



**MINISTRY OF LOCAL DEVELOPMENT
HIS MAJESTY'S GOVERNMENT OF NEPAL**



**JAPAN INTERNATIONAL
COOPERATION AGENCY**

ACTION PLAN ON SOLID WASTE MANAGEMENT

September 2005



Kathmandu Metropolitan City

Action Plan on Solid Waste Management of Kathmandu Metropolitan City

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Abbreviations

<Organizations>

BKM	Bhaktapur Municipality
CBO	Community Based Organization
CMU	Community Mobilization Unit
HMG/N	His Majesty's Government of Nepal
JICA	Japan International Cooperation Agency
KMC	Kathmandu Metropolitan City
KRM	Kirtipur Municipality
LSMC	Lalitpur Sub-Metropolitan City
MOLD	Ministry of Local Development
MTM	Madhyapur Thimi Municipality
NGO	Non Governmental Organization
SWMS	Solid Waste Management Section (KMC)
SWMRMC	Solid Waste Management and Resource Mobilization Center
T/F	Task Force
TWG	Technical Working Group

<Metric Units>

g	Gram
g/L	Gram per liter
ha	Hectare
kg	Kilogram
kg/day	Kilogram per day
kg/d-capita	Kilogram per day per capita
km	Kilometre
km ²	Square Kilometer
L	Liter
mm	Millimeter
m ²	Square Meter
m ³	Cubic Meter
mg/L	Milligram per liter
m	Meter
t	Ton
t/d	Ton per day

<Currency>

JPY	Japanese Yen
Rs	Nepalese Rupee
US\$	US Dollar

<Others>

A/P	Action Plan
BCC	Behavior Change Communication
CEO	Chief Executive Officer
CKV	Clean Kathmandu Valley
CRC	Community Recycling Center
CSO	Civil Society Organization
EIA	Environmental Impact Assessment

FY	Fiscal Year
HH	Household
HRD	Human Resource Development
LF	Landfill
L/T	Long-term
LFS	Landfill site
M&E	Management and Evaluation
OFP	Overall Facility Plan
OVI	Objectively Verifiable Indicators
PSO	Private Sector Organization
PPP	Public-Private Partnership
PR	Public Relations
S/T	Short-term
STV	secondary transportation vehicle
SW-C	Solid Waste Compost
SWM	Solid Waste Management
T/S	Transfer Station
UGR	unit generation rate
VDC	Village Development Committee
WPF	waste processing facility

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

Solid waste management (SWM) in The Kathmandu Valley faces great challenges not only in relation to the management system but also in gaining public awareness and participation of the people. In order to improve the current situations, His Majesty's Government of Nepal (HMG/N) and the Government of Japan have launched on a joint study titled "The Study on the Solid Waste Management for the Kathmandu Valley (the Study)" with the technical assistance of the Japan International Cooperation Agency (JICA). The Study commenced in January 2004 (Magh 2060¹) and ran for a total of 20 months until August 2005 (Bhadra 2062).

1.2 Objectives of the Study

The objectives of the Study were;

1. To formulate Action Plans (A/Ps) on solid waste management for five municipalities in the Kathmandu Valley, namely Kathmandu Metropolitan City (KMC), Lalitpur Sub-Metropolitan City (LSMC), Bhaktapur Municipality (BKM), Madhyapur Thimi Municipality (MTM), and Kirtipur Municipality (KRM), and
2. To pursue technology transfer regarding SWM for the Nepalese counterpart (C/P) personnel.

Through the formulation of the A/Ps, which aimed to strengthen management capability for the solid waste of each municipality and encourage public participation for solid waste management, the management ratios² of solid waste are expected to increase, toward the target year of 2015. In particular, capacity development of the Nepalese C/P personnel for planning and management of solid waste was carried out over the study period, which included the implementation of a series of pilot projects.

1.3 Study Area

The Study covered the jurisdiction of the five municipalities in the Kathmandu Valley, namely KMC, LSMC, BKM, MTM and KRM. In addition, "Okharpauwa" where a landfill site is proposed was also covered.

¹ Nepalese Year

² Management ratio is the ratio of "the quantity of waste" that is managed by waste generators or municipalities in the appropriate ways such as source reduction, recycling, appropriate collection, treatment and disposal after it has been generated from the sources to "the total quantity of generated waste".

1.4 Target of the Study

In the Study, solid waste was broadly classified into four categories by generation source, i.e. 1) Municipal solid waste, 2) Industrial solid waste, 3) Medical solid waste, and 4) other solid waste including agricultural and construction waste.

The target solid waste of the Study was mainly municipal solid waste, non-hazardous waste that would be collected by the Municipality. However, the Study also made recommendations for industrial, medical and other solid wastes, but the management of night soil was not included in the Study.

1.5 Organization and Staffing of the Study

The Study established three implementation organizations on the Nepalese side, which are the Steering Committee (ST/C), Technical Working Group (TWG) and Task Force (T/F). The implementation organizations of the Study and their roles, tasks and members are shown in Figure 1.5-1 and Table 1.5-1, respectively.

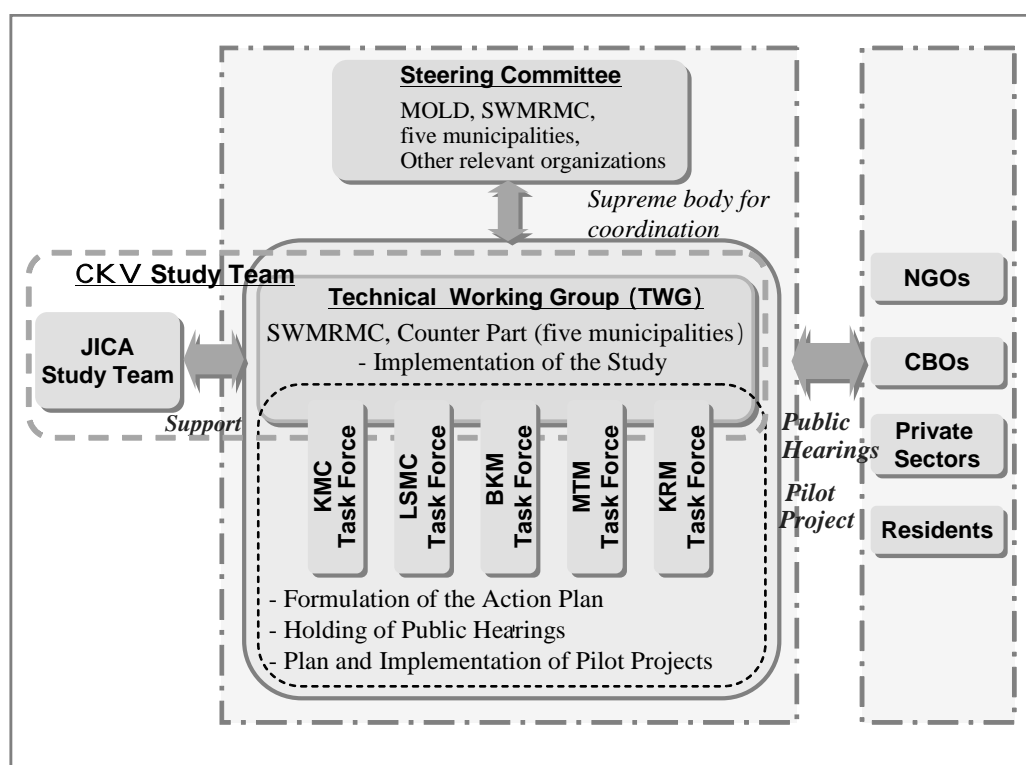


Figure 1.5-1 Implementation Organization of the Study

Source: JICA Study Team

Table 1.5-1 Roles, Tasks and Members of Organizations of the Study

Organi- zation	Roles	Tasks	Members
ST/C	Coordination of relevant organizations	<ul style="list-style-type: none"> - To confirm the overall policies and progress of the Study - To confirm and approve the contents of the reports to be submitted to the Nepalese side by the JICA Study Team - To discuss and approve the contents of the action plan to be prepared during the Study and to make a commitment to implement the action plan as policy makers - To coordinate the concerned organizations for SWM in the Kathmandu Valley and exchange information and opinions between the organizations of central and local governments 	<ul style="list-style-type: none"> - Ministry of Local Development (MOLD) - SWMRMC - Five municipalities - Ministry of Environment, Science and Technology (MOEST) (formerly MOPE) - Ministry of Physical Planning and Works (MOPPW) - Ministry of Industry, Commerce and Supplies (MOICS) - Ministry of Education and Sports (MOES) - Ministry of Agriculture and Cooperative (MOAC) - Ministry of Health and Population (MOHP) - Members of TWG (as observers)
TWG (C/P)	Implementation of capacity development and technology transfer from the JICA Study Team	<ul style="list-style-type: none"> - To carry out the Study together with the JICA Study Team. - To prepare necessary documents and materials which are to be discussed at the ST/C - To organize and operate a T/F 	<ul style="list-style-type: none"> - MOLD - SWMRMC - Staff of KMC - Staff of LSMC - Staff of BKM - Staff of MTM - Staff of KRM
T/F	Coordination of opinions within the relevant departments, formulation of action plan, formulation and implementation of pilot projects	<ul style="list-style-type: none"> - To formulate an Action Plan of the municipality and conduct pilot projects under the support from the JICA Study Team. - To coordinate opinions among the relevant sections of each municipality - To carry out Public Hearings with an aim to collect opinions from the residents 	<ul style="list-style-type: none"> - Members of TWG - Planning relevant section - Environmental and Public Relations relevant sections - Community mobilization/development section - Financial section - NGOs/CBOs - Private sectors - Intellectuals

Source: JICA Study Team

1.6 Acronym and Slogan of the Study

Based on the discussions of the TWG members, the Study adopted the acronym “CKV” which stands for “Clean Kathmandu Valley” to make the Study easier to promote and to be identifiable by relevant organizations and residents of the Kathmandu Valley as part of the public relations activities.

The Study also put up a slogan, “Sapha Sahar Hamro Rahar” in Nepalese, which means “clean city is our desire”.

Both the acronym and slogan have been spreading gradually by relevant organizations.

CHAPTER 2 CONDITIONS OF MUNICIPAL SOLID WASTE MANAGEMENT OF KATHMANDU METROPOLITAN CITY

2.1 Outline of Kathmandu Metropolitan City

Kathmandu Metropolitan City (KMC) is the capital city of the Kingdom of Nepal and is also the only city designated a metropolitan city in Nepal so far, which has 13 departments and 33 sections. The city is spread over an area of about 50 km² and it is divided into 35 wards administratively. KMC is listed in the world heritage list for its cultural, archeological and historical significances.

It is estimated that nearly 700,000 inhabitants lived inside the city in 2004 based on the national census data showing 672,846 population in 2001. Because of present conflict in the nation, people from all over the country are believed to be migrating into the capital at a greater extent, which has increased its population drastically. Rapid population growth and haphazard urbanization are causing SWM to become excessively challenging and difficult to accomplish successfully at this moment.

Its major industries are tourism, handicrafts, garments and cottage factories whereas big industries do not exist within the metropolitan boundary. It is believed that per capita income of the capital city is considerably higher than the national per capita income, which amounts to US\$360. Besides that, most educational institutes like colleges and universities with health institutions such as 10 hospitals and 16 nursing homes are situated inside the city.

2.2 Waste Generation and Stream

(1) Waste Quantity

TWG members of KMC summarized the current situations of waste quantity as follows.

Estimated Population:	701,962
Waste Generation:	700,000 liter/day
Per capita Generation:	1 liter/day-capita
Commercial Waste:	70 liter/day
Street Waste:	70 liter/day
Waste from VDCs:	70 liter/day
Total Waste Collected:	800,000 liter/day (800 m ³ /day)

In the course of the Kathmandu Valley Mapping Program (KVMP), a few studies were carried out and as per that waste sampling, it has been found that waste density is around 0.225 ton/m³.

The JICA Study Team conducted the waste quantity survey at the various generation sources in KMC sampling 40 households, 15 commercial establishments like hotels, restaurants or offices and 5 points in the streets in April 2004 during the dry season. The result of the waste quantity survey of households in KMC is shown in Table 2.2-1. About one liter of waste per person per day with 230 to 250 g/liter of bulk density are generated on average.

Table 2.2-1 Result of Daily Waste Generation Quantity Survey of Households (KMC: Dry Season)

Income Level	Weekdays			Weekend		
	Waste generation per person weight (g)	Waste generation per person volume (L)	Bulk density (g/L)	Waste generation per person weight (g)	Waste generation per person volume (L)	Bulk density (g/L)
High	318	1.1	289	241	1.0	241
Middle	208	0.8	260	229	1.0	229
Low	159	0.8	199	222	1.0	222
Average	223	0.9	248	231	1.0	231

Source: JICA Study Team

From commercial areas, it was observed in the dry season survey that 139 kg/day of waste was generated at the Grand Hotel with 286 g/litter of bulk density, and 2.5 to 7.4 kg/day was generated from each surveyed restaurant with 400 to 610 g/litter of bulk density. From each selected office, 0.3 to 5.1 kg/day of waste were generated with 60 to 1,020 g/litter of bulk density. In the street, about 22.3 kg of waste are collected per day per each 100 m and bulk density was 380 g/litter.

In September 2004, a second large scale waste quantity survey was conducted during the wet season in KMC sampling 400 households, 120 commercial establishments and 15 points in the street. The result of this detail waste quantity survey is shown in Table 2.2-2.

Table 2.2-2 Result of Daily Waste Generation Quantity Survey of Households (KMC: Wet Season)

Income Level	Weekdays			Weekend		
	Waste generation per person weight (g)	Waste generation per person volume (L)	Bulk density (g/L)	Waste generation per person weight (g)	Waste generation per person volume (L)	Bulk density (g/L)
High	332	1.53	217	287	1.35	213
Middle	240	1.51	159	261	1.12	234
Low	180	1.15	156	153	0.93	164
Average*	248	1.43	174	241	1.13	213

N/A: Not available at the moment

Note: * This is the average for only the surveyed household, it does not reflect the actual dispersion of income levels

Source: JICA Study Team

Figure 2.2-1 shows the frequency distribution of the unit generation rate (UGR) at different income levels of surveyed households. A large peak UGR for total surveyed households is shown around 100 to 150 g/day-capita and small peaks on 450 g/day-capita and 600 to 850 g/day-capita. The peak for low income households tends to appear around 100 g/day-capita, which is smaller than that for mid and high income households. It is also shown that high income households have a wide range of peaks from 100 to 850 g/day-capita.

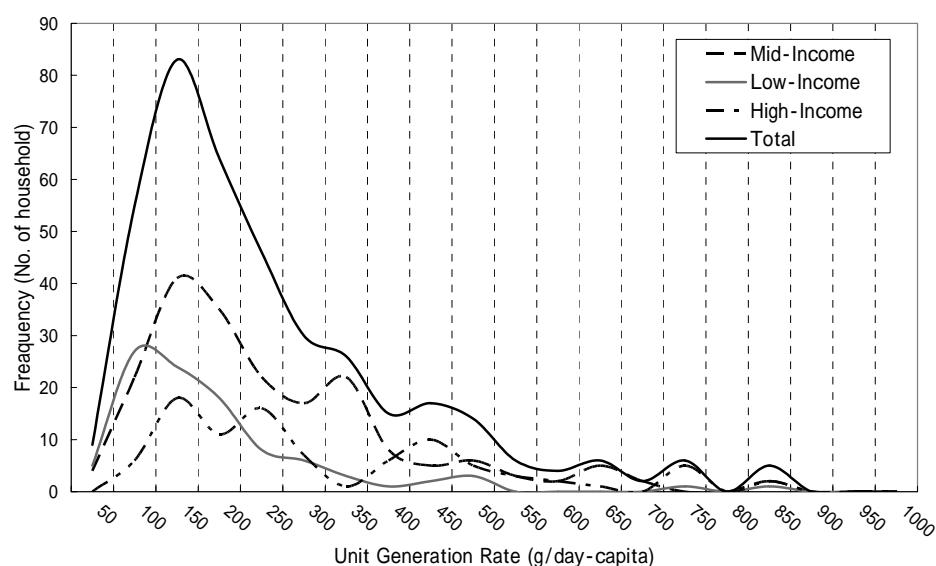


Figure 2.2-1 Frequency Distribution of UGR of Households in KMC

Source: JICA Study Team

(2) Waste Quality

Waste qualities given by TWG members of KMC and surveyed by the JICA Study Team in the dry season are shown in the following table. From households, about 70% is kitchen waste and plastic and paper items represent around 10%. The organic portion at hotels and restaurants fluctuated greatly. Almost 90% of waste generated from markets is organic. Offices are large generators of paper waste. Offices are large generators of paper waste.

Table 2.2-3 Waste Quality (KMC: Dry Season)

Items	Households		Hotels and Restaurants	Markets	Offices	Streets**
	TWG data	Study				
Kitchen waste	68%	72.4% (70.9%)	30.8% (75.2%)	90.1% (91.0%)	50.0% (22.4%)	- (51.3%)
Paper	8%	11.5% (8.1%)	29.1% (10.5%)	0.0% (0.0%)	20.6% (47.8%)	- (7.7%)
Textile	-	2.8% (1.5%)	0.0% (0.0%)	0.0% (0.0%)	0.0% (0.0%)	- (2.1%)
Wood/leaves	-	3.1% (1.8%)	0.0% (0.0%)	0.0% (0.0%)	0.0% (0.0%)	- (8.1%)
Plastic	11%	7.6% (14.2%)	19.8% (4.5%)	2.0% (2.4%)	4.4% (17.9%)	- (9.0%)
Rubber/leather	-	2.2% (0.0%)	0.0% (0.0%)	0.0% (0.0%)	1.0% (0.0%)	- (0.8%)
Metal	-	0.4% (0.0%)	5.2% (6.8%)	0.0% (0.0%)	0.6% (0.0%)	- (1.7%)
Glass	2%	0.0% (2.5%)	14.0% (3.0%)	0.0% (0.0%)	23.5% (0.0%)	- (0.6%)
Ceramics	-	0.0% (1.2%)	1.2% (0.0%)	0.0% (0.0%)	0.0% (0.0%)	- (0.4%)
Others	11%*	0.0% (0.0%)	0.0% (0.0%)	7.9% (7.3%)	0.0% (11.9%)	- (18.3%)

Items	Households		Hotels and Restaurants	Markets	Offices	Streets**
	TWG data	Study				
Bulk density	225 g/L	248 g/L (231 g/L)	440 g/L (477 g/L)	312 g/L (476 g/L)	396 g/L (265 g/L)	- (380 g/L)
Water content	-	55.0% (59.0%)	58.0% (72.0%)	75.0% (69.0%)	51.0% (40.0%)	- (62.0%)

Note: Lower numerical value in parenthesis is data on weekends and upper on weekdays

Total value of each composition is not always 100% because each one was rounded off.

* KMC shows 6% for “inorganic” and 5% for “others”

** Street waste on weekdays was not analyzed.

Source: JICA Study Team

Table 2.2-4 shows the result of the wet season survey. There is not much change from the dry season except the contents of kitchen waste from markets. Paper and plastic quantities generated by markets and offices are also greater than the other season.

Table 2.2-4 Waste Quality (KMC: Wet Season)

Items	Households	Hotels and Restaurants	Markets	Offices	Streets
Kitchen waste	71.1% (65.1%)	67.9% (60.7%)	7.9% (8.4%)	49.6% (27.3%)	58.5% (61.3%)
Paper	9.2% (10.6%)	10.0% (19.4%)	40.9% (70.5%)	32.8% (46.6%)	16.5% (19.3%)
Textile	2.4% (1.7%)	0.0% (1.0%)	4.7% (1.3%)	1.6% (1.5%)	0.0% (0.0%)
Wood/leaves	3.1% (6.0%)	0.2% (0.8%)	0.0% (0.0%)	0.4% (10.4%)	5.1% (4.3%)
Plastic	6.5% (8.0%)	12.0% (11.0%)	14.5% (7.3%)	14.7% (12.8%)	13.2% (4.8%)
Rubber/leather	0.0% (0.0%)	0.0% (0.0%)	0.0% (0.2%)	0.0% (0.0%)	0.0% (0.0%)
Metal	0.6% (0.6%)	1.1% (0.8%)	2.6% (1.1%)	0.8% (0.8%)	1.0% (0.4%)
Glass	5.1% (6.5%)	4.5% (0.9%)	29.1% (5.4%)	0.2% (0.0%)	1.7% (1.1%)
Ceramics	0.0% (0.4%)	4.4% (5.1%)	0.0% (1.4%)	0.0% (0.0%)	0.0% (0.0%)
Others	2.0% (1.1%)	0.0% (0.3%)	0.2% (4.5%)	0.0% (0.6%)	4.1% (8.9%)
Bulk density	174 g/L (213 g/L)	440 g/L (477 g/L)	312 g/L (476 g/L)	396 g/L (265 g/L)	292 g/L (400 g/L)
Water content	64.7% (65.5%)	57.7% (59.3%)	12.9% (11.7%)	40.1% (38.72%)	52.8% (54.1%)

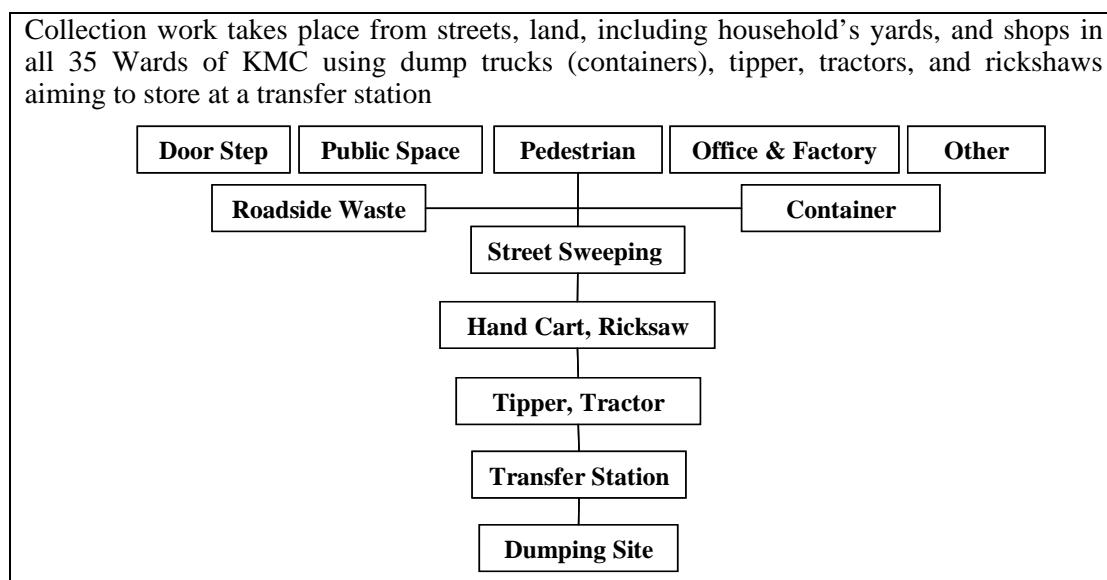
Note: Lower numerical value in parenthesis is data on weekends and upper on weekdays

Total value of each composition is not always 100% because each one was rounded off.

Source: JICA Study Team

2.3 Collection and Transportation

TWG members of KMC summarized the current situation of waste collection and transportation as follows:



KMC has around 950 street sweepers and most of them are allocated to ward offices and conduct a single daily sweeping except Wards 1, 13 and 24, which are done in two shifts, a 5:00 a.m. to 7:00 a.m. morning shift and 7:00 p.m. to 10:00 p.m. night shift. Only in the city area is there another shift from 1:00 p.m. to 4:00 p.m. In Wards 1, 13 and 24, street sweepings are fully managed by authorized private sectors.

Residents normally deposit their waste at a designated location on the roadside or in a public container. Those wastes are picked up by KMC or private sectors and transported to Teku Transfer Station (T/S) or Bagmati River dumping site. Recently, private sectors have started conducting door-to-door collection of waste in many wards, collecting the waste from the generation sources directly and transport it to the designated waste collection points including Teku T/S. The door-to-door collection services usually use tricycles or rickshaws for collection of waste. The private sector collectors charges about Rs 75 per month to the households, but some unauthorized organizations cause irregular collection, illegal dumping or other problems by making money the quick way. On the other hand, some people still discharge their waste in vacant plots or other public areas such as nearby river banks.

Teku T/S is located in Ward 12 in the southern part of the city next to the confluence of Bagmati and Bishnumati Rivers. According to the KMC records, Teku T/S currently receives approximately 400 m³ or 100 tons of waste per day. This waste is unloaded on to a concrete ground where waste pickers go through it to collect recyclables.

At the final disposal site, approximately 1,000 m³ or 250 tons of waste per day are disposed of from both KMC (200 tons) and LSMC (50 tons) according to the KMC records for three months in 2003 (in the Nepalese Calendar from Kartik to Poushr, 2060). In this period, disposed waste quantity fluctuated, there was less on weekends and more after holidays, and the maximum daily quantity was estimated to be 365 tons and the minimum was 98 tons.

In the two-day waste quality survey under the Study at the facilities in April 2004, about 275 to 300 tons of waste were disposed of at Bagmati River dumping site, of which 125 to 140 tons were handled through Teku T/S.

The table below shows the existing waste collection and transportation equipment available to KMC.

Table 2.3-1 Vehicles Available to KMC for SWM Works

S.No.	Equipment	Pay Load in m ³	Total Units	Year of Operation	Remarks
1 For Primary Collection					
1.1	Hydraulic Tipper (Mitsubishi Canter)	3.0	15	1993	
1.2	Dumper Placer (DCM Toyota)	4.0	8	1994	Donated by Govt. of India
1.3	Dumper Placer (Ashok Leyland)	6.0	4	1994	Donated by Govt. of India
1.4	Dumper Placer (Tata)	4.5	2	1988	One unit not working
1.5	Multi Compactor	6.0	1	1997	Japanese
1.6	Tractor	1.7	37	1988	Chinese
1.7	Multi Compactor	4.0	2	-	One unit not working
1.8	Hydraulic Tipper (Swaraj Mazda)	4.5	10	2002	
2 For Secondary Transportation					
2.1	Multi Compactor (Ashok Leyland)	14.0	7	1994	Donated by Govt. of India
2.2	Roll-off Tipper (M. Benz)	20.0	2	1988	One unit not working

Source: KMC,2004

Table 2.3-2 shows the summary of the results of the Time and Motion survey conducted by the JICA Study Team on April 12, 14 and 15, 2005 on 12 selected routes. This indicates that the average speed of a tractor and rickshaw, which is a tri-cycle and mini truck is lower than the others. Considering the returning speed, tri-cycle and tractor is also not lower than others.

Table 2.3-2 Tentative Result of Time and Motion Survey in KMC

Equipment	Average Collection/ Dumping Time in min	Total Distance Travel in km	Average Speed of Vehicle in moving km/hr	Average Speed of vehicle*	Return Distance in km	Average Speed on Return km/hr	Total Time for One Trip in min
Compactor	3.8	8.6	13.6	5.0	5.4	20.3	57.7
Tipper	7.5	12.0	16.4	9.9	5.8	17.8	71.0
Tractor	5.5	5.9	9.3	4.1	5.7	13.0	70.0
Rickshaw	8.4	1.7	5.2	1.4	1.3	5.9	41.2
Mini Truck	20.8	10.8	14.6	4.2	5.2	19.3	81.3

Note: *this includes collection and dumping time

Source: JICA Study Team

Since February 2005, KMC has shifted the waste collection system to the night/early morning shift from the former daytime collection in order to complete collecting the waste by 7:00 a.m. every day. Automatically, waste transferring at Teku T/S and waste disposal at Bagmati River dumping site are also conducted at night or early morning. Despite the fact that some bewilderment or difficulties occurred at the beginning days of this new collection shift, KMC has been contriving various measures to improve the collection efficiency such as introduction of bell/siren collection and setting up lighting on the truck.


2.4 Solid Waste Minimization Activities

(1) Composting

The Community Mobilization Unit (CMU) with five staff has taken a great role in community based waste minimization activities in KMC, and has promoted household level

composting activities mainly by distributing 100-liter compost bins. The home composting activity of KMC is summarized in Table 2.4-1. Almost 1,400 households have been provided home compost bins with technical training by CMU so far. The fruits of the promotional activities have been getting steadily more manifested.

Table 2.4-1 KMC/CMU Home Composting Activity

No.	Items	Contents
1.	Composting method	100 liters compost bin 
2.	Starting time	Year 2002
3.	No. of implementing households	About 1,400 households
4.	Composting duration	40 to 60 days
5.	Price of compost bin	Selling price Rs 700 (Total cost is Rs 1,000 and Rs 300 is subsidized by KMC)
6.	Installation location of compost bin	Rooftop or garden
7.	Purchasing price of compost	5-6 Rs/kg

Source: JICA Study Team

CMU has also promoted vermi-composting activities by providing a set of vermi-composting kit including 300 worms, worm bed, a bucket and three-hour training by CMU for Rs 500. So far 100 households have already taken the kit and started the vermi-composting at their house. In addition, several NGOs/CBOs have promoted the home composting activities including vermi-composting. They have also provided their own compost bins and/or kits for composting activities. Most of the compost produced by each household is consumed for of their own garden. The rest of the products are purchased by municipalities or NGOs/CBOs in the market or at NGO/CBO offices in sacks.

At the community level, only one community composting facility has been operating and compost has been produced and on sale favorably since September 2003, as shown in Table 2.4-2. The reasons why this community composting is well managed are as follows:

- The O&M cost for the composting facility can be managed because the implementing NGO is collecting a tariff for door-to-door waste collection service from residents.
- The operation worker (waste collector) is motivated to continue daily works because they can obtain cash income by separating and selling recyclable materials at the site.

Table 2.4-2 Community Composting Activity by NGO in KMC

No	Items	Contents
1.	Composting method	3,000 liter compost vessel
2.	Starting time	September 2003
3.	No. of implementing households	About 100 households
4.	Waste collection	Door-to-door collection by NGO (mixed waste)
5.	Waste separation	Site separation by waste collector (recyclable materials shall be sold)
6.	Operation & Maintenance of the composting facility	NGO manage all O&M works through waste collection to harvest of compost (Sagarmatha Environmental Development)
7.	Composting duration	Two and a half to three months
8.	Selling price for compost	8 Rs/kg

Source: JICA Study Team

Under the support of GTZ, a composting facility had been operating in the yard of Teku T/S since 1986 as mentioned in Table 2.4-3. However, it was closed in 1990 due to the public objection to offensive odors. Currently, only facilities for the screening process remain. In Teku T/S, the former fermentation field is used as a storage yard for recovered materials. During its operation, although a few impurities such as broken pieces of glass got included, the produced compost was purchased and used by surrounding farms.

Table 2.4-3 Operational Record of Teku Composting Facility 1986-1990

No.	Items	Contents
1.	Composting method	Semi-mechanical field heaping method
2.	Operating period	Year 1986 to 1990
3.	Waste disposal amount	about 15 to 30 tons/day
4.	Waste collection	Collected by municipality
6.	Waste separation	Collected by waste pickers at the site
7.	Operation & maintenance of the composting	Operated by municipality
8.	Composting duration	Two and a half to three months
9.	Selling price for compost	250 Rs/m ³ (Cost 600 Rs/m ³)

Source: JICA Study Team

(2) Recycling

1) Recycling by Independent Recyclers and Kabadi Shops

Most of the recyclable materials are collected by independent recyclers from waste generation points, i.e. mainly households, industrial enterprises, commercial enterprises and institutions. Independent recyclers are registered with Nepal Recycle Producer Association (NEREPA), an association of buyers of recyclable materials. Recyclable materials collected by independent recyclers are carried to kabadi shops, of which 250 shops are in operation in KMC, then the kabadi shops resell the collected recyclable materials to larger-scale wholesalers called “kabadi centers”, of which more than three dozen centers are recorded within KMC as presented in the following Table 2.4-4.

Table 2.4-4 List of Major Scrap Dealers in KMC (kabadi centers)

No.	Name of Shop Owner	Location (Ward)
1.	Chun Chun	Balkhu - 14
2.	Nand Kishor	Kuleshwor - 14
3.	Ram Bilas	Tahachal - 13
4.	Sanjaya Saha	Bhurungkhel - 15
5.	Uma Shankar	Dallu - 15
6.	Shameshwor	Chetrapati - 17
7.	Mahesh	Samakhusi - 29
8.	Bindeshwor	Samakhusi - 29
9.	Ganesh Dinesh	Kalanki - 14
10.	Jyodhda Bhagat	Balaju - 16
11.	Sunil Prasad	Balaju - 16
12.	Kadel Ji	Balaju - 16
13.	Sanjaya Rambalak Yadav	Balaju - 16
14.	Nirmal Lama	Samakhusi - 29
15.	Laxman	Maharajgunj
16.	Ramanand P.	Dhumbarahi
17.	Amar	Naxal - 1
18.	Krishna Prasad	Bishal Bazaar - 5
19.	Bhushan	Bhatbhateni - 5
20.	Bijaya Pramod	Chabhil - 7
21.	Nand Lal	Mitrapark - 7
22.	Nawal Pramod	Chuchepati - 6
23.	Umesh Chaudhari	Jorpati - 6
24.	Min Bahadur	Baudha - 6
25.	Abodh Kishor	Dillibazaar - 32
26.	Shameshwor	Maitidevi - 32
27.	Budhan	Baneshwor - 10
28.	Jeebacha	Baneshwor - 10
29.	Ram Kumar Khadka	Baneshwor - 10
30.	Ram Yekpal Raya	Anam Nagar - 32
31.	Newa Ji	Baneshwor - 10
32.	Suresh	Baneshwor - 10
33.	Ram Aayodhya	Baneshwor - 10
34.	Raj Kumar	Milanchowk - 12
35.	Ram Babu	Baneshwor - 10
36.	Sattya Dev	Baneshwor - 10
37.	Lal Bihari	Tinkune - 35
38.	Shambhu Singh	Koteshwor - 35
39.	Jiyalal Mahesh	Gangabu -

Source: KMC

2) Recycling by Waste Pickers

It is reported that there are altogether 30 to 35 groups of waste pickers operating in the KMC. They mainly operate at Teku T/S and Bagmati River dumping site. There are more waste pickers who are not recorded and operate individually in streets-side waste. Most of the waste pickers at Teku T/S and Bagmati River dumping site are working full-time. At each site, there are about 150 waste pickers as listed by KMC.

3) Recycling Promotion Activities by Municipalities, NGOs/CBOs and Private Sectors

CMU has assisted and encouraged citizens to recycle their waste. One of the CMU's activities to promote people's recycling is to establish Community Recycling Centers (CRC). By learning from the past experience in Wards 15, 18, 24, CMU has tried to operate a CRC in cooperation with private sector at Ward 21.

Several NGOs/CBOs have been promoting recycling activities by themselves or by collaboration with CMU. Nhu Pucha, one of the CBOs, has been collecting plastic from 20 target households in Ward 20 for sale to kabadi shops. They have also promoted home composting activities there.

A private sector, JAMARKO, has become involved in paper recycling activities with 10 staff and 3 volunteers since 2001. Because recycling paper is still much more costly and its quality is lower than normal paper, it has been difficult to find regular customers or a big market inside the Valley.



Recycling Paper Products

2.5 Final Disposal

At present KMC is disposing of their waste (total around 1,000 m³/day) mainly along and in the Bagmati River in LSMC and/or KRM. From February to May 2004 dumping proceeded along the eastern Bagmati River bank from Balkhu southwards reaching past Afadole area in LSMC. At that time, trenches of about 2-3 m height and widths of 5-10 m were excavated and the waste was dropped from the top into the trench. The waste was compacted by a "Sheep's foot" compaction roller. Soil that had been excavated from the trench was placed on top of the disposed of waste after the waste had reached the height of the trench. Disinfectants were sprayed to ward off disease vectors. After the eastern bank was filled up, the dumping was shifted to the western bank in KRM in the latter part of 2004, including the earthen dyke construction to prepare a landfill space intruding into the river section. The western bank dumping continued as of June, 2005.

The site, although located within LSMC and/or KRM, is operated by KMC. A contractor was hired by KMC for site preparation work and procurement of cover soil materials. KMC and LSMC have stationed staff at the site to record the incoming vehicle numbers, waste volume, arrival and departure times. KMC has spent about Rs 2 million monthly (Rs 1 million in operation and Rs 1 million for site development, local funds, etc.) to "operate" the Bagmati River dumping site.

The problems associated with this disposal site are as follows:

- The site is in a floodplain with the danger of waste washout.
- Many sections of the river have been altered by the waste dumping.
- In the absence of proper operation the immediately surrounding residents are affected by odors, scattering wastes and disease vectors.
- Access is uncontrolled permitting the disposal of any waste types, grazing of animals on the wastes and waste pickers working without control.
- There are no countermeasures to prevent leachate from flowing outside the constructed trenches/dykes and into the river and surroundings.
- There are no countermeasures to control landfill gas and prevent it from migrating into the surrounding houses (landfill gas is being tapped by neighboring households along the western bank which raises fears of explosions and property damages).
- A little construction can be observed on completed sections raising the fear of land misuse and dangers to human lives.

Since June 5, 2005, KMC has started transportation of their waste of 60-70 ton/day to Sisdol Short-term landfill (S/T-LF) through Teku T/S. After secondary transportation vehicles arrive at Kathmandu, full-scale operation of Sisdol S/T-LF will be put into practice. Then the Bagmati River dumping site is going into the post-closure maintenance stage.

2.6 Social Aspects

(1) Major Findings of Household Behavior and Attitude Survey on SWM¹

1) Priorities of Public Services

With regard to service priorities, the respondents were asked to choose three priorities among the following public services and utilities; a) water supply, b) drainage/sewerage, c) solid waste collection, d) air pollution, e) electricity supply, f) public transportation, g) access road to house, and h) noise pollution. 19% of sample households (HHs) determined solid waste collection as the second priority followed by drainage/sewerage (12%). Water supply was ranked as the top priority (48%).

2) Waste Disposal and Management

As indicated by 65% of the sample HHs, pick up of solid waste by door-to-door collection service was the most prevalent practice in KMC. This method of disposal was the highest proportion in all five municipalities in this Survey. A total of 18 HHs or 5% of the sample HHs have practiced open dumping on vacant land (10 HHs), on roads (7 HHs) or on the bank of a stream/river (1 HH). It was reported that unavailability of door-to-door collection services (8 HHs) and long practice (6 HHs) were the major two factors for following the open space dumping practice. Most of females (66%) were exclusively responsible for handling waste and taking it out for disposal (54%). A total of 23% of sample HHs responded that children were also responsible for handling waste. About 30% of HHs noted that any of the family members took it out for disposal. Most of HHs surveyed noted that

¹ Household Behavior and Attitude Survey on SWM was conducted from the end of March to the beginning of May 2004 by assigning 3 quality controllers and 15 social surveyors from local communities. Five municipalities were categorized into two groups i.e. Group A (KMC and LSMC) and Group B (BKM, MTM, and KRM). These groups were categorized into subgroups based on the population density, economy, settlement pattern as well as land use patterns. In KMC, 12 out of 35 wards were selected based on the core area, sub-core area and fringe area. 330 sample HHs were selected.

they disposed of waste once a day. The majority of sample HHs used the backyard for storing the waste. Plastic bags were the most popular containers used for carrying waste to collection points.

Table 2.6-1 Waste Disposal Practice among HHs Surveyed (KMC)

Sample HH nos.	331#	128%
Dispose of waste by door-to-door collection service	214	65%
Dispose of waste by putting into Municipal or Communal Container	65	20%
Dispose of waste at Municipality's designated disposal site	25	8%
Dispose of waste by open dumping out side the house	18	5%
Dispose of waste by open combustion	37	11%
Dispose of waste by burying in the ground	3	1%
Dispose of waste by Composting	30	9%
Dispose of waste by giving it for recycling	20	6%
Dispose of waste by using as animal feed	11	3%

Note: Considering that often more than one method was given by the respondent, the summation of responses exceeds 100%.

Source: JICA Study Team, 2004 "Interview and Questionnaire Survey on Household, Establishment and NGOs/CBOs regarding Solid Waste Management in the Kathmandu Valley"

3) Existing Waste Collection Services

As indicated in Table 2.6-2, 89% of sample HHs responded waste collection services were available in their areas, and they have used these services. It might be assumed that the majority of HHs in KMC had access to waste collection services. Actually, the collection ration in KMC was said to be around 80 - 90%, which supported this assumption. With regard to the mode of waste collection, the door-to-door collection was the most prevailing service (77% of sample HHs used this service), which was provided by the Municipality, NGO/CBO or private sector. A total of 65% of sample HHs using this service said that their waste was collected on a daily basis. The involvement of various service providers in SWM might contribute to such high frequency of waste collection services in the result of the Survey. A total of 66% of sample HHs have already made payment for waste collection services, which was the largest category in the five municipalities. This might imply that the payment system has become popular in KMC in accordance with the increasing involvement of private sectors in SWM. A high proportion of these HHs (93%) responded that they were very or somewhat satisfied with these services. Neither proper waste collection nor sweeping services were the major reasons for less satisfaction or dissatisfaction with services.

Table 2.6-2 Availability and Use of Waste Collection Service in KMC

Sample HH nos.	331#	100%
Service available and used	295	89%
Service available and not used	13	4%
Service not available but required	7	2%
Service neither available nor required	16	5%

Source: JICA Study Team, 2004 "Interview and Questionnaire Survey on Household, Establishment and NGOs/CBOs regarding Solid Waste Management in the Kathmandu Valley"

4) Waste Minimization and Recycling

The majority of HHs reported having knowledge about separation and actually separating waste (76% of sample HHs), which was the highest proportion in the five municipalities. It could imply that the residents in KMC had more opportunities in exposing themselves to information on SWM. Most of them responded that they were sorting their waste into two categories namely organic and inorganic waste. Regarding the willingness to cooperate for source separation, more than 90% of sample HHs including those who have been already doing showed positive attitudes. The reasons for unwillingness to cooperate were addressed by a few HHs as follows; a) no space inside the house to keep the separated waste, and b) inconvenient or hard to separate waste. Close to 60% of sample HHs responded that they are selling their recyclable material to a buyer. The major items collected for sale were glass and papers, followed by plastic. Only 17% of sample HHs have had experience in making compost. The majority of these HHs were composting their waste in open spaces or organic fields (71%) rather than in containers or composting bins (24%). Almost 60% of sample HHs noted they knew what compost was. Few of them reported that they have been taught about making compost by the municipality, private company or NGOs/CBOs. The majority of HHs learned how to make compost by themselves. More than half of HHs (53%) who responded that they have no experience in making compost have shown no interest in compost. In this regard, the following reasons were pointed out; a) no space available and b) takes too much time. On the other hand, 41% of respondent sample HHs have shown a positive attitude towards making compost.

5) Public and Community Involvement

A total of 44% of sample HHs showed that they were responsible for SWM (See Table 2.6-3). However, it was reported that only 20% of sample HHs actually took initiative towards proper SWM by adopting various methods such as 3R activities, cleaning, or proper disposal practice. Regarding the willingness to pay for SWM services, a significant percent of sample HHs (95%) including those who have been already paying showed positive attitudes. Most of them could afford to pay Rs 11-30 or Rs 31-50 per month. The majority of those who were not willing to pay responded that SWM was the duty of the municipality or government. Regarding CBOs' activities related to SWM, only one forth of sample HHs have ever participated in this. On the other hand, the majority of sample HHs considered that CBOs' activities regarding SWM were very necessary or somewhat necessary. Further, almost 90% of HHs surveyed noted that they were willing to participate in CBOs' activities such as campaign for raising awareness (35% of sample HHs); any activities related to SWM (17%), clean up program (16%). As a whole, it seemed to imply that the level of knowledge and awareness as well as attitude towards public involvement in SWM was relatively high. However, the level of actual involvement in community-based SWM activities, except for payment for services, still remained low.

Table 2.6-3 Perception on Responsibility for SWM in KMC

Sample HH nos.	331#	100%
Government/Ministry of Local Dev.	37	11%
Municipality	105	32%
Sweepers	7	2%
Yourselves	146	44%
Our Communities/CBOs	0	0%
Private Company	28	8%
NGO	0	0%
Do not know	7	2%
Others	1	0%

Source: JICA Study Team, 2004 "Interview and Questionnaire Survey on Household, Establishment and NGOs/CBOs regarding Solid Waste Management in the Kathmandu Valley"

(2) Municipality's Programs regarding Community Mobilization on SWM

It has been gradually realized by KMC that community participation is the key to improvement of the urban environment. It has brought about the epoch establishment of CMU within its Environment Department in 1999. Since then, CMU has taken initiatives in various activities which help to mobilize the community and to increase the level of awareness regarding the urban environment among the general population. There are five main activities promoted by CMU. They include a) Children and environment by focusing on establishment of Nature Clubs in schools (known as Balbalika ra Batabaran- "BABA" in Nepali), b) Community participation and training program, c) Demonstration of environmental technology such as promotion of community- and household-level composting, d) Community recycling center, and e) Mass education program by running radio program called "ANKUR" and producing IEC (Information, Education and Communication) materials such as calendars, posters and brochures. Exhibition on Earth Day is one of CMU's unique activities. For effective implementation of these activities, CMU has had close collaboration and partnership with a number of organizations/stakeholders such as relevant NGOs, CBOs, schools, press agencies and donor agencies. In addition, CMU has made efforts to mobilize youth by introducing the city volunteer program, which recruits city volunteers from students who are studying the environment at colleges/universities and are willing to participate in CMU's activities. This program has been successful in terms of youth development in the environmental sector and obtaining appreciation and cooperation towards a variety of activities being implemented by CMU/ KMC.

(3) NGOs/CBOs' Programs regarding Community Mobilization on SWM

A number of NBOs/CBOs have been involved in various SWM activities including collection services, awareness, and 3R activities. Most of the NGOs/CBOs have carried out small-scale SWM activities at the community- or tole- levels, which can contribute to community mobilization to some extent. However, the majority of them faces financial problems and cannot expand their activities nor ensure sustainability. Some of them have collaborated with CMU at the program or activity levels. The major NGOs/CBOs which the Study interviewed are summarized below.

Table 2.6-4 Major NGOs/CBOs Working in the Field of SWM in KMC

Name of NGOs/CBOs	Year of foundation	Number of staff	Working Areas
Ward Environment Committee -28*	2001	11 volunteers/ members	Public Awareness of SWM (promotion of proper waste disposal practices)
Ward Women Environment Committee- 32*	2001	13 volunteers/ members	Cleaning and home composting (32 HHs)
Bhotu Indira*	1998	19 volunteers	Public Awareness in women's issues and weekly cleaning
Center for Integrated Urban Development (CIUD)*	2002	4 paid staff, 6 volunteers	Promotion of compost bins & training in Ward 30 (50 HHs)
Youth Initiative*	2001	5 paid staff and 760 volunteers	Public awareness and youth mobilization
Jana Jagruk Safa Sughar Abhiya*	1997	70	Door-to-door collection in Wards 9,10,13,14,15,16,34 (4200 HHs)
Jamarko*	2001	10 paid and 3 volunteers	Waste paper recycling
Women Entrepreneurship*	2000	NA	Public awareness of women's issues & sweeping in Ward 14
Prayas	2002	9	Door-to-door collection in Wards 10, 11, 32 (500 HHs)
Ce Pro In*	1995	4	Public awareness of SWM, training of compost
Environment & Public Health Organization (ENPHO)*	1990	40	Medical waste management, water quality management
Nhu Pucha*	1979	15 paid, 71 volunteers	Composting & recyclable collection (20 HHs) in Ward 20
16 Ward Women's Environment Improvement Committee*	1999	2 paid, 50 volunteers	Home composting, Training
We Team / Jai Kishan*	2001	5 paid staff and 760 volunteers	Vermi- & community-compost in Wards 20, Home composting Wards 12, 15,19, 20
Society for Urban Poor (Soup)*	1992	2 paid and 33 volunteers	Community-based SWM including home composting (25 HHs) in Ward 21 targeting 225 HHs
Youth Corner Club*	1976	5 paid staff and 760 volunteers	
CLEAN- World Vision*	2000	150	SWM & Environment-public awareness and small local level projects along Bishnumati Corridor
15 Ward Community Committee	2001	4 paid staff, 40 volunteers	Community development including Ward 19 Community Committee compost training with the support of World Vision in Wards 15 &19
Nepal Pollution Control and Environment Management Center	2001	137	Door-to-door collection, home- & community-composting, sweeping in Wards 2, 3, 4, 5, 15, 16
Kathmandu 2020*	1995	1 paid and 1,500 volunteers	Vermi-compost & campaign, awareness in Ward 12
Environmental Camps for Conservation Awareness (ECCA)*	1987	8 paid and 50 volunteers	Environmental education by formation of nature clubs
Sagarmatha Environmental Development Center (SEDC)*	2000	11	Community compost bin in Ward 9 Door-to-door collection in Wards 7, 9, 13 (1,000 HHs)

Note: *According to CMU, there is coordination with KMC or CMU at program/activity levels.

Source: JICA Study Team, 2004 "Interview and Questionnaire Survey on Households, Establishments and NGOs/CBOs regarding Solid Waste Management in the Kathmandu Valley"

2.7 Managerial Condition

(1) Organizational Structure and Management Practices

1) Organizational Structure

The KMC office currently has 13 departments and 33 sections. The Environment Department is responsible for managing solid waste that is generated within the city. Three sections comprise the Environment Department: the Solid Waste Management (SWM) Section, Mechanical Section and Urban Environmental Section. KMC is the only municipality in Nepal that has a section with a mandate to comprehensively address various aspects of SWM.

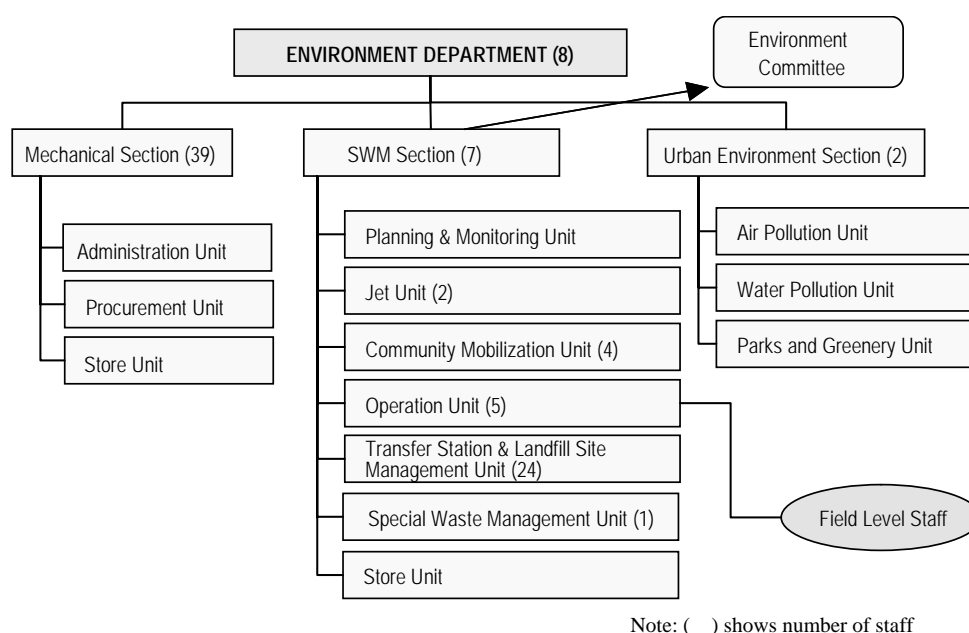


Figure 2.7-1 Organizational Structure of KMC Environment Department

Source: KMC, 2005

Under the SWM Section Chief, seven units exist specializing in various areas of SWM. These units are not official components as per the formal organization structure that was approved by the KMC Municipal Board, but were created to facilitate operations within the Section. It should be noted that arrangement with SWM-related private sector operators is also handled by this Section due to the absence of a centralized system/section for public private partnerships within the municipality. The major responsibilities carried out by the various units of the SWM Section are summarized in Table 2.7-1.

Table 2.7-1 Main Responsibilities of Various Units under KMC SWM Section

Unit Name	Main responsibilities
Planning and Monitoring	Overall management supervision of SWM section. Responsible for SWM program and resource planning (annual budgets) Maintains SWM data Oversees privatization schemes
Transfer Station and Landfill Site Management	Operation and maintenance of the current dumping site along the Bagmati Riverbank Operation and maintenance of Teku Transfer Station
Operations	Primary Waste collection and transportation Street sweeping and cleaning or drainage Management of field level staff
Community Mobilization	Public education programs on SWM and environment using media Mobilizing communities in Wards 18, 28 and 32 for waste reduction: e.g. promotion of home/community composting Recycling Center operations
Special Waste Management	Develop materials for public education concerning Medical Waste Management Provide training programs on Special Waste Management
Jet	Provision of cleaning services with jet machines on major drainage areas.

Source: KMC, 2005

During the Study, a restructuring plan of the Environment Department with new staffing arrangements and job descriptions were prepared to streamline operations. KMC committed to implement this plan in a phased approach. It should be noted that in late 2004 the function of landfill site management was agreed to be upgraded to a section directly under the Environment Department. This arrangement has not been formalized to date. However this unit, without the responsibilities regarding Teku T/S that is currently under the management of the SWM Section Chief, is managed independently directly under the Environment Department Head.

2) Management Practices

The SWM Section is by far the largest section within the KMC municipality office due to its sizable field staff. Among the various units, usually headed by a gazetted officer², decisions are taken based on discussions with the SWM Section Chief, or directly with the Head of the Environment Department. However, operation wise, most of the units are managed independently with relative autonomy, with a direct reporting line to the Head of the Environment Department.

In cases where there are specific issues that require more formal discussion processes, the Environment Committee is convened, of which the members consist of the Environment Department Head and three Ward Chairpersons with usually the SWM Section Chief participating. Based on their deliberations, the Environment Committee makes recommendations on various issues to be raised to the Municipality Board for discussion. As of June 2005, this Committee was not active since the Ward Chairpersons, who are political appointees, were not in office.

² Nepalese civil servants in local bodies are classified into officer level staff (level 6 and level 7), and assistant level staff (level 1 through level 5) as per section 212 of the Local Self Governance Regulation 2055. Within the report, Senior Level staff refers to the officer level staff, and mid-level staff refers to higher class assistant level staff (levels 4 and 5).

(2) Human Resources

Total number of staff under the Environment Department involved in SWM is 1,262 persons, which is about 60% of all municipal staff. The breakdown of human resources is as follows:

Table 2.7-2 KMC Environment Department Staff

Staff Category	Number of persons
Sweepers	950
Drivers	100
Mechanics	50
Administrative	50
Community Motivators	6
Engineers/Officers	9
Total	1,165

Source: KMC, 2005

1) Senior Officers and Mid Level Staff

KMC's senior officers of the Environment Department have the highest technical capacities among all other municipalities in the Kathmandu Valley. Many of the officers hold educational degrees attained overseas and have specialized backgrounds in various aspects of SWM responsibilities. Some of the officers are often invited as resource persons for external SWM training courses.

As for mid-level staff, most have undergone some kind of introductory training in SWM related technical topics. A sufficient number have computer literacy and operational experience. Some mid-level staff have not been designated to a unit, and provide general support to the Environment Department.

2) Field Level Staff

As shown in Figure 2.7-2, KMC's field level staff are managed based on a four-layered hierarchy under the supervision of Operation Unit Chief. Field level supervisors called *Naikes*, directly supervise and monitor the sweepers, who then report to supervisors based in ward offices. Zonal supervisors are stationed in the central KMC office, and on a daily basis report to the Operation Unit Chief and SWM Section Chief on the conditions of the streets and sweepers' performance.

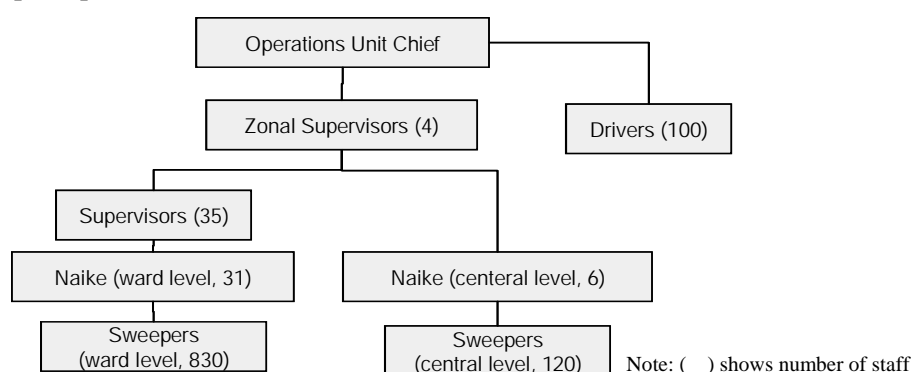


Figure 2.7-2 Structure of KMC Field Level Staff

Source: KMC, 2005

The troop of 950 sweepers are divided into two groups; one directly assigned to the 35 ward offices and the other assigned to the central KMC office. The sweepers usually work in three shifts per day (5:00 a.m. to 7:00 a.m., 1:00 p.m. to 4:00 p.m. only in the city area, and 7:00 p.m. to 10:00 p.m.). Centrally assigned sweepers are responsible for cleaning major highways and streets and bringing waste to collection stations to be picked up by trucks. Ward level assigned sweepers usually conduct street sweeping daily during their first shift of the day, but in the afternoon are assigned to a range of manual jobs from drainage cleaning to grass cutting, as the need arises within the designated wards. Over 80% of the sweepers are permanent staff of the municipality, and the majority belongs to the sweeper caste.

2.8 Financial Condition

KMC estimates direct expenditures for SWM services in FY2001/02 (2058/59³) as shown in Table 2.8-1.

Table 2.8-1 Expenditure for SWM in KMC (FY2001/02)

Items	Expenditure (Rs)	% in total of SWM
1. Street Sweeping	80,000,000	53.7%
2. Street Sweeping (Central)	10,000,000	6.7%
3. Collection	35,000,000	23.5%
4. Transfer Station	3,000,000	2.0%
5. Transportation	10,000,000	6.7%
6. Landfill	11,000,000	7.4%
Total of SWM	149,000,000	100.0%

Source: KMC, FY2001/2002 (2058/59)

KMC spends 30-35% of its total municipal expenditure on SWM. The SWM cost can be broken down by services and by account items as shown in Table 2.8-2. SWM cost of KMC is characterized by a high percentage for street sweeping cost and personnel cost.

Table 2.8-2 Breakdown of SWM Cost by Service and by Items

Account Items	Street Sweeping		Collection	T/S	Transportation	LF	Total
	Ward	Central					
1. Personnel	55%	5%	11%	1%	1%	1%	74%
2. Maintenance	-	-	4%	-	1%	2%	7%
3. Fuel	-	-	3%	1%	2%	2%	8%
4. Material	6%	4%	-	-	-	-	10%
5. Administration	1%	-	-	-	-	-	1%
Total	62%	9%	18%	2%	4%	5%	100%

Note: Depreciation and interest are excluded from calculation.

Source: JICA Study Team based on the data from KMC, FY2001/2002 (2058/59)

2.9 Issues and Constraints on Municipal Solid Waste Management

The analyzed issues and constraints on SWM in KMC are discussed as follows.

³ Nepalese Year

(1) Collection and Transportation

- KMC faced some difficulties with the night time and early morning collection system because of limited collection hours, working condition in the dark, the necessity of more positive public cooperation to discharge the waste at the designated time, or securing of public transportation for municipal staff like sweepers and drivers to commute in the early morning before daylight.
- For primary collection, it is difficult for KMC i) to collect the waste, especially in the core area due to the narrow streets and dense population, ii) to manage efficiently because of low operation rate of old equipment and iii) to securely grasp the activities by private sector because of an inadequate monitoring system for such collection activities on a business basis.
- It is not efficient to load the waste from the ground at the collection point into the collection vehicle. It causes KMC staff to consume more time for loading and to work harder under unsanitary conditions, and also may cause traffic jams and littering the waste around the points.
- NGOs or other private sector who are currently collecting the waste door- to-door near the city boundary have been expanding their collection service deeply into the surrounding VDCs and transporting those collected waste to the Teku Transfer Station (T/S) and the Bagmati River dumping site, or just leaving them at some waste collection points along the ring road.
- There are still some uncontrolled areas such as along the Bishnumati River that waste generated from those areas are being disposed of in public spaces and causing serious environmental problems.
- KMC has difficulties achieving appropriate maintenance and repair work for all kinds of SWM equipment like collection/transportation trucks and heavy equipment at the existing workshop because of poor and superannuated workshop equipment/tools, lack of engineering skills training program and an appropriate workshop management system.
- It is necessary to develop the efficient collection and transfer system including the possibility of a Balaju T/S for full operation of the Sisdol S/T-LF under a night time and early morning collection system

(2) Solid Waste Minimization

- The Community Mobilization Unit (CMU) in KMC is very active promoting home composting activities. In addition, a lot of NGOs/CBOs have also been promoting composting and recycling activities by themselves and sometimes by collaboration with CMU. However, CMU has not been able to grasp a wide range of SWM activities conducted by a number of NGOs and CBOs since there is no systematic data base about these organizations and groups in CMU.
- There are many individual recyclers who collect recyclable material from households, commercials, restaurants, etc. As they resell the collected recyclable materials to buyers at one of the more than 250 kabadi shops within KMC, making most of them is needed for more effective waste minimization activities.

(3) Final Disposal

- On June 5, 2005, KMC and LSMC commenced disposal of part of their waste at Sisdol short-term Landfill (S/T-LF). The rest of the waste is still disposed of at the Bagmati River dumping site.

- It is necessary for KMC to prepare a safe closure and rehabilitation plan for the Bagmati River dumping site and to regulate and control land use over the closed dump site carefully in cooperation with LSMC.

(4) Social Aspects

- The level of awareness, knowledge and skills on SWM might differ one to another among local people and local communities. In this regard, it is hard for CMU alone to meet these needs, provide diverse activities by covering relatively larger areas and conduct regular monitoring and follow-up activities at the field levels.
- Due to the lack of decisive policy regarding community participation at the departmental and central levels in KMC, CMU sometimes encounters difficulties in taking prompt action on various inquiries from the public.

(5) Managerial Conditions

- Continual changes in the municipal leadership have undermined stability and consistency from the organizational and managerial perspective. It has been observed that with each transition, municipal priorities, as well as internal administration practices, shift to adjust to the ways of the new CEO.
- The Environment Department in KMC is burdened with the responsibilities of managing a large body of field level staff, including sweepers, of which the majority are permanent staff. In addition, precarious management practices of field level staff have hampered KMC's initiatives, especially in the aspect of job-shifting of sweepers and improving Public Private Partnership (PPP) arrangement in SWM.

CHAPTER 3 FUTURE FRAMEWORK FOR ACTION PLAN

3.1 Socio-economic Framework (Projection of Future Population)

In Nepal, the official document which can be an aid to project future socio-economy at the national level is the Tenth Plan (Poverty Reduction Strategy Paper) 2001/02 (2058/59¹)-2006/07 (2059/60), May 2003, National Planning Commission (NPC) of HMG/N. The Tenth Plan is the government's main medium-term strategic planning document which provides sharply focused strategies for poverty alleviation.

This Tenth Plan discussed two alternative scenarios. The Normal Case scenario aims to reduce the overall poverty ratio from 38% estimated at the end of the Ninth Plan (2001/02) to 30% by 2006/07, while an alternative Lower Case scenario was 33%. This lower case scenario was used as the basis for formulating the budget and the Medium Term Expenditure Framework (MTEF) FY2003/04-05/06.

On the other hand, at the Valley level, the Kathmandu Valley Town Development Committee (KVTDC) under the Ministry of Physical Planning and Works (MOPPW) and the Department of Urban Development and Building Construction (DUBB) has a responsibility for preparing a physical development plan of the Kathmandu Valley.

The Kathmandu Valley Town Development Plan (KVTDP) 2020 was prepared in the year 2002 by KVTDC to establish a broad regional framework plan (strategic plan) for the Kathmandu Valley integrating both land use and the urban transportation network, which guides the valley's future growth in a planned manner.

The KVTDP 2020 had estimated that if a gross density of 300 persons per hectare could be achieved within the existing urban areas, the demand for urban land in the 20 years would be slightly over 3,600 ha. However, considering the difficulty in effecting public perception about apartment housing and overturning the current trend of owner occupied single housing, demand for urban land could be much higher than envisaged.

Since the 2001 national census data has become available recently, the JICA Study Team together with the TWG members examined these annual growth rates taking into account the actual growth rate between 1991 and 2001, and has decided to adopt this KVDTC study's rates except for MTM. For MTM, the actual growth rate between 1991 and 2001 was assumed to continue up to 2015 because MTM has relatively large potential for urbanization in land use in the future.

The projected future population based on the 2001 population is shown in Table 3.1-1.

¹ Nepalese Year

Table 3.1-1 Projected Population of Five Municipalities

Municipality	Actual Population	Projected Population	Annual Growth Rate (%)	
	2001 (2058)*	2015 (2072)	2001-2011 (2058-2068)	2011-2015 (2068-2072)
KMC	671,846	1,055,591	3.32	3.18
LSMC	162,991	260,790	3.44	3.35
BKM	72,543	117,380	3.52	3.44
MTM	47,751	83,696	4.09	4.09
KRM	40,835	54,400	2.07	2.07
Total Municipality	995,966	1,571,857	3.34	3.24
VDCs	525,498	603,891	0.95	0.84
Total Valley	1,521,464	2,175,748	2.61	2.54

Note: *Nepalese Year

Source: Draft Kathmandu Valley Development Plan 2020, KVTDC, July 2000
JICA Study Team

3.2 Solid Waste Management Ratio

For clear understanding of the solid waste management, the definition of waste index was proposed as follows and as shown in Figure 3.2-1.

- Generated waste: Material that has become useless and valueless for the owner if it is to keep it at the source
- Discharged waste: Part of generated waste that is discharged out from the owner's territory
- Self treatment waste: Part of generated waste that is treated, disposed of or utilized within the owner's territory
- Collected waste: Part of discharged waste that is collected by the municipality or a private sector operator
- Uncollected waste: Part of discharged waste but not collected and disposed of somewhere
- Disposed waste: Part of collected waste that is disposed of at the designated final disposal site
- Primary Valuables: Materials that become useless but may be valuable for the owner in exchange for cash or for some recyclable collector. The owner intends to separate that material from the waste and bring it directly to recycling dealers for sale or to a municipal/community recycling center. Private recyclable collectors can also visit each generation source to pick up those valuables as their business activity. Returnable bottles for deposit refund are also included in this category.
- Secondary Valuables (Recovered Valuables): Valuable materials that are collected and recovered for reuse and recycling after waste is discharged, from the various stages such as from streets, collection points, transfer stations, waste treatment facilities, or final disposal sites. This includes the recyclable waste collected by recyclable waste pickers.

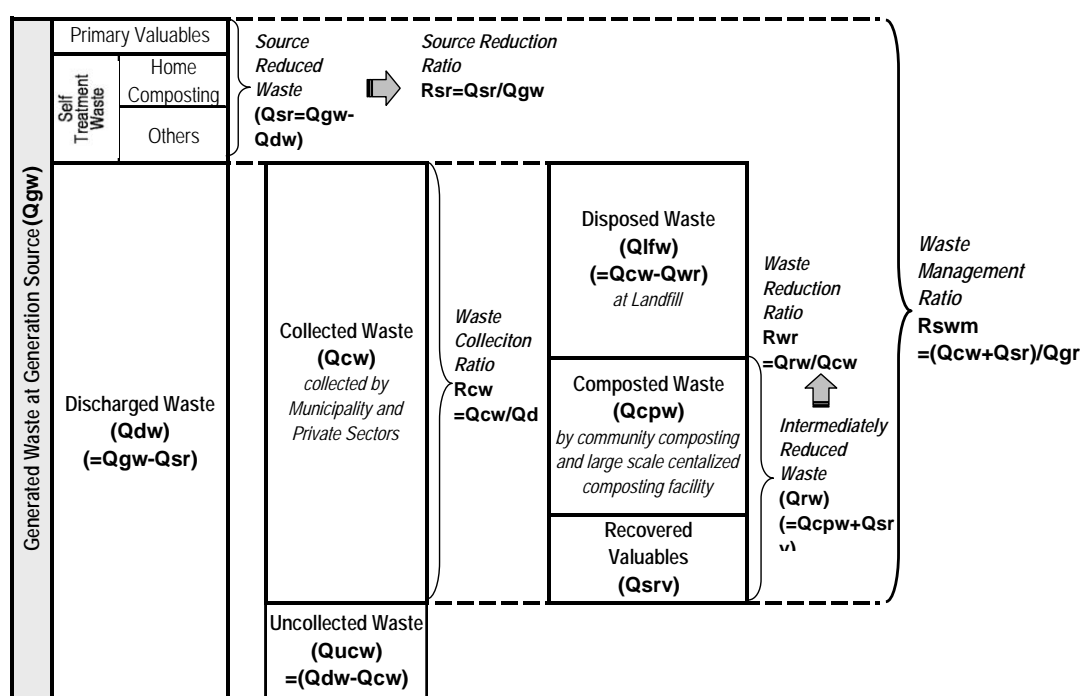


Figure 3.2-1 Definition of Waste Management Ratio

Source: JICA Study Team

It was proposed to introduce the concept of “Solid Waste Management Ratio” in the Study. Solid Waste Management Ratio can be estimated by the following formula.

$$\frac{(\text{Collected waste quantity} + \text{Source reduced waste quantity})}{\text{Generated waste quantity}}$$

One of the major purposes of solid waste management is to reduce the uncollected waste amount for improvement of the cleanliness, beautification and sanitation of the city. The wastes other than such uncollected waste are the waste reduced at source and that collected from the source. This means that the solid waste is managed by some organization like the municipality, the private sector, or the waste generator itself. Therefore, the “Solid Waste Management Ratio” has been set up as the waste index that collectively shows how much waste can be managed appropriately in various ways.

3.3 Projection of Future Generation of Solid Waste

3.3.1 Future Waste Generation without Measures

Considering the existing data of waste generation quantity in the Kathmandu Valley by various past studies, the result of the waste quantity and quality survey done by the Study, and an assumption of an annual increasing rate of unit generation rate which of 2%, the waste generation quantity of each municipality is estimated to be as shown in the following table.

Table 3.2-1 Projected Solid Waste Generation Quantity

Municipalities	Population		Municipal UGR (kg/d-capita)		Average daily generated quantity (tons/day)	
Year (Nepalese Year)	2004 (2061)	2015 (2072)	2004 (2061)	2015 (2072)	2004 (2061)	2015 (2072)
KMC	741,008	1,055,591	0.416	0.519	308.4	547.9
LSMC	180,397	260,790	0.416	0.519	75.1	135.4
BKM	80,476	117,380	0.316	0.394	25.5	46.2
MTM	53,853	83,696	0.266	0.332	14.3	27.8
KRM	43,424	54,400	0.266	0.332	11.6	18.1
Total 5 municipality	1,099,158	1,571,857	-	-	434.9	775.4

Source: JICA Study Team

3.3.2 Scenario Analysis

The 2% of annual increasing rate of waste unit generation predicted in the previous section is based on the future economic growth in the Kathmandu Valley as well as other country's experiences. In this assumption, total generated waste will be increased up to 1.8 times more than it is at present. Therefore, waste reduction at source such as home composting or material recycling activities is very important to reduce the waste generation. In the Kathmandu Valley, such source reduction activities have just been started promotion together with community development activities, and further waste reduction at source can be expected. Considering these circumstances, the following scenarios for the Study² was proposed and it is expected that for reach municipality will make an effort to reduce the waste at source to shift to Scenario 2 from Scenario 1 by promoting source reduction activities under the concept of waste management ratio.

Scenario 1: without measures (with 2% annual increase of the unit generation rate)

*Scenario 2: with measures for source reduction by home composting and source recycling.
Target reduction ratio in 2015 is around 85% of total generated quantity.*

² Since there is no existing data or record that can be used to estimate the annual increasing rate of waste unit generation in the past, the JICA Study Team suggested that all municipalities to carry out regular waste generation quantity surveys, at least once a year, to get an understanding of the changes of unit generation rate from the practical experience during the Study.

CHAPTER 4 UMBRELLA CONCEPT FOR FORMULATION OF ACTION PLAN

4.1 Umbrella Concept of Solid Waste Management in the Kathmandu Valley

Action plans (A/Ps) of each of the five municipalities should be developed reflecting their characteristics in terms of solid waste flow, waste quality and quantity, collection methods, waste minimization activities and the associated requirements such as promotion of public awareness and behavior change, and organizational and institutional arrangements. However, it is recommended that some activities to be included in the respective A/Ps should be conducted in a valley-wide in order to maximize the effect of these activities. In addition, in terms of facilities and equipment for intermediate treatment or landfill, the developments need to be done taking into consideration potential for inter-municipal coordination and sharing of these facilities and equipment so that development loads as well as investment and O&M costs be minimized. Table 4.1-1 indicates the components of the A/Ps that need to be discussed for each respective municipality or that may be combined for more than one municipality (zone).

Table 4.1-1 Components of Action Plans

Components of A/Ps	Individual Municipality or Zone
1. Primary and secondary collection	Individual municipality
2. Transportation (transfer haul)	Individual municipality or zone
3. Waste minimization (composting and recycling)	Individual municipality or zone
4. Waste disposal	Zone
5. Public participation and behavior change	Individual municipality and zone
6. Organizational and institutional arrangement	Individual municipality and zone

Source: JICA Study Team

In this connection, a basic concept common for all five municipalities, *an umbrella concept of solid waste management in the Kathmandu Valley (Umbrella Concept)*, has been proposed to clarify the administrative responsibilities of each municipality and to show a basic direction (road map) for effective solid waste management.

As parts of the Umbrella Concept, four basic concepts, i.e. improvements of collection and transportation and final disposal system, and promotion of waste minimization and public participation and behavior change have been proposed. In order to achieve these basic concepts, an overall facility plan (OFP) and overall equipment plan (OEP) in the Kathmandu Valley have been discussed. In addition, the directions for financial arrangement as well as organizational and institutional arrangement including the involvement of the private sector regarding SWM have been proposed. The overall framework of the Umbrella Concept is shown in Figure 4.1-1.

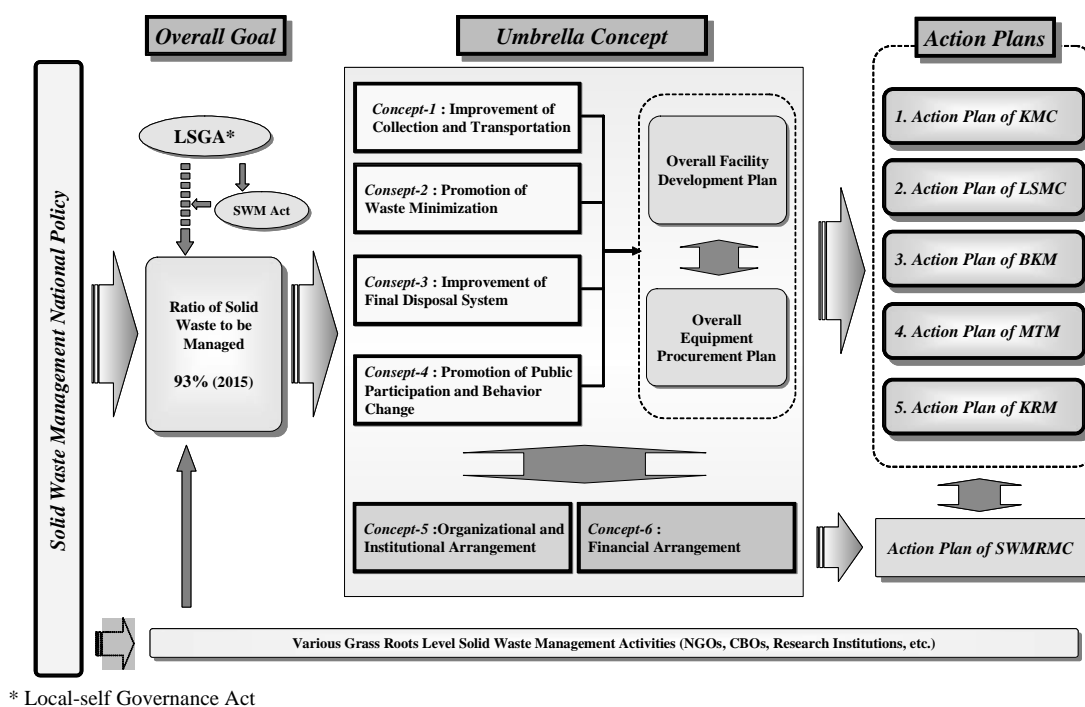


Figure 4.1-1 Overall Framework of the Umbrella Concept of the Kathmandu Valley

Source: JICA Study Team

4.2 Basic Concept for Improvement of Collection and Transportation

4.2.1 Collection and Transportation Practices and Coverage Improvement

The collection and transport systems are broadly identified in the Kathmandu Valley in the as shown in Figure 4.2-1.

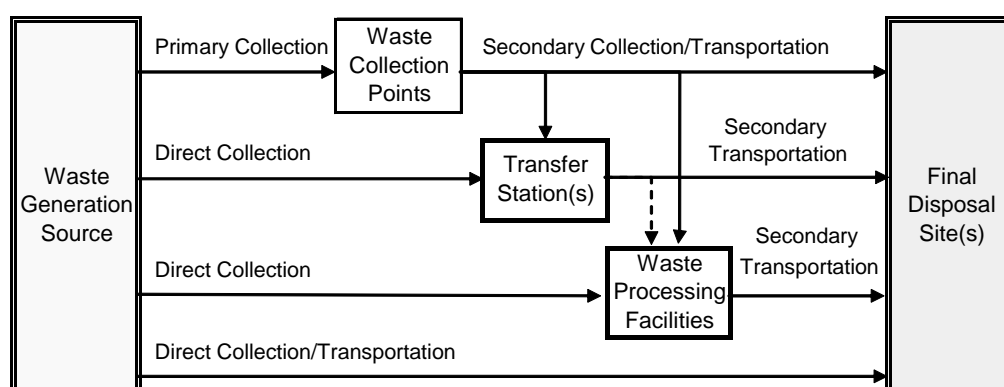


Figure 4.2-1 Definition of Collection and Transportation

Source: JICA Study Team

Accordingly, a basic concept for improvement of collection and transportation are summarized in the Table 4.2-1.

Table 4.2-1 Basic Concept for Improvement of Collection and Transportation

Activity	Basic Concept	Descriptions
Primary Collection	Decrease of street sweepers	Number of municipal sweepers: less than present
	More utilization of private sector	Share of private sector for primary collection: 60% in KMC, LSMC, 100% in KRM.
	Improvement of waste collection point	No direct manual loading point with shovels in the Valley
Direct Collection	Promoting of Door to Door collection	Preparation of private door to door collection service guideline
	Promoting bell collection system	Bell collection in all the collection area except the area of Door to Door collection and container collection
Secondary Collection	Abolishment of municipal tractor	100% of municipal tractors will be replaced by small sized compaction trucks
Secondary Transportation	Procurement of new secondary transportation vehicles	The existing equipment will also be replaced by the same type of new vehicle.
Others	Introduction of source-separated collection	In BKM, all waste to the existing composting facility should be separated at the generation source. In future including other municipalities, at least 50% of waste is separated at the source and the rest is separated at the facility by waste pickers.
	Improvement of mechanical workshop	All the equipment should be maintained appropriately with minimum cost.

Source: JICA Study Team

4.2.2 Collection and Transportation Facilities (Transfer Stations)

The streets of the five municipalities are mostly narrow and cannot accommodate large collection trucks, making smaller collection trucks, tractors and tri-cycles more suitable. These small trucks need to be served by small transfer stations or mini transfer points (depos) and are directly related to the primary collection activities.

As for larger transfer stations, as a basic concept, KMC should push forward with construction of another transfer station in Balaju in addition to the improved Teku T/S, and LSMC should secure the land and construct a temporary transfer station in Afadol and then should utilize a waste processing facility as a transfer station.

4.3 Basic Concept for Promotion of Solid Waste Minimization

4.3.1 Promotion of 3Rs Activities

In order to realize effective SWM, it is important that the residents should promote 3Rs activities as follows:

- Reduce: To minimize generated or discharged waste
- Reuse: To use goods or materials that can still be used a number of times
- Recycle: To recover waste as raw material and use it for reproduction

In order to promote 3Rs activities smoothly, cooperation of the private sector and support from municipalities are needed as shown below:

- 1) Cooperation of Private Sector
 - Produce and sell easy-to-recycle goods
 - Produce and sell long-life goods
 - Minimize packing and packaging for goods
 - Improve quality of recyclable and recycled goods and develop new products
- 2) Support by Municipality
 - Increase awareness for reduction of waste to residents and private sector
 - Establish more recycling centers (places for purchasing recyclable materials)
 - Develop and improve distribution pipeline for recyclable materials
 - Provide subsidies for the private sector involved in recycling activities
 - Develop legislation to establish a recycling-based society

4.3.2 Promotion of Waste Processing and Composting

Since approximately 70% of the generated solid waste is organic, composting has been actively conducted in the Kathmandu Valley. Composting activities can be broadly divided into three types as discussed in Table 4.3-1.

Table 4.3-1 Composting Activities conducted in the Kathmandu Valley

No.	Items	Composting Plant	Community Composting	Home Composting
1	Experience in the Kathmandu Valley	Composting plant in Bhaktapur Old composting plant in Teku	Compost chamber in Thimi 3,000 L compost bins in KMC	100 L compost bins of KMC Vermi-composting
2	Source separation of organic waste	Necessary for plant operation	Necessary for community composting operation	Necessary at each house
3	Waste collection and transportation to facility	Wide collection area and long distance transportation	Limited collection area and short distance transportation	Not necessary
4	Separation of non compostable material at facility site	To be required	To be required	Not necessary
5	Operating labor	Many exclusive operators are required.	Exclusive operators not required.	Household members operate
6	Operation and maintenance technique	Harder than community composting	Harder than domestic composting	Easy
7	Installation area	Large area with public consensus is required.	Limited area with community consensus is required	Small space is required in house
8	Investment cost	Large	Medium	Little
9	Running cost	Medium	Little	Little
10	Advantage for public participation	Getting produced compost or revenue by selling compost	Getting produced compost or revenue by selling compost	Getting produced compost or revenue by selling compost
11	Other related	Selection of installation area Financial balance	Cooperation of community	Expansion of number of cooperative households

Source: JICA Study Team

Considering necessary investment and O&M costs, ease of operation and environmental impact, home composting is considered to be the most practical in the Kathmandu Valley. For community composting, a pit method is recommended because of ease of operation and maintenance. For planning purposes, the suitable method or best combination of the above three types of composting should be examined.

From the viewpoint of reduction of waste transportation cost, a composting plant should be constructed in or near the city area of KMC or LSMC. The windrow method should be adopted because Nepal has experience in operation of the BKM composting plant with this method. This method may be enhanced through:

- Separated waste being received at the composting plant as much as possible.
- At the sorting area, uncompostable materials being removed manually, while compostable materials are piled up at the fermentation yard by using a wheel loader.
- During composting the heap being turned over several times and exposed to air for accelerating fermentation
- After about 60 days, raw compost being screened for the final product to be ready

4.3.3 Considerations to Waste Pickers

Waste pickers, one third of the estimated number of 2,500 who are below 15 years of age, are considered as the primary recyclable waste collectors. The main items salvaged by waste pickers are plastic bags and milk and oil pouches. The government and related authorities need to harness their contribution and efforts.

In several places, it was observed that waste pickers help with loading and unloading works. However, sometimes waste picking activities may obstruct waste collection or landfilling works and scatter the waste on the roads. It is apparent that waste pickers are working in a dirty, dangerous and health-hazard environment. Furthermore waste pickers are alienated from social communities and sometimes subject to many forms of discrimination. There is also a specific linkage between waste work and children. As the market for recyclables have increased, a number of children previously involved in begging have turned to rag-picking/scavenging as a means of survival.

For improvement of effective SWM in the Kathmandu Valley, the following consideration should be given to waste pickers.

- Improve working conditions among waste pickers
- Disseminate effectively information targeting waste pickers
- Gradually abolish child labor as waste pickers
- Incorporate waste pickers within new SWM facilities

4.4 Basic Concept for Improvement of Final Disposal System

4.4.1 Landfill System

The new landfills for the valley should be developed under clear standards. Two of these standards; landfill type and landfill level are described hereafter.

(1) Semi-aerobic Landfill Type

Anaerobic decomposition of organic matter produces methane and water, and the decomposition is slow and leachate content is large. On the other hand, under aerobic decomposition, organic matter decomposes into carbon dioxide and water and the decomposition is rapid. Aerobic decomposition requires a supply of oxygen to be pumped into the landfill, but this is a costly system. To cope with these problems, a particular type of semi-aerobic landfill known as “Fukuoka Method” was developed as a joint project of Fukuoka City and Fukuoka University. The semi-aerobic system is schematically presented in Figure 4.4-1.

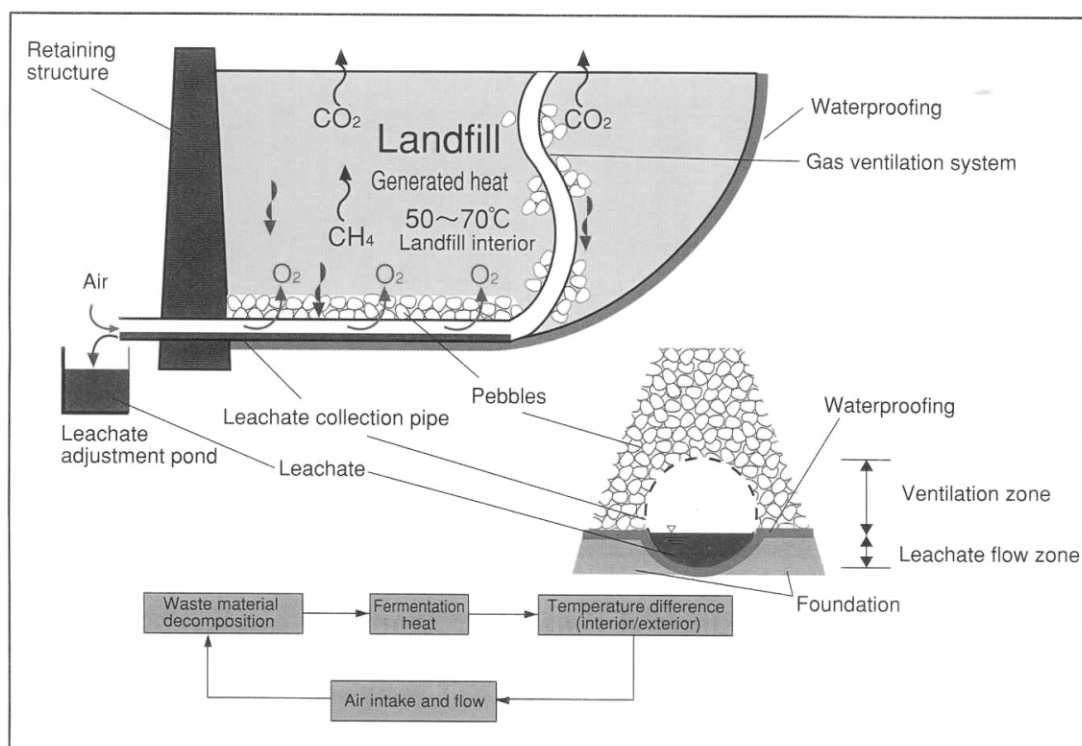


Figure 4.4-1 Schematic Presentation of Semi-aerobic System

Source: The Fukuoka Method, Fukuoka City Environmental Bureau

It is proposed to develop the landfills using the semi-aerobic system. The Sisdol S/T-LF has been designed under this concept and has started operation since June 2005. The operation of the Sisdol S/T-LF should be carefully monitored to determine the suitability of the semi-aerobic landfill system.

(2) Landfill Level

In past JICA studies in other developing countries, four landfill levels have been discussed as shown in Table 4.4-1. Level 4 offers the best countermeasures for mitigation of impact on the environment and therefore it is proposed that the Nepali decision makers aim to achieve that level in future. However considering the issues of high construction and operation costs for leachate treatment facilities and liner installation, and difficulty in treating the resulting chemical wastes from the leachate treatment, level 3 may be acceptable in the short term.

Table 4.4-1 Sanitary Landfill Levels

Facility	Level 1	Level 2	Level 3	Level 4
Description	Controlled tipping	SLF with bund and daily cover	SLF with leachate recirculation	SLF with leachate treatment facilities
Soil cover	O (Periodic)	O	O	O
Embankment		O	O	O
Drainage facility		O	O	O
Gas venting		O	O	O
Leachate collection			O	O
Leachate re-circulation			O	O
Leachate treatment				O
Liners				O

Source: JICA Study Team

In the case of the Sisdol S/T-LFS, it is expected to be operated for only 3-4 years and therefore application of natural liner and leachate re-circulation with natural attenuation treatment was recommended. This may be considered as Level 3 (+).

4.4.2 Post Closure Management of Landfill Sites

Management aspects with respect to closed landfills include collection and monitoring of landfill gas and leachate, landfill settlement, land use and access control and dissemination of information on the use of the site as a landfill.

A detailed mapping of the dump sites along the Bagmati River should be prepared and the priority sections for safe closure identified. For these sites river bank slope reformation, and installation of leachate collection pipes, landfill gas vents and storm water drains are considered.

4.5 Basic Concept for Public Participation and Behavior Change

4.5.1 Public Awareness and Behavior Change for Effective SWM

A successful SWM requires various forms of community mobilization and participation. The following Figure 4.5-1 provides a framework of stages of behavior change of the people. Most people go through these steps, sometimes moving forward or backward and sometimes skipping steps. Even when people adopt new behaviors, they may revert to old behaviors, at least under certain circumstances.

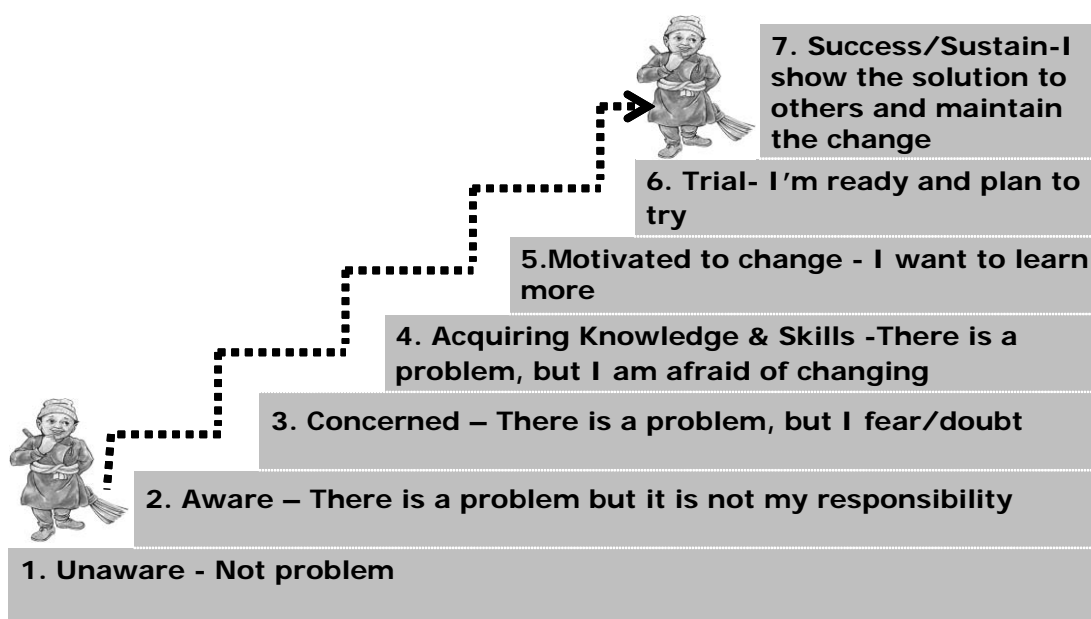


Figure 4.5-1 Behavior Change Stages

Note: The process of changing behaviors and attitudes may happen in the sequence. Most people move back and forth between steps before achieving success. Source: JICA Study Team, adopted from “A manual for communication for water supply and environmental sanitation programs” (UNICEF, 1999), and “How to create effective communication project” (AIDSCAP/FHI/USAID).

Behavior Change Communication (BCC) is considered to be an effective component of a comprehensive SWM program. It can impart information and knowledge regarding environment friendly behaviors and SWM issues and promote essential attitude change. It can also contribute to creating a demand for relevant information and services related to SWM, and to improving skills and sense of self-efficacy, which are required to stimulate behavior change. In order to integrate a BCC component into A/Ps effectively, the following steps¹ need to be taken.

- 1) Identification of the Program’s Goal and Target Group/Audience
- 2) Formative BCC Assessment and Definition of Behavior Change Objectives
- 3) Development of Messages
- 4) Communication Channels
- 5) Pre-testing
- 6) Implementation, Monitoring and Evaluation

4.5.2 Mass Communication and Education

Mass communication and education is a useful approach that reaches large groups of people quickly and effectively. It includes mass media, small media including print media, social marketing and public/educational events. However, producing awareness programs on SWM through mass media is relatively expensive. Thus, it requires inter-municipality

¹ These steps have been developed by FHI (“BCC for HIV/AIDS A Strategic Framework, FHI/USAID, 2002) and adopted by a number of BCC programs and projects in the world. Since they can be applied to SWM programs, Interpersonal Communication and BCC Skill Training conducted as part of Pilot Project D-1 for municipal staffs also highlighted and recommended these steps.

coordination among the five municipalities and technical as well as financial support from SWMRMC/MOLD, or other external organizations. On the other hand, since print media such as brochures, posters and flip charts are not so expensive, each municipality can produce them with their own financial resources. Social marketing, which uses similar commercial marketing techniques for stimulating public behavior change, is useful for promoting commodities with effective messages on SWM.

Public events are effective to disseminate basic information on SWM quickly and increase the level of knowledge on SWM among a large number of people. It is expected that all municipalities in coordination with SWMRMC carry out these events at least once a year on an occasion such as Earth Day or Environment Day according to their A/P for SWM.

4.5.3 Interpersonal Communication and Education

An approach using Interpersonal communication and education is recognized as an effective two-way communication channel that encourages the interactive dialogue between individuals or among group members. Figure 4.5-2 illustrates the difference between interpersonal and mass communications. The interpersonal communication and education approach, based on personal communication sources and channels, can disseminate, improve and reinforce the acquired knowledge, skills, attitude and behavior between individuals or among diverse group members.

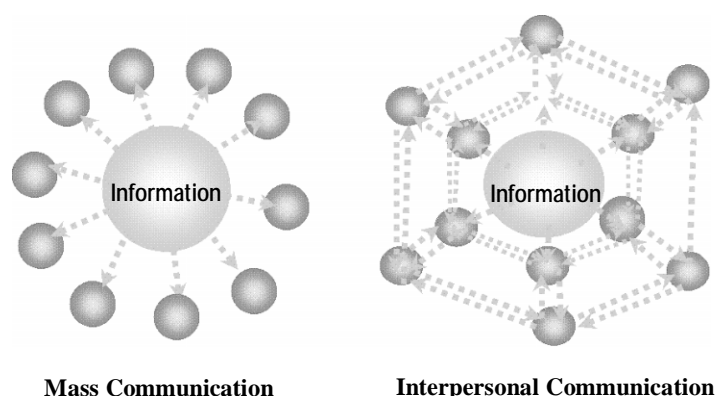


Figure 4.5-2 Difference between Mass Communication and Interpersonal Communication

Source: JICA Study Team

4.6 Overall Facility Plan in the Kathmandu Valley

4.6.1 Principle for Overall Facility Plan in the Kathmandu Valley

The principles adopted to develop the OFP were threefold:

Principle 1 : Waste Hierarchy; The SWM facilities should contribute to a more balanced SWM system that first works to reduce the waste at source, re-use, recycle and recover, treat and finally dispose of the waste.

Principle 2 : Sustainable Facilities; Facilities should be sustainable both financially and technically and should suit the existing Nepalese conditions.

Principle 3 : Urgent Implementation: To avoid delays in providing needed facilities, a step-wise approach was adopted. The past studies and plans were taken into consideration as much as possible.

4.6.2 Alternative Evaluation of OFP

As a first step, a short list of candidates for long-term landfill sites (L/T-LFSs) was prepared based on the 1998 study by the Department of Mines and Geology (DOMG). It is noted that six years have passed since the implementation of that study and development has been rapidly progressing. The four candidate sites, Pharshidol South, Pharshidol North, Taikabu, and Okharpouwa, for development of long-term sanitary landfill were selected. Ranking of these sites was made taking into account field visits and available information.

The facilities to be incorporated in the formulated alternatives mostly reflect existing plans and nine alternatives, based on the number of landfills, were analyzed. Alternatives 1a, b and c call for one sanitary landfill to serve the whole the Kathmandu Valley with provision of WPFs. Alternatives 2a, b and c call for two landfills to be developed. Alternative 2c is an offshoot of Alt. 2b but without WPFs. