

5. CLOSURE PLAN OF DANDORA DUMPSITE

5.1 Introduction

The Dandora Dumpsite currently in operation for Nairobi City is an open dumping site lacking in management and thus causing bad odour, garbage scattering and production of landfill gases that ill-affect the surroundings. To reduce the further contamination of the area it is necessary to close this dumpsite applying technical burying procedures.

5.2 Implementation of Dandora Dumpsite Urgent Improvement Plan

It is preferable to close the Dandora dumpsite as much as possible at the earliest time. However, as described in **Subsection 4.4.3**, there is no choice but to continue using the Dandora Dumpsite for additional six years (2011~2016) until the new landfill site will be in service in 2017. However, since it will not be desirable in terms of social and environmental consideration to continue operation of a landfill under the current operation, it will be necessary to implement the following countermeasures aimed to improve the current conditions for the landfill.

5.2.1 Levelling of Incoming Waste

The waste operators that carry waste to the Dandora Dumpsite, dispose the waste wherever they like; however, because the waste is not levelled by heavy machinery, the waste becomes piled in some places and this leads to the scattering of waste and generation of landfill gas and odour. To counter this situation, it will be necessary to flatten the waste as much as possible using heavy machinery. Toward this end, rather than allowing operators to dump waste with no control, dumping areas will be designated to some extent. For scraping and compacting waste in the landfill site the heavy machinery managed by CCN (2 bulldozers, 1 excavator) should be available in 2011 for efficient operations. However, from 2012 onward, 1 additional bulldozer will be necessary at the site.

The operation ability of heavy machinery in 2011 and those in 2016, the year when waste amount will increase, are as compared below.

Amount of incoming waste in 2011: 690m³/day

Bulldozer work capacity: 350m³/day per bulldozer

∴ Waste quantity 690m³ < Machinery work capacity 350m³ x 2 bulldozers = 700m³

Amount of incoming waste in 2016: 979m³/day

Bulldozer work capacity: 350m³/day per bulldozer

∴ Waste quantity 979m³ < Machinery work capacity 350m³ x 3 bulldozers = 1,050m³

Furthermore, if there is enough time, in addition to levelling the waste that is newly carried in, it will be desirable to flatten the waste that was previously piled along Osogo Road.

5.2.2 Implementation of Soil Covering

Because no cover soil at all is placed over waste on the Dandora Dumpsite, the waste is scattered and odour and landfill gas are generated. To address these issues, it will be necessary to carry out earth covering primarily in areas where plastics and other easily scattered wastes are dumped, as well as the old quarry on the west side of the site and the site entrance where landfill gas is currently being generated. Moreover, the stable supply of dirt is necessary; hence some kind of monetary consideration has to be made to ensure the continuity of earth covering. Since the dirt quality for covering earth cannot be pure clay, it should be possible to use excess earth generated by construction works taking place

around Dandora Dumpsite. It is estimated that the necessary amount of covering earth will be around 10 percent of the volume of incoming waste (measured in cubic meters), and the covering thickness will be around 10~30 cm, although a thickness of around 50 cm will be desirable in areas where landfill gas generation is especially intense. See **Table E.4.19 of Subsection 4.3.4** for details concerning the amount of waste and amount of covering soil from 2011 onwards.

As for the levelling of waste, it will be necessary to efficiently operate the heavy machinery (two bulldozers, one excavator) that is currently used by the CNN for landfill management.

5.2.3 Onsite Road Construction

Currently on Dandora Dumpsite, the only “road” existing inside the dumpsite area does not provide enough mobilisation and is partially damaged; vehicles are unable to enter the site when it rains. To improve this situation, CCN has plans to invest a total of KSh 200 million (KSh 50 million per year) for road construction over four years from 2011 to 2014. Following the road construction, since it is anticipated that the new in-site roads will become major waste dumping points, the road plans should be implemented upon giving full consideration to the current site conditions.

5.3 Formulation of Dandora Dumpsite Closure Plan

Dandora Dumpsite should be immediately closed once the new landfill site goes into operation. The closure plan should be compiled with consideration given to minimising local environmental impacts and stabilising (rendering harmless) the land-filled waste as quickly as possible. A negative environmental impact of Dandora Dumpsite is thought to be pollution of Nairobi River caused by leachate running off from the site. To confirm the water quality of the river, this study conducted water quality inspection of the leachate and water samples from upstream and downstream of Nairobi River parting from Dandora Dumpsite, but since only one water quality analysis has been done, the results are not definitive. Also no groundwater analysis has been realised, thus it is impossible to say that there is no effect to underground water. In case of measures to secure groundwater, this would require extracting and treating all the leachate, but since the cost for this kind of measure is extremely high, it is not a realistic option to implement. For this reason, the most viable option is to reduce the effects to Nairobi River by reducing the filtration of rainwater and reducing the production of leachate. Through these measures it is expected to be able to reduce/eliminate any ill effect to the groundwater. The results for the water quality analysis are shown in the **Section G of Volume 3, Supporting Report**. The required actions for the closure plan are as indicated below.

5.3.1 Cover Soil

An adequate layer of cover soil should be placed over the entire area of waste landfill. The cover soil should have a minimum thickness of 50 cm. Furthermore, since rain percolates down to the waste layer and becomes leachate, in order to mitigate the amount of water percolating down to the waste layer, the cover soil should be placed with a gradient running down from Osogo Road to Nairobi River.

5.3.2 Brick Retaining Walls

To prevent waste from escaping the landfill area, a structure will be constructed around the landfill to confine the waste. Since waste will continue to be land-filled until 2016, assuming the height of Osogo Road to be standard, it is estimated that the waste will be buried to a height of approximately 8 m from there. Two types of structure can be considered to retain waste piled to such height, i.e., enclosure dike and retaining wall. Since the area around Dandora Dumpsite contains an elementary school, houses and Nairobi River, it is desirable to complete the closure work as far removed from those parts as possible. Whereas an enclosure dike would need to have a width of around 19 m and the retaining wall has a standard gradient of 1:0.5, the dike would only need to be around 5 m wide. Accordingly, the retaining wall structure shall be adopted and this shall be the common masonry wall structure.

5.3.3 Rainwater Drainage Works

To prevent rainwater from infiltrating the waste layer, cover soil shall be placed with a downward gradient running down to Nairobi River; moreover, rainwater drains shall be installed over the cover soil to reduce the amount of water percolation. In addition, rainwater drains shall be installed around the landfill perimeter with the goal of preventing rainwater from flowing in from outside and protecting the masonry retaining walls. The rainwater drains shall be designed to carry water into Nairobi River.

5.3.4 Gas Exhaust Equipment

Gas exhaust equipment shall be installed to feed air into parts that are prone to generation of landfill gas, thereby creating an aerobic environment, limiting the generation of harmful gases (methane gas) and accelerating the stabilisation of waste. This equipment shall be installed in positions where there are high levels of landfill gas generation.

Moreover, when conducting the detailed design, it will be necessary to accurately gauge current conditions on Dandora Dumpsite through implementing surveying to confirm the landfill terrain and simple boring survey to confirm the distribution of waste depth.

Figure E.5.1 shows the Layout Closure Plan of Dandora Dumpsite.

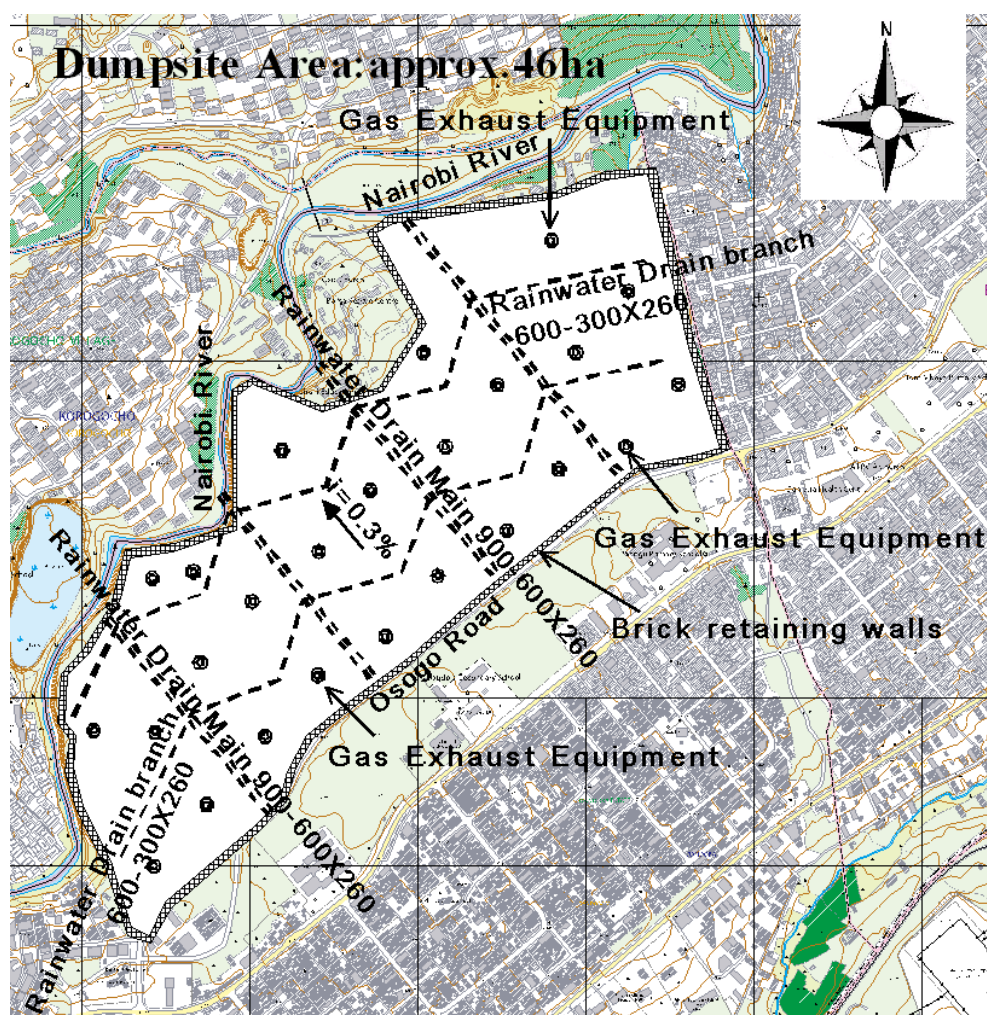


Figure E.5.1 Layout Closure Plan of Dandora Dumpsite

5.4 Cost Estimate

The results of calculating the necessary costs for implementing the policy described so far are described below.

5.4.1 Implementation of Dandora Dumpsite Urgent Improvement Plan

The necessary costs for improving Dandora Dumpsite are divided into the following two types, and both should be executed under the CCN budget:

- Cost for the urgent improvement work of Dandora Dumpsite
- Cost for the operation and maintenance of Dandora Dumpsite

(1) Urgent Improvement Work of Dandora Dumpsite

Emergency countermeasures will include the purchase of covering soil and construction of onsite roads. The cost of road construction has already been accounted for in the CCN budget, specifically KSh 200 million over four years (KSh 50 million per year) between 2011 and 2014.

The total cost for civil work of the urgent improvement work will entail approximately KSh 431 million as shown in **Table E.5.2** and the detailed cost estimate is shown in **Section E of Volume 4, Date Book**.

(2) Operation and Maintenance of Dandora Dumpsite

CCN is preparing a budget of approximately KSh 33 to 43 million per year to cover the operation and maintenance costs for Dandora Dumpsite. The necessary budget for levelling waste and covering earth on the site is thus thought to be secured. The detailed information of cost estimate is shown in **Section E of Volume 4, Date Book**.

- Total salary
- Heavy machinery and weighing bridge maintenance fee; heavy machinery fuel
- Heavy machinery hiring fee

5.4.2 Formulation of Dandora Dumpsite Closure Plan

The total cost of closing Dandora Dumpsite is KSh 1,539 million, as shown in **Table E.5.1**. A majority of the cost is accounted for by the outlay on covering earth.

The cost of survey and design work is 3 percent of the construction cost, i.e. KSh 46 million, and of this the survey costs are KSh 2.6 million comprising KSh 2.1 million for the topographical surveying and KSh 500,000 for the boring survey.

Accordingly, the total cost of surveying, design and the works will be approximately KSh 1,585 million.

Table E.5.1 Cost Estimate for Closure Works of Dandora Dumpsite

Works	Unit	Unit Quantity	Unit Price (KSh)	Cost (10 ³ KSh)
1. Cover Soil	m ³	460,000	1,630	749,800
2. Brick Retaining Walls	m ²	33,000	11,480	378,840
3. Rainwater Drainage	Main	1,800	4,000	7,200
	Branch	2,000	1,790	3,580
4. Gas Exhaust Pipe	unit	25	284,800	7,120
Sub Total				1,146,540
Overhead	Sub-Total × 25% (1/2 product expense removes)			252,460
Physical Contingency	Sub-Total + Overhead × 10%			139,900
Total				1,538,900

Table E.5.2 shows the annual Dandora Dumpsite expenditure in 2011-2017.

Table E.5.2 Annual Dandora Dumpsite Expenditure (2011-2017; in 1000KSh)

	Urgent Improvement Plan		Closure Plan		Total
	Urgent Improvement Works	O&M	Survey & Design	Closure Works	
2011	76,712	33,100	-	-	109,812
2012	78,726	43,100	-	-	121,826
2013	80,846	43,100	41,970	-	165,916
2014	82,966	43,100	-	-	126,066
2015	35,298	43,100	-	-	78,398
2016	37,842	43,100	-	-	80,942
2017	-	-	-	1,399,000	1,399,000
Sub-Total	392,390	248,600	41,970	1,399,000	2,081,960
P/C	39,239	0	4,197	139,900	183,336
Total	431,629	248,600	46,167	1,538,900	2,255,296

Note: P/C stands for "Physical Contingency" which is calculated as 10% of construction cost and engineering services cost.

5.5 Post-Closure Land Use Plan

Once Dandora Dumpsite has been closed, a vast flat area of 46 ha will remain, and it will be desirable to make effective use of this area as quickly as possible. However, it will be necessary to give consideration to the following points when utilising this site after landfill has finished. These factors are likely to continue for some time until the land-filled waste becomes stabilised, and it generally takes around 10 years or more for this to occur.

- Ground subsidence
- Landfill gas generation

The Dandora Dumpsite is an open landfill mainly for dumping organic garbage such as non-incinerated food waste. Much amount of landfill gas is generated at the Dandora Dumpsite and fires occur. Landfill gas, mainly methane, would be also generated at the final landfill site due to organic waste.

Recently, power generation projects using landfill gas generated from landfill are being implemented in many countries. Therefore, as one of the land uses for the period from the closure of Dandora Dumpsite

up to waste stabilisation, the implementation of landfill gas power generation is to be considered as well. At present, there is no information on the implementation of landfill gas power generation; therefore, it is necessary to do enough preliminary study such as test-well drilling, gas collection test, etc., in order to evaluate the gas amount before implementing the project.

6. CLEAN-UP AND CLOSURE OF ILLEGAL DUMPSITE

6.1 Introduction

Within Nairobi City there are several illegal dumping sites of various sizes. The effects of these illegal dumpsites to the surrounding areas depend on their scales, but all of them produce bad odour and scattering of garbage. For this reason it is necessary to elaborate a plan to eliminate the illegal dumpsites in Nairobi City.

6.2 Current Condition of Illegal Dumpsites in Nairobi City

Dandora Dumpsite is the only official dumpsite operating in Nairobi at present. However, due to the inadequate waste collection setup in Nairobi and other reasons that are given in **Table E.6.1**, numerous illegal dumpsites have arisen within the city.

Table E.6.1 Summary of Causes of Illegal Dumping

No.	Estimated Causes
1	Lack of waste generator's awareness toward appropriate waste segregation and discharge
2	Low affordability of waste generators to pay garbage fee
3	Very low frequency of waste collection and transportation
4	Lack of capability of waste collectors (Lack of collection staffs and collection vehicles)
5	Weak legal enforcement in terms of weak penalty clauses
6	Lack of administrator's enforcement capability on inspection and monitoring
7	Lack of containers to accept discharged waste

The DoE has confirmed the existence of 74 dumpsites distributed all over the city area apart from the eastern side. They are especially common in areas around markets, Kasarani Division and Kamukunji Division.

The amount of waste disposed in illegal dumpsites ranges from 20~50 tons in smaller sites to more than 1000 tons in the bigger ones.

6.3 Clean-Up and Closure of Illegal Dumpsites

Since illegal dumpsites impart negative impacts such as littering, odour, landfill gas, leachate, etc. throughout the local areas, there is urgent need to take countermeasures.

