		2020	
	Best	Worst	ISWM	BAU	ISWM	BAU
Total generated	3000	3200	3500	4400	4000	5400
Organic Fraction valorised at source	2%	1%	10%	2%	25%	2%
Organic Fraction otherwise valorised	1%	1%	4%	2%	5%	2%
OF rotting/scavenged/illegal	35%	40%	21%	36%	5%	36%
Organic Fraction to official dump	13%	9%	15%	10%	15%	10%
Recyclables recovered	8%	3%	10%	6%	20%	6%
Recyclables to official dump	9%	8%	13%	10%	15%	10%
Recyclables burnt or illegally dumped	21%	27%	15%	22%	3%	22%
Residual waste to official dump	5%	3%	8%	5%	10%	5%
Residual burnt or illegally dumped	6%	8%	4%	7%	2%	7%
Total	100%	100%	100%	100%	100%	100%
Total to dump	*30%*	*18%*	*36%*	*25%*	*40%*	*25%*
Total valorised	*8%*	*5%*	*24%*	*10%*	*50%*	*10%*
Total illegal	*62%*	*77%*	*40%*	*65%*	*10%*	*65%*
OF – Organic Fraction; BAU – Business As Usual.						

3.5 Guiding principles

- ✓ **Waste minimizing** – through implementation of 4R: reduce, reuse, recover, recycle
- ✓ **Polluter pays principle**
- ✓ **Competitiveness –** in waste collection, transportation and recycling
- ✓ **Multi-actor approach (PPPP)** in SWM
- ✓ **Sustainability**

3.6 Core values

- ✓ Clean, safe and secure environment for all
- ✓ Uphold the highest integrity and equity in all operations
- ✓ Flexible, adaptable and pro-active - PPPP and technology

Stakeholders in SWM in Nairobi place high value on being able to operate in a safe and secure environment, free of bribery, corruption and harassment. This came across very strongly during the stakeholder workshop of 1 December 2009.

4. The Situation before the ISWM Plan: A Summary

In this section, a summary is presented of the most important findings of the baseline study undertaken to support the development of this ISWM plan.

4.1 Composition of solid waste streams

The overall average composition of waste at source was estimated to be 51% organic (OF), 38% recyclable (paper, plastic, glass and metal) and 11% residual. There is a significant variation in waste composition between the different types of generators, with the organic fraction in residential waste being as high as 60% at source. There appears to be no statistically significant variation in waste composition between the various zones of Nairobi.

It is noteworthy that the composition analysis of waste from communal collection points showed a marked decrease in organic fraction (down to 43% from at least 51% at immediate source) and paper, but a doubling in the 'Other' (residual) waste stream from 11% to 22%. If one assumes that none of the 'Other' waste degrades or is removed for resource recovery between source and collection points, then the implications of this observation are:

- That only 50% of waste generated ends up at collection points;
- That about half of the organic fraction degrades, rots or is otherwise removed between generation at source and collection; in essence poorly disposed;
- That there is significant resource recovery taking place either at source or from collection points, esp. of paper and plastics, and probably also of metals.

4.2 Summary of solid waste quantities and their fate

The total amount of solid waste generated in Nairobi was estimated to be between 3000 and 3200 ton per day in 2009, which represents a doubling from the amount of 1530 t/day estimated by JICA 10 years earlier.

Current total waste collection levels are estimated at 50% at best, in general agreement with previous studies that found that over half of Nairobi's residents don't receive any waste collection service (Karanja, 2005). This equates to total collection levels of about 1560 tons/day. Based on April 2009 CCN records, average CCN collection levels at present are approximately 430 tons/day out of an average of 567 tons/day received at Dandora in 2009. Weighbridge records at the Dandora dumpsite over the period 2006 – end 2008 indicated an average 830 tons/day were disposed there prior to 2009.
There is an active and well documented material recovery and recycling sector operating in Nairobi, with several thousand people earning their livelihoods from this activity. This sector accounts for a sizeable fraction of the generated waste, but remains limited to about 300 t/day, estimated as follows:

- ~ 100 t/day of paper (~18% of paper waste)
- ~ 100 t/day of plastic (~20% of plastic waste)
- Up to 62 t/day of metal (most valuable metal in waste is recovered)
- ~ 2.4 t/day of organics is composted (< ~1% of organic waste).

- It is unknown how much organic waste is recovered for livestock feeding.
- Recycled glass volumes appear to be on the decline, possibly at ~50t/day.

4.3 Trends in solid waste management

Nairobi has been experiencing exponential population growth, which has in the past few years started to show signs of leveling off. Overall, the population of the Nairobi Metropolitan region is expected to keep growing, though at slower rates. Solid waste generation is however also a function of growth in wealth, and in this respect, Kenyans have experienced an average 3% growth in GDP/capita in the first decade of the new millennium.

Growth in waste is often the sum of the population and GDP/capita growth rates, and Nairobi in the 2000s seems to have experienced this too, resulting in a 7% p.a. growth rate in solid waste, or roughly a doubling of total quantity in ten years.

4.4 Systems analysis

Institutional, legal, financial, technical and stakeholder assessments of the current waste management system are included in the supporting technical document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***.

Against the pressures of exponential growth, defining moments for the solid waste management system include i) the corporatisation of the water services (with the abolition of waste collection fees) in the mid-1980s; ii) the emergence of private waste collectors around 1986 (who collect and transport to disposal sites); and iii) the emergence of CBOs (who collect but generally do not transport) around 1998.

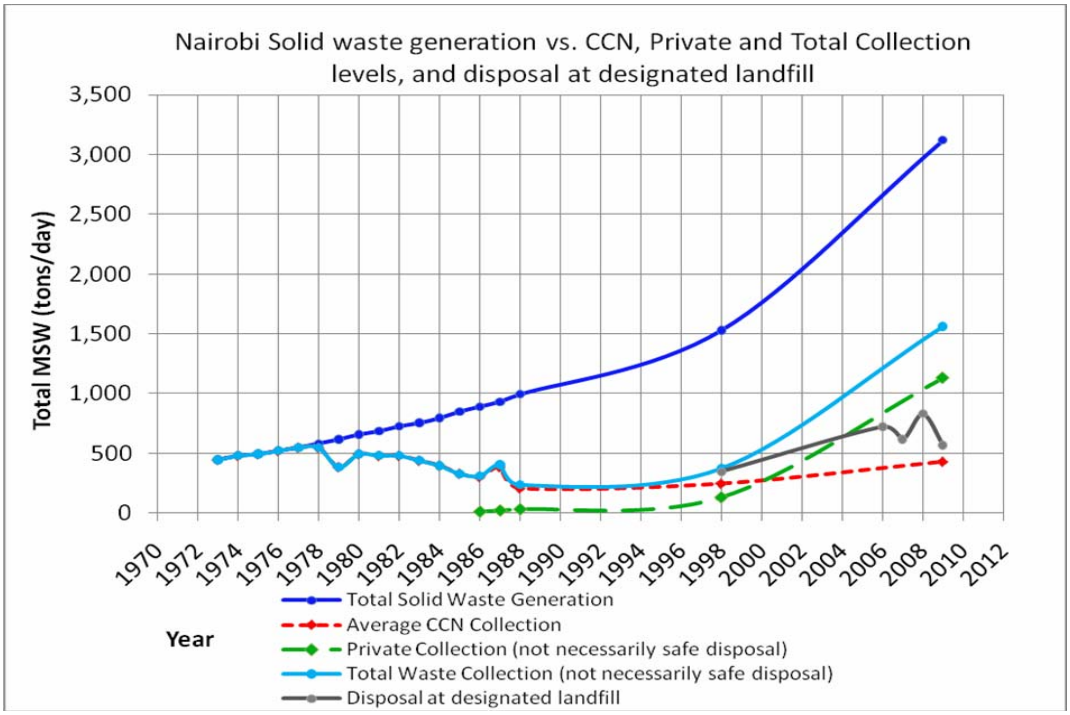

Figure 3: Solid waste generation and waste management trends in Nairobi

On the collection front, the joint effort of CBOs and private collectors (green line in Fig. 1) have been growing at similar rates as the overall growth in waste, whilst the publicly operated collection system has been falling further and further behind, despite some small growth. The ability to collect fees and/or access public budgets is key to these growth trends.

