

## **4.10 Community Participation Promotion Plan**

### **4.10.1 Short-Term Action Plan**

The period of the Short-Term Plan is from 2011 to 2015, and the total cost of the Plan is estimated at KSh 186 million including 10 % physical contingency for the construction work. Details of each component and cost are as described below.

#### **(1) Establishment of a Unit for Public Awareness, Environmental Education and Community Participation (PEC) under the Environmental Planning and Management Section of DoE, CCN**

The PEC Unit should be composed of current employees of CCN integrated from DoE or other departments as follows: One (1) Environmental Manager, five (5) officers for field operation with diploma as environmentalist, sociologist or public health provider; one (1) secretary for office works; one (1) driver for field operations; and one (1) messenger. Therefore, no additional personnel cost will be shouldered by CCN for establishing the new PEC Unit.

#### **(2) Capacity Development of the new PEC Unit**

As mentioned in **Subsection 4.6.2**, the Comprehensive Capacity Development Programmes (CCDP) shall be carried out by using external funds. Capacity development of the PEC Unit is to be one of the components of the CCDP. Its subcomponents are as described below:

##### **(a) Contract with Local Consultants to Support the Activities of the PEC Unit**

It is proposed to hire three (3) local assistants to support the PEC Unit in its first five (5) years of field operation and implementation of pilot projects. One (1) of the local assistants should have at least ten (10) years of experience in the field of SWM with diploma in engineering, environmental education, sociology or public health, and the other two (2) shall be assistants from the NGOs. The total cost of the employment is estimated at KSh 25,536 thousand between years 2011 and 2015.

##### **(b) Procurement of Equipment and Materials for the PEC Unit**

The following are proposed: one (1) double-cab vehicle for field operations; five (5) motorcycles for field operations; seven (7) desks and chairs for the personnel; five (5) chairs for visitors; two (2) shelves; seven (7) desktop computers for office works; two (2) printers; one (1) projector with screen and laptop computer for field operations; one (1) audio system for field operations; and one (1) set of stationery. The cost is estimated at KSh 7,650 thousand.

##### **(c) Training Programme for PEC Unit Personnel**

Foreign technical assistance is proposed for the training programme for personnel of the new PEC Unit. The contents of the training programme are detailed in **Section B of Volume 3, Supporting Report**.

##### **(d) Formulation of CBOs' Waste Collection Implementation Plan**

The Waste Collection Implementation Plan is to be prepared by the DoE in consultation with the CBOs, Kenya Alliance of Residents Association (KARA), and the Nairobi residents.

**(e) Formulation of Environmental Education Implementation Plan**

The Environmental Education Implementation Plan is to be prepared by the DoE in consultation with NEMA, KARA, recyclers, Nairobi residents and the Kenya Institute of Education (KIE).

**(f) Implementation of CBOs' Waste Collection Plan (I)**

The following activities shall be carried out in one of the pilot projects under the CCDP. The cost is estimated at KSh 13,811 thousand.

- Elaboration of guidelines, manuals and standards for CBOs
- Elaboration of educational materials for residents
- Strengthening of coordination between CCN, CBOs and residents
- Selection of targeted CBOs
- Training of CBOs
- Environmental education for residents to obtain their participation
- Provision of basic tools to CBOs
- Designation of collection points for CBOs
- Elaboration of collection zone maps of the project for each CBO

**(g) Implementation of Environmental Education Plan (I)**

The Environmental Education Plan which will include the following activities shall be carried out in one of pilot projects under the CCDP. The cost is estimated at KSh 7,732 thousand.

- Development of educational materials (for primary education)
- Training on recycling for school teachers
- Provision of bins for recyclable materials in the schools
- Environmental education for residents for waste reduction promotion
- Environmental education for residents for recovery at source promotion
- Environmental education for residents for reuse and recycling promotion

**(h) Mass Campaign to Raise Public Awareness**

During the pilot project, it is proposed to realise a mass campaign in order to raise the awareness of people and to get their cooperation and participation in the SWM. This activity shall include TV spots, radio spots, newspaper advertisements, posters, stickers and banners.

**(i) Implementation of Community-Based Solid Waste Management (I)**

This is related to the construction of facilities for composting by CBOs.

#### **4.10.2 Mid-Term Action Plan**

The period of the Mid-term Plan is from 2016 year to 2020 year. Basically, the activities proposed for this period are the continuation of the activities described in the short-term period as presented in the **Figure 4.10.1** below.

WBS	Action Plans	Cost '000 KSh	Schedule				
			2016	2017	2018	2019	2020
M-8-1	Review of CBOs' Waste Collection Implementation Plan	CCN					
M-8-2	Review of Environmental Education Implementation Plan	CCN					
M-8-3	Implementation of CBOs' Waste Collection Plan (II)	4,863					
M-8-4	Implementation of Environmental Education Plan (II)	8,915					
M-8-5	Implementation of Community Based Solid Waste Management (II)	51,786					
	Total	65,564					

**Figure 4.10.1 Mid-Term Action Plan of the Community Participation Promotion Plan**

After the pilot project is concluded, it is expected that the PEC Unit continues promoting the same activities during the mid- term period. The target for CBOs and schools are the same as in the pilot stage; however, if CCN can increase the number of human resources for the PEC Unit as well as the financial resources, then in the process of review of the Plan that will take place by early 2016, new targets could be set and agreed upon. In the mid-term period, the total cost of action plans including 10 % physical contingency for the construction work will be Ksh 65.6 million.

### 4.10.3 Long-Term Action Plan

The period of the Long-term Plan is from 2021 year to 2030 year. Basically, the activities proposed in the long term plan are the continuation of the activities described in the mid-term period as presented in **Figure 4.10.2** below.

WBS	Action Plans	Cost '000 KSh	Schedule									
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
L-8-1	Review of CBOs' Waste Collection Implementation Plan	CCN										
L-8-2	Review of Environmental Education Implementation Plan	CCN										
L-8-3	Implementation of CBOs' Waste Collection Plan (III)	9,726										
L-8-4	Implementation of Environmental Education Plan (III)	17,830										
L-8-5	Implementation of Community Based Solid Waste Management (III)	49,200										
	Total	76,756										

**Figure 4.10.2 Long-Term Action Plan of the Community Participation Promotion Plan**

After the medium-term period is concluded, it is expected that the PEC Unit continues promoting the same activities during the long- term period. The target for CBOs and schools are the same as in the pilot stage; however, if CCN can increase the number of human resources for the PEC Unit as well as the financial resources, then in the process of review of the Plan that will take place by early 2021 and 2026, new targets could be set and agreed upon. The cost of action plans during the long-term period does not include the physical contingency.

## **4.11 Urgent Projects and Preparatory Actions**

### **4.11.1 Urgent Projects**

Action plans have been formulated for each component of the master plan; however, the start-up of these plans will take more time due to financial arrangements. Environmental degradation in the city especially the slum areas, on the other hand, will be enhanced gradually day by day. Also, complaints of residents against disorders resulting from inappropriate waste management will increase as well. To avoid making the situation worse than the present, some of the plans should be implemented urgently by the City Council of Nairobi's own budget or subsidies from the central government.

Urgent implementation projects are considered to be in the following plans:

- Dandora Dumpsite Urgent Improvement Plan
- Plan of Cleanup of Illegal Dumpsites
- Urgent Waste Collection Plan

#### **(1) Dandora Dumpsite Urgent Improvement Plan**

As described in the environmental and social evaluation, Dandora is not operated in a sanitary way and brings severe adverse effects on the surrounding areas. Urgent measures for the Dandora Dumpsite, specifically covering soil should be purchased and onsite road construction should be required to be carried out.

In addition to these urgent countermeasures, regular operation and maintenance will also need to be carried out separately. In conducting the operation and maintenance, it will be particularly important to efficiently use the three existing heavy equipment for leveling the waste and applying covering soil.

The work above will be required to start shortly after the budget of CCN is secured and then have to continue until year 2017 when the new landfill site is expected to start operating. The cost for civil work of the urgent improvement work is estimated to be KSh 431 million between 2011 and 2016. The cost for regular operation and maintenance of the site will be about KSh 33 to 43 million annually and KSh 249 million will be necessary in total between 2011 and 2016. The total cost of the urgent improvement work is therefore estimated to be KSh 680 million.

#### **(2) Cleanup of Illegal Dumpsites**

The DoE had confirmed the existence of 74 dumpsites distributed all over the city area apart from the eastern side, which are especially common in areas around markets, Kasarani Division and Kamukunji Division. Since these illegal dumpsites impart negative impacts such as littering, odour, landfill gas, leachate, etc. throughout the local areas, there is urgent need to take countermeasures.

The DoE is already removing waste from some of the illegal dumpsites using its own equipment. However, since no regular waste collection setup has been adequately established, the illegal dumping in these areas may return soon after the illegal dumpsites are "removed".

Accordingly, to ensure that illegal dumpsites do not revert to the original state after cleanup, the cleanup activities shall be carried on in 2014, when waste collection containers will be installed as part of the effort to strengthen the collection setup. It is desirable to conduct cleanup in order, starting from the areas containing the most waste. This is because the areas that contain the most waste are likely to impart the biggest impact on the local environment.

In the cleanup, it shall be planned to remove waste with wheel loaders and to transport it to the Dandora Dumpsite in trucks. The plan shall target the 71 illegal dumpsites other than the three quite

large sites, namely; Mathare North, Zimerman and Gathundeki. The total cost of the cleanup will be approximately KSh 23 million.

### (3) Urgent Waste Collection Plan

CCN should carry out the cleanup of the scattered wastes along the road sides. The monitoring of scattered wastes will be also CCN's mandate. This cleanup work requires Ksh 7 million for the operation and maintenance of CCN collection vehicles from 2011 to 2014.

In addition, to improve waste collection ratio mainly in low income areas where private collectors seldom operate, CCN should cover the waste collection work with these areas by the procurement of waste collection vehicles as well as containers. Although budgetary arrangement, designing and tendering by CCN is required, a loan or grant-aid from foreign donors will be one of options of the financial support for the procurement. The required number of vehicles and containers in 2013 is estimated to be one dump truck, 10 pick-up trucks, 22 container carriers and 47 containers, and the cost of the procurement for these vehicles is estimated to be KSh 214 million.

#### 4.11.2 Preparatory Actions

Establishment of the Solid Waste Management Public Corporation (SWMPC) is an integral part of the Master Plan. To implement the action plans mentioned above, especially, the preparation for establishment of the SWMPC, the following actions will be required to be conducted by the middle of year 2011:

#### (1) Priority 1: Setup of Preparatory Unit (PU) in the Department of Environment (DoE) for the SWM Public Corporation (SWMPC)

- The SWMPC should be established by the beginning of 2015 and to start operations from the beginning of 2016. One-year preparation period will be required for the tendering process by SWMPC after its establishment. The Preparatory Unit for SWMPC should be urgently established inside the DoE.
- The detailed concept of the organisational structure of the Preparatory Unit is recommended in **Section B of Volume 3, Supporting Report**.
- The preparatory unit will be the target of the proposed Comprehensive Capacity Development Programme (CCDP).
- To initiate the CCDP, the following preparatory priority actions (PA) are required to be carried out:
  - **PA-1-1:** Selection of 3 Unit Managers and 13 Subunit Chiefs in accordance with the JICA Master Plan Final Report
  - **PA-1-2:** Selection of Staff of each Unit
  - **PA-1-3:** Setup of office (The Office of the JICA Survey Team is recommended to be utilised for the office of the Preparatory Unit.)
  - **PA-1-4:** Official Declaration of Setup of the Preparatory Unit
  - **PA-1-5:** Formation of the Detailed Job Description of Staff of the Preparatory Unit in accordance with the Recommendations in the JICA Master Plan Final Report
  - **PA-1-6:** Preparation of Provision of Incentives for Additional Tasks for the Selected Unit Managers, Chiefs and Staff
  - **PA-1-7:** Application of the Budget of the Preparatory Unit for the Financial Year 2012

**(2) Priority 2: Preparation for the Construction of New Sanitary Landfill Site and Closure of Dandora Dumpsite**

- To construct a new landfill site and close the existing Dandora on time, the following actions are required:
  - **PA-2-1:** Preparation for the Implementation of Environmental Impact Assessment (EIA) for Constructing the New Sanitary Landfill Site at Ruai
  - **PA-2-2:** Preparation for the Implementation of Environmental Impact Assessment (EIA) for Decommissioning the Dandora Dumpsite

**(3) Priority 3: Preparation for the Creation of SWM Special Account**

- To create the SWM Special Account, the following actions are required:
  - **PA-3-1:** Formation of Task Force for SWM Cost Accounting
  - **PA-3-2:** Request to MoLG to Create the SWM Special Account
  - **PA-3-3:** Preparation of a List of Revenue and Expenditure Items
  - **PA-3-4:** Preparation for the Transfer of the Current SWM Budget to the SWM Special Account
  - **PA-3-5:** Preparation for the Legalisation of the SWM Special Account

**(4) Priority 4: Preparation for the Drafting of By-law on the Establishment of SWMPC**

- In order to smoothly draft the By-law on the Establishment of SWMPC, the following preparatory works should be initiated:
  - **PA-4-1:** Review of Water Act 2002
  - **PA-4-2:** Conduct of Prior Consultation with MoLG
  - **PA-4-3:** Listing of Major Sections and Clauses of the Draft By-law on the Establishment of SWMPC

**(5) Priority 5: Preparation for the Introduction of the Step-wise Franchise System**

- To establish the zones for the franchise system, the following actions are required:
  - **PA-5-1:** Drafting of Boundaries of Franchise Zones by utilising the Zoning Map based on the Recommendation in the JICA Master Plan Final Report
  - **PA-5-2:** Rough Estimate of Population of Franchise Zones (If the latest Census data is available, the population of the Zones should be updated based on the new data.)

## **4.12 Implementation Schedule and Cost, and Plan of Operation**

The actions and costs required for the implementation of each component of the Master Plan are summarised in **Figures 4.12.1 and 4.12.2**, and the plan of operation of each action plan based on the breakdown of work items are presented in **Figures 4.12.3 to 4.12.10**.