Illegal dumpsite countermeasures can be divided into the following two types depending on the amount of waste and area of disposal, etc.:

- Option 1: Total Removal
- Option 2: Closure (Cover Soil, etc)

Since the first option (total removal) is desirable to totally eliminate the negative local environmental impacts of illegally disposed waste, total removal shall be adopted as the basic policy.

According to the field surveys, there are thought to be large quantities of waste disposed over a wide area and to a considerable depth at three sites, i.e., No. 14 Mathare North, No. 73 Zimerman, and No. 74 Gathundeki. Accordingly, the total removal option is not feasible from the viewpoint of cost, etc. Therefore, Pption 2 (Closure) shall be adopted at these three sites to minimise impacts on the local environment.

Tables E.6.2, E.6. 3 and E.6.4 give a list of illegal dumpsites; **Figure E.6.1** shows the location map of illegal dumpsites; and **Photo E.6.1** shows photographs of current conditions of No. 14 Mathare North, No. 73 Zimerman and No. 74 Gathundeki, where closure is planned.

Table E.6.2 List of Illegal Dumpsites (1/3)

DIVISION		SITE	Waste Amount (tons)	Location No.
1	Makadare	Kapiti Road	30	1
		Rurwa road (Maringo No. 10)	60	2
		Nyasa Road	30	3
		Hamza Road	40	4
		Enterprise Road	30	5
		Mutindwa Lane	150	6
		Makongeni Estate	80	7
TOTAL			420	
2	Kasarani	Lighthouse Industries	60	8
		Kamunde Road	200	9
		Mahtare 4A (Area 1 Primary Sch.)	200	10
		Kasabuni Playground	50	11
		Babadogo Playground	60	12
		Githurai Railway Line	100	13
		Mathare North Primary	1800	14
		Kamiti Road	40	15
		Mwiki - red soil	200	16
		Roysambu-Marurui Estate	40	17
		Gitathuru-Kariobangi North	50	18
		Zimerman	4600	73
TOTAL			7,400	
3	Westlands	Kangemi Cementery	100	19
		Kangemi-Marenga Road	20	20
		Deepsea Resort	30	21
		Limuru Road	70	22
		Githogoro	40	23
TOTAL			260	

Source: Department of Environment and City Council of Nairobi

Table E.6.3 List of Illegal Dumpsites (2/3)

Table 2.3.5 – List of Illegal Dumpsites (2/3)				
DIVISION		SITE	Waste Amount (tons)	Location No.
4	Dagoretti	Kawagware - Gitanga Rd	60	24
		Karandini Shopping Centre	80	25
		Kawagware Dada Mary	60	26
		Riruta Shopping Centre	40	27
		City Askaris Dagorretti Camp	40	28
		Gathundeki	6000	74
TOTAL			6,280	
5	Embakasi	John Osogo Road	40	29
		Kayole spine Road	70	30
		Kayole Saba Saba Road	40	31
		Nyando Road	30	32
		Mukuro Kwa Njenga	80	33
		Emakasi Village	30	34
TOTAL			290	
6	Langata	Kibera Drive	80	35
		Southlands Kijiji	70	36
		Kwindwa Slums	40	37
		Katwekera	50	38
TOTAL			240	
7	Starehe	Ngara Lane	30	39
		Milango Kubwa	60	40
		Juja Road	150	41
		Huruma Road	150	42
		Ziwani Cementery	80	43
		Huruma Jah Post	30	44
TOTAL			500	

Source: Department of Environment and City Council of Nairobi

Table E.6.4 List of Illegal Dumpsites (3/3)

DIVISION		SITE	Waste Amount (tons)	Location No.
8	Kamukunji	Eastleigh Airforce Fence	200	45
		1st Avenue Eastleigh	40	46
		Bahati Social Hall	10	47
		Mfududu Street	100	48
		3rd Avenue Eastleigh	30	49
		Eastleigh North Deliverance	40	50
		Zawadi Primary	30	51
		Eastleigh South Water and Sewage	100	52
		Chiriku Road	50	53
		California	20	54
TOTAL			620	
9	Markets	Uhuru Market	80	55
		Kahawa West Market	100	56
		Kariobangi-Gitathuru Market	40	57
		Limuru Road Hawkers Market	70	58
		Kenyatta Market	50	59
		Othaya Market	45	60
		Makina Market	30	61
		Toi Market	100	62
		Karen Market	30	63
		Nyayo Market	60	64
		Ngara Hawkers Market	40	65
		Burma Market	20	66
		Dandora Market A	10	67
		Phase I Market B	15	68
		Phase II Market C	30	69
		Phase III Market D	21	70
		Phase IV Market G	21	71
		Phase V Market H	15	72
		TOTAL		
GRAND TOTAL			16,787	

Source: Department of Environment and City Council of Nairobi

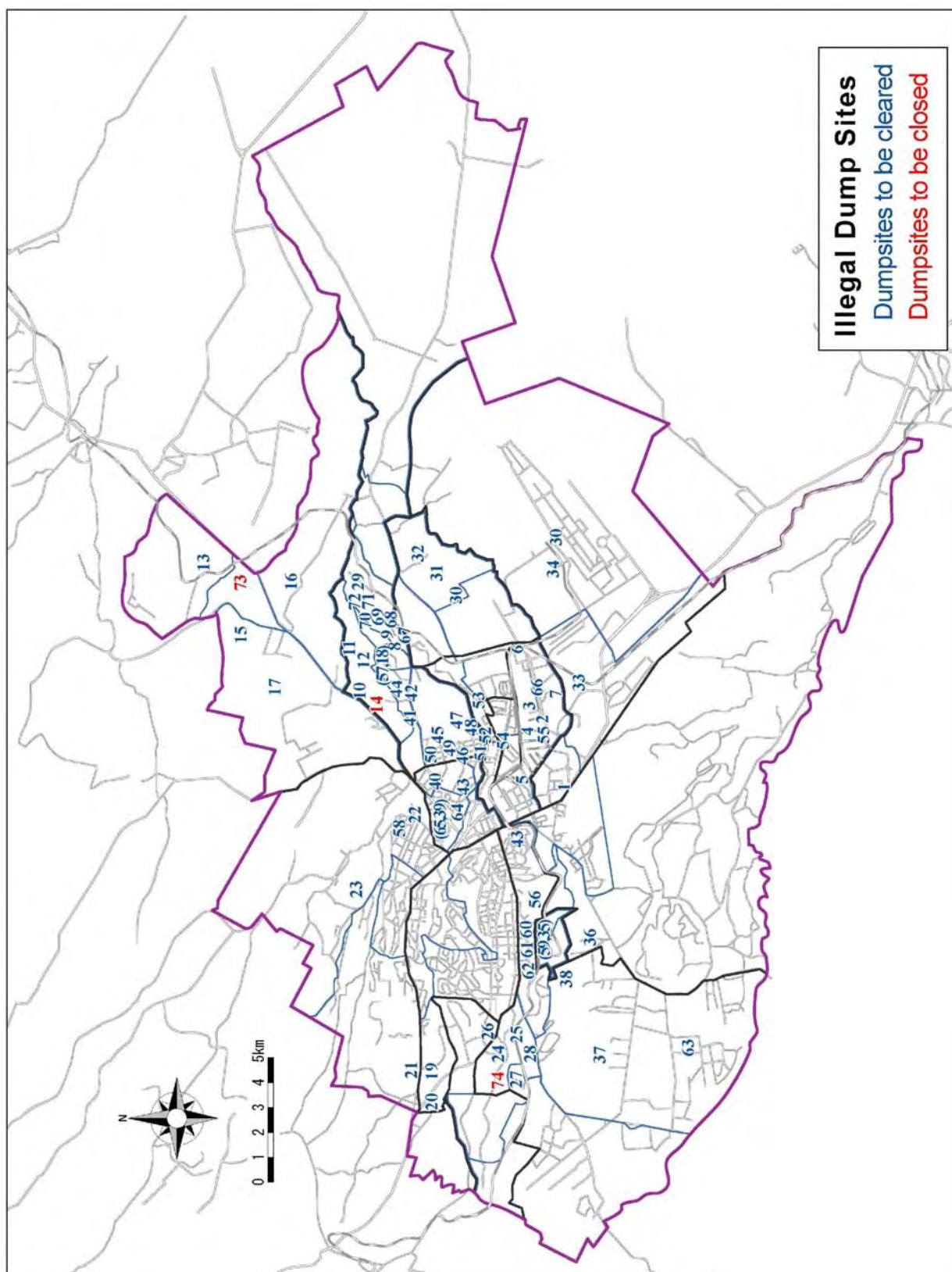


Figure E.6.1 Location Map of Illegal Dumpsites



No. 14 Mathare North



No. 73 Zimmerman



No. 74 Gathundeki

Photo E.6.1 Large-Sized Illegal Dumpsite

6.3.1 Clean-up of Illegal Dumpsite

The DoE is already removing waste from some of the illegal dumpsites indicated in **Tables E.6.2, E.6.3 and E.6.4**. 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 clean up 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 impacts on the local environment.

In the cleanup, it shall be planned to remove waste with wheel loaders and to transport it to Dandora Dumpsite in trucks. Since the waste is currently scattered without being compacted, the targeted quantity (m³) of waste shall be set as two times the weight (tons).

The plan shall target the 71 illegal dumpsites other than No. 14 Mathare North, No. 73 Zimmerman and No. 74 Gathundeki.

Table E.6.5 shows the costs of conducting cleanup on each illegal dumpsite. The total cost will be approximately KSh 21 million.

Table E.6.5 Cost Estimate of Cleanup of Illegal Dumpsite

Works	Unit Quantity (m ³) (Division Total Waste Amount)			Unit Price (KSh)	Cost (KSh)		
	Makadare	Kasarani	Westlands		Makadare	Kasarani	Westlands
Wheel loader	840	2,000	520	350	294,000	700,000	182,000
Truck	840	2,000	520	1,570	1,318,800	3,140,000	816,400
Sub-Total					1,612,800	3,840,000	998,400
Overhead				25%	403,200	960,000	249,600
Total					2,016,000	4,800,000	1,248,000

Works	Unit Quantity (m ³) (Division Total Waste Amount)			Unit Price (KSh)	Cost (KSh)		
	Dagoretti	Embakasi	Langata		Dagoretti	Embakasi	Langata
Wheel loader	560	580	480	350	196,000	203,000	168,000
Truck	560	580	480	1,570	879,200	910,600	753,600
Sub Total					1,075,200	1,113,600	921,600
Overhead				25%	268,800	278,400	230,400
Total					1,344,000	1,392,000	1,152,000

Works	Unit Quantity (m ³) (Division Total Waste Amount)			Unit Price (KSh)	Cost (KSh)		
	Starehe	Kamukunji	Markets		Starehe	Kamukunji	Markets
Wheel loader	1,000	1,240	1,554	350	350,000	434,000	543,900
Truck	1,000	1,240	1,554	1,570	1,570,000	1,946,800	2,439,780
Sub Total					1,920,000	2,380,800	2,983,680
Overhead				25%	480,000	5,95,200	745,920
Total					2,400,000	2,976,000	3,729,600

Grand Total: KSh 21,057,600

In case of consideration of physical contingency (10%): KSh 23,163,360

6.3.2 Closure of Illegal Dumpsite

On the larger illegal dumpsites, waste lies exposed and landfill gas emission has been confirmed. Accordingly, closure will be implemented through conducting the following works to mitigate the impacts on the local environment:

- Cover soil (t = 0.5 m):

In addition to preventing waste scattering and odour generation, the cover soil will prevent filtration of rainwater and reduce the generated amount of leachate.

- Gas exhaust pipes:

Gas exhaust pipes as indicated below will be installed in areas of landfill gas occurrence to promote aeration and mitigate landfill gas generation.

- Net fence (H = 2.5 m):

Following closure, fences will be built to prevent trespassing and re-dumping of wastes at the sites.

The closure work shall be implemented in 2017, by the time the collection setup has been established and the new landfill commissioned, and helping to prevent the illegal dumpsites from reappearing. Moreover, in the case where illegal dumpsites are privately-owned land, it will be necessary to obtain consent from the landowners before carrying out the works.

Table E.6.6 shows the closure costs for No. 14 Mathare North, No. 73 Zimerman and No. 74 Gathundeki, where closure will be implemented. The total cost will be approximately KSh 41 million.

Table E.6.6 Cost Estimate of Closure of Illegal Dumpsites

Works	Unit	Unit Quantity			Unit Price (KSh)	Cost(10 ³ KSh)		
		No.14	No.73	No.74		No.14	No.73	No.74
1.Cover soil	m ³	900	2,300	3,000	3,410	3,069	7,843	10,230
2.Gas exhaust pipe	Unit	1	3	3	286,100	286.1	858.3	858.3
3.Net fence	m	170	270	310	12,000	2,040	3,240	3,720
4.Gate	Unit	1	1	1	450,000	450	450	450
Sub Total						5,845.1	12,391.3	15,258.3
Overhead	Sub Total×25% (1/2product expense removes)					1,154.9	2,658.7	3,331.7
Total						7,000	15,050	18,590

Note: No. 14-Mathare North No. 73-Zimerman No. 74-Gathundeki

Grand Total: KSh 40,640,000

In case of consideration of physical contingency (10%): KSh 44,704,000

7. ACTION PLAN OF FINAL DISPOSAL

7.1 Planning Direction and Goals of the Final Disposal Plan

The action plan concerning final disposal is divided into three stages, i.e., short-term (2011~2015), mid-term (2016~2020) and long-term (2021~2030). The objective, planning policy, strategy and goal of the final disposal component of the Master Plan are elaborated, as follows:

7.1.1 Objective

In the concept of final process of solid waste management (SWM) system, the objective of the Final Disposal Plan is to have the solid waste stabilised and be hygienic to prevent secondary pollution.

7.1.2 Planning Policy

The sanitary landfill is evaluated to be the most appropriate landfill method from both economic and environmental viewpoints. Therefore, the final landfill plan shall be formulated for the construction and operation of a sanitary landfill. Altogether, a plan of urgent improvement and closure of Dandora and the existing illegal dump sites is considered sanitarily as possible where the present reclamation is performed.

7.1.3 Strategy

The scale of sanitary landfill facilities and their operation shall take financial availability into consideration. Due to financial constraints concerning SWM financing, a phased construction of the landfill site shall also be considered.

Urgent improvement plan and closure plan of the Dandora and existing illegal dumpsites shall take economical efficiency into consideration to reduce the negative impacts on the surrounding environment.

7.1.4 Goal

(1) Short-Term Plan

- Reduction of secondary pollution from Dandora Dumpsite by urgent improvement works at the site
- Preparation and commencement of construction of new sanitary landfill site at Ruai
- Reduction of number of illegal dumpsites in the city

(2) Mid-Term Plan

- Minimisation of secondary pollution from Dandora Dumpsite by closure works of the site
- Preparation of a post closure land use plan at Dandora
- Operation of an effective sanitary landfill at Ruai
- Elimination of major illegal dumpsites in the city

(3) Long-Term Plan

- Minimisation of adverse effects from the new landfill site by proper operation and management

It is necessary to accomplish all action plans of Final Disposal under the responsibility of DoE or SMWPC.

7.2 Action Plans for Each Term

7.2.1 Short-Term Plan (2011-2015)

The short-term plan contains the action plan for urgent countermeasures. Between 2011~2015, urgent measures on Dandora Dumpsite will comprise 1) survey and design for closure, 2) survey, design and execution of the new landfill site, and 3) cleanup of illegal dumpsites. The action plan and its outline are described below.

(1) Formulation of Dandora Dumpsite Closure Plan

EIA and surveys / design geared to closing Dandora Dumpsite will be carried out by 2011 and 2013. The surveys will entail surveying to confirm the landfill terrain and simple boring survey to confirm the distribution of waste depth. Based on the survey findings, detailed design on the amount of covering soil and height of retaining walls needed for closure will be conducted, and the cost of ordering works will be estimated.

(2) Implementation of Dandora Dumpsite Urgent Improvement Plan (Phase I)

As urgent measures on Dandora Dumpsite, covering soil will be purchased and onsite road construction will be carried out. The onsite road construction will be carried out over four years between 2011~2014. Covering soil will be purchased every year until 2016 when landfill works will be completed on the dumpsite.

As for Dandora Dumpsite itself, regular operation and maintenance will need to be carried out separately in addition to the urgent countermeasures. In conducting the operation and maintenance, it will be particularly important to efficiently use the three existing heavy machines for levelling the waste and applying the covering soil.

(3) Formulation of New Landfill Site Construction Plan at Ruai (First Portion covered by 2025)

EIA and surveys / design aimed to establish the new landfill site will be implemented by 2011 and 2013. The surveys will entail topographical surveying over the entire area and geological surveys for confirming the geological conditions and groundwater level existing in the site.

In the design, based on the survey findings, the facilities required for the first phase will be designed and the necessary costs for ordering the works will be estimated.