5. Success Factor Analysis

Key observations that point to limited control by the CCN DoE over SWM in Nairobi, and therefore to the importance of multi-actor collaboration, include:

- decreasing budget allocations whilst overall City budget increases
- realignment of roles of CCN and Ministry for Nairobi Metropolitan Development
- confusion around licensing and regulation roles of CCN DoE and NEMA as regards collectors, transporters and recyclers

For the ISWM plan to be successful, it therefore has to recognize these realities and proactively plan to work within the constraints they impose:

- Financing of SWM remains a challenge and CCN performance has been poor in this regard – both as a direct service provider and in partnerships. Adequate budget allocation is required for those functions that only CCN DoE can provide, and DoE must seek to utilize multiple strategies – PPPP, franchising, and application of the polluter-pays principle.
- Harmonization of roles/ mandates of City Council of Nairobi, Ministry of Local Government, Ministry of Environment and Mineral Resources, Ministry of Nairobi Metropolitan Development, the relevant Acts and Regulations (Cap. 265; Cap. 286; Public Healthy Act, and Occupational Health Safety Act) are essential.
- Current consensus is that Dandora's closure/ decommissioning is long over due. However, the problem is not the site but poor management, allowing open burning and control by criminal gangs. CCN considers that after closure Dandora can be rehabilitated (26 hectares), to provide for a transitional material recovery centre and transfer station through controlled tipping to allow for development of a suitable sanitary landfill. There is hardly any viable option for immediate use.
- Enforcement of relevant laws and regulations (EMCA, Local Government Act, etc.) with regard to SWM will remain essential.

6. Gap Analysis

The following gaps in Nairobi's waste management system were identified by the National Task Team:

Table 2: Gap Analysis

	Issues	Gaps	Proposed Interventions
1.	Prevention	– NEMA is yet to develop a law governing e-waste management in Kenya – Country lacks appropriate technologies/ know-how to handle e-waste – Lack of policies for handling toxic and hazardous wastes such as radioactive material and clinical waste.	– Develop policy / law on e-waste – Develop technologies on e-waste – Develop policies for handling toxic and hazardous wastes
2.	Minimization (Reduce)	– Excess packaging – Weak enforcement of policy on minimum thickness of plastic bags – No active policy on establishment of eco-industrial parks built around waste exchange and/or industrial symbiosis	– Discourage through levies – Enforce minimum thickness of plastic bags – Promote industrial production of recyclable material e.g plastics
3.	Reuse	– Limited access to suitable technology, e.g. for re-use of C&D wastes – Limited access to finance to fund acquisition of such technology – Unhelpful attitude that "poor people reuse"	– Promote safe re-use of C & D wastes by small operators – Awareness and attitude change on re-use
4.	Recycling	– Insufficient infrastructure, and no active land-use planning for such infrastructure – Insufficient incentives – Too many grades/types of plastic on the market – No technology incubation (this also relevant to the next heading)	– Provide infrastructure and space for recycling – Provide incentives – Enforcement of plastic laws and regulations – Develop incubation centres for recycling
5.	Recovery	– A significant gap exists around recovery of carbon-bound energy from the organic fraction (OF). It seems that composters currently handle in a year the amount of material that arises in 2-5 days. Can composters scale up significantly? Would (decentralized) biogas generation be a key technology to fill this gap? – No policy in place to encourage / regulate	– Introduce technology and know-how on composting and biogas production – Promote the use of compost and biogas – Enact by-laws to regulate composting and biogas generation and use

6.	Disposal	– New landfill project not proceeding with required urgency due to conflicting interests. – Limited financial and technical capacity	– Consultations to ensure speedy implementation – PPP and requisite technology transfer
7.	Waste Collection & Transportation	– Currently insufficient collection & transportation capacity in the city at both CCN and Private operator level, growing private collector/CBO interest and contribution is however observed – Most private trucks are small type (≈ 3 ton capacity), and inadequate for long distance waste transportation – Most waste transportation trucks are uncovered (CCN & Private) and in poor mechanical condition	– Encourage private sector participation via comprehensive Local Government policy development and economic incentives – CCN to increasingly focus its resources on regulation and supervision only of waste management incl. defining appropriate waste equipment; and leave pure waste collection & transportation to Private/CBO actors

7. Themes for Action

A plan of action is proposed as the centre-piece of the ISWM Plan. 16 actions are identified so as to respond to the identified gaps in waste management, and to reach the set objectives and targets. For better oversight, the actions are grouped into 5 themes. These themes and actions are summarized in Table 3, with each of the themes discussed in the following sections. The actions themselves are summarized in Section 8, and action plans detailed in the indicated sections of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***.

Table 3: Themes and Specific Actions

1: Strategic Alignment, and Recognition of Partners	**1.1** Strategic Alignment of DoE Mission	**1.2** Recognition of Partners in SWM	**1.3** Development of Waste Information System and Research Capacity	
Links to:		2.3, 3.1,3.2,3.4, 4.1, 4.2		
2: Waste Generation Reduction and Source Separation	**2.1** Volume-based Stream-lined Collection Fees	**2.2** Source Separation of Recyclable and Pure Organic Wastes with Incentives	**2.3** End-of-life Planning Levies for Problematic Wastes	**2.4** Awareness Campaigns and Education
Links to:	1.2, 3.1, 3.2, 3.4	1.2, 2.3, 3.2, 3.3, 4.1, 4.2, 5.1	4.2, 5.1	2.2
3: Waste Movement from Source to Efficient Collection, Derivation of Value, and/or Disposal	**3.1** Improving and Increasing Waste Collection & Management	**3.2** Zoning of Waste Collection	**3.3** Formalized Contracts for the provision of Waste Collection Services	**3.4** Development of Material Recovery & Transfer Stations
Links to:	1.1, 1.2, 3.5	1.2, 2.3, 2.2, 3.2, 3.4	1.2, 2.2, 2.3, 3.1, 3.4	1.2, 2.2, 4.1, 4.2, 5.1
	3.5 Regulation, Enforcement and Oversight of Private/CBO Waste Collection			
Links to:	2.2, 2.3, 3.1, 3.2			
4: Resource Recovery: Materials and Energy	**4.1** Recovery of Value from Organic Wastes	**4.2** Strengthening of Specific Recycling Strategies		
Links to:	2.2, 3.2, 3.3	2.1, 2.2, 3.2, 3.3		
5: Infrastructure and Systems for Residual Waste	**5.1** Development of New Engineered Landfill Site	**5.2** Rehabilitation of Dandora Dumpsite		
Links to:	2.1, 2.2, 3.3, 3.4	3.3		

It should also be noted that, in terms of targets, Table 1 implies:

- A strong valorization at source programme for OF (Organic Fraction)
- Strong controls to phase out burning, and to restrict illegal disposal
- Strengthening of the recycling value chain and industry
- More material going to safe disposal (but still only a minority)

Theme 1: Strategic alignment and recognition of partners

The mandate of the Department of Environment, City Council of Nairobi, stems from a time when the emphasis on the 4R approach to waste management was much weaker than it is today. For the DoE to be able to effectively lead an ISWMP in which the 4R activities are to be equally effective as collection, transportation and safe disposal, it is imperative that the mandate of the DoE be inspected and restated. This is also an opportunity to ensure that the new mandate is appropriately funded.

Equally, on setting out on the path of an ISWM plan, a good opportunity presents itself to formally recognize the multiple partners that already exist and that will need to be strengthened for the goals of the plan to be realized.