Action Plan (Programme 1 to 4)	Cost (thousand KSh)		Short-Term Plan					Mid-Term Plan					Long-Term Plan										
	CCN/Gov't*	External Source	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Programme 1: Collection & Transportation Plan																							
1-1 Formulation of Collection & Transportation Implementation Plan																							
1-2 Monitoring of Implementation of Collection & Transportation Plan																							
1-3 Implementation of Urgent Waste Collection Plan	7,344																						
1-4 Procurement of Waste Collection Vehicles for CCN/SWMPC Zones	1,510,890	463,693																					
1-5 Implementation of Regular Station Collection in CCN/SWMPC Zone	3,237,034																						
1-6 Construction of Access Road to Slum Areas in CCN/SWMPC Zone	39,528	332,145																					
1-7 Implementation of Waste Collection PPPP Scheme																							
Sub-Total of Programme 1	4,794,796	795,838																					
Programme 2: 3R & Intermediate Treatment Plan																							
2-1 Establishment of 3R & Intermediate Treatment Task Team		incl. CCDP																					
2-2 Formulation of 3R Implementation Plan		incl. CCDP																					
2-3 Formulation of Intermediate Treatment Implementation Plan		incl. CCDP																					
2-4 Monitoring of 3R Implementation Plan		incl. CCDP																					
2-5 Monitoring of Intermediate Treatment Implementation Plan		incl. CCDP																					
2-6 Implementation of Waste Reduction Plan		incl. CCDP																					
2-7 Implementation of Waste Recovery, Reuse and Recycling Plan		incl. CCDP																					
	119,210	115,372																					
2-8 Implementation of Intermediate Treatment Plan [Home Composting]	21,148	incl. CCDP																					
[Central Composting]	285,697	476,722																					
Sub-Total of Programme 2	426,055	592,094																					
Programme 3: Final Disposal Plan																							
3-1 Formulation of Dandora Dumpsite Closure Plan		46,167																					
3-2 Implementation of Dandora Dumpsite Urgent Improvement Plan	680,229																						
3-3 Formulation of New Final Landfill Site Construction Plan at Ruai (First Portion)		198,880																					
3-4 Construction of New Final Landfill Site at Ruai (First Portion)		4,176,480																					
3-5 Clean Up of Illegal Dumpsites	23,164																						
3-6 Implementation of Closure Work of Dandora Dumpsite		1,538,900																					
3-7 Operation & Maintenance of New Landfill Site at Ruai	6,010,406	140,300																					
3-8 Closure of Illegal Dumpsites		44,704																					
3-9 Formulation of New Final Landfill Site Construction Plan at Ruai (Second Portion)	73,975																						
3-10 Construction of New Final Landfill Site at Ruai (Second Portion)	1,553,475																						
Sub-Total of Programme 3	8,341,249	6,145,431																					
Programme 4: Organisational Restructuring and Human Resources Development Plan																							
4-1 Establishment of the Preparatory Unit for SWMPC		incl. CCDP																					
4-2 Establishment of the SWMPC		incl. CCDP																					
4-3 Rectification of Remaining Functions of DoE		incl. CCDP																					
4-4 Creation of SWM Special Account		incl. CCDP																					
4-5 Implementation of Comprehensive Capacity Development Programme (CCDP)		368,200																					
4-6 Consideration of Incomplete Action Plans of the Previous Master Plan		incl. CCDP																					
4-7 Formulation of Standard Working Procedures and Manuals		incl. CCDP																					
4-8 Start of Operations of Revolving Funds and Provision of Subsidies																							
4-9 Mid-Term Organisational Assessment and Feedback to SWMPC																							
4-10 Mid-Term Organisational Restructuring of SWMPC																							
4-11 Implementation of Ex-Post Mid-Term Performance Monitoring and Assessment on CCDP																							
4-12 Implementation of Skill-Targeted Follow-up Training Programme																							
4-13 Continuous Management of the Revolving Funds and Provision of Subsidies																							
4-14 Long-Term and Continuous Organisational Assessment and Feedback to SWMPC																							
4-15 Long-Term and Continuous Organisational Restructuring of SWMPC																							
4-16 Implementation of Long-term Performance Monitoring and Establishment of Feedback System																							
4-17 Long-term and Continuous Staff Deployment and Redeployment of Staff of SWMPC																							
Sub-Total of Programme 4		368,200																					
Total of Programme 1 to 4	13,562,100	7,901,563																					

Figure 4.12.1 Required Actions and Cost for Implementation of Components of the Master Plan (Programme 1 to 4)

———— To be conducted with local funds  
..... To be conducted with Technical Assistance  
———— To be conducted with Loan (Engineering and Construction including Supervision)

[illegible]

**Figure 4.12.2 Required Actions and Cost for Implementation of Each Component of the Master Plan (Programme 5 to 8)**

- |       |  |
|-------|--|
| ===== | To be conducted with local funds   |
| ..... | To be conducted with Technical Assistance                                      |
| ===== | To be conducted with Loan (Engineering and Construction including Supervision) |



Plan of Operation (Programme 1: Collection and Transportation Plan)

Time Framework of the Master Plan					Short-Term Plan Period																				Mid-Term Plan Period					Long-Term Plan Period									
Year					2011				2012				2013				2014				2015				2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Quarter					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4																			
WBS for Short-Term Plan																																							
S-1-1	Formulation of Collection&Transportation Implementation Plan																																						
	Monitoring of Implementation of Collection&Transportation Plan (I)																																						
	Implementation of Urgent Waste Collection Plan																																						
	Procurement of Waste Collection Vehicles for CCN/SWMPC Zone (I)																																						
	Implementation of Regular Station Collection in CCN/SWMPC Zone (I)																																						
	Construction of Access Road to Slum Areas in CCN/SWMPC Zone (I)																																						
	Implementation of Waste Collection PPPP Scheme (I)																																						
WBS for Mid-Term Plan																																							
M-1-1	Monitoring of Implementation of Collection&Transportation Plan (II)																																						
	Procurement of Waste Collection Vehicles of CCN/SWMPC Zone (II)																																						
	Implementation of Regular Station Collection in CCN/SWMPC Zone (II)																																						
	Construction of Access Road to Slum Areas in CCN/SWMPC Zone (II)																																						
	Implementation of Waste Collection PPPP Scheme (II)																																						
WBA for Long-Term Plan																																							
L-1-1	Monitoring of Implementation of Collection&Transportation Plan (III)																																						
	Procurement of Waste Collection Vehicles of CCN/SWMPC Zone (III)																																						
	Implementation of Regular Station Collection in CCN/SWMPC Zone (III)																																						
	Construction of Access Road to Slum Areas in CCN/SWMPC Zone (III)																																						
	Implementation of Waste Collection PPPP Scheme (III)																																						
PPPP Option					Improvement of Current Contracting Out/Licensing				Out/Licensing and Preparation of New Franchising Cointract								Zone-wise Franchising Contract (Phase 1)					Zone-wise Franchising Contract (Phase 2)					Zone-wise Franchising Contract (Phase 3)												
SWM Organisation Type					CCN/DoE, Separate Account				CCN/DoE, Special Account				SWM Public Corporation																										
Zoning System					Current Zone										New Zone (3 Zones)					New Zone (6 Zones)					New Zone (9 Zones)														

Figure 4.12.3 Plan of Operation (Programme 1: Collection and Transportation Plan)

Plan of Operation (Programme 2: 3R and Intermediate Treatment Plan)

Time Framework of the Master Plan		Short-Term Plan Period																				Mid-Term Plan Period					Long-Term Plan Period									
Year		2011				2012				2013				2014				2015				2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Quarter		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4															
WBS for Short-Term Plan																																				
S-2-1	Establishment of 3R & Intermediate Treatment Task Force																																			
S-2-2	Formulation of 3R Implementation Plan																																			
S-2-3	Formulation of Intermediate Treatment Implementation Plan																																			
S-2-4	Monitoring of Implementation of 3R Plan (I)																																			
S-2-5	Monitoring of Implementation of Intermediate Treatment Plan (I)																																			
S-2-6	Implementation of Waste Reduction Plan (I)																																			
S-2-7	Implementation of Waste Recovery, Reuse and Recycling Plan (I)																																			
S-2-8	Implementation of Intermediate Treatment Plan (I)																																			
WBS for Mid-Term Plan																																				
M-2-1	Monitoring of Implementation of 3R Plan (II)																																			
M-2-2	Review of Implementation of Intermediate Treatment Plan (II)																																			
M-2-3	Implementation of Waste Reduction Plan (II)																																			
M-2-4	Implementation of Waste Recovery, Reuse and Recycling Plan (II)																																			
M-2-5	Implementation of Intermediate Treatment Plan (II)																																			
WBS for Long-Term Plan																																				
L-2-1	Monitoring of Implementation of 3R Plan (III)																																			
L-2-2	Monitoring of Implementation of Intermediate Treatment Plan (III)																																			
L-2-3	Implementation of Waste Reduction Plan (III)																																			
L-2-4	Implementation of Waste Recovery, Reuse and Recycling Plan (III)																																			
L-2-5	Implementation of Intermediate Treatment Plan (III)																																			
PPPP Option		Improvement of Current Contracting Out/Licensing								Out/Licensing and Preparation of New Franchising Cointract								Zone-wise Franchising Contract (Phase 1)					Zone-wise Franchising Contract (Phase 2)					Zone-wise Franchising Contract (Phase 3)								
SWM Organisation Type		CCN/DoE, Separate Account								CCN/DoE, Special Account								SWM Public Corporation																		
Zoning System		Current Zone												New Zone (3 Zone)					New Zone (6 Zones)					New Zone (9 Zones)												

Figure 4.12.4 Plan of Operation (Programme 2: 3R and Intermediate Treatment Plan)

### Plan of Operation (Programme 3: Final Disposal Plan)

Time Framework of the Master Plan					Short-Term Plan Period																Mid-Term Plan Period					Long-Term Plan Period													
Year					2011				2012				2013				2014				2015				2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Quarter					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4															
WBS for Short-Term Plan																																							
S-3-1	Formulation of Dandora Dumpsite Closure Plan																																						
	Implementation of Dandora Dumpsite Urgent Improvement Plan (I)																																						
	Formulation of New Landfill Site Construction Plan at Rual (First Portion)																																						
	Construction of New Landfill Site at Rual (First Portion) (I)																																						
	Cleanup of Illegal Dumpsites																																						
WBS for Mid-Term Plan																																							
M-3-1	Implementation of Dandora Dumpsite Urgent Improvement Plan (II)																																						
	Implematation of Closure Work of Dandora Dumpsite																																						
	Construction of New Landfill Site at Rual (First Portion) (II)																																						
	Operation & Maintenance of New Landfill Site at Rual (I)																																						
	Closure of Illegal Dumpsites																																						
WBS for Long-Term Plan																																							
L-3-1	Formulation of New Landfill Site Construction Plan at Rual (Second Portion)																																						
	Construction of New Landfill Site at Rual (Second Portion)																																						
	Operation & Maintenance of New Landfill Site at Rual (II)																																						
PPPP Option					Improvement of Current Contracting Out/Licensing				Out/Licensing and Preparation of New Franchising Cointract								Zone-wise Franchising Contract (Phase 1)					Zone-wise Franchising Contract (Phase 2)					Zone-wise Franchising Contract (Phase 3)												
SWM Organisation Type					CCN/DoE, Separate Account				CCN/DoE, Special Account					SWM Public Corporation																									
Zoning System					Current Zone										New Zone (3 Zones)					New Zone (6 Zones)					New Zone (9 Zones)														

Figure 4.12.5 Plan of Operation (Programme 3: Final Disposal Plan)

Plan of Operation (Programme 4: Organisational Restructuring and Human Resources Development Plan)

Time Framework of the Master Plan					Short-Term Plan Period																				Mid-Term Plan Period					Long-Term Plan Period									
Year					2011				2012				2013				2014				2015				2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Quarter					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4															
WBS for Short-Term Plan																																							
	S-4-1	Establishment of Preparatory Unit for SWMPC																																					
	S-4-2	Establishment of SWMPC																																					
	S-4-3	Rectification of Remaining Functions of DoE																																					
	S-4-4	Creation of SWM Special Account																																					
	S-4-5	Implementation of Comprehensive Capacity Development Programme (CCDP)																																					
	S-4-6	Consideration of Incomplete Action Plans of the Previous MP																																					
	S-4-7	Formulation of Standard Working Procedures and Manuals																																					
WBS for Mid-Term Plan																																							
	M-4-1	Start of Operations of Revolving Funds and Provision of Subsidies																																					
	M-4-2	Mid-Term Organisational Assessment and Feedback to SWMPC																																					
	M-4-3	Mid-Term Organisational Restructuring of SWMPC																																					
	M-4-4	Implementation of Ex-post Mid-Term Performance Monitoring and Assessment on CCDP																																					
	M-4-5	Implementation of Skill-Targeted Follow-up Training Programme																																					
WBS for Long-Term Plan																																							
	L-4-1	Continuous Management of the Revolving Funds and Subsidies																																					
	L-4-2	Long-Term and Continuous Organisational Assessment and Feedback to SWMPC																																					
	L-4-3	Long-Term and Continuous Organisational Restructuring of SWMPC																																					
	L-4-4	Implementation of Long-Term Performance Monitoring and Establishment of Feedback System on CCDP																																					
	L-4-5	Long-Term and Continuous Staff Deployment and Redeployment of Staff of SWMPC																																					
PPPP Option					Improvement of Current Contracting Out/Licensing				Out/Licensing and Preparation of New Franchising Colcontract								Zone-wise Franchising Contract (Phase 1)					Zone-wise Franchising Contract (Phase 2)					Zone-wise Franchising Contract (Phase 3)												
SWM Organisation Type					CCN/DoE, Separate Account				CCN/DoE, Special Account				SWM Public Corporation																										
Zoning System					Current Zone												New Zone (3 Zones)					New Zone (6 Zones)					New Zone (9 Zones)												

Figure 4.12.6 Plan of Operation (Programme 4: Organisational Restructuring and Human Resources Development Plan)