(4) Construction of New Landfill Site at Ruai (First Portion covered by 2025) (Phase I)

Construction works in the new landfill site first phase will be commenced in 2015 and will last for two (2) years.

During the works, construction supervision will be carried out to confirm the progress of the works and check on the building of important structures.

(5) Cleanup of Illegal Dumpsites

The cleanup of 71 small illegal dumpsites will be carried out in 2014. Cleanup should be carried out in tandem with the installation of containers.

7.2.2 Mid-Term Plan (2016-2020)

Between 2016 and 2020, the Dandora Dumpsite closure works and the new landfill site works will be implemented and operations will be commenced on the new site. Also, closure works will be carried out

on larger scale illegal dumpsites to coincide with the start of operation on the new landfill site. The action plan and its outline are described below.

(1) Implementation of Dandora Dumpsite Urgent Improvement Plan (Phase II)

Operation and maintenance will be carried out on Dandora Dumpsite. The closure works of Dandora Dumpsite will begin from the year of its planned closure, and it will be desirable to conduct maintenance with a view to these works.

(2) Implementation of Closure Works of Dandora Dumpsite

Closure works on Dandora Dumpsite will be implemented in 2017 following the start of operations on the new landfill site.

(3) Construction of New Landfill Site at Ruai (First Portion covered by 2025) (Phase II)

The second year of construction works on the new landfill site first phase, which starts in 2015, will be conducted. The new landfill site will be completed within that year.

(4) Operation and Maintenance of New Landfill Site at Ruai (Phase I)

Operation and maintenance on the new landfill site will begin in 2017. Routine operation and maintenance will entail weighing of waste, soil covering works and control of treated leachate quality.

Prior to the start of operation, the heavy machinery needed to conduct landfill works will have to be purchased in 2016.

According to the progress of the landfill, construction of the enclosure dike will be executed in 2019. Incidentally, the timing of enclosure dike construction may be changed according to the level of progress of the landfill works.

(5) Closure of Illegal Dumpsites

Closure works of the three large illegal dumpsites will be carried out in 2017, when the new landfill site operations begin.

7.2.3 Long-Term Plan (2021-2030)

In the long-term plan, operation and maintenance on the new landfill site and the second phase design and execution will be carried out. The action plan and its outline are described below.

(1) Formulation of New Landfill Site Construction Plan at Ruai (Second Portion for utilisation after 2026)

Design for the second phase of the new landfill site will be carried out in 2022. It is desirable that the design is based from considerations given to problems that may have occurred during the construction and landfill works in the first phase.

(2) Construction of New Landfill Site at Ruai (Second Portion for utilisation after 2026)

The second phase for the construction works of the new landfill will be carried out during 2024 and 2025.

At this time, construction supervision will be carried out to confirm the needs and work progress, and also check the state of buildings and any other structure of importance. It is necessary to keep in mind that these works will be conducted parallel to the landfill operations.

(3) Operation and Maintenance of New Landfill Site at Ruai (Phase II)

Operation and maintenance of the new landfill site will be conducted after the conclusion of construction works. Additional heavy machinery required for landfill will be purchased in 2021 and 2026. Also 2027 onwards, it will be necessary to construct enclosure dikes every year.

Figures E.7.1 and E.7.2 show the action plans from 2011 to 2030, and Figure E.7.3 gives cost and responsibility of each action plan.

Time Framework of the Master Plan					Short-Term Plan Period																			
Year					2011				2012				2013				2014				2015			
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																							
S-3-1-1	Implementation of Environmental Impact Assessment																							
S-3-1-2	Survey for Closure Work of Dandora Dumpsite																							
S-3-1-3	Desgin of Closure Work of Dandora Dumpsite																							
S-3-2	Implementation of Dandora Dumpsite Urgent Improvement Plan (I)																							
S-3-2-1	Urgent Improvement Work of Dandora Dumpsite																							
S-3-2-2	Operation & Maintenance of Dandora Dumpsite																							
S-3-3	Formulation of New Landfill Site Construction Plan (First Portion)																							
S-3-3-1	Implementation of Environmental Impact Assessment																							
S-3-3-2	Survey for Construction of New Landfill Site (First Portion)																							
S-3-3-3	Desgin of New Landfill Site (First Portion)																							
S-3-4	Construction of New Landfill Site at Rual (First Portion) (I)																							
S-3-4-1	Construction of New Landfill Site at Rual (First Portion)																							
S-3-4-2	Construction Supervision (First Portion)																							
S-3-5	Cleanup of Illegal Dumpsites																							
PPPP Option					Improvement of Current Contracting Out/Licensing								Improvement of Current Contracting Out/Licensing and Preparation of New Franchising Contract											
SWM Organisation Type					CCN/DoE, Separate Account								CCN/DoE, Special Account								SWM Public Corporation			
Zoning System					Current Zone																			

Figure E.7.1 Plan of Operation of Final Disposal Plan (Short-Term Plan)

Time Framework of the Master Plan						Mid-Term Plan Period					Long-Term Plan Period									
Year						2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
WBS for Mid-Term Plan																				
M-3-1	Implementation of Dandora Dump Site Urgent Improvement Plan (II)																			
M-3-2	Implemation of Closure Work of Dandora Dumpsite																			
M-3-3	Construction of New Landfill Site at Rual (First Portion) (II)																			
M-3-3-1	Construction of New Landfill Site at Rual (First Portion)																			
M-3-3-2	Construction Supervision (First Portion)																			
M-3-4	Operation & Maintenance of New Landfill Site at Rual (I)																			
M-3-4-1	Procurement of Heavy Machine for New Landfill Site																			
M-3-4-2	Daily O&M of New Landfill Site																			
M-3-4-3	Construction of Enclosure Diike																			
M-3-5	Closure of Illegal Dumpsites																			
WBS for Long-Term Plan																				
L-3-1	Formulation of New Landfill Site Construction Plan at Rual (Second Portion)																			
L-3-2	Construction of New Landfill Site at Rual (Second Portion)																			
L-3-2-1	Construction of New Landfill Site (Second Portion)																			
L-3-2-2	Construction Supervision (Second Portion)																			
L-3-3	Operation & Maintenance of New Landfill Site at Rual (II)																			
L-3-3-1	Procurement of Heavy Machine for New Landfill Site																			
L-3-3-2	Daily O&M of New Landfill Site																			
L-3-3-3	Construction of Enclosure Diike																			
PPPP Option						Zone-wise Franchising Contract (Phase 1)					Zone-wise Franchising Contract (Phase 2)					Zone-wise Franchising Contract (Phase 3)				
SWM Organisation Type						SWM Public Corporation														
Zoning System						New Zone (3 Zones)					New Zone (6 Zones)					New Zone (9 Zones)				

Figure E.7.2 Plan of Operation of Final Disposal Plan (Mid- and Long-Term Plans)

Programme No.	WBS No.	WBS	Legal Action (Required=●)	Name of Act/Regulation/By-law	Budgetary Arrangement (Required=●)	Total Budget (Thousand Ksh)	Responsibility Assignment Matrix: M=Main Responsibility, S=Sub Responsibilities, B=Budgetary Arrangement, L=Legal Action, P=Participation In Discussions																			
							CCN/Dept. of Environment	CCN/Dept. of Treasury	CCN/Dept. of Procurement	CCN/Dept. of Human Resources	SWM Preparatory Committee	SWM Corporation	MoLG	MoNMD	NEMA	Office of Deputy Prime Minister and MoF	KRA	Donor Organisations	Private Contractors	Private Licensed Collectors	Recyclers	CBOs	Waste Pickers	PAPs around Dandora Dumping Site	PAPs around New Dumping Site	Nairobi Citizens
Programme 3: Final Disposal Plan																										
Short-Term Plan																										
S-3-1	Formulation of Dandora Dumpsite Closure Plan				●	46,167	M									B			B							
S-3-2	Implementation of Dandora Dumpsite Urgent Improvement Plan (I)				●	595,503	M	B																		
S-3-3	Formulation of New Landfill Site Construction Plan at Rual (First Portion)				●	198,880	M									B			B							
S-3-4	Construction of New Landfill Site at Rual (First Portion) (I)				●	1,461,768	M												B							
S-3-5	Cleanup of Illegal Dumpsites				●	23,164	M	B																		
	Sub-Total					2,325,482																				
Mid-Term Plan																										
M-3-1	Implementation of Dandorasump Site Urgent Improvement Plan (II)				●	84,726	M	B																		
M-3-2	Implementation of Closure Work of Dandora Dumpsite				●	1,538,900	M												B							
M-3-3	Construction of New Landfill Site at Rual (First Portion) (II)				●	2,714,712	M						S						B							
M-3-4	Operation & Maintenance of New Landfill Site at Rual (I)				●	953,279	S	B				M							B							
M-3-5	Closure of Illegal Dumpsites				●	44,704	M	B																		
	Sub-Total					5,336,321																				
Long-Term Plan																										
L-3-1	Formulation of New Landfill Site Construction Plan (Second Portion)				●	73,975	S	B					M													
L-3-2	Construction of New Landfill Site (Second Portion)				●	1,553,475	S	B					M													
L-3-3	Operation & Maintenance of New Landfill Site (II)				●	5,197,427	S	B					M													
	Sub-Total					6,824,877																				
	Grand Total					14,486,680																				

Figure E.7.3 Costs and Responsibilities of Final Disposal Plan

REFERENCES

1. International Civil Aviation Organisation: "Convention on International Civil Aviation", July 2004, Annex 14 Aerodromes Volume 1, Aerodrome Design and Operation, Chapter 9, pages 9-7.
2. Bird Strike Committee USA: Best Management Practices for Airport Wildlife Control, 15 June 2007, page 4.
3. Nobutoshi Tanaka, Gihoudou Publishing Corp.: Construction, Operation and Maintenance of Environmentally Conscious MSW Solid Waste Disposal Sites, 2001.2.1.
4. George Tschobanoglous, Hilart Theisen, Samuel Vigil, McGrawiHill, Inc.: Integrated Solid Waste Management: Engineering Principles and Management Issues, 1993.
5. Nobutoshi Tanaka, Gihoudou Publishing Corp.: Construction, Operation and Maintenance of Environmentally Conscious MSW Solid Waste Disposal Sites, 2001.2.1.
6. George Tschobanoglous, Hilart Theisen, Samuel Vigil, McGrawiHill, Inc.: Integrated Solid Waste Management: Engineering Principles and Management Issues, 1993, pages 474 to 475.
7. WHO textbook, written originally by Frank Flintoff and translated by the Tokyo Metropolitan Government: "Management of Solid Waste in Developing Countries"
8. JICA, CTI Engineering Co., Ltd. and Environmental Technology Consultants Co., Ltd.: "GEOLOGICAL SURVEY OF THE PROPOSED WASTE DUMPING SITES IN NAIROBI, KENYA, FINAL REPORT," January 1998, Fig. 3-01-07.
9. ditto
10. KENYA METEOROLOGICAL DEPARTMENT: "READINGS OF VARIOUS METEOROLOGICAL PARAMETERS" 2009, Station ID 9136168 Station Name: J.K.I.A. Meteorological Station.
11. National Environment Management Agency, "WATER QUALITY REGULATIONS", 2006, pages 11 and 16.
12. KENYA METEOROLOGICAL DEPARTMENT: "READINGS OF VARIOUS METEOROLOGICAL PARAMETERS" 2009, Station ID 9136168 Station Name: J.K.I.A. Meteorological Station.
13. National Environment Management Agency, "WATER QUALITY REGULATIONS", 2006, pages 11 and 16.
14. NGO Practical Action: "Situation Analysis on Solid Waste Management" 2007.

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

FINAL REPORT

VOLUME 3

SUPPORTING REPORT

SECTION F

PUBLIC AND ESTABLISHMENT AWARENESS FOR SWM

TABLE OF CONTENTS

Table of Contents	i
List of Tables	ii
List of Figures.....	ii
List of Photos	ii
1. INTRODUCTION.....	F-1
2. DESCRIPTION AND EVALUATION OF CURRENT CONDITION.....	F-2
2.1 Public and Establishment Awareness Survey.....	F-2
2.2 Situation and Evaluation of Public Awareness-Raising and Environmental Education	F-11
2.3 Basic Analysis of CBO Interventions on SWM in Nairobi City.....	F-17
3. REVIEW OF RELEVANT STUDIES	F-26
3.1 Review of UNEP Integrated Solid Waste Management Plan.....	F-26
3.2 Review of the Previous JICA Master Plan.....	F-27
4. COMMUNITY PARTICIPATION PROMOTION PLAN.....	F-30
4.1 Justification	F-30
4.2 Objective	F-30
4.3 Planning Policy	F-30
4.4 Strategy	F-30
4.5 Goals of the Community Participation Promotion Plan.....	F-31
4.6 Plan of Operation	F-32
REFERENCES.....	F-41

LIST OF TABLES

Table F.2.1	Number of Samples for Public Awareness Survey	F-3
Table F.2.2	List of Survey Items for Public Awareness Survey	F-3
Table F.2.3	Number of Samples for the Establishment Awareness Survey	F-4
Table F.2.4	List of Survey Items for the Establishment Awareness Survey	F-4
Table F.2.5	General Findings of the Public Awareness Survey	F-5
Table F.2.6	General Findings of Commercial Establishment and Institution Survey	F-8
Table F.2.7	Hospitals Surveyed and Main Characteristics	F-9
Table F.2.8	Primary Schools in Nairobi City by Location	F-12
Table F.2.9	Summary of Results of Workshop on Basic Analysis of CBOs Intervention on SWM in the City of Nairobi	F-18
Table F.2.10	Summary of Results of Workshop on Basic Analysis of CBOs Intervention on SWM in the City of Nairobi (cont'd)	F-20
Table F.3.1	Comparison between the Previous JICA MP and the Current JICA MP	F-29
Table F.4.1	Estimated Employees' Salary Cost for PEC Unit	F-33

LIST OF FIGURES

Figure F.4.1	Plan of Operation of Community Participation Promotion Plan (Short-Term Plan)	F-38
Figure F.4.2	Plan of Operation of Community Participation Promotion Plan (Mid-Term Plan)	F-39
Figure F.4.3	Plan of Operation of Community Participation Promotion Plan (Long-Term Plan)	F-40
Figure F.4.4	Cost and Responsibilities of Community Participation Promotion Plan	F-41

LIST OF PHOTOS

Photo F.2.1	Training Session with Interviewers before the Survey	F-5
Photo F.2.2	Interview Survey at Low Income Area (Households)	F-5
Photo F.2.3	Burning of Waste after Open Dumping in an Institution	F-8
Photo F.2.4	Segregation of Waste in a Commercial Establishment	F-8
Photo F.2.5	Collection Point used by CBO in Kibera Slum	F-15
Photo F.2.6	Handcart used by CBOs for Waste Collection and Transportation	F-15
Photo F.2.7	Presentation of the JICA Survey to CBO Members during the Workshop	F-18
Photo F.2.8	Group Discussion Session during the Workshop for CBOs	F-18

SECTION F

PUBLIC AND ESTABLISHMENT AWARENESS FOR SWM

1. INTRODUCTION

This Supporting Report Section F considers the aspects of public awareness and environmental education. **Chapter 2** of this Section presents the results of the survey entrusted to a local consultant hired by the JICA Survey Team on the current condition of awareness of the public and the establishments. Likewise, it also presents the current condition on Public Awareness Raising and Environmental Education which was confirmed by the JICA Survey Team through field investigation. Besides, Subsection 2.3 describes the results of the workshop entitled “Basic Analysis of Community-Based Organisations Intervention on SWM” which was organised by the JICA Survey Team conjointly with CCN.

Chapter 3 summarises the review of relevant studies, and **Chapter 4** presents one component of the Master Plan which is the Community Participation Development Plan.

2. DESCRIPTION AND EVALUATION OF CURRENT CONDITION

2.1 Public and Establishment Awareness Survey

This Survey was conducted by a local consultant, the Environmental Cost Management (EMC) Centre Limited, which was involved in the development of the questionnaire, the selection of the survey samples, survey administration and evaluation.

2.1.1 Purpose of the Survey

The purpose of the survey was to obtain the following features in relation to the awareness of the public and establishments about solid waste management in Nairobi City.

- General and detailed information on solid waste management and cleansing practices and services in Nairobi City
- Actual practice on solid waste management at household and establishment levels
- Behaviour of household and establishments toward solid waste management
- Affordability and willingness to pay for services of solid waste management
- Current perception of the public and establishments toward solid waste

2.1.2 Outline of the Survey

The survey was intended to conduct a structured interview among households and commercial establishments concerning the actual practice of waste discharge. Prior to the commencement of work, the survey areas and items were discussed and agreed among CCN, the JICA Survey Team and the surveyor to identify the general information which will be important for implementing the survey.