Theme 2: Waste reduction and source separation

An essential starting point for ISWM in Nairobi is to develop a strong drive for material separation at source. However the main barriers are: negative attitude, lack of awareness, vested interests and unaffordable technology. There is need to build awareness and capacity through: enactment and enforcement of appropriate laws and regulations, effective pricing signals enabled by functioning resource recovery systems, media campaigns, and effective use of environmental education opportunities, such as a no-burn programme in Council schools.

There are opportunities to link this theme of the ISWM plan to:

- The National Recycling Programme
- The Nairobi River Basin Programme
- The new e-waste management plant in Embakasi
- Existing recycling industries

Theme 3: Waste movement from generation to efficient collection, derivation of value and/ or disposal

The current level of waste collection is estimated at 50%. It is higher in middle to higher income areas, offices, businesses and industry. There is poor collection in informal settlements and informal business areas. The ISWMP seeks to restructure and extend efficient and equitable collection and transportation services. Strong controls to phase out burning, and to restrict illegal disposal shall be implemented.

Major features of this theme of the ISWM plan are:

- Streamlining of collection fees, complementary roles of CBO collectors and private collectors, with licensing and regulatory clarity.
- Non-motorized and frequent movement of the source-separated organic fraction for valorization close to source
- Strong controls to phase out burning, and to restrict illegal disposal
- Establishment of operation zones for controlled waste collection and management. Establishment of eco-parks for material recovery and composting by 2020, and bulking of residual waste for onward transport.
- Streamlining of collection fees, type of collection vehicles, and complementary roles of CBOs, NGOs, private sector, NEMA, City Council of Nairobi and other government agencies with regard to licensing and regulatory clarity to be achieved for all zones by the end of 2010.

Theme 4: Resource recovery: materials and energy

In Nairobi 51% of the waste is of an organic nature, allowing for energy recovery by anaerobic digestion to produce biogas and/or nutrient recovery by means of composting. Another 38% of the waste is recyclable (plastic, paper, glass and metal). There is considerable material recovery in Nairobi particularly by small scale operators and waste pickers. However, the recyclers are faced with numerous challenges including lack of operational space, harassment by officials, insecurity, multiple taxation by government agencies, and illegal groups. Market fluctuation and uncertainty also persist.

The purpose of this theme of the ISWM plan is for as much as possible of the utilizable 89% of wastes to end up in resource recovery operations instead of disposal sites. If by 2020, half of the organic fraction (= 25% of total waste, or 1000 t/day) plus 25% of the 38% of recyclables (another 1000 t/day) could be diverted to valorization, a major battle would have been won for sustainable development of Nairobi.

An interesting link could possibly be made to:

- Kenya Industrial Estates Microfinance Programmes

Theme 5: Infrastructure and systems for residual waste

In Nairobi 38% of the total waste is recyclable (plastic, paper, glass and metal). However, it is estimated only about 20% of these recyclables are recovered. Approximately another 20% recyclables end up in the dumpsite, while the remainder is either uncollected or disposed of through open burning. The City has not established transfer stations. Currently Nairobi does not have a sanitary landfill. The existing open dumpsite at Dandora is both a health and environmental hazard and is overdue for decommissioning. Dandora is to be rehabilitated and transformed to a material recovery/transfer centre with controlled tipping.

The purpose of this part of the ISWM plan therefore is to establish at least one sanitary landfill for the city, possibly for the metropolitan area. Agreement will be reached by mid 2010 between CCN, MoNMD and other key actors for CCN to lead the development of a safe disposal facility for residuals arising from the ISWM system. Such a facility must be on stream at the latest by 2015.

8. Specific Actions for Implementation

Name of Action:	Strategic Alignment of CCN DoE Mission		Number: 1.1
Introduction	It was noted that the mission of the Department of Environment within the CCN needed to be inspected relative to its inherited and legal mandates, so as to align with this ISWM plan.		
Purpose	– To ensure that the DoE's mission is sufficiently specific to solid waste management – To ensure that the philosophy of ISWM is sufficiently strongly present in the DoE's mission		
Description	This is a pre-requisite for all actions of a "reduce" nature, which could sum to 1000 t/day of avoided waste in 2020. Equally, CCN DoE's mandate needs to be explicit about valorization (derivation of value from), especially of organic material – another 1000 t/day by 2020.		
Reference Section for detail in supporting ISWM document	**Section 10.1** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN DoE	**Support from:**	– Council
Location	Council offices		
Budget	Small		
Timeframe	By end 2010		
Examples of similar successful initiatives	City of Cape Town Waste Management's current efforts to realign it's mechanisms towards waste reduction, separation, recovery, and diversion		
Inter-linkages with other actions	2.1 (End-of-life Levies on Problematic Wastes) is impossible without this, parts of 4.1 (Derivation of Value from Organic Waste Fraction) are strongly dependent on it.		

Name of Action:	Recognition of Partners in SWM	Number:	1.2
Introduction	In addition to the current registration and oversight of Private Waste Collection Companies in Nairobi by CCN, there is a need to similarly recognize, formalize and streamline the operation of CBOs, and Actors involved in Waste Recovery and Trading activity in Nairobi as important, legal partners in Nairobi's SWM.		
Purpose	To appreciate the significance of, and enable the amplified participation and contribution of CBOs and Waste Recovery and Trading activity to Nairobi's Solid Waste Collection and Management.		
Description	This action seeks to recognize, formalize and streamline the operation of CBO's in waste collection so that they have the same legal and operational status as Private Collectors; to formalize the operation and complimentary roles of actors in (currently informal) Waste Recovery and Trading activity; and to develop and organize waste material supply chains to the recycling industry to minimize exploitation and create dependable supplies; all in pursuit of a spirit of 'Participatory' Solid Waste Management that taps into the strengths of different actors and addresses environmental and social needs.		
Reference Section for detail in supporting ISWM document	**Section 10.2** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN DoE	**Support from:**	– MoLG
Location	All wards of Nairobi		
Budget	Small		
Timeframe	2010-2012		
Examples of similar successful initiatives	Organized Recyclers' Movement in Brazil officially created in 2001 with the participation of more than 1700 recyclers from all over Brazil. The movement has gone on to gain momentum through strengthening of regional South American networks.		
Inter-linkages with other actions	Strong links with 2.3(Streamlined Collection Fees), 3.1(Zoning of Waste Collection), 3.2(Waste Collection Contracts), 3.4(Regulation, Enforcement and Oversight of Waste Collection), 4.1(Recovery of Value from Organic Wastes) and 4.2(Strengthening of Recycling Strategies)		

Name of Action:	Development of Waste Information System & Research Capacity		Number: 1.3
Introduction	The future planning of solid waste management in Nairobi, measurement of policy performance, and execution of decisions by relevant decision makers will rely on the provision of accurate and timely information.		
Purpose	To make provision for the regular update of waste-related information, and research and development into SWM in Nairobi City to facilitate future planning, and inform policy and investment decisions in the public and private sector.		
Description	Several Record keeping and Research Activities are proposed to keep tabs on solid waste and its related information in Nairobi City, as well as to enable local capacity growth in solid waste research & development to mould and inform future policy, and aid deployment of locally appropriate and innovative knowledge/technologies.		
Reference Section for detail in supporting ISWM document	**Section 10.3** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN DoE	**Support from:**	– NEMA – Local Research and Academic institutions
Location	CCN DoE		
Budget	Modest to large recurrent costs		
Timeframe	2010 onwards		
Examples of similar successful initiatives	City of Cape Town Solid Waste Management which conducts regular waste surveys, has a waste exchange website, and whose departments undertake specialized research projects with local universities related to solid waste management, technology application, and innovation.		
Inter-linkages with other actions	Most other actions will also require a good waste and research information system, as will partners as recognized in 1.2.		