### Plan of Operation (Programme 5: Legal and Institutional Reform Plan)

Time Framework of the Master Plan					Short-Term Plan Period																Mid-Term Plan Period					Long-Term Plan Period													
Year					2011				2012				2013				2014				2015				2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Quarter					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4																			
WBS for Short-Term Plan																																							
S-5-1	Improvement of Monitoring and Enforcement In CCN SWM By-law 2007																																						
S-5-2	Improvement of Monitoring and Enforcement in other SWM-related Legal Frameworks																																						
S-5-3	Minor Modification of CCN Solid Waste Management By-law 2007																																						
S-5-4	Legallisation of Act for Establishment of SWMPC																																						
S-5-5	Amendment of Procurement and Disposal Act 2005																																						
S-5-6	Legallisation of Establishment of SWM Special Account																																						
S-5-7	Legallisation of Establishment of SWM Capital Revolving Fund and SWMORF*																																						
S-5-8	Legallisation of Franchise Fee																																						
S-5-9	Legallisation of Operational Regulations on Subsidy Provision to Franchisees																																						
WBS for Mid-Term Plan																																							
M-5-1	Legallisation of PPP Act																																						
M-5-2	Legal Arrangement of Auditing for SWMPC and Revolving Funds																																						
WBS for Long-Term Plan																																							
L-5-1	Legallisation of Consolidated SWM Act																																						
L-5-2	Long-term Monitoring and Enforcement of SWM-related Acts, Regulations and By-laws																																						
PPPP Option					Improvement of Current Contracting Out/Licensing				Out/Licensing and Preparation of New Franchising Colntract								Zone-wise Franchising Contract (Phase 1)					Zone-wise Franchising Contract (Phase 2)					Zone-wise Franchising Contract (Phase 3)												
SWM Organisation Type					CCN/DoE, Separate Account				CCN/DoE, Special Account				SWM Public Corporation																										
Zoning System					Current Zone																New Zone (3 Zones)					New Zone (6 Zones)					New Zone (9 Zones)								

**Figure 4.12.7 Plan of Operation (Programme 5: Legal and Institutional Reform Plan)**

Note: \*SWM ORF: Solid Waste Management Operating Revolving Fund

Plan of Operation (Programme 6: Financial Management Plan)

Time Framework of the Master Plan		Short-Term Plan Period																Mid-Term Plan Period					Long-Term Plan Period													
Year		2011				2012				2013				2014				2015				2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Quarter		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4															
WBS for Short-Term Plan																																				
S-6-1	Establishment of SWM Cost Accounting System																																			
S-6-2	Establishment of Waste Charge System for Households																																			
S-6-3	Revision of Waste Charging System for Business Establishments																																			
WBS for Mid-Term Plan																																				
M-6-1	Financial Review of Revolving Funds (I)																																			
M-6-2	Financial Review of Level of Franchise Fees (I)																																			
M-6-3	Execution of New Waste Charge System (SWMPC) (I)																																			
M-6-4	Review of SWMPC Cost Accounting System (I)																																			
M-6-5	Review of SWMPC Waste Charging System (I)																																			
M-6-6	Revision of SWMPC Waste Charging System (I)																																			
M-6-7	Monitoring & Supervising of SWMPC Waste Charging System for All SWM Service Providers (I)																																			
WBS for Long-Term Plan																																				
L-6-1	Financial Review of Revolving Funds (II)																																			
L-6-2	Financial Review of Level of Franchise Fees (II)																																			
L-6-3	Execution of Revised SWMPC Waste Charging System																																			
L-6-4	Review of SWMPC Cost Accounting System (II)																																			
L-6-5	Review of SWMPC Waste Charging System (II)																																			
L-6-6	Revision of SWMPC Waste Charging System (II)																																			
L-6-7	Monitoring & Supervising of SWMPC Waste Charging System for All SWM Service Providers (II)																																			
L-6-8	Application of the SWMPC Waste Charging System to All SWM Service Providers																																			
PPPP Option		Improvement of Current Contracting Out/Licensing				Improvement of Current Contracting Out/Licensing and Preparation of New Franchising Contract								Zone-wise Franchising Contract (Phase 1)					Zone-wise Franchising Contract (Phase 2)					Zone-wise Franchising Contract (Phase 3)												
SWM Organization Type		CCN/DoE, Separate Account				CCN/DoE, Special Account				SWM Public Corporation																										
Zoning System		Current Zone										New Zone (3 Zones)					New Zone (6 Zones)					New Zone (9 Zones)														

Figure 4.12.8 Plan of Operation (Programme 6: Financial Management Plan)

Plan of Operation (Programme 7: Private Sector Involvement Promotion Plan)

Time Framework of the Master Plan					Short-Term Plan Period																Mid-Term Plan Period					Long-Term Plan Period													
Year					2011				2012				2013				2014				2015				2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Quarter					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4															
WBS for Short-Term Plan																																							
S-7-1	Establishment of PPP Structure for Collection and Transportation																																						
S-7-2	Establishment of PPP Structure for Sanitary Landfill and Intermediate Treatment Facilities																																						
S-7-3	Implementation of Contract Procedures for Franchise Contracts and Service Contracts																																						
WBS for Mid-Term Plan																																							
M-7-1	Mid-Term Monitoring of Franchised Zone Management																																						
M-7-2	Mid-Term Performance Monitoring of Franchisees and Service Providers																																						
WBS for Long-Term Plan																																							
L-7-1	Auditing of Franchisees, Service Providers and Revolving Funds																																						
L-7-2	Continuous and Long-Term Performance Monitoring of Franchisees and Service Providers, and Enlargement of Franchise Zones																																						
L-7-3	Long-Term Management of Revolving Funds and Provision of Subsidies																																						
L-7-4	Management of PPPP Manifestos																																						
PPPP Option					Improvement of Current Contracting Out/Licensing				Out/Licensing and Preparation of New Franchising Cointract								Zone-wise Franchising Contract (Phase 1)					Zone-wise Franchising Contract (Phase 2)					Zone-wise Franchising Contract (Phase 3)												
SWM Organisation Type					CCN/DoE, Separate Account				CCN/DoE, Special Account				SWM Public Corporation																										
Zoning System					Current Zone												New Zone (3 Zones)					New Zone (6 Zones)					New Zone (9 Zones)												

Figure 4.12.9 Plan of Operation (Programme 7: Private Sector Involvement Promotion Plan)



Plan of Operation (Programme 8: Community Participation Promotion Plan)

Time Framework of the Master Plan		Short-Term Plan Period																Mid-Term Plan Period					Long-Term Plan Period													
Year		2011				2012				2013				2014				2015				2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Quarter		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4															
WBS for Short-Term Plan																																				
S-8-1	Establishment of PEC Unit																																			
S-8-2	Contract with Local Consultants for Support on PEC Unit																																			
S-8-3	Procurement of Equipment & Materials for PEC Unit																																			
S-8-4	Formulation of Training Programme for PEC Unit Personnel																																			
S-8-5	Formulation of CBOs' Waste Collection Implementation Plan																																			
S-8-6	Formulation of Environmental Education Implementation Plan																																			
S-8-7	Implementation of CBOs' Waste Collection Plan (I)																																			
S-8-8	Implementation of Environmental Education Plan (I)																																			
S-8-9	Mass Campaing for Raising Public Awareness																																			
S-8-10	Implementation of Community-Based Solid Waste Management (I)																																			
WBS for Mid-Term Plan																																				
M-8-1	Review of CBOs' Waste Collection Implementation Plan																																			
M-8-2	Review of Environmental Education Implementation Plan																																			
M-8-3	Implementation of CBOs' Waste Collection Plan (II)																																			
M-8-4	Implementation of Environmental Education Plan (II)																																			
M-8-5	Implementation of Community-Based Solid Waste Management (II)																																			
WBS for Long-Term Plan																																				
L-8-1	Review of CBOs' Waste Collection Implementation Plan																																			
L-8-2	Review of Environmental Education Implementation Plan																																			
L-8-3	Implementation of CBOs' Waste Collection Plan (III)																																			
L-8-4	Implementation of Environmental Education Plan (III)																																			
L-8-5	Implementation of Community-Based Solid Waste Management (III)																																			
PPPP Option		Improvement of Current Contracting Out/Licensing				Out/Licensing and Preparation of New Franchising Cointract								Zone-wise Franchising Contract (Phase 1)					Zone-wise Franchising Contract (Phase 2)					Zone-wise Franchising Contract (Phase 3)												
SWM Organisation Type		CCN/DoE, Separate Account				CCN/DoE, Special Account								SWM Public Corporation																						
Zoning System		Current Zone																New Zone (3 Zones)					New Zone (6 Zones)					New Zone (9 Zones)								

Figure 4.12.10 Plan of Operation (Programme 8: Community Participation Promotion Plan)



## **4.13 Evaluation of the Master Plan**

### **4.13.1 Financial Evaluation of the Master Plan**

#### **(1) Period of Evaluation**

The period for the evaluation of the Master Plan is presumed to be twenty (20) years from 2011 to 2030, including the period for the construction of final landfill site, transfer station, intermediate treatment facilities and procurement of trucks and containers for waste collection.

#### **(2) Setup of Alternatives**

Two alternatives are setup for the financial evaluation of the final landfill site and waste collection system, as follows:

- Case-A: The final landfill site (Ruai) and the direct haul system for waste collection/transportation
- Case-B: The final landfill site (Ruai) and the transfer-transport system for waste collection/transportation

#### **(3) Basic Assumptions**

##### **(a) Discount Rate**

The discount rate as the cut-off ratio to judge the financial viability is set as 0.55% of the international financial institute.

##### **(b) Waste Charge Level of Household**

Three (3) scenarios of waste charge level by income level are set to be the same as those of the simulation analysis for SWMPC, as shown in **Table 4.8.2**.

##### **(c) Waste Charge Level of Business Establishments**

The waste charge level of business establishments is set also on the basis of operation and maintenance per ton. This waste charge level is assumed to increase at 5% per annum, the same increase rate of per capita GRDP of Nairobi City.

##### **(d) Tipping Fees**

The average unit rate of existing tipping fees is assumed to be KSh 35 per ton of disposed waste during 2010-2016. After the final landfill site (Ruai) is completed in the year 2017, the tipping fees are estimated to be 164 KSh/ton based on the total amount of disposed wastes (9.5 million tons) and the O&M cost for the final landfill site (Ruai) during the period 2017-2030.

#### **(4) Project Cost**

##### **(a) Component of Project Cost**

The project costs of the Master Plan differ according to the composition of the two alternatives of collection/transportation system, the direct collection/transportation system (Case-A) and the collection/transportation through transfer station (Case-B), as shown in the following table.

**Table 4.13.1 Project Cost of the Master Plan (Financial Price)**

No.	Name of Project	Project Cost (Ksh Million )	Case-A	Case-B
1	Collection and Transport Plan (Direct Haul to Ruai)	5,590	●	×
2	Collection and Transport Plan (Transfer Station in Dandora)	13,396	×	●
3	3R and Intermediate Treatment Plan	1,018	●	●
4	Final Disposal Plan	14,487	●	●
5	Community Participation Promotion Plan	328	●	●
<b>Total Cost</b>			<b>21,423</b>	<b>29,229</b>

Note: ● Item of the project component is to be considered in the Master Plan.  
 × Item of the project component is not to be considered in the Master Plan.

Source: JICA Survey Team

**(b) Physical Contingency**

The physical contingency is calculated as 10% of the total cost of civil works, equipment and engineering services.

**(c) Classification of Project Cost**

The project cost is divided into the local currency portion (LCP) and the foreign currency portion (FCP). The LCP is classified into labour cost and other costs including materials. The labour cost is divided into the skilled labour and the unskilled labour. The summaries of project cost are shown in **Tables 4.13.2 to 4.13.5** and implementation schedules of the projects composing the Master Plan are shown in **Table 4.13.7 and 4.13.8**. Total project cost for the direct haul system is KSh 21,423 million and that of the transfer station transportation system is KSh 29,229 million which is 1.36 times that of the direct haul system.

**(5) Case of Evaluation**

The evaluation is set into six (6) cases according to the two (2) alternatives of collection/transportation system and the scenario of waste charge level for households, the same as in the simulation for the SWMPC.

**Table 4.13.2 Summary of Project Cost of the Master Plan (Market Price): Case-A (1)**

(Unit: in Million KSh)

Items of Cost	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>A .CONSTRUCTION</b>										
<b>(A) Civil Works Cost</b>										
1. Local Currency Portion										
(1) Material & Equipment	61	73	65	83	1,132	2,006	1,258	96	420	0
(2) Labour										
(Skilled)	5	5	5	6	85	150	94	7	31	0
(Unskilled)	11	13	11	15	198	351	220	17	73	0
Sub-Total	15	18	16	21	283	502	314	24	105	0
Total	77	91	81	104	1,415	2,508	1,572	121	525	0
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0
Total	77	91	81	104	1,415	2,508	1,572	121	525	0
<b>(B) Equipment Cost</b>										
1. Local Currency Portion	0	0	0	0	0	0	0	0	0	0
2. Foreign Currency Portion	0	2	178	0	389	63	53	99	52	209
Total	0	2	178	0	389	63	53	99	52	209
Total (Civil Works + Equipment)	77	93	259	104	1,804	2,571	1,626	220	576	209
<b>(C) Engineering Fee</b>										
Design (5%)	4	5	233	11	3	3	5	7	5	0
Construction Supervision (5%)	4	8	14	21	66	134	15	17	5	0
Total (Design + Construction Supervision)	9	13	247	31	69	137	21	25	10	0
Total (A+B+C)	86	106	506	135	1,873	2,707	1,646	245	587	209
Physical Contingency (10%)	9	11	51	14	187	271	165	24	59	21
<b>Total</b>	94	117	557	149	2,060	2,978	1,811	269	646	230
<b>(D) Other Costs</b>										
1. Local Currency Portion	0	0	0	0	0	0	0	0	0	0
(1) Material&Equipment	9	18	16	16	12	3	1	1	1	1
(2) Labour	0	0	0	0	0	0	0	0	0	0
(Skilled)	7	15	13	13	10	3	1	1	1	1
(Unskilled)	5	10	9	9	7	2	1	1	1	1
Sub-Total	12	25	22	22	17	4	1	1	1	1
Total	21	42	37	37	29	7	2	2	2	2
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0
Total	21	42	37	37	29	7	2	2	2	2
<b>B. O&amp;M Cost</b>										
1. Local Currency Portion	0	0	0	0	0	0	0	0	0	0
(1) Material & Equipment	26	35	35	115	121	134	166	185	201	216
(2) Labour										
(Skilled)	2	3	3	9	9	10	12	14	15	16
(Unskilled)	5	6	6	20	21	23	29	32	35	38
Sub-Total	7	9	9	29	30	33	42	46	50	54
Total	33	43	44	143	151	167	208	231	251	270
2. Foreign Currency Portion	0	0	0	0	0	140	0	0	0	0
Total	33	43	44	143	151	307	208	231	251	270
<b>Grand Total</b>	149	203	638	329	2,240	3,293	2,021	502	898	502

Source: JICA Survey Team

**Table 4.13.3 Summary of Project Cost of the Master Plan (Market Price): Case-A (2)**

(Unit: in Million KSh)