2.1.3 Methodology

The survey was carried out through interview with respondents using questionnaires for the public and establishments. As for the public, a sample of respondents was selected from the population, i.e., from various categories in both the residential and commercial areas. As for the establishments, a sample of respondents was selected from commercial establishments and institutions - both private and public.

Data analysis was done using both MS Excel and SPSS software (Statistical Package for the Social Sciences). A copy of the survey questionnaire and raw data are contained in the **Volume 4, Data Book, Section F**.

(1) Public Awareness Survey

(a) Number of Samples Surveyed

To establish the level of awareness among the households, the study sampled five (5) of the same study areas of the previous JICA study in 1998 and CCN, and added another five (5) new study sites. The samples were selected from five (5) income group areas, namely; (i) Upper income group area; (ii) Middle income group area; (iii) Lower middle income group area; (iv) Low income group area; and (v) Slum area. A sample size of 250 respondents was used, as shown in **Table F.2.1**. The households were selected randomly in the targeted areas by the surveyor.

Table F.2.1 Number of Samples for Public Awareness Survey

Income Level	Samples
Upper	50 Households
Middle	50 Households
Lower Middle	50 Households
Low	50 Households
Slum	50 Households
Total	250 Households

(b) Survey Items

The survey items were determined through the discussions with CCN by taking the local condition into consideration. The survey items were reflected on the questionnaire.

Table F.2.2 shows the survey items.

Table F.2.2 List of Survey Items for Public Awareness Survey

Items	Sub-Items
Part 1: General Information	<ul style="list-style-type: none"> - Location - SWM conditions in the area
Part 2: Description of Interviewed subject	<ul style="list-style-type: none"> - Number of members - Type of dwelling - Unit rent or ownership - Household income
Part 3: Solid Waste Conditions	<ul style="list-style-type: none"> - Waste containers used - Waste discharge habits - Discharge location - Separation and recycling - Waste collection system - Charge paid
Part 4: Awareness on SWM issues	<ul style="list-style-type: none"> - Concept of SWM in the city - Willingness to pay to improve SWM - Affordability to pay to improve SWM

(2) Establishment Awareness Survey

(a) Number of Samples Surveyed

The sample groups were categorised into offices (large-scaled), restaurant, shop, hotel, factory for commercial establishment, public facilities, markets and hospitals/clinics referring to the previous JICA study in 1998 and also including latest trend of social changes. A total of 67 samples were selected as shown in **Table F.2.3** from which 57 were commercial establishments and 10 medical institutions. The identification and selection of survey areas were made through the discussion with CCN. The individual establishments and institutions were randomly sampled by the surveyor.

Table F.2.3 Number of Samples for the Establishment Awareness Survey

Type of Establishment	Number of Samples	Remarks
1. Commercial Establishment		
- Offices	8	Large-scaled offices
- Restaurants	8	
- Shops	15	
- Hotels	5	
- Factory	10	
2. Public Facilities	6	
3. Markets	5	
4. Hospitals	10	
Total	67	

(b) Survey Items

The survey items were determined through the discussions with CCN by taking the local conditions into considerations. The survey items were reflected on the questionnaire. **Table F.2.4** shows the survey items.

Table F.2.4 List of Survey Items for the Establishment Awareness Survey

Items	Sub-Items by Type of Establishment	
	General Establishments	Medical Institutions
Part 1: General Information	- Location - SWM conditions in the area	- Location - SWM conditions in the area
Part 2: Description of Interviewed Subject	- Type of commercial activity - Number of employees - Ownership - Income/expenditure	- Number of beds - Hospital specialisation
Part 3: Solid Waste Conditions	- Waste containers used - Waste discharge habits - Discharge location - Separation and recycling - Waste collection system - Charge paid	- Waste containers used - Hazardous and non-hazardous waste separation - Discharge location - Waste collection system - Treatment system within the institutions
Part 4: Awareness on SWM Issues	- Concept of SWM in the city - Willingness to pay to improve SWM - Affordability to pay to improve SWM	- Concept of SWM in the city - Willingness to pay to improve SWM - Affordability to pay to improve SWM

2.1.4 Results of the Public Awareness Survey (Households)

Two hundred and fifty (250) households were interviewed, fifty (50) from each income area. Each income area was represented by two (2) estates as follows: (a) High income area represented by Kitisuru and Karen estates; (b) Middle income area represented by South B and Langata estates; (c) Low-Middle income area represented by Umoja and Riruta estates; (d) Low income area represented by Bahati and Dandora estates; and (e) Slum area represented by Kibera and Mukuru settlements.



Photo F.2.1 Training Session with Interviewers before the Survey



Photo F.2.2 Interview Survey at Low Income Area (Households)

General findings of the survey are summarised in **Table F.2.5**.

Table F.2.5 General Findings of the Public Awareness Survey

Questions	High Income	Middle Income	Low-Middle Income	Low Income	Slum
Existence of waste collection service	Yes: 88% No: 12%	Yes: 78% No: 12% Do not know: 10%	Yes: 62% No: 30% Do not know: 8%	Yes: 34% No: 54% Do not know: 12%	Yes: 24% No: 64% Do not know: 12%
Methods of collecting discharged waste					
(a) door to door by vehicles	(a) 67%	(a) 63%	(a) 13%	(a) 0%	(a) 0%
(b) door to door by workers	(b) 23%	(b) 29%	(b) 39 %	(b) 11%	(b) 0%
(c) residents carry to collection point	(c) 8%	(c) 6%	(c) 48%	(c) 78%	(c) 100%
(d) collection from building dust chute	(d) 0%	(d) 3%	(d) 0%	(d) 0%	(d) 0%
(e) I do not know	(e) 3%	(e) 0%	(e) 0%	(e) 11%	(e) 0%
Point of waste discharge from the house:					
(a) into containers to be collected by worker	(a) 54%	(a) 76%	(a) 52%	(a) 52%	(a) 6%
(b) around the premises without container	(b) 12%	(b) 2%	(b) 16%	(b) 4%	(b) 12%
(c) communal container	(c) 4%	(c) 4%	(c) 8%	(c) 4%	(c) 22%
(d) discharge point	(d) 4%	(d) 12%	(d) 2%	(d) 2%	(d) 2%
(e) compartment fixed in the house	(e) 20%	(e) 0%	(e) 10%	(e) 30%	(e) 54%
(f) other	(f) 6%	(f) 6%	(f) 12%	(f) 8%	(f) 4%
Person responsible for waste discharge from the house:					
(a) housewife	(a) 54%	(a) 42%	(a) 46%	(a) 38%	(a) 40%
(b) the master	(b) 4%	(b) 10%	(b) 10%	(b) 34%	(b) 32%
(c) children	(c) 2%	(c) 8%	(c) 16%	(c) 12%	(c) 4%
(d) other house member	(d) 0%	(d) 4%	(d) 0%	(d) 0%	(d) 0%
(e) housekeeper	(e) 36%	(e) 30%	(e) 24%	(e) 10%	(e) 8%
(f) other	(f) 4%	(f) 6%	(f) 4%	(f) 6%	(f) 16%
Satisfaction with the waste collection service	Yes: 80% No: 7% Average: 11% Do not know: 2%	Yes: 56% No: 18% Average: 26 % Do not know: 0%	Yes: 35% No: 35% Average: 29 % Do not know: 0%	Yes: 18% No: 24% Average: 59% Do not know: 0%	Yes: 8% No: 75% Average: 17% Do not know: 0%

Table F.2.5 General Findings of the Public Awareness Survey (cont'd)

Questions	High Income	Middle Income	Low-Middle Income	Low Income	Slum
Reasons why not satisfied with the collection service: (a) Frequency of collection is low (b) Collection time is irregular (c) Collection time early or late (d) Behavior of worker is very bad (e) Collection work is very crude (f) Collection fee is very expensive	(a) 0% (b) 67% (c) 33% (d) 0% (e) 0% (f) 0%	(a) 0% (b) 67% (c) 33% (d) 0% (e) 0% (f) 0%	(a) 9% (b) 36% (c) 18% (d) 27% (e) 9% (f) 0%	(a) 20% (b) 10% (c) 20% (d) 40% (e) 0% (f) 10%	(a) 22% (b) 11% (c) 0% (d) 11% (e) 22% (f) 33%
Guidance received on proper waste discharge	Yes: 56% No: 44%	Yes: 36% No: 64%	Yes: 16% No: 84%	Yes: 10% No: 90%	Yes: 16% No: 84%
Willingness to participate in cleaning campaign	Yes: 82% No: 14% Do not know: 4%	Yes: 54% No: 44% Do not know: 2%	Yes: 42% No: 54% Do not know: 4%	Yes: 48% No: 52% Do not know: 0%	Yes: 18% No: 80% Do not know: 2%
Participation in public education programme on SWM	Yes: 34% No: 66%	Yes: 20% No: 80%	Yes: 36% No: 64%	Yes: 28% No: 72%	Yes: 38% No: 62%
Awareness on whether insects breed in the solid waste	Yes: 56% No: 44%	Yes: 36% No: 64%	Yes: 42% No: 58%	Yes: 52% No: 48%	Yes: 72% No: 28%
Awareness on recyclable materials	Yes: 86% No: 14%	Yes: 90% No: 10%	Yes: 84% No: 16%	Yes: 78 % No: 22 %	Yes: 64% No: 36%

As for the results on willingness and affordability to pay, please refer to **Section H of Volume 3, Supporting Report**.

Evaluations on the main findings are as follows:

- (1) The high and middle income areas are well serviced with waste collection. However, the lowest rate of collection is given in the slum areas where solid wastes are disposed by residents along the roads, riverbanks, open spaces, etc.
- (2) With regard to the question on the methods used for collecting discharged waste, most of the households of high and middle income areas receive collection services by door-to-door vehicles. As for the low income and slum areas, most of the respondents stated that they carry their solid waste to the collection point.
- (3) A significant percentage of respondents discharge their waste around their premises without containers.
- (4) According to the survey, most of the respondents were housewives. This proportion is expected because most of the interviews were conducted during daytime when most men as the main income earners are in their respective workplaces. In cases where both the wife and husband are working, the households are in most cases left under the care of a female housekeeper. In most surveyed households it is the housewives and househelps (maid) who dispose the waste from the houses.
- (5) The highest level of satisfaction with the collection services is given in the high income area. However, it is very low in the low income and slum areas. Among the main reasons of

dissatisfaction with the services given by the respondents are (a) the collection frequency is low; and (b) the collection time is very irregular or it is very early or late. Some 33% consisting of unsatisfied respondents from the slum areas indicated that the collection fee was expensive.

- (6) More than 70% of all respondents have not received any guidance or instruction on methods of proper waste discharge.
- (7) The level of willingness of the respondents to participate in cleaning campaigns was found to be highest in the high income area and the lowest in the slum areas. This can be attributable to the low level of awareness of the people on SWM issues.
- (8) Almost 70% of the respondents have not participated in any public education programme on SWM. Those who ventured to give suggestions to improve the current situation on SWM said that there should be cooperation by the community; more bins and trash cans should be provided so that waste will not scatter; sharing of information and campaign about SWM to increase community awareness and participation should be intensified; there should be proper disposal and segregation, daily garbage collection, and upgrading of facilities, among others.
- (9) More than half of the respondents said that insects bred in their domestic waste areas. The highest number of respondents on this was found to be in the slum areas.
- (10) The level of awareness on whether materials are recycled across the five income groups was found to be relatively high. The upper, middle and lower middle income were found to be over 80% aware of the recyclable materials in their waste. On the other hand, 70% of the respondents indicated that bicycle is the main method used by collectors to transport the recyclable materials.
- (11) From the survey results, it can be concluded that there is a necessity of implementation of educational programmes for citizens for raising or creating their awareness on proper waste management in Nairobi City.

2.1.5 Results of the Survey on Commercial Establishments and Institutions

Fifty-seven (57) commercial establishments and institutions were sampled in this survey. Of this number, 8 (14%) are large-scale offices; 8 (14%) are restaurants; 15 (26%) are shops; 5 (9%) are hotels; 10 (18%) are factories; 6 (11%) are public facilities such as universities, public offices and schools; and 5 (9%) are markets.

Fifty-four percent (54%) of the commercial establishment surveyed in this study were located in the commercial area of the central business district. Likewise, 23% were found in the urban areas of Nairobi which are zoned by CCN as both commercial and residential areas.

Though it was observed that institutions and commercial establishments dispose their wastes properly, some institutions were found to be burning their wastes, as shown in the photograph below (left). On the other hand, in some commercial establishments, such as hotels, some restaurants, public institutions and some large-scale offices, segregation of waste is a common practice as shown in the photograph (right).



Photo F.2.3 Burning of Waste after Open Dumping in an Institution



Photo F.2.4 Segregation of Waste in a Commercial Establishment

General findings of the survey are summarised in **Table F.2.6**.

Table F.2.6 General Findings of Commercial Establishment and Institution Survey

Questions	Percent (%)
Point of waste discharge from establishment: (a) into containers to be collected by worker (b) around premises without container (c) communal container (d) discharge point (e) compartment fixed in the company (f) others (chute system, etc.)	(a) 26% (b) 4% (c) 16% (d) 21% (e) 23% (f) 11%
Contract with entity for waste collection (a) CCN (b) Private company	(a) 49% (b) 51%
Guidance received on proper waste discharge	Yes: 14%; No: 86%
Degree of satisfaction with the waste collection service	Yes: 58% No: 18% Average: 25% Do not know: 0%
Reasons why not satisfied with the collection service: (a) Frequency of collection is low (b) Collection time is irregular (c) Collection time very early or late (d) Behavior of worker is very bad (e) Collection work is very crude (f) Collection fee is very expensive	(a) 30% (b) 10% (c) 10% (d) 20% (e) 10% (f) 20%
Willingness to participate in cleaning campaign	Yes: 22.8%; No: 73.7% Do not know: 3.5%

Evaluations on the main findings are as follows:

- (1) Most of the respondents confirmed that they place their waste into containers to be collected by worker, or in a compartment designed at the company, or bring it to the communal container.

- (2) All the establishments surveyed confirmed that they have contract with either CCN or private collectors.
- (3) Eight out of fifty-seven (14%) have received specific guidance on proper waste segregation, storage and discharge. However, a high rate (86%) had never received instruction on proper waste discharge.
- (4) The level of satisfaction with the current collection service was found to be 57.8% of the establishments sampled. However, dissatisfied respondents indicated that the main reasons are: (a) low frequency in the collection; (b) behaviour of workers is very bad.
- (5) Most of the respondents are not willing to participate in a cleaning campaign.
- (6) From the survey, it can be concluded that all establishments sampled are covered with collection services being more than half were satisfied with the service. However, a high rate had never received guidance on SWM, all this resulting in a low awareness for getting a proper waste management.

2.1.6 Results of the Survey on Medical Facilities

Ten (10) hospitals were sampled in the survey, which names, categories and services offered are shown in **Table F.2.7** below.

Table F.2.7 Hospitals Surveyed and Main Characteristics

Nº	Name of Hospital	Category	No. of beds	Services Provided	Medical Waste Generated (kg/d)	General waste Generated (kg/d)
1	The Nairobi Hospital	Primary	302	Consultancy, Diagnostics, pharmacy, theater	650	200
2	The Aga Khan Hospital	Primary	596	Consultancy, Diagnostics, pharmacy, theater, training	600	739
3	The Pumwani Maternity Hospital	Primary	420	Maternity, prenatal, postnatal, pharmacy	400	80
4	GK Remand Hospital	Health center	150	Diagnosis, pharmacy	50	50
5	Langata women prison health centre	Health center	57	Maternity, prenatal, postnatal, diagnosis	50	80
6	Avenue Group Health care	Secondary	80	Diagnosis, casualty, theater	200	300
7	Melchizedek Hospital	Secondary	70	Inpatient, diagnosis, outpatient, pharmacy	150	100
8	Nairobi west hospital	Secondary	110	Inpatient, outpatient, pharmacy, theater	450	220
9	MP Shah Social Services League	Primary	120	Inpatient, outpatient, maternity, theater, diagnostics, consultancy	500	200
10	Mater Hospital	Primary	144	Inpatient, outpatient, consultancy, diagnosis	500	300

Evaluations on the main findings are as follows:

- (1) All hospitals have a specific department for solid waste management. Responsibilities of these departments are: (a) cleaning of the hospital, (b) treatment of clinical wastes; and (c) safe disposal in a holding area.
- (2) Nine of the ten interviewed hospitals contract out SWM services for collection of general and medical waste.
- (3) All hospitals have a waste classification set by the respective hospital management offices or classify wastes by using the waste classification given by the Ministry of Public Health.
- (4) All hospitals give special treatment to their pathological waste including sterilisation of potential infectious waste before discharge to designated areas. The use of septic vault to store pathological waste such as blood was also common in primary hospitals; however, the tertiary centres were found to be burn it. Some kinds of treatment given to pathological waste include: incineration, chemical treatment and burning in premises.
- (5) Seven (7) hospitals make contract with contractors to transport medical waste off their premises. Among reasons for contracting out are affordability or lack of adequate capacity to manage medical waste internally.
- (6) All hospitals stated that they have an in-house education programme on SWM.
- (7) Within the health centres it was found that malaria and waterborne diseases were the more widely treated diseases.