Name of Action:	Volume-based Stream-lined Collection Fees		Number: 2.1
Introduction	The collection of arbitrary service charges directly from generators by private collectors as is the case under the current regime of open unregulated competition promotes the provision of service to only those who can pay the desired arbitrary rates, and leads to the alienation of lower income areas by the majority of private collectors due to perceived lower ability to pay.		
Purpose	To determine real waste disposal costs and reasonable fees due to waste collectors, and use these to officially streamline volume based waste collection charges/fees (including source separation costs) collected in the city to encourage transparency, accountability and good will towards private, CBO, and CCN waste collection in the city. A second important purpose of the volume-based fees is to provide a strong economic feed-back mechanism to waste generators, so as to reduce the excessive generation & disposal of waste at source.		
Description	Development of streamlined collection fees including separation costs for 3-way separation at source, payable per unit volume (through standard size bags) and recommended to all collectors and generators. Being volume-based, these streamlined fees will also provide a direct behavioral feedback mechanism to generators, with excessive waste generation (as is usually the case for more affluent communities) penalized by higher charges, and lower charges levied on lower income communities that usually put out less for disposal. An investigation into the feasibility of reintroducing general public waste tariffs payable to CCN for waste management is also proposed.		
Reference Section for detail in supporting ISWM document	**Section 11.1** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN DoE	**Support from:**	– NEMA
Location	All wards in Nairobi City		
Budget	Small investment to set up systems that will unlock large cash flows		
Timeframe	2011 – 2013		
Examples of similar successful initiatives	Pay as you Throw schemes in countries such as Sweden, Belgium, Denmark (Dahlén and Lagerkvist, 2009).		
Inter-linkages with other actions	Strong links with 1.2(Recognition of Partners), 3.1(Zoning of Waste Collection), 3.2(Formalized Waste Collection Contracts), and 3.4(Regulation, Enforcement and Oversight of Waste Collection)		

Name of Action:	Source Separation of Recyclable and Pure Organic Wastes		Number: 2.2
Introduction	The longer term successful diversion of waste necessitates the separation of waste at source, to assist downstream material recovery and improve captured material quality.		
Purpose	The early implementation of source separation in Nairobi's waste management system will help the City avoid the trap of more expensive and inflexible mixed-waste mechanical separation systems as now used in much of the developed world, where considerable effort and expense goes into trying to liberate pure materials that are collected mixed. The amplified economic value of minimally contaminated recyclable and pure organic waste as a result of source separation is expected to create a reinforcing loop towards more resource recovery and trading activity, strengthening material reuse and recycling in the City.		
Description	Reduced streamlined charges for separated high purity recyclable and pure organic wastes are proposed to incentivize the source separation of waste by generators. These reduced waste collection fees are also designed to encourage waste collectors to trade their separated quality recyclables on Nairobi's waste recovery and trading market or sell to recyclers, as well as potentially sell or deposit their separated organic waste at distributed anaerobic digestion facilities in Nairobi to reduce their disposal transportation costs and realize improved profit margins.		
Reference Section for detail in supporting ISWM document	**Section 11.2** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN DoE	**Support from:**	– NEMA
Location	All Wards		
Budget	Modest to large investment into new systems		
Timeframe	2011 – 2013		
Examples of similar successful initiatives			
Inter-linkages with other actions	Strong links 1.2(Recognition of Partners), 2.3(Streamlined Collection fees), 3.1(Zoning of Waste Collection), 3.2(Formalised Waste Collection Contracts), 3.3(Development of Material Recovery & Transfer stations), 4.1(Recovery of Value from Organic Wastes), 4.2(Strengthening of Specific Recycling Strategies) and 5.1(Development of Engineered Landfill Site)		

Name of Action:	End-of-Life Planning Levies on Problematic Wastes	Number:	2.3
Introduction	Some waste materials generated in Nairobi do not currently have sufficient recycling infrastructure in the City, or are altogether not readily recyclable and therefore pose end-of-life disposal burdens to the City.		
Purpose	To institute city or national-level end-of-life planning or landfill levies on problematic waste materials that would go into a central pool fund enabling the purchase and/or development of appropriate recycling capacity or end of life treatment infrastructure for problem materials.		
Description	A proposal is made to institute end-of-life treatment or disposal planning levies on problematic materials, payable at the gate of manufacturers, importers, or relevant sellers as appropriate; on Problematic waste materials in Nairobi. These include broken glass for which limited appropriate recycling infrastructure is available; several poor grade plastics and plastic bags (esp. < 30 microns), polystyrene food packaging, some grades of paper (e.g. waxed) which are either non-recyclable or hard to recycle, laminated beverage containers, and construction & demolition waste. Other candidates to this list include e-waste, for which no recycling capacity and legislation currently exists.		
Reference Section for detail in supporting ISWM document	**Section 11.3** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– NEMA	**Support from:**	– CCN DoE – Ministry of Industrialization – Kenya Revenue Authority
Location	All wards in Nairobi City		
Budget	Modest costs to unlock large new revenue flows		
Timeframe	2010 – 2012		
Examples of similar successful initiatives	– KNCPC Plastic Wastes Strategy resulting in 120% exercise duty on plastic carrier bags and a ban on production of the same of less than 30 micron thickness. Enforcement/implementation however remains unclear. – Municipal Council of Nakuru which stipulates payment of up to 20% of the cost of Business Permit fees for businesses using polythene materials, towards the cost of treating or disposing of such materials.		
Inter-linkages with other actions	4.2(Strengthening of Specific Recycling Strategies) and 5.1(Development of New Engineered Landfill Site)		

Name of Action:	Awareness Campaigns and Education		Number: 2.4
Introduction	The source separation actions in this ISWMP, which are critical to its success, will depend strongly on habits of waste generators. Council schools provide an ideal location to start changing habits.		
Purpose	To inform waste generators, collectors, and transporters of required changes to waste separation and disposal habits, and to educate about resource recovery and safe disposal.		
Description	There need to be: – Targeted awareness raising campaigns, timed to coincide with introduction of source separation systems in specified zones. – General education interventions, especially in the school system, to ensure better general knowledge of effects of unsafe disposal, and of the importance of resource efficiency. – A programme to phase out burning in schools and other institutions in the city.		
Reference Section for detail in supporting ISWM document	**Section 11.4** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN DoE / education department	**Support from:**	– Communication agencies
Location	General information, ward-based campaigns, school-based campaigns		
Budget	Modest to large recurring costs		
Timeframe	2011–2013		
Examples of similar successful initiatives	Pune (India)		
Inter-linkages with other actions	2.2(Source Separation): it is very important that the introduction of source separation (one ward at a time), be properly supported by education and awareness campaigns.		

Name of Action:	Improving and Increasing Waste Collection & Management		Number: 3.1
Introduction	There are several challenges to waste management in Nairobi, and CCN faces severe physical and financial limitations in its ability to both execute waste collection and transportation, and control overall waste management in the city. Since the 1990's there has also been a rapid growth of several alternate actors in waste collection and transportation in Nairobi in the form of private collection companies, transport contractors, and CBOs.		
Purpose	– To concentrate the various current actors in Nairobi's SWM in what they do best and minimize duplication of resources and roles, so as to increase collection levels and lead to more equitable service delivery, and to improve the performance and regulation in general of solid waste management in Nairobi. – To investigate ways to improve and expand non-motorized CBO waste collection and movement. – To determine the feasibility of using railway for bulk residual waste transport to landfill.		
Description	It is proposed that CCN gradually move out of the collection and transportation to disposal of solid waste in the city, and increasingly leave this role to private collectors and CBOs in Nairobi City. With this withdrawal, CCN can increasingly focus its current funding channels and resources on the regulation, supervision and strategic oversight of solid waste management and collection in the City. Ways to expand non-motorized CBO waste collection and movement are also suggested, and investigations to determine the feasibility of using railway for bulk waste transport to landfill will be undertaken by JICA.		
Reference Section for detail in supporting ISWM document	**Section 12.1** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN DoE	**Support from:**	– MoLG
Location	All wards in Nairobi City		
Budget	Modest		
Timeframe	2010 – 2020		
Examples of similar successful initiatives	– Privatization of Waste Collection in the CBD – CCN Contracting of Private Collectors and Transporters in other zones of Nairobi to execute work on their behalf		
Inter-linkages with other actions	1.1 (Strategic Alignment of DoE Mission) , 1.2 (Recognition of Partners in SWM), 3.5 (Regulation, Enforcement and Oversight of Private / CBO Waste Collection in the City).		