Items of Cost	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
<b>A. CONSTRUCTION</b>											
<b>(A) Civil Works Cost</b>											
1. Local Currency Portion											
(1) Material&Equipment	365	0	352	700	699	0	237	234	231	209	8,222
(2) Labour											
(Skilled)	27	0	26	52	52	0	18	18	17	16	617
(Unskilled)	64	0	62	122	122	0	42	41	40	37	1,439
Sub-Total	91	0	88	175	175	0	59	59	58	52	2,055
Total	457	0	440	875	874	0	297	293	288	261	10,277
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0	0
Total	457	0	440	875	874	0	297	293	288	261	10,277
<b>(B) Equipment Cost</b>											
1. Local Currency Portion	0	0	0	0	0	0	0	0	0	0	0
2. Foreign Currency Portion	0	0	48	0	625	0	0	48	0	142	1,907
Total	0	0	48	0	625	0	0	48	0	142	1,907
Total (Civil Works + Equipment)	457	0	488	875	1,499	0	297	340	288	403	12,184
<b>(C) Engineering fee</b>											
Design (5%)	0	70	16	16	0	0	2	0	7	0	388
Construction Supervision (5%)	0	2	16	39	44	0	2	0	7	0	395
Total (Design+Construction Supervision)	0	72	31	55	44	0	5	0	14	0	783
Total (A+B+C)	457	72	519	930	1,543	0	302	340	302	403	12,967
Physical Contingency (10%)	46	7	52	93	154	0	30	34	30	40	1,297
<b>Total</b>	<b>502</b>	<b>79</b>	<b>571</b>	<b>1,023</b>	<b>1,697</b>	<b>0</b>	<b>332</b>	<b>374</b>	<b>333</b>	<b>443</b>	<b>14,264</b>
<b>(D) Other Costs</b>											
1. Local Currency Portion											
(1) Material&Equipment	3	1	1	1	1	3	1	1	1	1	89
(2) Labour											
(Skilled)	3	1	1	1	1	3	1	1	1	1	76
(Unskilled)	2	1	1	1	1	2	1	1	1	1	51
Sub-Total	4	1	1	1	1	4	1	1	1	1	127
Total	7	2	2	2	2	7	2	2	2	2	216
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0	0
Total	7	2	2	2	2	7	2	2	2	2	216
<b>B. O&amp;M Cost</b>											
1. Local Currency Portion	0	0	0	0	0	0	0	0	0	0	0
(1) Material&Equipment	232	246	261	277	292	312	569	603	638	676	5,340
(2) Labour											
(Skilled)	17	18	20	21	22	23	43	45	48	51	401
(Unskilled)	41	43	46	48	51	55	100	106	112	118	935
Sub-Total	58	62	65	69	73	78	142	151	160	169	1,335
Total	289	308	326	346	366	390	712	754	798	845	6,675
2. Foreign Currency Portion	58	0	0	0	0	71	0	0	0	0	268
Total	347	308	326	346	366	460	712	754	798	845	6,943
<b>Grand Total</b>	<b>857</b>	<b>389</b>	<b>899</b>	<b>1,370</b>	<b>2,065</b>	<b>468</b>	<b>1,046</b>	<b>1,130</b>	<b>1,133</b>	<b>1,290</b>	<b>21,423</b>

Source: JICA Survey Team

**Table 4.13.4 Summary of Project Cost of the Master Plan (Market Price): Case-B (1)**

(Unit: in Million KSh)

Items of Cost	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>A.CONSTRUCTION</b>										
<b>(A) Civil Works Cost</b>										
1. Local Currency Portion										
(1) Material&Equipment	61	73	65	83	2,139	3,013	1,258	96	420	0
(2) Labour										
(Skilled)	5	5	5	6	160	226	94	7	31	0
(Unskilled)	11	13	11	15	374	527	220	17	73	0
Sub-Total	15	18	16	21	535	753	314	24	105	0
Total	77	91	81	104	2,674	3,767	1,572	121	525	0
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0
Total	77	91	81	104	2,674	3,767	1,572	121	525	0
<b>(B) Equipment Cost</b>										
1. Local Currency Portion	0	0	0	0	0	0	0	0	0	0
2. Foreign Currency Portion	0	2	178	0	365	937	53	99	52	203
Total	0	2	178	0	365	937	53	99	52	203
Total (Civil Works + Equipment)	77	93	259	104	3,039	4,703	1,626	220	576	203
<b>(C) Engineering fee</b>										
Design (5%)	4	5	286	63	34	34	5	7	5	30
Construction Supervision (5%)	4	8	67	73	98	165	15	17	5	30
Total (Design+Construction Supervision )	9	13	353	137	132	199	21	25	10	60
Total(A+B+C)	86	106	611	241	3,172	4,903	1,646	244	587	263
Physical Contingency (10%)	9	11	61	24	317	490	165	24	59	26
<b>Total</b>	94	117	673	265	3,489	5,393	1,811	269	645	289
<b>(D) Other Costs</b>										
1. Local Currency Portion										
(1) Material&Equipment	9	18	16	16	12	3	1	1	1	1
(2) Labour										
(Skilled)	7	15	13	13	10	3	1	1	1	1
(Unskilled)	5	10	9	9	7	2	1	1	1	1
Sub-Total	12	25	22	22	17	4	1	1	1	1
Total	21	42	37	37	29	7	2	2	2	2
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0
Total	21	42	37	37	29	7	2	2	2	2
<b>B. O&amp;M Cost</b>										
1. Local Currency Portion										
(1) Material&Equipment	26	35	35	112	118	130	215	237	257	278
(2) Labour										
(Skilled)	2	3	3	8	9	10	16	18	19	21
(Unskilled)	5	6	6	20	21	23	38	42	45	49
Sub-Total	7	9	9	28	30	33	54	59	64	69
Total	33	43	44	140	148	163	269	297	321	347
2. Foreign Currency Portion	0	0	0	0	0	140	0	0	0	0
Total	33	43	44	140	148	303	269	297	321	347
<b>Grand Total</b>	149	203	754	442	3,665	5,704	2,082	568	968	639

Source: JICA Survey Team

**Table 4.13.5 Summary of Project Cost of the Master Plan (Market Price): Case-B (2)**

(Unit: in Million KSh)

Items of Cost	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
<b>A.CONSTRUCTION</b>											
<b>(A) Civil Works Cost</b>											
1. Local Currency Portion											
(1) Material&Equipment	365	0	352	700	699	0	237	234	231	209	10,236
(2) Labour											
(Skilled)	27	0	26	52	52	0	18	18	17	16	768
(Unskilled)	64	0	62	122	122	0	42	41	40	37	1,791
Sub-Total	91	0	88	175	175	0	59	59	58	52	2,559
Total	457	0	440	875	874	0	297	293	288	261	12,795
2.Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0	0
Total	457	0	440	875	874	0	297	293	288	261	12,795
<b>(B) Equipment Cost</b>											
1. Local Currency Portion	0	0	0	0	0	0	0	0	0	0	0
2. Foreign Portion	601	0	48	0	593	628	27	75	27	758	4,646
Total	601	0	48	0	593	628	27	75	27	758	4,646
Total (Civil Works + Equipment)	1,057	0	488	875	1,467	628	324	368	316	1,019	17,441
<b>(C) Engineering fee</b>											
Design (5%)	0	70	15	15	31	1	4	1	38	0	651
Construction Supervision (5%)	0	2	15	38	75	1	4	1	38	0	658
Total (Design+Construction Supervision)	0	72	30	53	107	3	8	3	76	0	1,309
Total (A+B+C)	1,057	72	517	928	1,574	631	332	370	391	1,019	18,750
Physical Contingency (10%)	106	7	52	93	157	63	33	37	39	102	1,875
<b>Total</b>	<b>1,163</b>	<b>79</b>	<b>569</b>	<b>1,021</b>	<b>1,731</b>	<b>694</b>	<b>365</b>	<b>407</b>	<b>431</b>	<b>1,121</b>	<b>20,625</b>
<b>(D) Other Costs</b>											
1. Local Currency Portion											
(1) Material&Equipment	3	1	1	1	1	3	1	1	1	1	89
(2) Labour											
(Skilled)	3	1	1	1	1	3	1	1	1	1	76
(Unskilled)	2	1	1	1	1	2	1	1	1	1	51
Sub-Total	4	1	1	1	1	4	1	1	1	1	127
Total	7	2	2	2	2	7	2	2	2	2	216
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0	0
Total	7	2	2	2	2	7	2	2	2	2	216
<b>B. O&amp;M Cost</b>											
1. Local Currency Portion											
(1).Material&Equipment	298	318	340	362	384	409	673	713	756	800	6,496
(2).Labour											
(Skilled)	22	24	25	27	29	31	50	53	57	60	487
(Unskilled)	52	56	59	63	67	72	118	125	132	140	1,137
Sub-Total	75	80	85	90	96	102	168	178	189	200	1,624
Total	373	398	425	452	480	511	841	891	945	1,000	8,120
2. Foreign Currency Portion	58	0	0	0	0	71	0	0	0	0	268
Total	431	398	425	452	480	581	841	891	945	1,000	8,388
<b>Grand Total</b>	<b>1,601</b>	<b>479</b>	<b>996</b>	<b>1,475</b>	<b>2,213</b>	<b>1,283</b>	<b>1,208</b>	<b>1,301</b>	<b>1,378</b>	<b>2,123</b>	<b>29,229</b>

Source: JICA Survey Team

**Table 4.13.6 Implementation Schedule and Cost of Projects of the Master Plan (1)**

(Unit: in Million KSh)

Names of Project	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
<b>1. Waste Collection and Transport Plan (Case A-1: Direct Haul to Ruai)</b>											
(1) Construction & Other Costs	2	2	180	2	390	73	73	121	0	208	0
(2) Engineering Fee & Physical Contingency	10	10	41	23	44	12	18	29	11	21	0
(3) O&M Cost	0	0	0	99	107	116	126	137	147	157	170
Subtotal	11	11	221	124	541	202	217	286	158	386	170
<b>2. Waste Collection and Transport Plan (Case A-2: Transfer Station at Dandora)</b>											
(1) Construction & Other Costs	2	2	180	2	1,626	2,206	73	121	0	203	601
(2) Engineering fee & Physical Contingency	10	10	157	139	237	295	18	28	11	86	60
(3) O&M Cost	0	0	0	96	103	112	187	202	217	234	254
Subtotal	11	11	337	237	1,965	2,613	278	351	228	523	914
<b>3. 3R and Intermediate Treatment Plans</b>											
(1) Construction & Other Costs	3	3	3	3	99	96	99	99	99	1	0
(2) Engineering fee & Physical Contingency	0	3	3	11	10	24	21	21	10	0	0
(3) O&M Cost	0	0	0	0	0	6	14	20	25	31	31
Subtotal	3	7	7	14	109	125	134	140	134	32	31
<b>4. Final Disposal Plan</b>											
(1) Construction & Other Costs	77	79	81	104	1,301	2,388	1,440	0	478	0	457
(2) Engineering fee & Physical Contingency	8	8	253	10	200	368	144	0	48	0	46
(3) O&M Cost	33	33	33	33	33	33	33	33	33	33	33
Subtotal	117	120	367	148	1,534	2,789	1,617	33	559	33	535
<b>5. Community Participation Promotion Plan</b>											
(1) Construction & Other Costs	17	52	33	33	42	21	16	2	2	2	7
(2) Engineering fee & Physical Contingency	0	3	0	0	3	3	3	0	0	0	0
(3) O&M Cost	0	0	1	1	2	2	1	5	5	5	5
Subtotal	17	55	34	34	47	26	20	7	7	7	12
<b>Total (Direct Haul)</b>	137	180	573	305	1,935	2,688	1,890	481	845	477	315
<b>Total (Transfer Station)</b>	137	180	689	417	3,359	5,099	1,951	546	915	614	1,060

Source : JICA Survey Team

**Table 4.13.7 Implementation Schedule and Cost of Projects of the Master Plan (2)**

(Unit: in Million KSh)

Names of Project	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
<b>1. Waste Collection and Transport Plan (Case A-1: Direct Haul to Ruai)</b>										
(1) Construction & Other Costs	0	48	0	625	0	0	48	0	142	1,913
(2) Engineering Fee & Physical Contingency	5	39	34	63	0	5	5	16	14	400
(3 ) O&M Cost	184	198	213	228	244	261	278	296	315	3,277
Subtotal	189	285	247	916	244	266	331	312	471	5,590
<b>2. Waste Collection and Transport Plan (Case A-2: Transfer Station at Dandora)</b>										
(1) Construction & Other Costs	0	48	0	593	628	27	75	27	758	7,170
(2) Engineering fee & Physical Contingency	5	37	33	128	66	11	11	86	76	1,504
(3 ) O&M Cost	274	296	319	343	365	390	415	443	470	4,722
Subtotal	279	381	352	1,064	1,059	429	501	557	1,304	13,396
<b>3. 3R and Intermediate Treatment Plan</b>										
(1) Construction & Other Costs	0	0	0	0	0	0	0	0	0	510
(2) Engineering fee & Physical Contingency	0	0	0	0	0	0	0	0	0	103
(3 ) O&M Cost	31	31	31	31	31	31	31	31	31	405
Subtotal	31	31	31	31	31	31	31	31	31	1,018
<b>4. Final Disposal Plan</b>										
(1) Construction & Other Costs	0	440	875	874	0	297	293	288	261	9,731
(2) Engineering fee & Physical Contingency	74	44	113	136	0	30	29	29	26	1,565
(3 ) O&M Cost	88	92	97	101	180	415	440	466	494	3,191
Subtotal	162	576	1,085	1,111	180	741	762	783	781	14,487
<b>5. Community Participation Promotion Plan</b>										
(1) Construction & Other Costs	2	2	2	2	7	2	2	2	2	245
(2) Engineering fee & Physical Contingency	0	0	0	0	0	0	0	0	0	12
(3 ) O&M Cost	5	5	5	5	5	5	5	5	5	71
Subtotal	7	7	7	7	12	7	7	7	7	328
<b>Total (Direct Haul)</b>	819	388	1,238	1,826	389	677	931	922	809	17,826
<b>Total (Transfer Station)</b>	909	484	1,343	1,974	1,204	839	1,101	1,166	1,642	25,632

Source : JICA Survey Team



## (6) Results of Evaluation

The profit and loss statement of Case-A.2 is shown in **Table 4.13.8**. The net benefits would be negative during the period from 2011 to 2015, but after the establishment of the new waste charge system for households, the net benefits would be positive, and the accumulated benefit would change from 2024 and increase every year except during three years from 2026 to 2028.

The cash flow statement is shown in **Table 4.13.9**. In spite of cash inflow of loan, the cash flow would be shortages from 2011 to 2015 but after the establishment of the new waste charging system introduced in 2016, the surplus is expected to be positive until 2023 except 2021, but again cash shortages are projected from 2024 to 2025 and from 2027 to 2030 because of increase of investment. However, these cash shortages could be expected to decrease because of the increase of waste charges, the decrease of investment and saturating of loan repayment.

The cash flow to judge the financial viability of Case-A.3 is shown in **Table 4.13.10**. This case is the direct haul collection/transportation system and the scenario of waste charge level is high. The net financial benefits would be negative before 2018 mainly because of the few revenues from waste charge of business establishment and the increase of investment. However, after 2018, the increase of revenue from waste charge under the new waste charging system for households and the decrease of investment is expected, and the net financial benefits would increase. The FIRR is figured out to be 5.8% and B/C ratio is 1.18, which are high enough for financial viability as over the cut-off ratio of 0.55%.

The summary of the result of evaluation is shown in **Table 4.13.11**. For Case-A, only the FIRR of Case-A.3 at 5.8% is more than the 0.55% cut-off ratio to judge the financial viability, as mentioned above. For Case-B, all FIRRs are non-available and B/C is less than 1.0 which means that the revenue is less than the cost. According to the sensitivity analysis, the condition to be financially viable is that the waste charge level must be 1.1 times the optimistic level as in Case-B.3, the high scenario of the waste charge level. It is therefore concluded that Case-A (Direct Haul Transportation System) is financially viable.

**Table 4.13.8 Profit and Loss Statement of the Master Plan (Case-A.2)**

(Unit: in Million KSh)

Year	Expenditure			Revenues			Net Profit	Accumulated Net Profit
	O&M Cost	Depreciation	Total	Waste Charge	Tipping Fees	Total		
2011	33	0	33	21	8	29	-183	-183
2012	43	0	43	22	9	31	-205	-388
2013	44	1	45	24	9	33	-219	-607
2014	143	23	166	25	10	35	-352	-959
2015	151	23	174	27	11	37	-373	-1,332
2016	307	153	460	563	50	613	34	-1,298
2017	208	346	554	673	54	727	43	-1,255
2018	231	356	587	785	59	844	116	-1,139
2019	251	365	616	914	63	977	210	-929
2020	270	401	671	1,057	68	1,125	291	-638
2021	347	421	768	762	79	841	10	-628
2022	308	435	743	894	86	980	172	-456
2023	326	435	761	1,042	93	1,135	308	-148
2024	346	464	810	1,211	101	1,312	436	288
2025	366	523	888	1,402	109	1,510	558	846
2026	460	642	1,103	794	122	916	-91	755
2027	712	645	1,357	922	131	1,054	-189	566
2028	754	665	1,418	1,066	139	1,205	-77	489
2029	798	684	1,482	1,229	148	1,377	57	546
2030	845	703	1,548	1,415	158	1,573	216	762

Source: JICA Survey Team

**Table 4.13.9 Cash Flow Statement of the Master Plan**

(Unit: in Million KSh)

Year	Cash Outflow					Cash Inflow				Surplus	Accumulated Surplus
	Investment Cost & Replacement Cost	Loan Repayment	Loan Interest Payables	O&M Cost	Total	Loan	Waste Charge	Tipping Fees	Total		
2011	115	0	0	33	149	0	0	21	21	-128	-128
2012	159	0	0	43	203	3	0	22	25	-177	-305
2013	594	0	0	44	638	247	0	24	271	-367	-672
2014	186	0	1	143	331	31	0	25	56	-274	-946
2015	2,089	0	2	151	2,242	1,839	0	27	1,866	-376	-1,322
2016	2,986	0	12	307	3,304	2,794	549	15	3,358	53	-1,269
2017	1,813	0	27	208	2,048	1,631	657	16	2,304	256	-1,013
2018	271	0	36	231	538	234	768	17	1,019	481	-532
2019	648	0	37	251	936	99	895	18	1,012	77	-456
2020	232	0	38	270	540	0	1,037	20	1,057	517	61
2021	510	0	38	347	894	0	745	17	762	-133	-72
2022	81	0	38	308	427	0	876	18	894	467	395
2023	573	8	38	326	945	0	1,022	19	1,042	96	491
2024	1,025	9	38	346	1,418	0	1,190	21	1,211	-207	284
2025	1,700	71	38	366	2,174	0	1,379	22	1,402	-772	-487
2026	7	164	37	460	669	0	775	19	794	125	-363
2027	334	218	36	712	1,300	0	902	20	922	-378	-740
2028	377	226	35	754	1,392	0	1,044	22	1,066	-326	-1,066
2029	335	229	34	798	1,396	0	1,206	23	1,229	-167	-1,234
2030	445	229	33	845	1,552	0	1,390	24	1,415	-137	-1,371

Source : JICA Survey Team

**Table 4.13.10 Cash Flow of Financial Cost and Revenue of the Master Plan (Case-A.3)**

Year	Costs			Revenues			Net Benefit
	Investment Cost & Replacement Cost	O&M Cost	Total	Waste Charge	Tipping Fee	Total	
2011	115	33	149	21	8	29	-119
2012	159	43	203	22	9	31	-171
2013	594	44	638	24	9	33	-605
2014	186	143	329	25	10	35	-294
2015	2,089	151	2,240	27	11	37	-2,203
2016	2,986	307	3,293	862	50	912	-2,381
2017	1,813	208	2,021	1,036	54	1,090	-932
2018	271	231	502	1,211	59	1,269	767
2019	648	251	898	1,412	63	1,475	577
2020	232	270	502	1,636	68	1,704	1,202
2021	510	347	857	1,206	79	1,285	429
2022	81	308	389	1,419	86	1,505	1,116
2023	573	326	899	1,656	93	1,750	851
2024	1,025	346	1,370	1,929	101	2,030	660
2025	1,700	366	2,065	2,237	109	2,346	281
2026	7	460	468	1,391	122	1,513	1,045
2027	334	712	1,046	1,618	131	1,749	703
2028	377	754	1,130	1,871	139	2,010	880
2029	335	798	1,133	2,159	148	2,307	1,174
2030	445	845	1,290	2,486	158	2,644	1,355
Total	14,480	6,943	21,423	24,245	1,510	25,755	4,332

Source: JICA Survey Team

FIRR = 5.8%  
NPV = 3,681.8  
B/C = 1.18  
(Discount Rate: 0.55%)

The results of evaluation of the cash flow of financial cost and revenue for Case-A.1 and A.2, and Case-B.1~B.3 are shown in **Table 2.1.1~2.1.5** in **Section H of Volume 4, Data Book**, respectively.

**Table 4.13.11 Indicators for Financial Evaluation of the Master Plan**

Case	Case No.	Scenario	FIRR (%)	NPV (Million KSh)	B/C
A Direct Haul	A.1	Low	-	-12,799.9	0.37
	A.2	Medium	-12.6	-5,009.5	0.75
	A.3	High	5.8	3,681.8	1.18
B Transfer Station	B.1	Low	-	-20,184.2	0.27
	B.1	Medium	-	-12,393.8	0.55
	B.3	High	-4.2	-3,702.5	0.87
		Waste Charge (1.1 times of Case-B.3)	0.55	0.0	1.00

Source: JICA Survey Team

## 4.13.2 Economic Evaluation of the Master Plan

### (1) Methodology of Economic Evaluation

The economic evaluation for this project is carried out based on the concepts of “with-the-project” and “without-the-project” situations. In this method, the project is evaluated from the economic

viewpoint by comparing the costs and benefits in case that the project is implemented (i.e., “with-the-project”) and in case that the project is not implemented (i.e., “without-the-project”).

## (2) Period of Evaluation

The period of evaluation for the Master Plan is twenty-one (21) years from 2010 to 2030, including the period for the construction of final landfill site, transfer station, intermediate treatment facilities and procurement of trucks and containers for waste collection. It also includes the period for the preparatory survey for the next implementation stage and the technical assistance for the capacity development programme. Since the preparatory survey would start from 2010, the period of evaluation is one year earlier than that of the financial analysis in 2011-2030.

## (3) Setting Up of Alternatives

Two (2) alternatives are set for the financial evaluation on the final landfill site and the waste collection system, as follows:

- Case-A: The final landfill site (Ruai) and the direct haul system for waste collection/transportation
- Case-B: The final landfill site (Ruai) and the transfer-transport system for waste collection/transportation

## (4) Discount Rate

The discount rate as the cut-off ratio to judge the economic viability is set at 12.0%, which is considered to be the standard value for official development assistance (ODA) projects.

## (5) Economic Benefits

The economic benefits of the Master Plan include the following:

### (a) Improvement of Living Environment of Residents of Nairobi

This is estimated on the basis of Willingness to Pay (WTP).

WTP is estimated by income level and by zone on the basis of three (3) growth scenarios, as shown in the following table.

**Table 4.13.12 Scenario for WTP by Income Level and by Zone**

Scenario	Income Level	WTP (KSh/HH/Month)
Low	Low	10
	Middle	30
	High	100
Medium	Low	20
	Middle	40
	High	150
High	Low	30
	Middle	60
	High	300

Source: JICA Survey Team

**(b) Savings on Waste Disposal Cost at Final Landfill Site**

The savings on waste disposal treatment cost include the savings on the O&M cost and construction cost of the final landfill at Ruai. These cost savings are estimated based on the following factors:

- Unit cost of waste disposal treatment: 1,191 KSh/ton
- Planned potential waste collection amounts during 2017 to 2030 (with-the-project)
- Estimated potential waste collection amounts during 2017 to 2030 (without-the-project)

The amounts of potential waste collection without-the-project are estimated on the assumption that the target of waste reduction rate is 0% from 2010 until 2030. The cost savings estimated based on these factors are allocated to the years of investment for the waste disposal treatment by the rate of cost for waste disposal treatment. The result of the estimates of the saved waste disposal and the cost savings of the waste disposal treatment at the final landfill site of Ruai is shown in the table below.

**(c) Other Benefits**

The following benefits are also important benefits of this project, but are very difficult to quantify in money terms.

**(i) Preservation of Natural Environment**

The effects of the preservation of natural environment are the protection from the pollution of water quality, soil and air.

**(ii) Improvement of Public Sanitation**

The improvement of public sanitation would generate the reduction of rates of fatality, of disease and the reduction of absence from office work.

In this study, the above benefits were not included in the calculation of EIRR in the Master Plan.

**Table 4.13.13 Estimates of Saved Waste Disposal in Final Landfill Site**

(Unit: ton/day)

Year	Planned Amounts of Disposal (With-the-Project) (A)	Amounts of Waste Disposal in the Existing Conditions (Without-the-Project) (B)	With - Without (A)-(B)
2017	1,971	2,185	-214
2018	2,025	2,266	-241
2019	2,081	2,350	-269
2020	2,138	2,437	-299
2021	2,203	2,524	-321
2022	2,270	2,615	-345
2023	2,339	2,708	-369
2024	2,411	2,805	-395
2025	2,484	2,906	-422
2026	2,557	3,004	-447
2027	2,632	3,106	-474
2028	2,710	3,212	-502
2029	2,790	3,320	-531
2030	2,872	3,433	-561
Per Day	33,484	38,873	-5,389
Per Year	12,221,566	14,188,731	1,967,166

Source: JICA Survey Team

**Table 4.13.14 Estimates of Saved Cost on Waste Disposal Treatment at Final Landfill Site (Ruai)**

Period	Amounts of Waste Disposal at Final Landfill Site (ton)		Saved Waste Disposal (ton)	
	With	Without		
2017~2030	12,221,566	14,188,731	1,967,166	
Period	Cost for Waste Disposal Treatment at Final Landfill Site (Million KSh)		Saved Cost (Million KSh)	Unit Cost of Waste Disposal Treatment at Final Landfill Site (KSh/ton)
	With	Without		
2017-2030	14,558	16,901	2,343	1,191

Source: JICA Survey Team

## (6) Case of Evaluation

The evaluation was set for six (6) cases according to the alternatives of collection/transportation system and the scenarios of willingness to pay of households, as below.

**Table 4.13.15 Cases of Economic Evaluation for the Master Plan**

Case No.	Final Landfill Site and Waste Collection & Transportation System		Willingness to Pay		
	Case-A	Case-B	Household		
			Low	Medium	High
A.1	●		●		
A.2	●			●	
A.3	●				●
B.1		●	●		
B.2		●		●	
B.3		●			●

Source: JICA Survey Team

## (7) Economic Costs

### (a) Exclusion of Transfer of Expenditure Items

Taxes, Customs duties, loan interest, government subsidies, etc., are not inherent cost items incurred in the project. These transfer items should be excluded from the project cost. In this study, VAT (Value-Added Tax) of 16% is deducted from the local currency portion.

### (b) Present Value-Based Cost

The project cost is evaluated at 2009 prices. Therefore, inflationary cost elements incurred during the construction period should be excluded because these are external factors for the project.

### (c) Standard Conversion Factor (SCF)

The local currency portion for the materials including machinery and equipment should be converted into economic prices by applying the standard conversion factor, because this portion is usually evaluated within Kenya and their prices are distorted due to the inefficient markets and information. Consequently, they do not reflect international market prices. In this study, the SCF adopted is 0.968.

### (d) Opportunity Cost of Unskilled Labour

The skilled labour cost is considered to reflect the market price and to be the economic price. However, the unskilled labour cost is not considered to reflect the market price because of the lack of liquidity of workers, i.e., the surplus of workers caused by the high rate of unemployment or potential unemployment in developing countries. The unskilled labour cost is necessary to be revised by the opportunity cost. Then the opportunity cost of unskilled labour is assumed to be 0.60 of the financial price as the conversion factor by taking account the unemployment ratio of around 40% in Kenya.

### (e) Physical Contingency

The physical contingency is calculated as 10% of the total cost of civil works, equipment and engineering services.

Summaries of the economic cost of the project are given in **Table 4.13.16 to Table 4.13.19** and the economic costs of the components of the Master Plan are given in **Table 4.13.20**. Based on the economic prices, the total project cost of Case-A is KSh 18,327 million and that of Case-B is KSh 25,233 million.