2.1.7 Waste Pickers Awareness Survey

During the survey the current situation of waste pickers working at the Dandora Dumpsite was analysed. The survey was conducted by analysing previous information and carrying out direct interviews with 10 waste pickers. The main findings are as described below:

- (1) The CCN has no record on the number of waste pickers working at the site although the number of waste pickers at the Dumpsite is estimated from 1,200 to 1,500; however, some CCN personnel estimated that the number is around 600 persons. These workers include men and women who collect valuable things from incoming wastes such as paper, glass, metal, plastics, etc. The recovered valuable things are sold at the site to brokers, or directly to recyclers who finally bring them to the recycling plant.
- (2) The number of brokers at the site is more than 5. Waste pickers sell valuables mainly on the monthly basis. Waste pickers prefer the brokers or the recyclers since they own vehicles for the transportation of recovered materials to the recycling plant.
- (3) Waste pickers work 7 days a week, 12 hours a day, mostly from 6 am to 6 pm.
- (4) Half of those interviewed mentioned that they would like to continue waste picking at the site and would protest if the site is closed.
- (5) All of those interviewed are willing to have a job if a recycling plant is built.
- (6) Monthly income of the respondents ranges between KSH 5,000 and KSH 10,000.
- (7) The major problem facing the waste pickers is the marketing of recovered materials.

- (8) As additional information, about 200-300 waste pickers are working at the illegal disposal site named Eastleigh Air Force Fence and 100 at the temporary disposal site named Kayole Orbit.

2.2 Situation and Evaluation of Public Awareness-Raising and Environmental Education

2.2.1 General

The promotion and implementation of environmental education programmes are essential to raise the public awareness of residents and get them involved in solid waste management. In this sense, the JICA Survey Team had made a field investigation through analysing relevant documents and direct interviews to the officials of related organisations on SWM in order to assess the current situation on this sector. The results are as described in the succeeding items.

2.2.2 Objective

The survey was conducted to assess the current level of public awareness raising and environmental education related to SWM in Nairobi City.

2.2.3 Survey Procedure

The survey was conducted through analysis of the existing documents and available statistical information and direct interview with officials of the institutions related to SWM.

2.2.4 Overview on the Major Findings

(1) Environmental Education

(a) Formal Education

Formal education is defined as the education given in the classroom to the students on a structured system and provided by trained teachers under the supervision of the Ministry of Education.

In this survey, analysed was the present situation of environmental education in the primary education only recognising that it is the starting point where the students may learn and develop awareness of the environment. Primary education lasts for 8 years for 6 to 14 years old students after which they are awarded with the Kenya Certificate of Primary Education.

The Kenya Institute of Education is responsible for the development of the curricula to be used by students of primary schools. At present, the curricula focuses on the general environment under the subject of Geography and no specific theme is developed in the sector of SWM. Besides, the teachers do not have instruction materials such as textbooks, videos, etc., to help the students understand and be aware of the issues involving the SWM. As of 2008, 1,409 primary schools were operating in Nairobi City and their locations are as shown in the table below.

Table F.2.8 Primary Schools in Nairobi City by Location

No.	Location	Number of Primary Schools		
		Public	Private	Total
1	Nairobi East	70	388	458
2	Nairobi North	90	415	505
3	Nairobi West	179	267	446
Total		339	1070	1409

Source: Ministry of Education

During the survey, it was noted that a high number of school-age children in Kibera Slum do not attend schools due to lack of money. To address this issue, the Ministry of Education had established non-formal education institutions for children of school age. By 2008, Nairobi recorded the highest number of 640 institutions with 111,795 enrolled students and most of the schools are located in the slum areas. Non-formal education institutions are of two types, namely; the Non-Formal Schools that offer the primary education curriculum and the Non-Formal Centre that uses the Non-Formal curriculum¹. *(Figures affixed to a word or at the end of a sentence refers to the reference number listed at the bottom of this report.)*

(b) Informal Education

Informal education is defined as the education given to the people on a non-structured system and can be received from daily experience such as from family, friends, NGOs, the media, public or private institutions, etc. Generally speaking, in the field of SWM, the implementation of environmental education programme through the informal education aims to raise the awareness of the people and get them involved in the necessary projects for upgrading the existing solid waste management. Some activities in this sector were promoted especially by CCN, the National Environment Management Agency (NEMA) and NGOs.

(2) Organisations dealing with Public Awareness and Environmental Education on SWM in Nairobi City

(a) Department of Environment of CCN

This Department has no specific unit that deals with public awareness and environmental education on SWM. However, some activities of awareness creation had been conducted by the Section of Environmental Planning and Management aiming to sensitise the people through the provision of information materials on SW issues. In addition, the Department of Environment (DoE) is undertaking, currently, the beautification programme of the city, which includes landscaping of roads, reserves, roundabouts and open spaces, tree plantation in the main roads and parks, maintenance of recreational facilities, etc., and, to enhance public awareness, is utilising message boards installed along major roads and designated parks.

On the other hand, DoE had been involved with other institutions such as the Ministry of Environmental Resources and NEMA in many activities to create public awareness through environmental education programmes or cleaning campaigns. Some relevant activities are described below.

(i) Kazi Kwa Vijana Programme

The Government of Kenya had estimated by 2009 that 10 million Kenyans were faced with starvation. To alleviate this situation, the Government had prepared the Kazi Kwa Vijana (KKV) Programme which was executed during 6 months (starting May 1, 2009) in the provinces of Nakuru, Thika, Kakamega, Nyeri, Embu, Kisumu, Kissi, Garissa, Eldoret, Mombasa and Nairobi. The main activities implemented by the KKV

Programme were garbage collection, slum cleaning, cleaning of markets and cleaning of clogged drains. The Programme was implemented by the Ministry of Local Government and Municipal Councils with an allocated fund of KSh 300 million. In order to give job opportunities for the youth, the Programme had hired a total of 14,700 Kenyan youths. As for Nairobi City, 1,000 and 500 youths were hired to make garbage collection from the Eastleigh illegal dumping site and cleaning of Mukuru Kwa Njenga Slum, respectively. The garbage collected was transported by CCN to the Dandora dump site².

All these works and preparatory training sessions were accompanied and supervised by the Department of Environment.

(ii) Removal of Illegal Dumping Sites

In 2009, there was a collaboration activity between the Ministry of Environment and Mineral Resources and the DoE for the closure of illegal dumping sites.

(iii) Nairobi Rivers Rehabilitation and Restoration Programme

In the frame of this Programme, the DoE holds meetings with CBOs operating along the Nairobi riverbanks to ask them firstly to be registered with the CCN and, secondly, to ask their cooperation on avoiding the discharge of collected wastes into rivers by bringing them to a designated collection point from where CCN could transport them to the disposal site with a fee. According to the CCN officials, the CBOs are making their best to collaborate with the initiative.

(iv) Other Activities

The Department of Environment of CCN works closely with NEMA on the organisation of public meetings to create awareness for the implementation of environmental activities such as cleaning of rivers of Nairobi, clean-up activities, etc.

(b) NEMA

This institution through its Department of Environmental Education, Information and Public Participation develop and implement programmes intended to enhance environmental education and public awareness of the people on environmental issues.

Among the activities conducted by this Department is the development of environmental education and awareness materials to sensitise various stakeholders including learning institutions, policy makers, media, civil society organisations and the general public. Recent materials produced include state of environment for secondary schools, climate change, effects of mercury on the environment; keep Kenya clean, effects of plastic on the environment, etc. On the other hand, NEMA had developed modalities to obtain public participation in environmental management activities³.

(c) Non-Governmental Organisations (NGOs)

The role of NGOs is very important in the creation of awareness through the implementation of environmental education programmes and small projects targeted to improve the social and environmental condition of the communities. The list of main NGOs that are operating in the field of SWM in Nairobi City is given in **Section F of Volume 4, Data Book**.

The NGOs frequently work with one another and with CBOs. Following is presented some experiences conducted by NGOs in Nairobi City:

(i) Practical Action

It is an NGO that works with the communities on environmental projects which include SWM. In the field of SWM, it promotes the creation of Small and Medium Enterprises (SME) and Community-Based Enterprises (CBE) for waste management considering the following approaches⁴:

- Policy and reforms at local authority to recognise and allow SME's participation
- Social mobilisation and capacity development
- Establishment or strengthening of SMEs and CBEs to participate/invest in waste services

Examples of the work done by Practical Action are:

- Waste Venture Fund with Family Bank: addressed to micro, small and medium and community-based waste and sanitation enterprises. The Family Bank lends the money to the successful applicant with annual interest of 9%, grace period of 3 months and repayment period of 24 months (minimum).
- Case Nakuru - Making Small and Medium Enterprise effective and economical in SWM
- NAWACOM - Organic Waste Processing: it is a cooperative started in 2006 (before it became a CBO) to produce organic fertilisers. It also supports other businesses like plastics and waste paper production in Nairobi.
- St. Joseph's Waste Collection Community Enterprise: composed by 30 members, had received a loan from the Family Bank to buy a 7-ton lorry.
- Training on SWM addressed to CBOs and youth self-help groups, held on January 28, 2010

(ii) Kenya Alliance of Residents Association (KARA)

It is a civil organisation recognised by the government and formed to represent its affiliated resident associations on consumers and taxpayers' rights countrywide. KARA focuses its actions on improving access to public services delivery.

An example of work that has been implemented in the SWM by KARA with other partners such as Practical Action, UNDP, UNEP and NEMA, is the pilot project to separate solid waste at source in the Plainsview Estate of Nairobi City. The conclusion of this pilot project is that there is a need for education and training to change the attitude and culture of the people from disposing wastes without carrying out any separation at source⁵.

According to KARA, the Resident Association can play the following main roles in the SWM⁶:

- Education and sensitisation on good environmental practices – including the 3R's
- Sorting of wastes at source
- Ensuring that their neighbourhoods are protected from careless dumping of wastes on open grounds; water resources and even policing unscrupulous private sector players
- Promote change of attitude and culture towards proper waste management
- Organise campaigns for clean-ups; trimming of hedges; general cleanliness of the environment
- Contributing their views on Environmental Impact Assessment reports
- Resident Associations can provide a market for recycled wastes
- Invest and promote local investment on environment, e.g., form collection companies

(iii) Destiny Africa & Green Africa International Limited

It is a joint venture between a non-governmental organisation and a private company to run a business on the production of plastic poles from recycled plastic. These plastic poles are being used currently for fence or house building and are produced at a factory which currently operates with 20 workers. The raw material used by the factory is the recovered plastic which is collected by thousands of youths from each house, disposal sites, etc.

At the beginning of the business, some youths were trained on SW before going to each household for the collection of used plastic. The key point is that the collected used plastic should be clean to avoid spending extra money for cleaning. In this sense, the trained youth asked the household owners to separate used plastics from the other wastes⁷.

It is opportune to say that plastics are non-biodegradable materials and can last a long time in the environment. Besides, the plastics at the disposal sites hold water creating mosquito breeding grounds.

This initiative is a good example of partnership that creates job opportunities necessary at this moment for Nairobi residents.

(d) Community-Based Organisations (CBOs)

CBOs mainly work with the low income settlements and slum areas of Nairobi city. Around 60% of Nairobi City residents live in slums areas. Most of the urban poor live in the slums and informal settlements with inadequate infrastructure, services and housing (water and sanitation, roads, educational and health facilities). Kenyan urban poverty level is estimated at 60%⁸.

In the sector of SWM, the CBOs provide the waste collection service to the communities that they represent. Commonly the CBOs use handcarts for the collection especially in the low and slum areas where the access is limited. The CBOs after door-to-door collection bring their collected waste to the designated collection point where they usually make separation of valuables and the remaining waste is left for CCN to transport to the Dandora dumpsite.

However, most of the CBOs hire lorries for the transportation of waste to the disposal site, or bury them in shallow pits or burn them. CBOs have a low level of knowledge on the existing laws that manage the solid waste⁹.



Photo F.2.5 Collection Point used by CBO in Kibera Slum



Photo F.2.6 Handcart used by CBOs for Waste Collection and Transportation

The CBOs assist their members through the implementation of capacity building activities to get them ready to provide the services. They work closely with NGOs and the CCN during both the initial establishment and the implementation phases of self-help initiatives. They are well aware of the issues of concern of the communities they represent and the approaches to mobilising community resources. The CBOs are important stakeholders in the SWM for Nairobi City, and CCN should develop at least one section to deal with these organisations to support their activities. In **Section F of Volume 4, Data Book**, is a list of registered CBOs that are dealing with SWM in Nairobi City.

Besides the CBOs there exist other groups called as “Youth Self-Help Groups” that operate in the same way as the CBOs. The only difference among them is the number of members: while CBOs are composed usually of up to 30 members, Youth Self-Help Groups consist generally of up to 15 members, but these criteria are not so restricted. Hence, the real number of members of these groups could not be obtained.

An example is the Riruta Environmental Group, a youth group that has over 150 active members of which 14 are working full time. They own two trucks for waste collection with approximately 1,400 clients in several estates. The group had leased an adequate site for waste management activities. Members collect and sell plastics¹⁰.

(e) Other Groups

There are many other groups that work on the creation of public awareness to living in a clean and healthy environment. Such groups include the Korogocho Catholic Church; National Christian Churches of Kenya; Lions Club International; boy scouts and guides, etc.

2.2.5 Evaluation of Current Condition of Public Awareness-Raising and Environmental Education

The following points are considered as important issues on the current condition of public awareness and environmental education:

- (1) The current curricula of primary education focus on the general environment and no specific theme is developed in the sector of SWM.
- (2) The teachers assigned to primary schools do not have instructive materials such as textbooks, videos, etc., to help them understand and be aware of the issues involving SWM and teach these properly to their students. The development of these educational materials is considered of great importance to create proper awareness inside the educational community starting with primary education.
- (3) A high number of school age children at Kibera Slum do not attend schools due to the lack of money.
- (4) The DoE of CCN does not have at present a section to implement a regular programme oriented to educate the people on solid waste aspects. The establishment of a Section inside the DoE is considered indispensable to deal with Public Awareness, Environmental Education and Community Participation and obtain more involvement of the communities in the SWM.
- (5) The DoE of CCN is conducting an awareness campaign addressed to CBOs that operate along the Nairobi riverbanks in the frame of the Rehabilitation and Restoration Programme for Nairobi rivers. Through this campaign, the CBOs are requested to bring the wastes to a designated point from where the CCN could transport them to the disposal site. This good experience could be replicated in other areas of Nairobi.

- (6) NEMA conjointly with the DoE has developed good initiatives for raising awareness of the general public. The implementation of these types of initiative should be sustainable to keep the level of environmental awareness of the people.
- (7) The NGOs are well recognised for their assistance to the communities in the implementation of small projects besides giving training on environmental education for awareness creation. NGOs frequently work with one another and with CBOs. The joint-venture initiative between an NGO and a private organisation to produce plastic poles from recycled plastic employing for the process of collection of recovered plastic thousands of youths is a good example on how these organisations are working in favour of the environment and at the same time creating job opportunities for many people.
- (8) CBOs are playing an important role in providing collection services and the recycling of garbage especially in the low and slum areas. These organisations should be assisted by CCN to develop practical strategies for the improvement of their activities.

2.3 Basic Analysis of CBO Interventions on SWM in Nairobi City

2.3.1 General

The participation of the CBOs in providing collection services is considered crucial as it was pointed out in the evaluation of the current condition on public awareness raising and environmental education. These groups mainly provide primary garbage collection services for households located in the low income and slum areas and bring the wastes to a designated point from where CCN take part to transport them to the disposal site.

It is opportune to point out that in many places of the low and slum areas the road condition is bad or there is no access into the area. Under these circumstances, only the CBOs can provide the collection services in these areas and for this reason the JICA Survey Team had focused their attention on the development of these groups in order to increase the collection ratio that is still low in these areas.

In order to analyse in more detail the working condition of these groups, the main problems and causes that they face into their daily activities, and how they could contribute better in the SWM, a workshop was prepared specially for them by the JICA Survey Team conjointly with CCN as described below.

2.3.2 Implementation of Workshop for “Basic Analysis of CBOs’ Intervention on SWM in Nairobi City”

(1) Objectives

- (a) To introduce the JICA survey on SWM to CBOs
- (b) To make the CBOs understand the current influence of SWM on environmental condition of Nairobi City
- (c) To present the good experiences of partnership between CBOs and private collectors
- (d) To understand the current problems that CBOs face on solid waste collection

(2) Results

- (a) More than 150 CBOs attended the workshop.