Name of Action:	Zoning of Waste Collection		Number: 3.2
Introduction	Nairobi has an estimated 200 registered Resident Associations which lobby for improved public service delivery. Nairobi is also broken down into several administrative units with the ward level comprising the smallest unit. These two systems/forms of administration provide potential mechanisms to aid the zoning, allocation, and administration of the waste collection operation areas of the different actors in Nairobi's waste collection sector.		
Purpose	– To zone waste collection operation areas to minimize transport and disposal costs to collectors and to residents, and legally bind residents to use the same collector to enable economically viable localized collection operations – To reduce unhealthy competition of private collectors/CBOs in similar localities – To improve organization and efficiency of waste collection, and create accountability for performance in specific areas – To enable greater equity in service delivery as a result of providers having to spread away from already allocated areas.		
Description	Zoning of the waste collection operation areas of different private collectors, CBOs and CCN to achieve the results above. Zoning of collection operation areas can potentially be done on a ward by ward basis, with operation area contract allocations based on the capacities of tendering collectors (company or CBO) relative to the size of the service area, and collection area administration done potentially primarily done by the relevant Resident Association (RA) for the area in question, and renewed annually by the participating residents based on performance.		
Reference Section for detail in supporting ISWM document	**Section 12.2** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN & UoN Urban Planning Departments	**Support from:**	– CCN DoE – Ward Councilors
Location	All wards in Nairobi city		
Budget	Modest		
Timeframe	2010–2012		
Examples of similar successful initiatives	200 existing resident associations in Nairobi, organized into two umbrella organizations. While they currently don't have strict legal mandate to oversee local waste collection, their formation for other concerns illustrates their potential as a zoning & admin. mechanism		
Inter-linkages with other actions	Strong links with 1.2(Recognition of Partners), 2.2(Source Separation), 2.3(Streamlined Collection Fees), 3.2(Formalised Waste Collection Contracts) and 3.4(Regulation, Enforcement and Oversight of Waste Collection)		

Name of Action:	Formalized Contracts for the provision of Waste Collection Services		Number: 3.3
Introduction	The drawing up of contractual arrangements for the provision of a service provides a moral and legal expectation to deliver the service at an agreed standard, and for the serviced party to pay for the service.		
Purpose	Contracts entered into between private waste collectors/CBOs and residents' associations will provide legal protection to both parties regarding fee collections and service provision as per set standards, and improve accountability.		
Description	Contractual arrangements between collectors and serviced generators or communities will provide legal protection to both parties regarding fee collections and service provision as per set standards; however they will require standard minimum stipulations for the efficient provision of the collection service. Minimum stipulations envisaged in such waste collection contracts are developed to encourage the growth of an economically viable, socially and environmentally responsible waste collection sector in the city.		
Reference Section for detail in supporting ISWM document	**Section 12.3** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN Legal Department	**Support from:**	– CCN DoE – Ward Councilors
Location	All wards in Nairobi City		
Budget			
Timeframe	2010 – 2012		
Examples of similar successful initiatives	Collection Service Agreements between Koma Rock Residents Association and Jacaranda Welfare Residents Association and private collectors/CBO		
Inter-linkages with other actions	Strong links with 1.2(Recognition of Partners), 2.2(Source Separation), 2.3(Streamlined Waste Collection Fees), 3.1(Zoning of Waste Collection), and 3.4(Regulation, Enforcement and Oversight of Waste Collection)		

Name of Action:	Development of Material Recovery and Transfer Facilities		Number: 3.4
Introduction	Plans are proposed for the establishment of material recovery and transfer facilities in Nairobi City		
Purpose	To reduce waste volumes for disposal through the extended recovery of recyclables and quality organic waste not already captured, and to reduce residual disposal transportation costs.		
Description	These facilities will reduce waste volumes for landfill disposal and help to reduce residual waste transportation costs to disposal through the compression of residual waste, and use of bulk transportation to landfill as opposed to smaller trucking.		
Reference Section for detail in supporting ISWM document	**Section 12.4** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– NEMA	**Support from:**	– MoNMD – CCN
Location	Across Nairobi		
Budget	Very large capital investment		
Timeframe	2013 – 2015		
Examples of similar successful initiatives	Cape Town material recovery and transfer facilities. (It should however be noted that labor intensive material recovery at the Cape Town's mixed-waste recovery & transfer facilities is very low; underlining the critical importance of waste separation at source to ease downstream recovery, as opposed to relying heavily on central recovery facilities – whether labor intensive or mechanical)		
Inter-linkages with other actions	Strong links with 1.2(Recognition of Partners), 2.2(Source Separation), 4.1(Recovery of Value from Organic Wastes), 4.2(Strengthening of Specific Recycling Strategies) and 5.2(Development of Engineered Landfill Site)		

Name of Action:	Regulation, Enforcement and Oversight of Private / CBO Waste Collection in the City	Number: 3.5
Introduction	The success of key result areas in the ISWM Plan will be dependent on the effective regulation and enforcement of approved plans, policies and bylaws.	
Purpose	– To ensure that all partners in the ISWM system live up to their responsibilities, without infringing on their rights. – To reduce regulatory duplication.	
Description	Residential associations and participating residents can potentially provide the local collection operation area monitoring force to ensure efficient collection service provision, with the result that if performance is deemed unsatisfactory the contracted collector company/CBO's contract for a collection operation area or zone would not be renewed on expiration. The CCN, using its current funding mechanisms as an income source, can focus on supervisory oversight and regulation of Private /CBO Waste collection and management across the city. There is also a need at the higher government level to streamline the complementary and specific roles of the various institutions related to solid waste management in Nairobi. Best institutional arrangements are proposed to this effect.	
Reference Section for detail in supporting ISWM document	**Section 12.5** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***	
Lead agency	– CCN DoE	**Support from:** – NEMA – MEMR – MoLG – MoNMD
Location	Ward based, and at council offices	
Budget	Modest recurring costs	
Timeframe	2011	
Examples of similar successful initiatives	– City of Cape Town management of private and CBO waste collection in different areas of the city	
Inter-linkages with other actions	This is an important counterpart to 3.2 (Formalisation of Waste Collection Contracts), but this action also needs to link in sensibly with 1.2(Recognition of Partners).	

Name of Action:	Derivation of Value from the Organic Waste Fraction		Number: 4.1
Introduction	Organic waste comprises Nairobi's largest waste fraction at approximately 51% of total waste generation. A significant gap exists around recovery/derivation of value from the organic fraction. Composting accounts for less than 1% of daily organic waste generation, and seems to be currently uncompetitive against synthetic fertilizers on a cost per nutrient value basis.		
Purpose	The fast and effective derivation of value from this fraction would divert a large percentage of Nairobi's waste from landfill, radically reduce transport and disposal costs, reduce pathogen prevalence, and with its encouraged capture at source also aid the recycling and reuse of other waste materials by reducing material contamination.		
Description	Alternative and/or parallel routes for the derivation of value from, and diversion of organic waste from landfill are proposed including; – Semi-decentralized (distributed) biogas generation for energy at anaerobic digester facilities – Encouragement of bio-digestion or composting at source by large organic waste generators – Quick movement of fresh organic waste from large rich generators such as restaurants and markets to livestock farmers as income generating activity. – Smaller scale composting of dried sludge from anaerobic digestion and of other non-digester suitable organic wastes e.g. hard biodegradables such as wood chips, hard greens, etc.		
Reference Section for detail in supporting ISWM document	**Section 13.1** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN – KenGen	**Support from:**	– CCN DoE – NEMA – MoNMD
Location	At source for large OF generators; and initially adjacent to planned material transfer facilities across Nairobi City, but later distributing to other areas based on pilot experiences		
Budget	Large investment into new infrastructure, much of it public, some private		
Timeframe	2010 – 2015		