**Table 4.13.16 Summary of Project Cost of the Master Plan (Economic Price): Case-A (1)**

(Unit: in million KSh)

Items of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>A .CONSTRUCTION</b>											
<b>(A) Civil Works Cost</b>											
1. Local Currency Portion											
(1) Material&Equipment	0	50	59	53	68	921	1,631	1,023	78	341	0
(2) Labour											
(Skilled)	0	5	5	5	6	85	150	94	7	31	0
(Unskilled)	0	8	9	8	10	139	246	154	12	51	0
Subtotal	0	12	14	13	16	224	396	248	19	83	0
Total	0	62	73	65	84	1,144	2,027	1,271	97	424	0
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0	0
Total	0	62	73	65	84	1,144	2,027	1,271	97	424	0
<b>(B) Equipment Cost</b>											
1.Local Currency Portion											
2.Foreign Currency Portion	0	0	2	178	0	389	63	53	99	52	209
Total	0	0	2	178	0	389	63	53	99	52	209
Total (Civil Works + Equipment)	0	62	75	243	84	1,533	2,091	1,325	197	476	209
<b>( C ) Engineering fee</b>											
Design (5%)	0	4	4	196	9	3	3	5	6	4	0
Construction Supervision (5%)	0	4	7	12	17	56	112	13	15	4	0
Total (Design+Construction Supervision )	0	7	11	208	26	58	115	17	21	9	0
Total (A+B+C)	0	69	87	451	110	1,591	2,205	1,342	218	485	209
Physical Contingency (10%)	0	7	9	45	11	159	221	134	22	48	21
<b>Total</b>	0	76	95	496	121	1,750	2,426	1,476	239	533	230
<b>(D) Other Costs</b>											
1. Local Currency Portion											
(1) Material&Equipment	0	7	14	13	13	9	2	1	1	1	1
(2) Labour											
(Skilled)	0	7	15	13	13	10	3	1	1	1	1
(Unskilled)	0	3	7	6	6	5	1	0	0	0	0
Subtotal	0	11	22	19	19	15	4	1	1	1	1
Total	0	18	36	32	32	25	6	2	2	2	2
2. Foreign Currency Portion	150	64	94	89	80	40	0	0	0	0	0
Total	150	82	130	121	112	64	6	2	2	2	2
<b>B. O&amp;M Cost</b>											
1. Local Currency Portion											
(1) Material&Equipment	0	22	28	29	93	98	109	135	150	163	176
(2) Labour											
(Skilled)	0	2	3	3	9	9	10	12	14	15	16
(Unskilled)	0	3	4	4	14	15	16	20	23	25	26
Subtotal	0	5	7	7	23	24	26	33	37	40	43
Total	0	27	35	36	116	122	135	168	187	203	218
2. Foreign Currency Portion	0	0	0	0	0	0	140	0	0	0	0
Total	0	27	35	36	116	122	275	168	187	203	218
<b>Grand Total</b>	150	186	261	653	349	1,936	2,707	1,646	428	738	450

Source: JICA Survey Team



**Table 4.13.17 Summary of Project Cost of the Master Plan (Economic Price): Case-A (2)**

(Unit: in million KSh)

Items of Cost	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
<b>A .CONSTRUCTION</b>											
<b>(A) Civil Works Cost</b>											
1. Local Currency Portion											
(1) Material&Equipment	297	0	286	569	569	0	193	190	188	170	6,685
(2) Labour											
(Skilled)	27	0	26	52	52	0	18	18	17	16	617
(Unskilled)	45	0	43	86	86	0	29	29	28	26	1,007
Subtotal	72	0	69	138	138	0	47	46	46	41	1,624
Total	369	0	356	707	707	0	240	236	233	211	8,309
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0	0
Total	369	0	356	707	707	0	240	236	233	211	8,309
<b>(B) Equipment Cost</b>											
1. Local Currency Portion											
2. Foreign Currency Portion	0	0	48	0	625	0	0	48	0	142	1,907
Total	0	0	48	0	625	0	0	48	0	142	1,907
Total (Civil Works + Equipment)	369	0	403	707	1,332	0	240	284	233	353	10,216
<b>( C ) Engineering fee</b>											
Design (5%)	0	58	13	13	0	0	2	0	6	0	326
Construction Supervision (5%)	0	2	13	33	37	0	2	0	6	0	332
Total (Design+Construction Supervision )	0	61	26	46	37	0	4	0	12	0	658
Total (A+B+C)	369	61	430	753	1,369	0	244	284	245	353	10,874
Physical Contingency (10%)	37	6	43	75	137	0	24	28	24	35	1,087
<b>Total</b>	<b>406</b>	<b>67</b>	<b>473</b>	<b>829</b>	<b>1,505</b>	<b>0</b>	<b>268</b>	<b>313</b>	<b>269</b>	<b>388</b>	<b>11,961</b>
<b>(D) Other Costs</b>											
1. Local Currency Portion											
(1) Material&Equipment	2	1	1	1	1	2	1	1	1	1	72
(2) Labour											
(Skilled)	3	1	1	1	1	3	1	1	1	1	76
(Unskilled)	1	0	0	0	0	1	0	0	0	0	36
Subtotal	4	1	1	1	1	4	1	1	1	1	111
Total	6	2	2	2	2	6	2	2	2	2	184
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0	517
Total	6	2	2	2	2	6	2	2	2	2	701
<b>B. O&amp;M Cost</b>											
1. Local Currency Portion											
(1) Material&Equipment	188	200	212	225	238	254	463	490	519	550	4,342
(2) Labour											
(Skilled)	17	18	20	21	22	23	43	45	48	51	401
(Unskilled)	28	30	32	34	36	38	70	74	78	83	654
Subtotal	46	49	52	55	58	62	112	119	126	133	1,055
Total	234	249	264	279	296	315	575	609	645	683	5,397
2. Foreign Currency Portion	58	0	0	0	0	71	0	0	0	0	268
Total	292	249	264	279	296	386	575	609	645	683	5,665
<b>Grand Total</b>	<b>704</b>	<b>317</b>	<b>738</b>	<b>1,110</b>	<b>1,803</b>	<b>392</b>	<b>846</b>	<b>924</b>	<b>917</b>	<b>1,073</b>	<b>18,327</b>

Source: JICA Survey Team

**Table 4.13.18 Summary of Project Cost of the Master Plan (Economic Price): Case-B (1)**

(Unit: in Million KSh)

Items of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>A .CONSTRUCTION</b>											
<b>(A) Civil Works Cost</b>											
1. Local Currency Portion											
(1) Material&Equipment	0	50	59	53	68	1,740	2,450	1,023	78	341	0
(2) Labour											
(Skilled)	0	5	5	5	6	160	226	94	7	31	0
(Unskilled)	0	8	9	8	10	262	369	154	12	51	0
Subtotal	0	12	14	13	16	423	595	248	19	83	0
Total	0	62	73	65	84	2,162	3,045	1,271	97	424	0
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0	0
Total	0	62	73	65	84	2,162	3,045	1,271	97	424	0
<b>(B) Equipment Cost</b>											
1. Local Currency Portion											
2. Foreign Currency Portion	0	0	2	178	0	365	937	53	99	52	203
Total	0	0	2	178	0	365	937	53	99	52	203
Total (Civil Works + Equipment)	0	62	75	243	84	2,527	3,982	1,325	197	476	203
<b>(C) Engineering fee</b>											
Design (5%)	0	4	4	240	53	29	29	5	6	4	25
Construction Supervision (5%)	0	4	7	56	62	82	139	13	14	4	25
Total (Design+Construction Supervision )	0	7	11	296	115	111	168	17	21	9	50
Total (A+B+C)	0	69	87	540	199	2,638	4,150	1,342	217	484	253
Physical Contingency (10%)	0	7	9	54	20	264	415	134	22	48	25
<b>Total</b>	0	76	95	593	219	2,902	4,564	1,476	239	533	279
<b>(D) Other Costs</b>											
1. Local Currency Portion											
(1) Material & Equipment	0	7	14	13	13	9	2	1	1	1	1
(2) Labour											
(Skilled)	0	7	15	13	13	10	3	1	1	1	1
(Unskilled)	0	3	7	6	6	5	1	0	0	0	0
Subtotal	0	11	22	19	19	15	4	1	1	1	1
Total	0	18	36	32	32	25	6	2	2	2	2
2. Foreign Currency Portion	150	64	94	89	80	40	0	0	0	0	0
Total	150	82	130	121	112	64	6	2	2	2	2
<b>B. O&amp;M Cost</b>											
1. Local Currency Portion											
(1) Material&Equipment	0	22	28	29	91	96	106	175	193	209	226
(2) Labour											
(Skilled)	0	2	3	3	8	9	10	16	18	19	21
(Unskilled)	0	3	4	4	14	14	16	26	29	31	34
Subtotal	0	5	7	7	22	23	26	42	47	51	55
Total	0	27	35	36	113	119	132	217	240	259	281
2. Foreign Currency Portion	0	0	0	0	0	0	140	0	0	0	0
Total	0	27	35	36	113	119	272	217	240	259	281
<b>Grand Total</b>	150	186	261	750	444	3,085	4,843	1,695	481	794	561

Source: JICA Survey Team

**Table 4.13.19 Summary of Project Cost of the Master Plan (Economic Price): Case-B (2)**

(Unit: in Million KSh)

Items of Cost	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
<b>A .CONSTRUCTION</b>											
<b>(A) Civil Works Cost</b>											
1. Local Currency Portion											
(1) Material&Equipment	297	0	286	569	569	0	193	190	188	170	8,323
(2) Labour											
(Skilled)	27	0	26	52	52	0	18	18	17	16	768
(Unskilled)	45	0	43	86	86	0	29	29	28	26	1,254
Subtotal	72	0	69	138	138	0	47	46	46	41	2,022
Total	369	0	356	707	707	0	240	236	233	211	10,344
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0	0
Total	369	0	356	707	707	0	240	236	233	211	10,344
<b>(B) Equipment Cost</b>											
1. Local Currency Portion											
2. Foreign Currency Portion	601	0	48	0	593	628	27	75	27	758	4,646
Total	601	0	48	0	593	628	27	75	27	758	4,646
Total (Civil Works + Equipment)	970	0	403	707	1,300	628	267	312	260	969	14,990
<b>( C ) Engineering fee</b>											
Design (5%)	0	58	12	12	26	1	3	1	32	0	547
Construction Supervision (5%)	0	2	12	32	63	1	3	1	32	0	553
Total (Design+Construction Supervision )	0	61	25	45	89	2	6	2	64	0	1,100
Total (A+B+C)	970	61	428	752	1,389	630	273	314	324	969	16,090
Physical Contingency (10%)	97	6	43	75	139	63	27	31	32	97	1,609
<b>Total</b>	<b>1,067</b>	<b>67</b>	<b>471</b>	<b>827</b>	<b>1,528</b>	<b>693</b>	<b>301</b>	<b>345</b>	<b>356</b>	<b>1,066</b>	<b>17,699</b>
<b>(D) Other Costs</b>											
1. Local Currency Portion											
(1) Material&Equipment	2	1	1	1	1	2	1	1	1	1	72
(2) Labour											
(Skilled)	3	1	1	1	1	3	1	1	1	1	76
(Unskilled)	1	0	0	0	0	1	0	0	0	0	36
Subtotal	4	1	1	1	1	4	1	1	1	1	111
Total	6	2	2	2	2	6	2	2	2	2	184
2. Foreign Currency Portion	0	0	0	0	0	0	0	0	0	0	517
Total	6	2	2	2	2	6	2	2	2	2	701
<b>B. O&amp;M Cost</b>											
1. Local Currency Portion											
(1) Material&Equipment	243	259	276	294	312	332	547	580	615	650	5,282
(2) Labour											
(Skilled)	22	24	25	27	29	31	50	53	57	60	487
(Unskilled)	37	39	42	44	47	50	82	87	93	98	796
Subtotal	59	63	67	71	76	81	133	141	149	158	1,283
Total	302	322	343	366	388	413	680	720	764	808	6,565
2. Foreign Currency Portion	58	0	0	0	0	71	0	0	0	0	268
Total	359	322	343	366	388	484	680	720	764	808	6,833
<b>Grand Total</b>	<b>1,432</b>	<b>390</b>	<b>816</b>	<b>1,195</b>	<b>1,918</b>	<b>1,183</b>	<b>983</b>	<b>1,067</b>	<b>1,122</b>	<b>1,876</b>	<b>25,233</b>

Source: JICA Survey Team

**Table 4.13.20 Project Cost of the Master Plan (Economic Price)**

No.	Name of Project	Project Cost (KSh Million)	Case-A	Case-B
1	Collection and Transport Plan (Direct Haul to Ruai)	4,870	●	×
2	Collection and Transport Plan (Transfer Station in Dandora)	11,776	×	●
3	3R and Intermediate Treatment Plans	876	●	●
4	Final Disposal Plan	11,788	●	●
5	Community Participation Promotion Plan	276	●	●
6	Preparatory Survey for the Next Implementation Stage	150	●	●
7	Capacity Development Programme	367*	●	●
<b>Total Cost</b>			<b>18,327</b>	<b>25,233</b>

Note: ● Item of the project component is to be considered in the Master Plan.

× Item of the project component is not to be considered in the Master Plan.

\* The project cost of “Capacity Development Programme” does not include costs of pilot projects that will be carried out in the Programme.

Source: JICA Survey Team

## (8) Results of Economic Evaluation

The cash flow to judge the economic feasibility of Case-A.3 is shown in **Table 4.13.21**. This case is the direct haul collection/transportation system and the waste charge level is high. The net economic benefits are negative before 2018 mainly because of the very few benefits except the revenue from the cost savings of construction of final landfill site. However, after 2018, the increase of benefit due to the improvement of living environment by the provision of SWM services to households and the decrease of investment are expected, and the net economic benefit increases annually. The EIRR is figured out to be 11.6% and the B/C ratio is 0.98, which are recognised to be economically viable since it is almost the same as 12.0% as the cut-off ratio.

The summary of the results of evaluation is shown in **Table 4.13.22**. For Case-A, as already mentioned, only the EIRR of Case-A.3 (11.6%) is almost the same as 12.0% as the cut-off ratio for economic viability. For Case-B, all EIRRs are non-viable because B/C is less than 1.0, which means that the benefit is less than the cost.

According to the sensitivity analysis, the condition to be economically viable is that the willingness to pay must be 1.4 times the high scenario of waste charge level for Case B.3. It could then be concluded that Case-A (Direct Haul Transportation System) is economically viable.