Photo F.2.7 Presentation of the JICA Survey to CBO Members during the Workshop



Photo F.2.8 Group Discussion Session during the Workshop for CBOs

- (b) Attendants were divided into 5 groups to discuss their main problems, the main causes and possible solutions from the perspective of CBOs. For the results of each group see **Section F of Volume 4, Data Book**.
- (c) Each group was guided by a moderator and the summary results are presented in the following tables:

Table F.2.9 Summary of Results of Workshop on Basic Analysis of CBOs Intervention on SWM in the City of Nairobi

Area	Main Problems	Main Causes	Possible Solutions
Collection of garbage	- The collection rate is low	<ul style="list-style-type: none"> - Lack of enough manpower and equipment - Households are not willing to pay the collection fee - Uncooperative customers who dump into the river 	<ul style="list-style-type: none"> - Provision of more bicycles and handcarts for collection and safety equipment such as gloves, masks, gumboots to avoid exposure to communicable diseases - Educate residents to raise their awareness on the importance of cost-sharing and consequences of unsanitary behaviour - Promotion of public participation to maintain cleanliness in their places
	- Lack of sufficient collection points	<ul style="list-style-type: none"> - Lack of land and funds to construct collection points and storage for recyclables - Communities not willing to donate collection points 	<ul style="list-style-type: none"> - CCN should allocate enough accessible collection points in areas near to CBOs and make appropriate proposals for funds to construct facilities. - Public Awareness creation among communities to get their collaboration on SWM
	- Land for CBO activities is being grabbed		- CCN should provide land together with the document that permits CBOs operate without being molested by land grabbers
	- There is severe competition among CBOs	<ul style="list-style-type: none"> - All CBOs are making the same work - Lack of mapping of collection 	<ul style="list-style-type: none"> - Demarcation on waste management whereby some CBOs do the collection and the others do the recycling - Creation of mapping of collection by the Department of Environment
	- Delay in issuing authorisation letter leading to harassments from CCN	<ul style="list-style-type: none"> - Mismanagement by CCN in relation to issuing of licenses - Lack of Section that deals with CBOs by the Department of Environment 	<ul style="list-style-type: none"> - CCN should improve the license issuing mechanism - Establishment of Section to deal with CBOs (main tasks: licensing, training, supervision)
	- Plastic bags are	- Lack of suitable collection	- To develop a suitable collection method (development of garbage handling kits like proper cheap bins, durable

	expensive	method	collecting bags for easy handling)
	- Collection is not made compulsory in existing by-laws	Lack of by-laws	-To develop adequate by-laws
Reduce, Reuse, Recycling, Recovery (4R)	- Lack of knowledge on recycling	- No training opportunities	- Provision of training on recycling
	- Lack of financing for equipment	- Lack of searching of financial opportunities	- Provision of recycling machines to CBOs for establishment of recycling centres. In this way, the creation of jobs will be secured
	- Lack of information to CBOs	- Lack of sharing research finding with the CBOs makes it difficult to start a recycling project	- Share research findings to improve performances

Table F.2.9 Summary of Results of Workshop on Basic Analysis of CBOs Intervention on SWM in the City of Nairobi (cont'd)

Area	Main Problems	Main Causes	Possible Solutions
Reduce, Reuse, Recycling, Recovery (4R) (cont'd)	- Lack of land for recycling and material storage	- Lack of initiative on finding a land for recycling	- Provision of land for recycling
	- Abundant plastic bags at the market leading to mismanagement	- There is no regulation on the use of plastic bags	- Make research on the use of plastic bags
	- Culture inform people not have anything to do with waste (culture leads people to disregard on solid waste issues)	- Inadequate/low public awareness leading to no cooperation from households	- Educate the community on 4 Rs - Create awareness campaign importance on 4Rs
	- No separation at source	- Lack of knowledge on sorting at source at community level - No awareness on profitability from sorting waste	- Support recycling at source, first giving training to the residents and then implement it
	- Not market for recycled materials	- Lack of promotion of new markets	- CCN to procure most of its supply from recyclers, i.e., manure for tree/flower planting - Promotion for marketing of recycled and reused products such as plastic poles and organic manure
	- Lack of link among stakeholders on 4R	- Lack of initiatives to create a link among stakeholders	- To promote the partnership with different parties on garbage collected for recycling including CBOs
	- Rare appearance or often delaying of CCN trucks for transport collected waste by CBOs and due to this fact the collection points become temporary dumping sites making trouble to the community	- Low priority given to SWM - Lack of finance to purchase vehicles - Lack of sufficient CCN trucks for transportation - CCN trucks being old, easily broken down	- Provision of more garbage trucks to provide services of transportation to CBOs - Provision of financial resource for transport
Transportation of garbage	- Poor management of transportation	- Poor coordination of the trucks	- Transport should be organised at the ward level and not from Division - Allocate the trucks following a reasonable schedule - CCN to improve efficiency to transport all the collected wastes to the disposal site
	- Lack of good working relation among all stakeholders	- Lack of initiatives to improve the working relation	- CCN needs to improve relationship with CBOs and the private stakeholders
	- Poor infrastructure of roads resulting to high maintenance cost of vehicles	- Lack of maintenance of roads	- CCN to make efforts for well maintenance of roads
	- Some areas are not accessible for garbage trucks	- Poor planning	- Allocate collecting points outside of those areas

Table F.2.9 Summary of Results of Workshop on Basic Analysis of CBOs Intervention on SWM in the City of Nairobi (cont'd)

Area	Main Problems	Main Causes	Possible Solutions
Transportation of garbage (cont'd)	- CCN lorries charge a lot of money for transportation - High fee charged by the private sector to transport a small quantity of garbage.	- Lack of regulation	- Regulated transport cost by the CCN - Affordable transportation fee would make garbage collection easy and continuous
	- Lack of sanitary disposal sites	- Poor planning by the Government - Lack of awareness on the importance of a safe disposal	- The government should intervene to provide a land for sanitary disposal site, which should be away from human settlements - Creation of awareness on safe disposal
Disposal	- Poor management of Dandora dumpsite representing a health hazard	- Lack of training on waste management for disposal - Lack of financial support	- Training on waste disposal management - Involve the private sector in garbage disposal management
	- Congestion at existing dumping site specially in rainy season, therefore, trucks often get stuck	- Poor access to Dandora dumpsite	- Cannot stop rain but roads into dump site can be better maintained
	- Presence of cartels who charge a fee	- Laxity of the government to rid cartels such as 'Mungiki' in Dandora.	- CCN should excerpt full control on the disposal site to ensure security of the place
	- Existence of illegal dumping sites (riverside, private areas, etc.)	- Lack of programme for avoiding illegal dumping - Careless dumping in the streets especially in the slums	- Establishment of special programme by ward managers to combat illegal dumping - Stiff penalties for illegal disposal - Stem illegal dumping through applying harsh by-laws
	- Some houses cannot afford to pay for the collection	- Poverty, not job or lack of proper job - Lack of funds for the poor who cannot pay	- A subsidy need to be considered case by case
Financial difficulties	- Residents not willing to pay the collection fee - Customers fail to pay	- Lack of awareness	- Creation of awareness to make people understand their responsibilities on SWM
	- Lack of proper management of funds by CBOs	- Lack of financial management knowledge - Lack of proper training on financial management	- Training on business and financial management

Table F.2.9 Summary of Results of Workshop on Basic Analysis of CBOs Intervention on SWM in the City of Nairobi (cont'd)

Area	Main Problems	Main Causes	Possible Solutions
Financial difficulties (cont'd)	- Lack of finance to buy proper materials and equipment	- Poor payment for the services, therefore, low level income of the CBOs - Lack of funding from institutions - Lack of sponsors	- Putting together local resources attracting support from other stakeholders, e.g. CCN, NGOs, etc. - The government and other partners should fund active CBOs to work properly and encourage cooperation among them - More NGOs should take part in helping the CBOs with the facilities - Grants to small businesses dealing with recycling and processing to encourage local development - Investment in high capacity CBOs to develop strong business
	- Discrimination of CBOs by private financiers	- Accountability problems in CBOs - Lack of financial transparency in CBOs	- Ensure fully functioning and well staffed council offices within the communities to monitor financial matters - Strengthening the working system that improve accountability
	- Public lack knowledge on SWM	- No awareness programme is conducted for the community	- Public should be educated on managing their solid waste - Incorporation of Environmental Education from the primary level to the tertiary level - CBOs to be used to organise seminars & workshops at the grassroots level for awareness creation in the communities - Hold community meetings and clean-up campaigns frequently to keep community awareness on the issue
Public awareness	- Lack of awareness on existing laws and the relevant stakeholders on SWM by CBOs - Community members are not cooperative and not aware of the benefits of a good SWM - Many CBOs lack technical knowledge in garbage handling and the effects of their actions on the public health and environment i.e. burning of waste	- Lack of opportunities for awareness creation on proper handling of waste by CBOs	- Educate CBOs on the laws and institutions that manage the sector and on the importance of their contribution towards a proper SWM - High capacity CBOs already established should work together with CCN to give training to existing CBOs or new groups doing collection
	- Negative perception given by the costumers on CBOs members	- Lack of understanding between households and CBOs	- CCN should control the operation of CBOs to promote a good service and overcome the negative perception given by costumers

Table F.2.9 Summary of Results of Workshop on Basic Analysis of CBOs Intervention on SWM in the City of Nairobi (cont'd)

Area	Main Problems	Main Causes	Possible Solutions
Collaboration with the private sector (waste companies and organisations)	- Private sector do not trust people from slums dealing to poor or negative collaboration among them	- Fear to work with the community	- Net work of CBOs to be formed to build trust
	- Private sector tends to work exclusively with wealthier clientele		- Private sector needs to consider all members of the community
	- Some private organisations are too rigid on their project management thus CBOs find it difficult to collaborate with them	- Suspicion between the parties	- Net work of CBOs to be formed to build trust - Strengthening the working system that improve accountability
	- Poor relationship among CBOs and the private sector	- Absence of awareness on the significance of collaboration and opportunities among CBOs and the private sector	- CCN should promote the collaboration among the CBOs and the private sector (strengthening of PPPP) - Community to change attitude on private sector and be welcoming and cooperative
	- CCN recognises only big companies for collection and ignore small CBOs	- Most of the CBOs do not meet the requirements for tendering process	- To develop reasonable criteria, one for CBOs and other for private companies for their participation in the tendering process for collection
	- Lack of information on private organisations by CBOs	- Lack of opportunities to disseminate the information	- Create awareness about existing private organisations of interest
Institutional/ Legal Issues	- CCN harassing CBOs	- Lack of understanding among both parties	- Establishment of a Section under Department of Environment to deal with CBOs issues in order to improve communication on the ground. Activities of this Section should be: (a) Elaboration of policies that clearly address SWM with the intervention of CBOs; (b) Supervision of CBOs activities, issue licenses to participating CBOs and get off the inactive ones; (c) Training sessions
	- No good relationship or communication between institutions and the CBOs	- Not clear guide on the activities of CBOs - CBOs are not contacted on the ground	- Recognition of CBOs as a partner by the CCN
	- CBOs requires lot of licenses	- Many Departments involved	- Reduce the number of licenses in 1 or 2
	- Not access to loan of bank	- CBOs usually lack document asked for the bank to access to the loan i.e. document of the operating plot	- CCN should help CBOs who are registered and working properly on the necessary arrangements to get the document of the land asked by lenders Banks
	- Lack of knowledge on legal issues by the officers, the public and CBOs	- Lack of opportunities for training	- All stakeholders should be trained on legal issues for skill enhancement

Table F.2.9 Summary of Results of Workshop on Basic Analysis of CBOs Intervention on SWM in the City of Nairobi (cont'd)

Area	Main Problems	Main Causes	Possible Solutions
Institutional/ Legal Issues (cont'd)	- Lack of coordination among institutions (Ministries, NEMA, CCN), NGOs and CBOs - Relevant institutions no cooperative with CBOs i.e. CCN, private partners - Political interference from civic leaders due to rivalry	- Lack of goodwill among key players	- CCN to play key role to promote good coordination among institutions and CBOs - Frequent meetings with CBO to discuss problems and set goals that could ease challenges - Privatisation of Department of Environment by CCN for healthy & efficient waste management
	- Weak enforcement of waste by-laws by CCN	- Laxity to enforce laws	- Strict enforcement of waste By-Laws by CCN on the ground to make sure proper handling of waste
	- Conflicting laws by different major stakeholders e.g. CCN and NEMA on appropriate waste management strategies	- Lack of goodwill to analyse and correct conflicting laws	- All stakeholders should formulate laws that do not conflict with each other (one legal framework for SWM by all stakeholders) - Involvement of CBOs in decision and law making to promote transparency

(3) Evaluation of CBOs Intervention on SWM

The activities of CBOs on SWM were evaluated from the results of the workshop, as follows:

- (a) CBOs provide mainly primary collection services of garbage door-to-door to the households located in the low and slum areas;
- (b) Once collected the garbage, it is taken to the collection point where some CBOs make recovery of valuable things and the residual is transported by CCN to the disposal site;
- (c) CBOs demand CCN to allocate more accessible collection points and to construct facilities for recycling and storage of valuables;
- (d) To improve the current working condition of CBOs, increase the ratio of collection in the low and slum areas and improve their recycling activities, these groups need assistance from CCN in the provision of elemental materials and equipment and the related training on SWM which must include training on environment, recycling, safe disposal, financial management, laws, institutions, etc.;
- (e) CCN charges a fee from CBOs for the transportation of waste to the disposal site. The criteria for establishment of the charges need to be regulated;
- (f) Sometimes residents are reluctant to pay the charges causing financial difficulty to the CBOs;
- (g) The development of environmental education programme for the residents is considered fundamental for awareness raising in order to get their collaboration on SWM. In this connection, CCN must organise through CBOs workshops at the grassroots level for

awareness creation in the communities. The education programme should include, but not limited to, aspects of environmental pollution by solid waste and its relation with public health, importance of cost sharing on SWM, management of waste at source and aspects of legal and institutional issues; and

- (h) CCN needs to improve relationship with CBOs. Likewise, CCN should control the operation of CBOs to promote good service and overcome the negative perception given by costumers. In this sense, it is indispensable to create a Unit for Public Awareness, Environmental Education and Community Participation, which shall deal with CBOs (main tasks: licensing, training, supervision) and with the communities to get their involvement in the SWM.

3. REVIEW OF RELEVANT STUDIES

3.1 Review of UNEP Integrated Solid Waste Management Plan

3.1.1 Goals

The goal of the UNEP Integrated Solid Waste Management Plan (UNEP ISWMP) related to public awareness and education is to build awareness and capacity for source separation as an essential component of sustainable waste management.

3.1.2 Targets

The targets of the UNEP ISWMP related to public awareness and education are as follows:

- (1) School curricula to include 4R at all levels, and relevant education materials available by the year 2013; and
- (2) Awareness among the general public about 4R at 75% by the year 2015.

3.1.3 Specific Actions for Implementation

The actions proposed to reach the above targets are as follows:

- (1) No action is proposed for the school curricula including the 4R at all levels and the elaboration of relevant educational materials;
- (2) No action is proposed to create awareness among the general public about 4R; and
- (3) Among the other actions proposed, one of them exists and is related to the recognition of partners where the formalisation and streamline of the operation of CBOs is proposed.

3.1.4 Evaluation

- (1) UNEP is targeting to include 4R in the school curricula at all levels and the development of relevant educational materials. However, no action to reach these targets has been proposed.

The present JICA MP also focuses on the schools; however, it proposes to start firstly with the development of educative materials for teachers of primary education since they lack educational tools to teach their pupils on SWM. In addition, it is proposed to train teachers of primary education on recycling aspects so they can implement it in their respective schools.

- (2) UNEP targets also to create awareness among the general public. However, no action to reach this target is proposed.

The present JICA MP also focuses on the creation of awareness among the general public through environmental education programmes on solid waste reduction, recovery at source, reuse and recycling and through implementation of mass campaign using TV and radio programmes, newspapers, pamphlets, posters, stickers and banners.

- (3) It is important to mention that this review was made on the first draft document made available to the JICA Survey Team on 17 February 2010; therefore, further review will be necessary when the document is finalised.

3.2 Review of the Previous JICA Master Plan

The previous JICA Master Plan related to public education and awareness focused on the following plans:

3.2.1 Short-Term Plan

(1) Establishment of Community Development Unit

The creation of this Unit within the DoE was recommended due to the fact that some 50% of the population of Nairobi live in informal settlements which are largely beyond the reach of conventional centralised SWM services, and that a key role of the CCN in these circumstances can be of help to facilitate the development of demand-based self-help community services in these areas. However, this Unit could not be established due mainly to the low priority given by CCN to the sector.