Examples of similar successful initiatives	– Prevalent interest in the use of organic waste as animal feed in Nairobi City (Karanja, 2005 ; Onduru *et al*, 2009; ISWM Secondary Report) – 700m^3 organic waste digester on Sisal Estate in Kilifi, Coastal Kenya (Onduru et al, 2009) – 124 m^3 and 91 m^3 medium scale organic waste digesters at Egerton University (Njoro) and in Moi University respectively (Onduru et al, 2009) – 70 ton/day organic MSW treatment facility for the stabilization of organic waste, electricity generation through anaerobic digestion and production of soil conditioner in Rayong municipality, Thailand. Produces 5100 MWh electricity per annum and 5600 tons/year of soil conditioner. Plant is expected to pay the invested cost of US$ 4.3 million in 10 years from financial gains from electricity sales and soil conditioner (Polprasert, 2007).
Inter-linkages with other actions	Strong links with 2.2(Source Separation), 3.2(Formalized Waste Collection Contracts) and 3.3(Development Of Material Recovery And Transfer Stations)

Name of Action:	Strengthening of Specific Recycling Strategies		Number: 4.2
Introduction	The current total recycling capacity in Nairobi City is low relative to the total generation of recyclable waste materials.		
Purpose	– To increase total recycling capacity in Nairobi City – To take up the increased volumes of separated quality recyclable material so as to realize significant waste diversion from landfill.		
Description	In 2006, the KNCPC finalized a Comprehensive Plastic Waste Strategy for Nairobi City centered on the reduction, reuse and recycling of plastic wastes in the city. While its progress to date is not yet officially documented, there is a need to develop similar strategies for other recyclable waste streams such as paper. Strategy efforts similar to the KNCPC Plastics Strategy should be steered towards the encouragement of private enterprise in recycling, into the organization and securing of dependable supply chains for quality recyclable waste material, into local research and development of various technologies/knowledge base and innovations to tap into the value of various recyclable materials, and towards the provision of economic incentives for entrepreneurs or participants.		
Reference Section for detail in supporting ISWM document	**Section 13.2** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– KNCPC – NEMA – Ministry of Industrialization	**Support from:**	– CCN DoE
Location	Across Nairobi		
Budget	Modest for policy development, large capital investments by recyclers		
Timeframe	2010 – 2015		
Examples of similar successful initiatives	KNCPC Comprehensive Plastics Waste Strategy for Nairobi City launched 2006. Official documentation of success to date pending.		
Inter-linkages with other actions	Strong links with 2.1(End-of-life Levies for Problematic Wastes), 2.2(Source Separation), 3.2(Formalized Waste Collection Contracts) and 3.3(Development of Material Recovery and Transfer Stations)		

Name of Action:	Development of New Engineered Landfill Site		Number: 5.1
Introduction	The designated dumpsite at Dandora has reached full capacity, and has been noted to be responsible for severe environmental and public health hazards (Kimani, 2007).		
Purpose	To reduce the environmental and public health effects of the City's generated waste.		
Reference	There is an urgent need to accelerate the movement of residual waste disposal to the proposed new engineered landfill at Ruai as per JICA's (1998) recommendations. The accelerated development of a new engineered landfill would result in minimized environmental pollution from the waste, and have long-term implications for the future ecological and general health of Nairobi City. It is envisaged that such an engineered landfill facility would be primarily for the disposal of residual waste, with greater emphasis placed on waste diversion for recyclable and organic/biodegradable materials via value derivation. This would reduce overall disposal distances and costs, and extend landfill life expectancy.		
Reference Section for detail in supporting ISWM document	**Section 14.1** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN	**Support from:**	– MoNMD – MoLG – MEMR
Location	Ruai		
Budget	Substantial		
Timeframe	2013 – 2015		
Examples of similar successful initiatives	Cape Town Hazardous and Non-hazardous Sanitary waste landfills		
Inter-linkages with other actions	Strong links with 2.1(End-of-life Levies for Problematic Wastes), 2.2(Source Separation), 3.3(Development of Material Recovery and Transfer Facilities) and 3.4(Regulation, Enforcement and Oversight of Waste Collection)		

Name of Action:	Regaining control of Dandora dumpsite as a transitional disposal site, and decommissioning and rehabilitation on completion of new sanitary landfill		Number: 5.2
Introduction	The Dandora dumpsite has reached capacity, and is already causing significant environmental pollution and damage to human health (Kimani, 2007).		
Purpose	To regain control of Dandora dumpsite to allow the transitional disposal of solid waste there until the planned new sanitary landfill is established. Thereafter decommission and rehabilitate.		
Description	While there is doubtless a need to develop a new landfill site for residual waste in the City, the construction of landfills is by nature a long term undertaking that while being developed needs the provision of transitional waste disposal facilities. To this end, a proposal is put forward to first retake complete control of Dandora dumpsite from its current mafia control, stop open burning, and redevelop part of the site for controlled dumping. Thereafter on completion of new sanitary landfill, decommission and rehabilitate the Dandora site for material recovery and transfer stations, and explore options for controlled landfill methane gas recovery and utilization. These will be a number of costly engineering projects that have to be carried out in close dialogue with interested and affected parties.		
Reference Section for detail in supporting ISWM document	**Section 14.2** of the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan***		
Lead agency	– CCN DoE	**Support from:**	– MEMR
Location	Dandora		
Budget	Substantial		
Timeframe	2010 – 2015		
Examples of similar successful initiatives	Ellis Park Rugby Stadium, Johannesburg – an old but classic example of a dumpsite that became an urban park, later with construction of a sports stadium.		
Inter-linkages with other actions	3.3 (Development of Material Recovery and Transfer Stations)		

9. Financial Strategy

This section presents an overview of the Financial Strategy that must form a key part of the Integrated Solid Waste Management Plan (ISWMP) for the City of Nairobi in Kenya. The Financial Strategy has been designed to complement the 5 themes and 16 actions detailed in the plan description.

The material flows associated with waste in Nairobi, along with the various actors involved at each of the nodes in the flow, are shown in Figure 4. The thickness of the arrows represents the volumes of flows.