**Table 4.13.21 Cash Flow of Economic Cost and Benefit of the Master Plan (Case-A.3)**

(Unit: in Ksh Million)

Year	Costs			Benefits			Net Benefit
	Investment Cost & Replacement Cost	O&M Cost	Total	Improving of Living Environment	Cost Savings of Construction of Final Landfill Site	Total	
2010	150.0	0.0	150.0	0.0	0.0	0.0	-150.0
2011	158.9	26.8	185.7	0.0	0.0	0.0	-185.7
2012	225.6	35.1	260.7	0.0	0.0	0.0	-260.7
2013	616.8	35.8	652.7	0.0	0.0	0.0	-652.7
2014	233.5	115.8	349.3	0.0	0.0	0.0	-349.3
2015	1,814.2	122.2	1,936.4	0.0	554.8	554.8	-1,381.7
2016	2,432.1	275.2	2,707.3	562.2	1,030.3	1,592.4	-1,114.9
2017	1,478.0	168.2	1,646.2	667.5	0.0	667.5	-978.7
2018	241.3	186.8	428.1	761.3	0.0	761.3	333.2
2019	535.0	202.6	737.7	878.2	0.0	878.2	140.5
2020	231.5	218.5	449.9	1,007.4	0.0	1,007.4	557.5
2021	412.4	291.5	703.9	1,079.7	0.0	1,079.7	375.8
2022	68.4	248.8	317.3	1,275.6	0.0	1,275.6	958.3
2023	474.5	263.8	738.3	1,458.6	0.0	1,458.6	720.3
2024	830.5	279.4	1,109.9	1,686.8	375.0	2,061.8	952.0
2025	1,507.3	295.5	1,802.8	1,943.8	383.2	2,327.1	524.2
2026	6.3	385.7	392.0	2,666.5	0.0	2,666.5	2,274.6
2027	270.2	575.4	845.6	3,026.6	0.0	3,026.6	2,181.1
2028	314.6	609.4	924.0	3,422.3	0.0	3,422.3	2,498.3
2029	271.3	645.2	916.6	3,869.2	0.0	3,869.2	2,952.7
2030	389.7	683.0	1,072.6	4,374.1	0.0	4,374.1	3,301.4
Total	12,662.0	5,664.8	18,326.8	28,679.8	2,343.2	31,023.0	12,846.2

Source: JICA Survey Team

EIRR = 11.6%  
NPV = -114.9  
B/C = 0.98

The results of the cash flow of economic cost and benefits for Case-A.1 and A.2, and Case-B.1 to B.3 are shown in **Table 3.1.1~3.1.5** in **Section H of Volume 4, Data Book**, respectively.

**Table 4.13.22 Summary of Economic Evaluation for the Master Plan**

Case	Case No.	Scenario	EIRR (%)	NPV (Million KSh)	B/C
A Direct Haul	A.1	Low	-9.1	-3,072.1	0.47
	A.2	Medium	1.5	-2,070.8	0.65
	A.3	High	11.6	-114.9	0.98
B Transfer Station	B.1	Low	-	-5,324.1	0.34
	B.1	Medium	-6.7	-4,322.8	0.47
	B.3	High	4.5	-2,366.9	0.71
		WTP (1.4 times of Case-B.3)	12.0	-1.5	1.00

Source: JICA Survey Team

### 4.13.3 Justification of the Master Plan

#### (1) Technical Aspect

##### (a) Collection and Transportation Plan

Based on the comparative study mentioned before, the collection and transportation plan does not include large-scale civil works because construction of the transfer station is not a better option than the direct haul system. Additionally, since the railway transportation requires additional transfer facilities for loading and unloading waste, additional burden for operation and management of these facilities may bring other unexpected constraints, such as mechanical trouble and negative impacts on the surrounding environment. Not only from the economic and financial points of view as explained before, but direct haul using vehicles will be the best option to reduce these risks.

Although the waste collection and transportation activities will be conducted mostly by private collectors, CCN should cover the low income areas including informal settlements at least up to year 2030. The degree of CCN involvement in collection work for low income areas will depend mainly on business performance of the franchised private companies from year 2016. At any rate, the waste collection and transportation system in each community should be organised and managed by CBOs in cooperation with CCN, and this is an integral part of the new Master Plan. Pilot projects for the promotion of CBO's waste collection plan in some designated informal settlements should be carried out in the next stage with appropriate environmental education in the same location.

##### (b) 3R and Intermediate Treatment Plant

Promotion of 3R is the key issue for ISWM (Integrated Solid Waste Management) all over the world these days. Considering the locality of Nairobi, promotion of composting is the best option while mechanisation with power generation, in other words, "waste to energy" option is considered to be still a potential alternative if such feasibility is studied with proper surveys and reviews. Composting does not require any special mechanisation and huge investment, and three (3) types of composting, namely, "Home Composting", "Community Composting", and "Central Composting", will be introduced depending on income level, types of housing, and location and volume of waste. Workability of these composting programmes should be examined by implementation of pilot projects in the next stage.

##### (c) Final Disposal Plan

The present official disposal site in Nairobi, the Dandora Dumpsite, should be decommissioned and a new landfill site should be operated accordingly. Ruai is selected as the new landfill site in consideration of collection and transportation system efficiency, and it will be operated on a sanitary manner and managed by proper technologies. The planned area at Ruai is owned by the City Council of Nairobi and thus, no land acquisition will be necessary.

#### (2) Social Aspect

It is expected that some of the waste pickers will move to the new disposal site after closure of Dandora. Keeping all the waste pickers out of the site would be difficult, and careful control is required of the managers at the site. The material recovery facility (MRF) centre will be built in Dandora to provide work opportunities for the remaining waste pickers such as sorting and segregation work. In addition, a CBO at the nearest location where the waste pickers in Dandora live will be established to assign some jobs for the operation of waste collection, transportation and composting in the area. The existing Dandora open dumping site can be also used for a park or football ground after closure. Those measures will mitigate the negative impacts on the closure work.

The candidate site in the Ruai area is located next to a sewage treatment facility. There are few houses located around the site, but there is no house inside the candidate site of 80 hectares in area. Therefore, it is expected that the location in Ruai Area will cause few impacts from the social viewpoint.

As for the introduction of the container system especially in low income areas and areas of apartment houses, the system would be effective if the people are well informed about the places for waste dumping and collection. The awareness on proper waste disposal, in any case, should be improved.

Promotion of composting will entail cooperation and actual operation by the residents. Therefore, the CBOs should be organised well. This will foster social solidarity and much deeper understanding of the importance of sanitation and proper SWM.

If the financial situation of the newly established Solid Waste Management Public Cooperation (SWMPC) and the franchised private collectors results in a better position than expected, the collection rate can be increased gradually to match the improvement of finances without so much difficulty. The most important thing is to prove to the residents that the CCN/SWMPC can improve its performance in order to obtain confidence from them. Once the CCN/SWMPC obtains trust from the people, it is expected that it could initiate much more cooperation as well as higher charges from the people who will be benefited by its SWM services.

### **(3) Economic Aspect**

From the economic viewpoint, the following matters are expected with the implementation of the Master Plan:

- (a) Improvement of the urban environment which will contribute to the enhancement of public health, which in turn will increase human life expectation and reduce medical costs;
- (b) Improvement of the urban scenery, which in turn will increase income and foreign exchange from tourism, an important industry in the Kenyan economy, because Nairobi City is an important gateway to Kenya and East Africa and where every foreigner has to get through to visit places of Kenya and other East African countries;
- (c) Improvement of income level for informal settlements by the introduction of 3R and intermediate treatment, such as recycling and composting, will raise the residents' quality of life in all aspects;
- (d) Improvement of human resource quality through capacity development and public education, which in turn will strengthen the economic base and expand employment opportunities; and
- (e) Improvement of the reputation of Nairobi City as "*a world class city*", and Kenya, as a final result, which in turn will initiate people's confidence and promote national unification.

### **(4) Environmental Aspect**

The decommissioning of Dandora will bring better environmental conditions on the surrounding areas, and a post closure plan of utilisation of the reclaimed land will also result in a much comfortable scenery, landscape and recreational opportunities for the residents as well.

The new final disposal site at Ruai is expected to eliminate or decrease the factors influencing public health and the environment by utilising the method of sanitary landfill. In addition, the site is designed with technical considerations to minimise environmental impacts. With regard to the construction of the new final landfill site, Environmental Impact Assessment (EIA) would be required.

The container system would reduce negative impacts including dust, noise, traffic jam and odour in the waste collection.

## **(5) Organisational and Institutional Aspect**

With regard to the sustainability of SWM, the new Master Plan proposes the framework of a win-win-win relationship among these three parties: Public (Government or City Council of Nairobi), Private (private waste collectors), and People (Nairobi residents). This PPPP (Public–Private–People–Partnership Model) will function through establishment of effective and sustainable provision of SWM services incorporating community-based SWM activities, introduction of new zoning and franchised waste collection system, and establishment of the new SWM Public Cooperation (SWMPC) in early 2015 in order to secure efficiency, transparency and accountability.

One of the most important actions to implement the proper SWM through the PPPP scheme is to establish and operate the SWMPC. Most actions proposed in the Master Plan are formulated based on the establishment of SWMPC. Although many obstacles and constraints will be expected to create the new organisation, and it seems to be a big challenge for CCN, this sort of drastic change shall be required for achieving the goal in cooperation with other foreign technical assistance schemes.



## CHAPTER 5. CONCLUSION

The target collection rate of 100% in year 2030 is an ideal goal for all the residents of Nairobi, so that the plans for pursuing this goal should be carried out with dedication and dispatch. To realise the Vision of SWM for Nairobi City, the proposed projects in the Master Plan should be carried out since implementation of these projects will bring large benefits to the residents of Nairobi.

Almost half of the residents in Nairobi are living in low income areas and informal settlements at present. Waste collection in these areas is the bottom line to realise sustainability of the SWM proposed in the Master Plan. A community-based SWM especially in these areas is proposed with the cooperation of CBOs. The 3R activities will enhance the support of CBOs, and they are integral parts of the new Master Plan. Public awareness raising and the implementation of environmental education are indispensable for the promotion of 3R even if the visible effects on SWM will take quite a long time to appear.

With regard to the sustainability of SWM, the new Master Plan proposes the framework of a win-win-win relationship among the three parties, namely; the Public sector (Government or City Council of Nairobi); the Private sector (private waste collectors); and the People (Nairobi residents). This “PPPP (Public–Private–People–Partnership) Model” will function through the establishment of effective and sustainable provision of SWM services, incorporating community-based SWM activities, introduction of new zoning and franchised waste collection system, and establishment of the new SWM Public Cooperation (SWMPC) in early 2015, in order to secure efficiency, transparency and accountability.

One of the most important actions to implement a proper SWM through the PPPP scheme is to establish and operate the SWMPC, because most of the actions proposed in the new Master Plan are formulated based on the establishment of SWMPC. Although many obstacles and constraints are expected in the creation of this new organisation, and it seems to be a big challenge to CCN, this sort of drastic change is required for achieving the goal, in cooperation with the other foreign technical assistance programmes.

Simultaneously, the Government of the Republic of Kenya, including the City Council of Nairobi (CCN), should consider that some financial arrangements are indispensable for the implementation of the action plans. The financial resources should, therefore, come not only from foreign countries but also from their own funds. It should also be recognised that the implementation of a proper SWM requires to some extent a financial burden from the government, but the responsibility should be shared equally by the government or public sector, the private collectors or private sector, and the residents or people.



## CHAPTER 6. RECOMMENDATIONS

The JICA Survey Team recommends that the Government of the Republic of Kenya and the City Council of Nairobi (CCN) should carry out the action plans in the Master Plan from year 2011. The urgent projects, namely; the Dandora Dumpsite Urgent Improvement; the Cleanup of Illegal Dumpsites; and the Urgent Waste Collection, should be conducted firstly by using the Government and CCN's own budget while implementation of some of the other major components is expected to be arranged through foreign donors.

In addition, the Government of the Republic of Kenya including the City Council of Nairobi (CCN) should prepare for the establishment of the SWMPC in order to proceed to the next stage of project implementation at the earliest possible time.

With regard to project implementation, the following actions are recommended to be carried out with dedication and dispatch:

- Priority 1:** Setup of the Preparatory Unit (PU) in the Department of Environment (DoE) for the SWM Public Corporation (SWMPC);
- Priority 2:** Preparation for the Construction of New Sanitary Landfill Site and Closure of Dandora Dumpsite;
- Priority 3:** Preparation for the Creation of SWM Special Account;
- Priority 4:** Preparation for the Drafting of By-law for the Establishment of SWMPC; and
- Priority 5:** Preparation for the Introduction of Step-wise Franchise System.



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## *ANNEXES*

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**ANNEX-1**

Scope of Work

for

The Preparatory Survey for  
Integrated Solid Waste Management  
in Nairobi City in the Republic of Kenya

6 August 2009





SCOPE OF WORK  
FOR  
THE PREPARATORY SURVEY  
FOR  
INTEGRATED SOLID WASTE MANAGEMENT IN NAIROBI CITY  
IN  
THE REPUBLIC OF KENYA

AGREED UPON BETWEEN


OFFICE OF THE DEPUTY PRIME MINISTER AND MINISTRY OF LOCAL  
GOVERNMENT  
AND  
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NAIROBI, AUGUST 6th, 2009




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Mr. Yoshiyuki Takahashi  
Chief Representative  
Japan International Cooperation Agency  
JICA Kenya Office



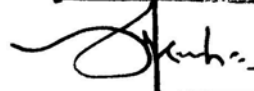
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Mr. Phillip Kisia  
Town Clerk  
City Council of Nairobi



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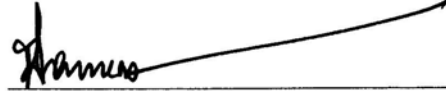
Mr. Sammy Kirui, CBS  
Permanent Secretary  
Office of the Deputy Prime Minister and  
Ministry of Local Government



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Mr. Joseph K. Kinyua, CBS  
Permanent Secretary  
Ministry of Finance

THE PERMANENT SECRETARY  
MINISTRY OF FINANCE,  
P. O. Box 30007,  
NAIROBI



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L. N. Lenayapa, CBS  
Permanent Secretary  
Ministry of Environment and Mineral Resources

## I. INTRODUCTION

In response to an official request of the Government of the Republic of Kenya, the Government of Japan has decided to conduct "the Preparatory Survey for Integrated Solid Waste Management in Nairobi City in the Republic of Kenya (hereinafter referred to as "the Survey.")"