In the present Master Plan, the Unit for Public Awareness, Environmental Education and Community Participation (PEC Unit) is proposed to be established due to the necessity of increasing the current public awareness level of the people through environmental education in order to get their involvement in a sustainable solid waste management. In addition, this PEC Unit will promote and control the activities of CBOs for the expansion of primary collection services given by them in the low income and slum areas. High priority should be given to the creation of this Unit since on it relies the promotion of awareness raising so necessary to improve the current condition of SWM in Nairobi City.

(2) Raising of Awareness within CCN

The previous Master Plan proposed to improve the CCN's own awareness of the requirements of a new solid waste management strategy. This action could not be realised due to the low priority given to the sector.

In the present Master Plan a capacity development programme is proposed for the PEC Unit whose members shall be trained to support and control CBOs activities and implement environmental education programmes addressed to CBOs and the general public.

(3) Communication Strategy

The previous Master Plan recommended the elaboration of a communication strategy by CCN to inform the public of the measures it proposes taking to improve SWM services and of how it proposes to fund these by increasing the existing low level of charges. This action could not be realised since the measures for improvement of SWM had not been decided.

In the present Master Plan a mass campaign for public awareness raising is proposed, which shall be promoted by the PEC Unit.

(4) Public Campaign/Education

The previous Master Plan recommended to implement a public campaign/education which could not be realised since the measures for improvement of SWM had not been decided.

In the present Master Plan, the implementation of environmental education plan/mass campaign for public awareness-raising is proposed, which shall be promoted by the PEC Unit. For the mass campaign, the PEC Unit shall decide on the content of the materials to be produced, develop the programme for TV, radio and newspaper advertisement, and develop the programme for the distribution of pamphlets, posters, stickers and banners.

3.2.2 Mid-Term Plan

(1) Public Campaign/Education Focusing on Business Establishments/Recycling Industries

This plan was proposed by the previous Master Plan as a means of promoting recycling in Nairobi City and thus reducing the amount of waste to be disposed by the public. This plan also could not be implemented since the measures for improvement of SWM had not been decided.

In the present Master Plan, the implementation of an environmental education plan is proposed focusing on waste reduction, recovery at source, reuse and recycling, which shall be promoted by the PEC Unit.

3.2.3 Long-Term Plan

(1) Continuation of the Public Campaign/Education Focusing on Business Establishments/Recycling Industries

The continuation of the mid-term plan was proposed by the previous Master Plan, but it was not implemented.

In the present Master Plan, the continuation of implementing the environmental education plan is proposed focusing on waste reduction, recovery at source, reuse and recycling, which shall be promoted by the PEC Unit.

The summary of the previous Master Plan and the current one related to public education and awareness is presented in **Table F.3.1**.

3.2.4 Evaluation

The previous master plan has been compared with the master plan formulated in this survey and the result is also summarised in **Table F.3.1**.

Table F.3.1 Comparison between the Previous JICA MP and the Current JICA MP

Action Plans in Old Master Plan 1998	Actual Performance of Action Plans in Old Master Plan 1998		Proposed Action Plans in New Master Plan 2010	New Concepts to Remove Constraints in Old Master Plan 1998
	Results (Done: ●, Not done yet: × Partially done: ▲)	Cause or Constraints of "Not done yet" or "Partially done"		
Programme 5: Public Education and Awareness Plan			Programme 8: Community Participation Promotion Plan	
Short-term Plan (Old Master Plan 1998-2003 , New Master Plan 2011-2015)				
Establishment of Community Development Unit	×	Low priority given to the sector	Establishment of Unit for Public Awareness, Environmental Education and Community Participation (PEC Unit)	Technical Assistance for Capacity Development of the proposed Unit
Raising Awareness Within the CCN	×	Low priority given to the sector	Establishment of Unit for Public Awareness, Environmental Education and Community Participation	Technical Assistance for Capacity Development of the proposed Unit
Communications Strategy	×	Nothing to inform the people since the measures of improvement SWM had not been decided	Mass campaign for public awareness raising	The proposed PEC Unit shall promote these activities*
Public Campaign/Education	×	Since the measures of improvement SWM had not been decided, no public campaign/education had taken place	Implementation of Environmental Education Plan/Mass campaign for public awareness raising	The proposed PEC Unit shall promote these activities**
Mid-term Plan (Old Master Plan 2004-2007 , New Master Plan 2016-2020)				
Public Campaign/Education Focusing on Bussiness Establishments/Recycling Industries	×	Since the measures of improvement SWM had not been decided, no public campaign/education had taken place	Implementation of Environmental Education Plan focusing on waste reduction, recovery at source, reuse and recycling	The proposed PEC Unit shall promote these activities**
Long-term Plan (Old Master Plan 2008 , New Master Plan 2021-2030)				
Continuation of Public Campaign/Education Focusing on Bussiness Establishments/Recycling Industries	×	Since the measures of improvement SWM had not been decided, no public campaign/education had taken place	Continuation of Implementation of Environmental Education Plan focusing on waste reduction, recovery at source, reuse and recycling	The proposed PEC Unit shall promote these activities**

Note: *For the mass campaign, PEC Unit will decide on the content of the materials to be produced, to develop the programme for Tv, radio and newspaper advertisement and; to develop the programme for the distribution of pamphlets, posters, stickers and banners

**PEC Unit will promote environmental education in primary schools through development of textbooks for teachers, training to teachers for recycling, likewise, will promote environmental education to the residents for waste reduction, recovery, reuse and recycling

4. COMMUNITY PARTICIPATION PROMOTION PLAN

4.1 Justification

Community participation is essential for good solid waste management in the City of Nairobi. Currently observed in the city are the many illegal disposal sites where the residents indiscriminately dispose their wastes, negatively affecting public health and the environment.

The low income and slum areas aggravate this situation due to the following reasons:

- (1) Lack or poor collection services provided by CCN or private collectors. This is due mainly to the lack of roads to enter these areas or the lack of willingness to pay for the services. Under this situation, the residents discharge their waste everywhere along the streets, river banks, etc.
- (2) Lack of awareness of the people on SWM, resulting in no collaboration for the proper handling of waste.

The CBOs are the major stakeholders in providing the collection of garbage in these areas and the support for their strengthening are considered necessary to increase the rate of collection in these areas. Likewise, the implementation of environmental education programmes for the communities is indispensable to change their attitude towards the SWM.

In this connection, it is proposed that the “**Community Participation Promotion Plan**” shall focus mainly in educating the people to raise their awareness and collaboration in SWM and to strengthen the participation of CBOs to increase the collection ratio especially in the low income and slums areas.

4.2 Objective

The objective of Community Participation Promotion Plan is to raise awareness of the residents and their cooperation in solid waste management, and the strengthening/control of CBOs and waste pickers' activities.

4.3 Planning Policy

- (1) The Plan shall be formulated to promote better understanding of residents through public and school environmental education by establishing a workable implementation system within CCN; and
- (2) The Plan shall be formulated to strengthen the involvement of CBOs in the provision of collection services, especially in the informal settlements.

4.4 Strategy

(1) New Unit within the CCN

(a) Necessity of the Establishment of the New Unit

There is a necessity of establishment of a new Unit within the CCN, this is, the Unit of Public Awareness, Environmental Education and Community Participation due to the following main reasons:

- (i) The CBOs are key players in providing primary collection services of garbage to the households located in the low and slum areas, where the uncollected or illegal disposal of garbage creates unsanitary condition that affects the environment and the health of the

residents. Under this circumstance CCN needs to control and facilitate the operation of the CBOs through the new proposed Unit.

- (ii) There is a necessity of increasing the current public awareness level of the people through environmental education in order to get their involvement in a sustainable solid waste management. In this sense, on the proposed new Unit will rely the promotion of regular programmes for awareness raising to improve the current condition of SWM in Nairobi City.

(b) Main Functions of the New Unit

- (i) To control and facilitate the operation of CBOs in terms of licensing, training and supervision
- (ii) To raise the awareness of the people through environmental education initiatives in order to get their involvement as a responsible partner for the improvement of the existing SWM
- (iii) To be in charge of the implementation of the pilot project and activities described in the short, mid and long term plans

The proposed Unit should work closely with the NGOs and CBOs to maintain a strong link with them. It is proposed also that the Unit should collaborate closely with the Department of Social Services and Housing in the City Council of Nairobi (CCN).

(2) Communications Strategy

The CCN has to inform the public of the measures to be taken to improve SWM services in the city. A properly structured communications strategy is to be proposed.

(3) Public Environmental Education

A public environmental education and awareness programme should be carried out to raise public awareness to involve the public in the initiatives for better SWM in the city.

(4) Primary Environmental Education

The development of educational materials for teachers of primary education is considered essential as a tool to promote environmental education and awareness creation among the educational community. In addition, the promotion of recycling activities in the schools is a must that shall be considered.

4.5 Goals of the Community Participation Promotion Plan

4.5.1 Short-Term Plan

- Strengthening of coordination among CBOs, CCN and citizens on SWM
- Enhancement of knowledge of CBOs to improve their collection services
- Enhancement of residents' awareness to get their participation in SWM and to promote 3R
- Commencement of collection services given by CBOs with the full participation of the community
- Enhancement of knowledge of teachers and students in primary education on SWM
- Commencement of recycling in primary schools
- Commencement of composting activities by CBOs

4.5.2 Mid-Term Plan

- Proper maintenance of coordination among CBOs, CCN and citizens on SWM
- Continuation of knowledge enhancement of CBOs to improve their collection services
- Continuation of residents' awareness enhancement to get their participation in SWM and to promote 3R
- Continuation of collection services given by CBOs with the full participation of the community
- Continuation of knowledge enhancement of teachers and students in primary education on SWM
- Continuation of recycling in primary schools
- Continuation of composting activities by CBOs

4.5.3 Long-Term Plan

- Attainment of sustainable proper coordination through the establishment of a Committee among CBOs, CCN and citizens
- Attainment of a Proper CBOs Training System operated by CCN with the collaboration of trained CBOs and NGOs
- Attainment of a proper Awareness Creation System operated by CCN with the collaboration of NGOs and Resident Associations
- Attainment of Proper Training System on SWM for schools teachers and students by CCN in collaboration with KIE
- Promotion of obligatory recycling system in all Nairobi primary schools by CCN
- Establishment of the Compost Producers CBO Association which conjointly with CCN will continue promoting the insertion of more CBOs in composting activities

4.6 Plan of Operation

The Plan of Operation which includes the actions plans and the cost is presented in **Figure F.4.1**. The Plan of Operation which includes the actions plans and the general schedule is presented in **Figure F.4.2** and the summary of the action plans, the cost, the funding sources and the general schedule are presented in **Figure F.4.3**. The following topics describe the details of the plans.

4.6.1 Short-Term Action Plan

The period of the Short-term Plan is from 2011 to 2015. The components are described as follows:

(1) Establishment of the 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, particularly, from DoE or other departments, as follows: One (1) Environmental Manager; Five (5) officers for field operations with diploma as environmentalist, sociologist or public health; One (1) secretary for office works; One (1) driver for field operations; and One (1) messenger. Therefore, no additional cost will be shouldered by CCN when establishing the new PEC Unit. The table below shows the estimated cost that CCN is currently paying to the employees which will form part of the PEC Unit.

Table F.4.1 Estimated Employees' Salary Cost for PEC Unit

Position	Quantity	Monthly Salary (KSh)	Total (KSh/month)	Total (KSh/year)
Manager	1	125,000	125,000	1,500,000
Officers	5	85,000	425,000	5,100,000
Secretary	1	40,000	40,000	480,000
Driver	1	40,000	40,000	480,000
Messenger	1	35,000	35,000	420,000
Total			665,000	7,980,000

Figure F.4.3 presents the summary of the action plans, the project cost, the funding sources and the general schedule. The "CCN" written in this figure, represents the local contribution that CCN will assume in the project and in this case means the cost of paying the salary of the personnel assigned to the PEC Unit totaling KSh 7.98 million per year.

(2) Capacity Development of the New PEC Unit

Once the PEC Unit is established, its strengthening is deemed necessary in order to achieve its main functions. The capacity development of the PEC Unit is proposed to be carried out through the Technical Assistance which includes among others, the implementation of the following pilot projects: Implementation of CBOs' Waste Collection Plan; Implementation of Environmental Education Plan and; Implementation of Community Based Solid Waste Management Plan

Subcomponents include the following items:

(a) Contract with Local Consultant to Support the Activities of the PEC Unit

It is proposed to contract three (3) local assistants to support the PEC Unit in its first five (5) years with the activities of field operations and implementation of pilot projects. One (1) of these local assistants should have least ten (10) years of experience in the field of SWM with diploma as an engineer, environmentalist, sociologist or public health officer, and the other two (2) shall be assistants from NGOs.

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

The following equipment and materials are proposed: one (1) double cab car 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/cabinets; seven (7) desktop computers for office works; two (2) printers; one (1) projector with screen and notebook for field operations; one (1) audio system for field operations; and one (1) set of stationery.

(c) Formulation of Training Programme for PEC Unit Personnel

One (1) foreign technical assistant is proposed for the implementation of the training programme for members of the new PEC Unit. The contents of the training programme are detailed in **Volume 3, Supporting Report, Section B**.

(d) Formulation of CBOs' Waste Collection Implementation Plan

The Plan has to be formulated by DoE in consultation with CBOs, KARA and Nairobi residents.

(e) Formulation of Environmental Education Implementation Plan

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

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

The following activities are proposed: (i) Elaboration of Guidelines, Manuals and Standards for CBOs; (ii) Elaboration of Educational Materials for Residents; (iii) Strengthening of Coordination among CCN, CBOs and Residents; (iv) Selection of Targeted CBOs; (v) Training of CBOs; (vi) Environmental Education for Residents to get their Participation; (vii) Provision of Basic Tools to CBOs; (viii) Designation of Collection Points for CBOs; (ix) Elaboration of Collection Zone Maps of the Project for each CBO; and (x) Implementation of collection work. Explanations of each activity are presented below.

(i) Elaboration of Guidelines, Manuals and Standards for CBOs

It is proposed to contract a local consultant specialised on SWM and institutional aspects with a least of ten (10) years of experience for the development of these materials. These materials will be used for the training of CBOs. The hired consultant shall work under the supervision of the PEC Unit, DoE, and in consultation with CCN and the CBOs. The guidelines and standards shall define the operational rules of CBOs and their relationship with CCN. As for the manual, it must cover all aspects of SWM, including collection, transportation, recovery, reuse, recycling and sanitary disposal of solid wastes, as well as their relation with environmental and public health. The manual will be used for the training of CBOs on proper techniques for their best operation and to acquire the knowledge related to environmental issues and public health.

(ii) Elaboration of Educational Materials for Residents

It is proposed to produce one (1) video for adults (1 master copy and 5,000 copies) and ten thousand (10,000) pamphlets for public awareness creation. The production of these materials shall be entrusted to a local production company who shall design the materials in consultation with the PEC Unit. The video shall have fifteen (15) minutes of duration, and shall cover the current SWM in Nairobi City and the main issues to be solved with the participation of residents. As for the pamphlets, it shall cover the general aspects of the current solid waste management and how people should manage solid waste to avoid environmental pollution and health problems.

(iii) Strengthening of Coordination among CCN, CBOs and Residents

One of the issues given by the CBO participants in the workshop conducted in the frame of this Survey is related to the poor relation and coordination between CCN and CBOs. To overcome this issue and to strengthen the mutual understanding among CBOs and CCN, it is proposed to hire a technician from an NGO to assist the PEC Unit in all coordination aspects during the short-term period. The hired technician shall assist in the coordination of all actions that should be taken by the PEC Unit and addressed to the CBOs and residents such as the establishment of collection points, provision of transportation, selection of targeted CBOs, resolution of conflicts among CBOs and residents, promotion of environmental education to residents, licensing, training, and supervision.

(iv) Selection of Targeted CBOs

The PEC Unit shall select the CBOs targeted for the strengthening in order to expand the services given by them. It is proposed to select eight (8) CBOs for the short-term period in the eight (8) Divisions of Nairobi City, that is, one (1) CBO per city division. This selection shall be made from the communities willing to participate in the plan.

(v) Training of CBOs

In this pilot project, it is intended to involve eight (8) existing CBOs in SWM to cover all of the eight (8) divisions of Nairobi City. The materials produced for this pilot project under item (i) above will be used for the training of the target CBOs. This activity should be implemented by the proposed PEC Unit four (4) times a year and the venue shall be the existing public facilities located in the places where the CBOs operate such as churches, schools, etc.