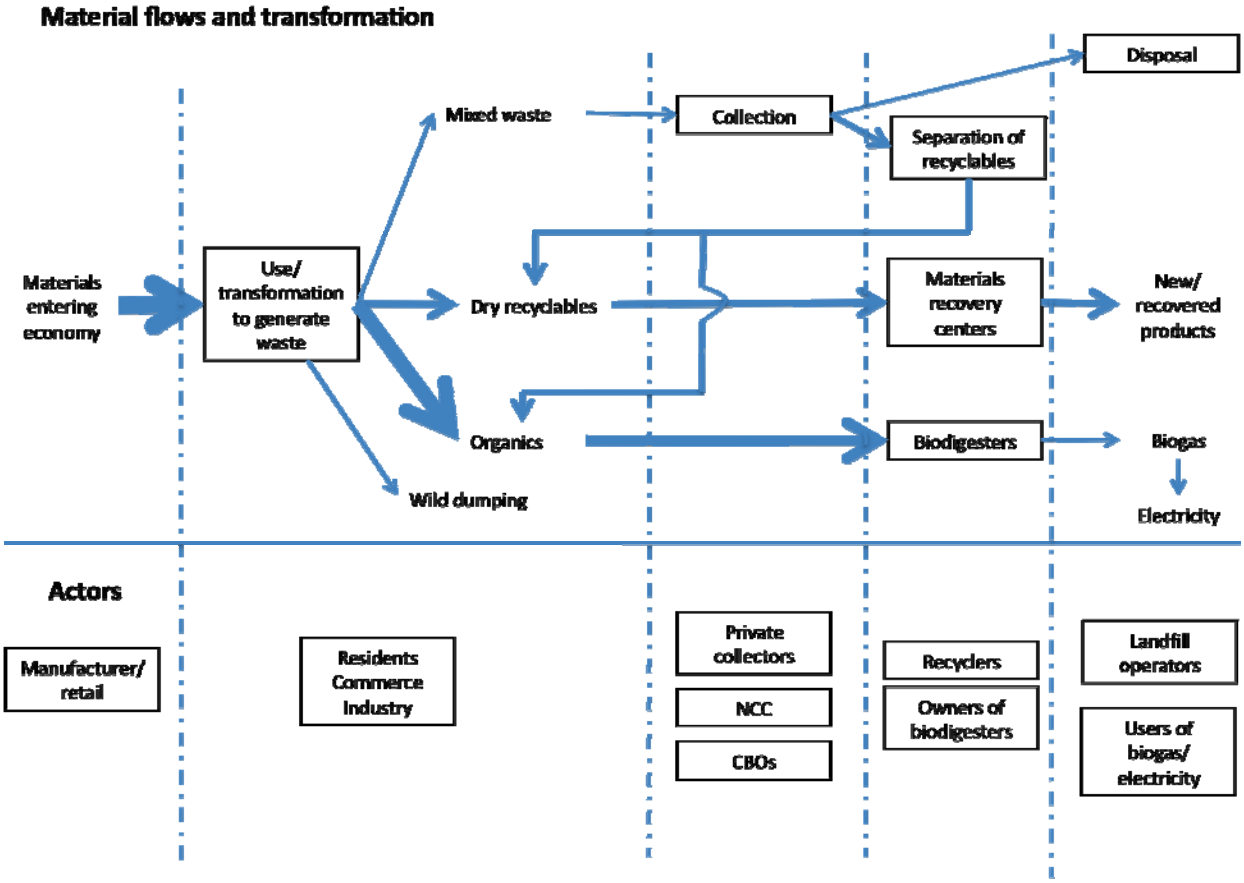

Figure 4: Material Flows and Actors in the Nairobi ISWMP

The Financial Strategy considers the financial implications of implementing the ISWMP in terms of:

- Initial establishment and potential future **capital investment**, as well as other upfront costs for implementing the ISWMP
- Ongoing **financial flows** into, out of and within the ISWM system.

Some comments are also offered of the financial implications of not implementing the plan.

9.1 Capital investment and other upfront implementation costs

Capital investment refers to the provision for items of a physical nature that do not need to be supplied on a regular basis. This includes:

- Purchase of collection equipment, including trucks
- Development of material recovery and transfer stations (3.4)
- Recovery of value from organic wastes – building of anaerobic digesters (4.1)
- Development of a new engineered landfill site (5.1)
- Rehabilitation of Dandora dumpsite (5.2)

Also considered here are once-off investments required to provide the systems for implementation of various actions. These include establishment (but not execution) of:

- A waste information system (1.3)
- End of life levies for problematic wastes (2.3)
- Awareness campaigns and educational material (2.4)

Clearly each of these requires a different level of investment, with the building of the new engineered landfill and rehabilitation of Dandora representing the largest costs. It is likely that these will have to be funded through international aid/donor funding. The remainder of the items could be funded through government budgets, perhaps with some contribution from international sponsors.

Building of anaerobic digesters for organic biodegradable waste (4.1) could be undertaken by private investors, as initial indications are that revenue generated from these will be sufficient to recover the capital expenditure in a relatively short period of time and then become profitable.

9.2 Ongoing monetary flows in the ISWMP

A summary of the different ongoing monetary flows in the ISWMP, along with a brief description and the beneficiaries thereof, is shown in the Table overleaf. The flows are also illustrated in Figure 5.

Table 4: Ongoing monetary flows in the ISWMP

	Action	Description	Revenue flows	Details
1.	2.3	Levies on problematic wastes	Levy will be collected by manufacturer or seller and will have to be paid over to the government body administering the levy (e.g. Kenya Revenue Authority). The pool of monies collected will be used to purchase/develop recycling capacity and/or treatment infrastructure	Collected at the point of manufacture or point of sale to help support increased recycling or safe disposal of these wastes. It needs to be ensured that this money does not merely get absorbed into the general budget of CCN or DoE, and remains ring-fenced for the purposes for which it is intended.
2.	2.1, 2.2 and 3.3	Collection fees paid to Community Based Organizations (CBOs)	CBOs paid directly by individual waste generators	CBOs typically collect fees from individuals to take wastes to central collection points from which it is removed by council or private contractors paid by council. The ISWMP suggests that lower fees should be paid for source separated materials, as CBOs or onward transport contractors are able to sell these on to recyclers and anaerobic digesters for further revenue. Furthermore it is suggested that collection fees for residual and mixed waste be based on volumes collected to encourage increased source separation.

	Action	Description	Revenue flows	Details
3.	2.1, 2.2 and 3.3	Collection fees to private collectors	From waste generators to private collectors	Private collectors accept fees from residential, commercial and industrial waste generators to remove their wastes to landfill.
			From CBOs to private collectors	CBOs must pay for the removal of residual waste from centralized collection points by private collectors, out of the revenue collected from waste generators. The combined RA-CCN regulation of CBOs must be designed to ensure that this happens. Here differential collection costs for mixed and separated wastes should be implemented. Furthermore, removal charges for residual/mixed waste should be volume based.
4.	2.1, 2.2 and 3.3	Collection fees gathered by CCN and incomes from potential waste management tariff	From waste generators to CCN, which will be used to cover the costs of collection and other running costs	Considerations as per private collectors.
5.	3.1	Fuel, staff and maintenance on trucks	From CCN to suppliers	Considered here in terms of CCN owned trucks, as private contractors will cover these costs out of their collection charges independently of the ISWMP. The CCN needs to build in these costs to the calculated collection charges.

	Action	Description	Revenue flows	Details
6.	4.1	Sale of organics	From companies which recover organic material to owners/operators of biodigesters	Source separated organics are used in the biodigesters for generating gas for cooking or to drive turbines/generator sets to generate electricity. The owners of these facilities might be prepared to pay for the material as they can recover value from it.
7.	4.2	Sale of other recyclables	From companies which recover the material to collectors of recyclables	A number of players in the ISWMP generate revenue from the sale of recyclables including plastic, paper, glass and organics. The value paid by these players will be higher for clean recyclables. It is noted that the price paid will be determined by markets for these materials.
8.	1.1 5.1	Disposal charges at landfill (Dandora or new engineered landfill)	Fees paid to operator of landfill site. At Dandora this might currently not be the Council.	Collectors bringing waste to site are charged tipping fees.
9.	4.1	Sale of biogas or electricity from biogas	From purchasers of biogas or electricity to generators	Organic waste is fed into biodigesters which generate biogas. This may in turn be used either directly for cooking or may be burned to drive turbines to generate electricity. Both the gas and the electricity can potentially be sold. Electricity can be sold into the grid under the national energy feed-in tariffs.
10.	1.1	Council budget allocated to DoE	From Council to DoE	Council allocates some budget to DoE ISWM overhead costs (education, awareness, regulation, clean-ups where the systems fail, etc.)
11.	2.4	Special project funds	From CCN, Central Government Transfer, Bilateral Support, PPP, etc to the relevant service providers	Ongoing delivery of education and awareness campaigns in schools, community groups, the media etc

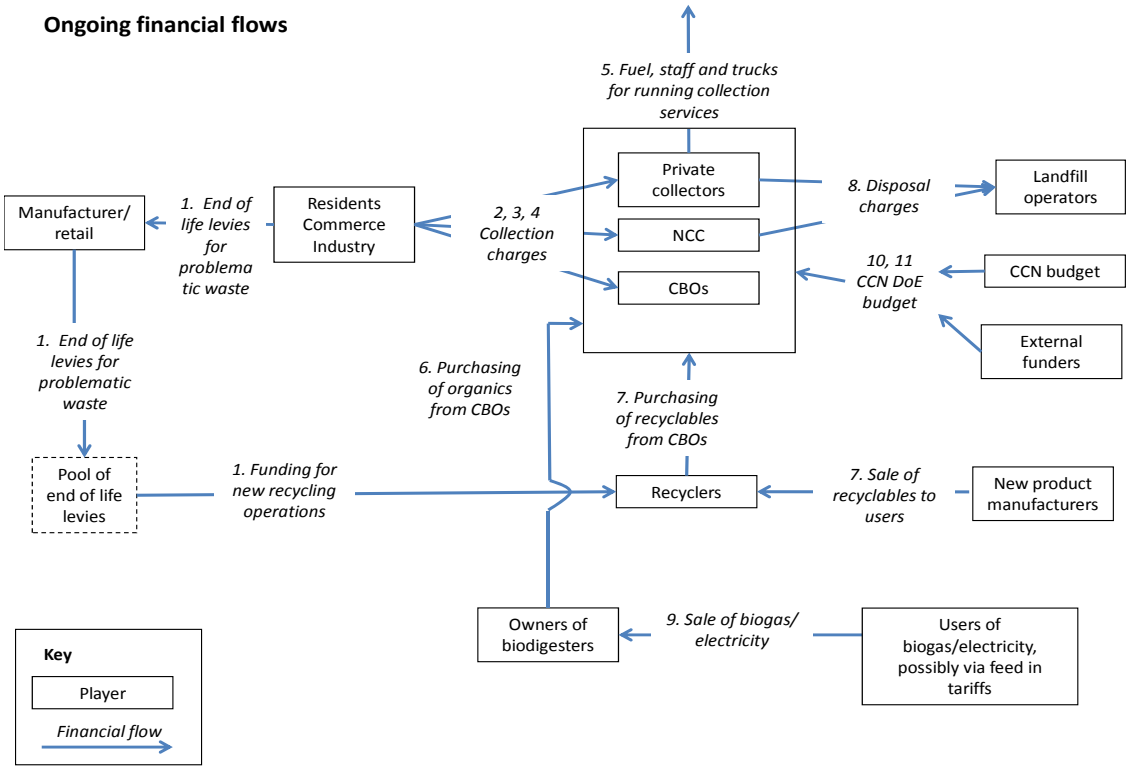

Figure 5: Ongoing Financial Flows in the ISWM system.

9.3 *Implications of business as usual versus implementing the ISWMP*

This plan has presented the potential cost and revenue streams associated with implementation of the ISWMP. There is merit in exploring further some of the considerations in evaluating the costs of following a Business as Usual (BAU) scenario, where none of the recommendations in this plan are implemented, against one in which less sustainable management measures will be stopped one by one over the next few years. Some implications of the latter scenario over the former are identified in the following sections. It is recommended that these be further elaborated by CCN under action 1.1 (Strategic Alignment) by means of a SWOT and a cost-benefit analysis.

1. Job Creation

The ISWMP has the potential to create a number of jobs. It is noted that already a number of individuals are employed at various points in the waste management system. By moving towards a target of increased waste collection and recovery, additional jobs will be created including those for waste collectors, recyclers, owners/operators of biodigesters, those responsible for enforcement etc. Most of these will be at no cost to the government, but will have additional community benefits.

2. Environmental Hygiene and Degradation

Informal disposal of waste around Nairobi has potential negative environmental implications which will be reduced and avoided through implementation of the ISWMP. These include:

- Impact on humans through exposure to air and water borne pollutants generated through informal dumping and burning on the side of the road, as well as around Dandora
- Impact on people living on Dandora, and earning a living by picking. Through the rehabilitation of Dandora and the investments envisioned to develop it into a transfer station and material recovery facility, these individuals will be able to continue to earn their income from recovery of clean materials, thus reducing risks to them.
- Impact on animals which include the same effects as for humans, as well as health implications of eating wastes off the ground
- Impacts on plant and river systems through pollutants being released into the environment

While the financial implications of these considerations may not directly be considered in the context of the ISWMP itself, the costs will affect broader society and include increased medical care costs (to be borne by individuals or the state), loss of productivity and income through illness and death, death of animals, lower crop yields and loss of utility of water systems. These knock on effects can be significant.

3. Landfill implications

Building and operating a sanitary landfill is expensive, has negative impacts on the environment and takes up valuable land. Reducing the waste sent to landfill has the benefits of reducing these costs and impacts, and extending the life of any new landfill site.

4. Global competitiveness/tourism

Nairobi is the gateway to the Kenyan tourism market, and a clean environment has the potential to improve the desirability of visiting Nairobi as a tourist destination, and presenting a better front for foreign interest.

10. Implementation Strategy

A mix of different considerations informs the sequence in which actions should be implemented:

1. Importance

In terms of overall quantities, the three actions that must account for the largest fractions of waste are 2.3 (the 2020 target is reduction of 1000 t/day through the use of financial instruments), 4.1 (recovery of 1000 t/day of organics for valorisation) supported strongly by 2.2 (source separation) and 3.3 (waste collection contracting), and 5.1 (a safe disposal site for about 2000 t/day of waste is critically and urgently required). Planning for all three of these actions (2.3, 4.1 and 5.1) must therefore start immediately, with adequate resourcing.

2. Quick wins / low-hanging fruit

Phasing out burning of waste (as part of action 2.4 awareness and education) is an easy action to start early, with long-term benefits and quick returns in terms of health. The ISWM implementation should also build on the momentum generated in the Nairobi River Basin Programme.

3. Logical order – building one action on another

Actions 1.1 and 1.2 are important to get the buy-in from politicians and partners, they are pre-requisites for the ISWM system to function, and must thus be done early on.

The source separation programme (2.2) is dependent on revenue generation not only from the recyclables, but also from the organic fraction. It can thus only be started once a sufficiently high feed-in tariff is in place for electricity generated from biogas, or once other income sources for biogas programmes (e.g. CDM, tipping fees at facilities, and/or gas prices for heating fuels) are confirmed to be high enough for action 4.1.

It is also important to point out that action 3.3 (formalization of waste collection contracts) would function best with action 3.2 (zoning of waste collection).

4. Investing in flexible platforms

Investments into building trust with partners will be useful to build flexibility into the system.

5. Financial logic – using savings/revenue from one action to invest in another

Action 2.3 (Fees for problematic end-of-life materials) is designed to generate revenues that can be used to finance other parts of the system. This action will be difficult to implement, and planning must start early.

11. Outlook

Nairobi has experienced strong population growth for the past four decades, and recently also moderately strong economic growth, and this has translated to a fast growth in waste quantities, which have doubled every 10 years. Its investments into infrastructure, operational systems and human resources to manage this waste has not kept pace with this growth, and the city and its residents now face the consequences of improper waste management.

This integrated solid waste management plan lays out the framework for a co-ordinated and well planned response to this waste management crisis. The plan embraces the integrated approach to solid waste management as recommended by UNEP, with a strong emphasis on local government actions in often neglected activities such as source reduction, re-use, resource recovery and recycling.

Very importantly, the process of developing this plan has been accompanied by some significant capacity building, for three important constituencies:

i) The national task team;
ii) Staff of the Department of Environment of the City Council of Nairobi;
iii) Stakeholders in the city's waste management systems.

As the City Council of Nairobi moves forward with the adoption and implementation of this ISWM plan, care must be taken to nurture and further strengthen the human capacity base that will prove to be essential to achieve the vision of a healthy, safe, secure and sustainable solid waste management system fit for a world-class city, in a time of increasing resource scarcity.

12. References

All sources referred to in this document are referenced in the supporting document: ***Integrated Solid Waste Management Plan for Nairobi City, Kenya: Situation Analysis & Detailed Action Plan.***