The present document sets forth the Scope of Work with regard to the Survey.

## II. OBJECTIVE OF THE SURVEY

The objectives of the Survey are:

- (1) To review the current situation of waste management in Nairobi City and update the existing Master Plan.
- (2) To develop human resources for Solid Waste Management in the course of the Survey with the full commitment of the concerned authorities of the Government of Kenya.

## III. SURVEY AREA

The Survey will cover the whole area of Nairobi City as shown in the attached Annex I.

## IV. SCOPE OF THE SURVEY

In order to achieve the objectives mentioned above, the Scope of Work for the Survey shall cover the following items:

1. Collection, review and analysis of related data and information
  - a. Natural, economic, social and environmental conditions
  - b. Laws, regulations, policies, land use plans and development plans regarding the Survey
  - c. Conditions regarding Solid Waste Management in Nairobi City (Physical, operational, institutional, financial, and other aspects)
  - d. Related projects (on-going, planned), and
  - e. Other relevant data and information
2. Field Survey
  - a. Amount of solid waste and its composition
  - b. Current solid waste collection and transportation arrangements (time and motion study)
  - c. Existing dumping site and facilities including groundwater and leachate quality analysis
  - d. Recycling market, possibility of material recycle and thermal recycle
  - e. Present situation of waste pickers
  - f. Public awareness regarding solid waste management
  - g. Initial Environmental Examination (IEE)
  - h. Others
3. Evaluation of the present conditions, identification of the problems
  - a. Social and Economic/financial analysis
  - b. Legal system and organizational structure concerning solid waste management
  - c. Managerial conditions
4. Establishment of planning framework, forecasting through projection on:
  - a. Population growth, city planning, urban development plan and land use plan

- b. Economic growth and changes in living conditions
  - c. Trends in quality and quantity of solid waste, and
  - d. others
- 5. Establishment of basic strategies
  - a. Technical aspects
  - b. Financial aspects
  - c. Institutional and managerial aspects
  - d. Social aspects, and
  - e. Environmental and hygienic aspects
- 6. Update of the existing Master Plan including institutional and financial aspects
- 7. Preparation of the implementation plan of the priority program(s) and project(s).

## V. SURVEY SCHEDULE

The Survey will be carried out in accordance with the tentative schedule as attached in the Annex II. The schedule is tentative and subject to modification when agreed upon both parties and also as a result of any necessity that arises during the course of the Survey.

## VI. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Kenya.

1. Inception Report:  
Twenty (20) copies at the commencement of the Survey. This report will contain the schedule and methodology of the Survey as well as the outline of the field survey.
2. Interim Report:  
Twenty (20) copies about three (3) months after the commencement of the Survey. This report will summarize the findings of the first stage of the Survey and include the draft of the action plan.
3. Draft Final Report:  
Twenty (20) copies at the end of the last work period in Kenya. The Government of Kenya shall submit its comments within one (1) month after receipt of the Draft Final Report.
4. Final Report:  
Thirty (30) copies within one (1) month after the receipt of the comments on the Draft Final Report from the Government of Kenya.

## VII. UNDERTAKING OF THE GOVERNMENT OF THE REPUBLIC OF KENYA

1. To facilitate smooth implementation of the Survey, the Government of Kenya shall take the following necessary measures ;
  - (1) To secure the safety of the Japanese Survey team (hereinafter referred to as "the Team"),
  - (2) To permit the members of the Team to enter, leave and sojourn in the Republic of Kenya for the duration of their assignments therein and exempt them from foreign registration

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JICA

- requirements and consular fees,
- (3) To exempt the members of the Team from taxes, duties, fees and any other charges on equipment, vehicles, and other materials brought into Kenya for the implementation of the Survey,
  - (4) To exempt the members of the Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Team for their services in connection with the implementation of the Survey,
  - (5) To provide necessary facilities to the Team for remittance as well as utilization of the funds introduced into Kenya from Japan in connection with the implementation of the Survey,
  - (6) To secure permission for the Team to enter into private properties or restricted areas for the implementation of the Survey,
  - (7) To secure permission for the Team to take all data and documents including photographs and maps related to the Survey out of Kenya to Japan
  - (8) To provide medical services in case of necessity and whose expenses will be chargeable to the members of the Team, and
  - (9) To accept the information disclosure principle. All information, data and any results acquired from JICA projects shall be disclosed to the public.
2. The Government of Kenya shall bear claims, if any arises, against the members of the Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Survey, except when such claims arise from gross negligence or willful misconduct on the part of the member of the Team.
  3. City Council of Nairobi shall act as counterpart agency to the Team and also Office of the Deputy Prime Minister and Ministry of Local Governments shall act as a coordinating body in relation with other governmental and non-governmental organizations including Developing Partners concerned for the smooth implementation of the Survey.
  4. Office of the Deputy Prime Minister and Ministry of Local Government, and City Council of Nairobi shall, at its own expense, provide the Team with the followings, in cooperation with other organizations concerned:
    - (1) available data and information related to the Survey,
    - (2) additional survey related to the Survey, if necessary,
    - (3) counterpart personnel and supporting staff,
    - (4) suitable office space with necessary office equipment and vehicles with drivers,
    - (5) credentials or identification cards,
    - (6) security-related information on as well as measures to ensure the safety of the Team,
    - (7) information on as well as support in obtaining medical services.

## VIII. OTHERS

- (1) JICA, Office of the Deputy Prime Minister and Ministry of Local Government and City Council of Nairobi shall consult with each other in respect of any matter that may arise from or in connection with the Survey.
- (2) Although the name of the Survey is "the Preparatory Survey for Integrated Solid Waste Management in Nairobi City in the Republic of Kenya", it shall not be understood to mean that JICA has a commitment or responsibility to formulate and implement the any/all project(s) specified in the Survey. However, the results of the survey will be a good basis for the Government of Kenya to directly implement priority projects, request Development Partners for assistance, or to engage in Public Private Partnerships(PPP).
- (3) Environmental Impact Assessment (EIA) and Feasibility Studies (F/S) for any priority projects are not included in the Survey because such studies like EIA or F/S should be conducted in the implementation phase of the priority projects by implementing agency or

Developing Partners. Instead, IEE (Initial Environment Examination) would be carried out within the Survey with the initiative of the government of Kenya in order to clarify the necessary consideration for the future implementation of the priority projects.

- (4) City Council of Nairobi is planning to introduce Public Private Partnership (PPP) in Solid Waste Management of Nairobi City. JICA will consider incorporating PPP arrangements where such systems can be applicable and appropriate when updating the existing Master

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**ANNEX-2**

**Minutes of Meeting**

**on**

**The Preparatory Survey for  
Integrated Solid Waste Management  
in Nairobi City in the Republic of Kenya**

**6 August 2009**





MINUTES OF MEETING  
ON  
THE PREPARATORY SURVEY  
FOR  
INTEGRATED SOLID WASTE MANAGEMENT IN NAIROBI CITY  
IN  
THE REPUBLIC OF KENYA

AGREED UPON BETWEEN

OFFICE OF THE DEPUTY PRIME MINISTER AND MINISTRY OF LOCAL  
GOVERNMENT  
AND  
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)


NAIROBI, August 6th, 2009



Mr. Yoshiyuki Takahashi  
Chief Representative  
Japan International Cooperation Agency  
(JICA) Kenya Office



Mr. Sammy Kirui, CBS  
Permanent Secretary  
Office of the Deputy Prime Minister and  
Ministry of Local Government

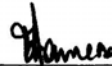


Mr. Phillip Kisia  
Town Clerk  
City Council of Nairobi



Mr. Joseph K. Kinyua, CBS  
Permanent Secretary  
Ministry of Finance

THE PERMANENT SECRETARY  
MINISTRY OF FINANCE  
P. O. Box 300  
NAIROBI



Mr. L.N. Lenayapa, CBS  
Permanent Secretary  
Ministry of Environment and Mineral Resources



The minutes of meeting have been prepared to confirm the points agreed upon between the authorities concerned of the Government of the Republic of Kenya and Japan International Cooperation Agency, concerning the implementation framework of the Preparatory Survey for Integrated Solid Waste Management in Nairobi City in the Republic of Kenya. Hence these Minutes of Meeting should be read in conjunction with the "Scope of Work" signed in Nairobi on 6th August 2009.

**1. TITLE OF THE SURVEY**

Both sides agreed that the title of the Survey will be "the Preparatory Survey for Integrated Solid Waste Management in Nairobi City in the Republic of Kenya".

**2. TARGET YEAR**

Both sides have reached an agreement that the target year would be 2030.

**3. SURVEY PERIOD**

The Survey period is approximately 10 months.

**4. THE SOLID WASTE TO BE COVERED UNDER THE SURVEY**

Solid waste covered under the Survey shall be domestic and commercial waste.

**5. INSTITUTIONAL SETUP**

Concerning the institutional setup for implementation of the Survey, both sides agreed on the following;

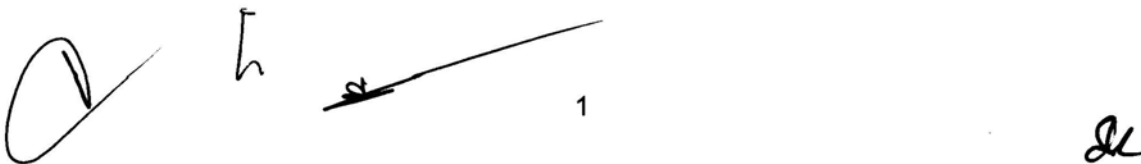
**(1) Formulation of the Steering Committee**

The Government of Kenya has assured that for the smooth implementation of the Survey and effective use of the Survey results, a steering committee will be organized at the commencement of the Survey.

The steering committee (hereinafter referred to as "the committee") will be chaired by the Director of Urban Development Department, Office of the Deputy Prime Minister and Ministry of Local Government, and will be composed of, but not limited to, representatives of the organizations concerned, as follows;

- Ministry of Environment and Mineral Resources
- Office of the Deputy Prime Minister and Ministry of Local Government (MOLG)
- Ministry of Nairobi Metropolitan Development
- Ministry of Public Health and Sanitation
- Ministry of Water and Irrigation
- City Council of Nairobi (CCN)
- National Environmental Management Authority (NEMA)
- Ministry of Finance
- JICA Kenya Office

The committee shall meet at the time of submission of reports as well as upon the request of the Survey Team.

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- a. MOLG and CCN as the leading counterpart will engage in overall coordination for the Survey.
- b. The Director of Urban Development Department, MOLG shall chair the steering committee.
- c. Other members, as collaborating counterparts, will provide necessary advice and support for the smooth and effective implementation of the Survey.

Further, to that, in view of the fact that assistance from Developing Partners such as AfDB, UNEP, UN Habitat, World Bank etc. is inevitable for future implementation of the priority projects and those assistances are currently under consideration with response to "Nairobi Rivers Restoration and Rehabilitation Programme", MOLG and CCN should take the coordination role between those agencies activities and the Survey in the field of Solid Waste Management.

Ministry of Environment and Mineral Resources shall take the entire coordination role of "Nairobi Rivers Restoration and Rehabilitation Programme" and MOLG shall act as lead Ministry of Integrated Solid Waste Management intervention.

## (2) Formulation of the Technical Working Group

The Government of Kenya has assured that for the smooth implementation of the Survey and effective use of the Survey results, a technical working group shall be organized at the commencement of the Survey. The Technical Working Group shall be chaired by the Director of Environment, CCN, and composed of, but not limited to, staffs who are in charge of Solid Waste Management in the organizations concerned as follows;

- Waste Management Division, Environment Department, CCN
- Environmental Management and Planning Division, Environment Department, CCN
- Park and Public Space Division, Environment Department etc. CCN
- Human Resources Department, CCN
- City Treasury's Department, CCN
- Public Health Department, CCN
- City Planning and Architecture Department, CCN
- Environment Directorate, Ministry of Environment and Mineral Resources
- Urban Development Department, Ministry of Local Government
- Metropolitan Planning & Environment Department, Ministry of Nairobi Metropolitan Development
- Compliance and Enforcement Department, NEMA

## **6. NECESSARY ARRANGEMENT BY THE KENYAN SIDE**

### (1) Coordination with the UNEP survey

The small-scale funding agreement with Kenya was concluded on 20<sup>th</sup> March, 2009 between CCN and UNEP. The main components of this survey are listed as follows;

- Data collection and analysis (waste inventory)

- Assessment of current waste management system
- Target setting and identification of concerns
- Development of ISWM (Integrated Solid Waste Management) Plan
- Development of detailed actions and specific schemes
- Dissemination at National Level

The government of Kenya and CCN consider that UNEP's survey and the Survey can be the complement for each survey, and both surveys cannot be omitted for the elaboration of Integrated Solid Waste Management Plan in Nairobi City. Therefore, the Government of Kenya will take the coordination role between UNEP's survey and the Survey for the smooth implementation of the Survey.

(2) Full commitment by the counterpart Agencies

JICA Survey's main characteristic is to conduct the survey in very close cooperation with the Counterpart Agencies. Therefore, full commitments by the MOLG and CCN are an indispensable condition for updating the Master Plan for Integrated Solid Waste Management in Nairobi City.

(3) Coordination with other Developing Partners for the execution of the priority projects

For the future execution of the priority projects, necessary budget must be secured by the Government of Kenya including some financial assistance from Developing Partners such as World Bank, African Development Bank, etc. In order to secure the financial assistance from other Developing Partners, mutual communication with Developing Partners is essential in order to clarify the conditions of their assistance and put those ideas into the Survey results.

MOLG and CCN will take the coordination role among Developing Partners and the Survey in the field of Solid Waste Management, and Ministry of Environment and Mineral Resources will entirely coordinate "Nairobi Rivers Rehabilitation and Restoration Programme".

The Survey will be conducted with related to "Nairobi Rivers Rehabilitation and Restoration Programme".

(4) Assignment of focal point of MOLG

MOLG shall assign one person to be a focal point in MOLG for smooth implementation of the Survey.

**7. EXPECTED BUDGET FOR THE SURVEY**

The tentative budget for the Survey would be 150 million JPY. However, this budget may be changed according to the actual budget allocated by JICA.

**8. REPORT**

Both sides agreed that all the reports would be disclosed to the public in order to achieve maximum use of the Survey results.

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