(vi) Environmental Education for Residents' Participation

The participation of residents is essential for the success of the pilot project and this could be attained through educating people in order to create the necessary awareness on solid waste issues. Residents in areas where the target CBOs work shall be chosen as participants in the environmental education programme. This activity is proposed to be implemented once in every two months through workshops organised by the proposed PEC Unit in the target areas. In this activity, the elaborated materials as proposed in item (ii) above should be used. The venue shall be the existing public facilities located in the places where the CBOs operate such as churches, schools, etc.

(vii) Provision of Basic Tools to CBOs

In the CBO workshop conducted, the attendants had requested proper tools to improve their current working condition. The provision of basic tools to the targeted CBOs is proposed as an incentive for their participation in the pilot project. Among the basic tools are: handcarts, wheelbarrows, hand gloves, gum boots, brooms, dust coat, rakes, shovel, safety helmet, dust mask, first aid kit, etc. Detailed items are given in **Section F of Volume 4, Data Book**.

(viii) Designation of Collection Point for CBOs

One of the biggest problems that affront the low income and slum areas is the lack of adequate roads inside of the communities that would allow the entry of trucks for garbage collection. Due to this situation, the CBOs after making the primary collection from the households need a designated area outside of the community to store the garbage until the trucks come to transport them to the final disposal site. It is proposed that the PEC Unit in conjunction with the Planning Office of CCN take the initiative to look for an available land and make it available as the collection point. The designated collection points must be reachable by the trucks at all times. Eight (8) designated collection points will be necessary for the pilot project.

(ix) Elaboration of Collection Zone Maps of the Project for each CBO

The Unit PEC shall ask the assistance of the GIS Section of CCN to make the respective collection maps more elaborate for the use of each targeted CBO for the project.

(x) Implementation of Collection Work

Once the above items are completed, the actual implementation of collection work by the targeted CBOs shall start with the supervision of the PEC Unit.

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

(i) Development of Education Materials

It is proposed to develop environmental education materials for the teachers of primary schools, which shall include the elaboration of 2000 textbooks (with 100 pages) and 2000 videos on SWM for children (10 minutes) in public schools in Nairobi City. Each primary school shall receive one package of the materials, which shall serve as a tool for the teachers to teach SWM to their pupils. The contents of the textbook and the video shall be prepared by the PEC Unit and approved by the Kenya Institute of Education (KIE). The main contents for the textbook recommended by the JICA Survey Team are: solid waste, generation, types of solid waste, collection, transportation, recovery, reuse, recycling and sanitary disposal of solid wastes, environmental pollution due to solid waste, public health and solid waste. As for the video, it should cover the current SWM in Nairobi City and the main issues to be solved with the participation of the whole community. Once the contents of the materials are agreed, the production shall be entrusted to local producers.

This activity shall be promoted by the proposed Unit PEC before the KIE.

(ii) Training on Recycling for School Teachers

For this pilot project, it is proposed to select eighteen (18) primary schools in the eight (8) divisions plus CBD of Nairobi City; i.e., two (2) primary schools in each Division. Firstly, one teacher from each school shall be trained on recycling (18 schools/year; 4 times/year) and then the teachers will themselves implement the recycling activities together with their pupils. This activity shall be implemented and promoted by the proposed PEC Unit before the Ministry of Education.

(iii) Provision of Bins for Recycling in the Schools

Each school targeted for the pilot project (18 schools/year) shall receive four (4) bins of 50 litres each for recycling (for paper, for plastics, organic materials and for other wastes). This activity shall be promoted by the proposed PEC Unit before the Ministry of Education.

(iv) Environmental Education for Residents to Promote Waste Reduction

This activity is proposed in order to promote waste reduction by the residents. For the promotion, it is proposed to produce pamphlets on waste reduction to educate the people and to raise their awareness. The pamphlets shall be explained and distributed by the PEC Unit to the residents at the churches or other public meeting places. The contents of the pamphlet shall be decided by the PEC Unit, and it must cover the following aspects, but not limited to: how improperly managed waste affect the environment and public health; the benefits of reducing waste; and how people can contribute to this plan. The production of 10,000 units per year is proposed. The production shall be entrusted to local producers. This activity shall continue during the lifetime of the Master Plan.

(v) Environmental Education for Residents to Promote Recovery at Source

For the promotion, it is proposed to produce pamphlets on recovery at source to educate the people and to raise their awareness. The pamphlets shall be explained and distributed by the PEC Unit to the residents at the churches or other public meeting places. The contents of the pamphlet shall be decided by the PEC Unit, and it must cover the following aspects, but not limited to: how improperly managed waste affect the environment and public health; the benefits of recovering valuables at source; and how people can contribute to this plan. The production of 10,000 units per year is proposed.

The production shall be entrusted to local producers. This activity shall continue during the lifetime of the Master Plan.

The PEC Unit shall formulate a plan for the collection of valuables from the houses that are willing to exercise recovery at source. In this respect, it is proposed that the collection shall be made by the CBOs and waste pickers currently working at the Dandora dumpsite.

(vi) Environmental Education for Residents to Promote Reuse and Recycling

For the promotion, it is proposed to produce pamphlets on reuse and recycling to educate the people and to raise their awareness. The pamphlets shall be explained and distributed by the PEC Unit to the residents at the churches or other public meeting places. The contents of the pamphlet shall be decided by the Unit PEC, and it must cover the following aspects, but not limited to: how improperly managed waste affect the environment and public health; the benefits of reusing and recycling of valuable items; and how people can contribute to this plan. The production of 10,000 units per year is proposed. The production shall be entrusted to local producers. This activity shall continue during the lifetime of the Master Plan.

(vii) Mass Campaign for Raising Public Awareness

During the pilot project, it is proposed to realise a mass campaign in order to raise the awareness of people and get their cooperation and participation in SWM.

This activity shall include TV spots of 15 second in duration (5 times/week during prime time for two months/year), radio spots of 30 seconds in duration (5 times/week during prime time for two months/year), newspaper advertisements of a quarter page, in colour (5 times/week for two months/year), posters (10,000 units/year), stickers (20,000 units/year) and banners (40 units/year). These educational campaign materials shall be prepared for the creation of awareness before the implementation of projects proposed in the Master Plan.

The contents of these materials shall be decided by the PEC Unit, and must, but not limited to: the current situation of SWM in Nairobi City; the implementation of the project to overcome the current situation; and how people can participate in this project. The production shall be entrusted to local producers.

In addition, the PEC Unit shall promote clean-up campaign days (2 times/year) together with the communities willing to participate especially in the targeted areas where the CBO collection plan will be implemented.

(viii) Implementation of Community Based Solid Waste Management (Phase I)

It is proposed to construct eight (8) facilities for CBO composting, each composting facility with the production capacity of 200 kg/d; i.e., four (4) in the short time period and four (4) in the mid-term period. The targeted CBOs shall receive appropriate training for the smooth operation of the facilities.

4.6.2 Mid-Term Action Plan and Long-Term Action Plan

Basically the activities proposed in the mid- and long-term plans are the continuation of the activities described in the short-term period as Phase II and III.

After the pilot project is concluded, it is expected that the PEC Unit will continue promoting the same activities during the mid-term and long term periods. The target for CBOs and schools are the same as in the pilot stage; however, if CCN can increase the number of human resources as well as the financial

resources for the PEC Unit, then, in the process of review of the Plan that will take place by early 2016, new targets could be set and agreed upon.

4.6.3 Work Breakdown Structures (WBS) and Plans of Operation

Figures F.4.1 to F.4.3 show the action plans from 2011 to 2030 in short-, mid- and long-term, and Figure F.4.4 gives the cost and responsibilities in each action plan.

Time Framework of the Master Plan			Short-Term Plan Period																											
Year			2011				2012				2013				2014				2015											
Quarter			Q1	Q2	Q3	Q4	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-8-7-1	Elaboration of guidelnlnes, manuals and standards for CBOs																													
S-8-7-2	Elaboration of education materials for residents																													
S-8-7-3	Strengthening of coordination between CCN, CBOs and residents																													
S-8-7-4	Selection of targeted CBOs																													
S-8-7-5	Training of CBOs																													
S-8-7-6	Environmental education for residents to get their participation																													
S-8-7-7	Provision of basic tools to CBOs																													
S-8-7-8	Designation of collection points for CBOs																													
S-8-7-9	Elaboration of collection zone maps for each CBO of the project																													
S-8-7-10	Implementation of collection work																													
S-8-8	Implementation of Environmental Education Plan (I)																													
S-8-8-1	Development of educative materials																													
S-8-8-2	Training on recycling for schools teachers																													
S-8-8-3	Provision of bins for recycling in the schools																													
S-8-8-4	Environmental education for residents for waste reduction promotion																													
S-8-8-5	Environmental education for residents for recovery at source promotion																													
S-8-8-6	Environmental education for residents for reuse and recycling promotion																													
S-8-9	Mass Campaing for Raising Public Awareness																													
S-8-10	Implementation of Community-Based Solid Waste Management (I)																													
S-8-10-1	Construction of Community Composting (200kg/day)																													
S-8-10-2	Training of CBOs																													
S-8-10-3	Operation & maintenance of community composting																													
PPPP Option			Improvement of Current Contracting Out/Licensing										Improvement of Current Contracting Out/Licensing and Preparation of New Franchising CoIntract																	
SWM Organisation Type			CCN/DoE, Separate Account										CCN/DoE, Special Account														SWM Public Corporation			
Zoning System			Current Zone																											

Figure F.4.1 Plan of Operation of Community Participation Promotion Plan (Short-Term Plan)

Time Framework of the Master Plan		Mid-Term Plan Period				
Year		2016	2017	2018	2019	2020
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-8-3-1	Review of guidelines, manuals and standards for CBOs/printing					
M-8-3-2	Printing of education materials for residents for public awareness creation					
M-8-3-3	Strengthening of coordination between CCN, CBOs and residents					
M-8-3-4	Selection of targeted CBOs					
M-8-3-5	Training of CBOs					
M-8-3-6	Environmental education for residents to get their participation					
M-8-3-7	Provision of basic tools to CBOs					
M-8-3-8	Designation of collection points for CBOs					
M-8-3-9	Elaboration of collection zone maps for each CBOs of the project					
M-8-3-10	Implementation of collection work					
M-8-4	Implementation of Environmental Education Plan (II)					
M-8-4-1	Development of educative materials					
M-8-4-2	Training on recycling for schools teacher					
M-8-4-3	Provision of bins for recycling in the schools					
M-8-4-4	Environmental education for residents for waste reduction promotion					
M-8-4-5	Environmental education for residents for recovery at source promotion					
M-8-4-6	Environmental education for residents for reuse and recycling promotion					
M-8-5	Implementation of Community-Based Solid Waste Management (II)					
M-8-5-1	Construction of Community Composting (200kg/day)					
M-8-5-2	Training of CBOs					
M-8-5-3	Operation & maintenance of community composting					
PPPP Option		Zone-wise Franchising Contract (Phase 1)				
SWM Organisation Type		SWM Public Corporation				
Zoning System		New Zone (3 Zones)				

Figure F.4.2 Plan of Operation of Community Participation Promotion Plan (Mid-Term Plan)

Time Framework of the Master Plan		Long-Term Plan Period									
Year		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
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-8-3-1	Review of guidelines, manuals and standards for CBOs/printing										
L-8-3-2	Printing of education materials for residents for public awareness creation										
L-8-3-3	Strengthening of coordination between CCN, CBOs and residents										
L-8-3-4	Selection of targeted CBOs										
L-8-3-5	Training of CBOs										
L-8-3-6	Environmental education for residents to get their participation										
L-8-3-7	Provision of basic tools to CBOs										
L-8-3-8	Designation of collection points for CBOs										
L-8-3-9	Elaboration of collection zone maps for each CBOs of the project										
L-8-3-10	Implementation of collection work										
L-8-4	Implementation of Environmental Education Plan (III)										
L-8-4-1	Development of educative materials										
L-8-4-2	Training on recycling for schools teacher										
L-8-4-3	Provision of bins for recycling in the schools										
L-8-4-4	Environmental education for residents for waste reduction promotion										
L-8-4-5	Environmental education for residents for recovery at source promotion										
L-8-4-6	Environmental education for residents for reuse and recycling promotion										
L-8-5	Implementation of Community Based Solid Waste Management (III)										
L-8-5-1	Operation & maintenance of community composting										
PPPP Option		Zone-wise Franchising Contract (Phase 2)					Zone-wise Franchising Contract (Phase 3)				
SWM Organisation Type		SWM Public Corporation									
Zoning System		New Zone (6 Zones)					New Zone (9 Zones)				

Figure F.4.3 Plan of Operation of Community Participation Promotion Plan (Long-Term Plan)

Programme No.	WBS No.	WBS	Legal Action (Required=●)	Name of Act/Regulation/By-law	Budgetary Arrangement (Required=●)	Total Budget (Thousand KSh)	Responsibility Assignment Matrix: M=Main Responsibility, S=Sub Responsibilities. B=Budgetary Arrangement, L=Legal Action, P=Participation In Discussio																			
							CCN/Dept. of Environment	CCN/Dept. of Treasury	CCN/Dept. of Procurement	CCN/Dept. of Human Resources	SWM Peraparatory Committee	SWM Coporration	MoLG	MoNMD	NEMA	Office of Deputy Prime Minister and MoF	KRA	Donor Organisations	Private Contractors	Private Lencensed Collectors	Recyclers	CBOs	Waste Pickers	PAPs around Dandora Dumping Site	PAPs around New Dumping Site	Nairobi Citizens
Programme 8: Community Participatpon Promotion Plan																										
Short-Term Plan																										
S-8-1		Establishment of PEC Unit	●			CCN	M		S																	
S-8-2		Contract with Local Consultants for Support on PEC Unit				25,536	P		P									M								
S-8-3		Procurement of Equipment & Materials for PEC Unit				7,650	P		P									M								
S-8-4		Formulation of Training Programme for PEC Unit Personnel			● Foreign		P		P									M								
S-8-5		Formulation of CBOs' Waste Collection Implementation Plan				CCN	M											P				P			P	
S-8-6		Formulation of Environmental Education Implementation Plan				CCN	M											P			P				P	
S-8-7		Implementation of CBOs' Waste Collection Plan (I)				13,811	M											P			P				P	
S-8-8		Implementation of Environmental Education Plan (I)				7,732	M											P			P				P	
S-8-9		Mass Campaing for Raising Public Awareness				92,690	M	S					S	S	P		P								P	
S-8-10		Implementation of CBSWM (I)				38,599	M										S				S					
		Sub-Total				186,018																				
Mid-Term Plan																										
M-8-1		Review of CBOs' Waste Collection Implementation Plan				CCN	M											P			P				P	
M-8-2		Review of Environmental Education Implementation Plan				CCN	M											P			P				P	
M-8-3		Implementation of CBOs' Waste Collection Plan (II)				4,863	M											P			P				P	
M-8-4		Implementation of Environmental Education Plan (II)				8,915	M											P			P				P	
M-8-5		Implementation of CBSWM (II)				51,786	M											S			S					
		Sub-Total				65,564																				
Long-Term Plan																										
L-8-1		Review of CBOs' Waste Collection Implementation Plan				CCN	M											P			P				P	
L-8-2		Review of Environmental Education Implementation Plan				CCN	M											P			P				P	
L-8-3		Implementation of CBOs' Waste Collection Plan (III)				9,726	M											P			P				P	
L-8-4		Implementation of Environmental Education Plan (III)				17,830	M											P			P				P	
L-8-5		Implementation of CBSWM (III)				49,200	M											S			S					
		Sub-Total				76,756																				
		Grand Total				328,338																				

Note: (a) The new PEC Unit will be established with the current staff of CCN; (b) In the table CCN means the local contribution of CCN to the project by paying the salary of the staff of the new PEC Unit.

Figure F.4.4 Cost and Responsibilities of Community Participation Promotion Plan

REFERENCES

1. Ministry of Education: Education Facts and Figures, 2002-2008, June 2009, page 13.
2. KKV Programme: Programme Brief, page 2-11; Manual on the KKV Programme, page 8.
3. NEMA at a Glance, pages 15 and 24.
4. Document presented by Practical Action in the Seminar organised by the JICA Survey Team and CCN on Solid Waste Management on December 7, 2009
5. Background Information to Tenga Taka Tuimariki (Separation of Waste for Prosperity) Project
6. Document presented by KARA in the Seminar organised by the JICA Survey Team and CCN on Solid Waste Management on December 7, 2009.
7. Direct interview with an executive of Destiny Africa
8. State of Environment Report 2004, page 204.
9. Document presented by Riruta Environmental Group in the Seminar organised by the JICA Survey Team and CCN on Solid Waste Management on December 7, 2009, page 8.
10. Document presented by Riruta Environmental Group in the Seminar organised by JICA Survey Team and CCN on Solid Waste Management on December 7, 2009, page 9.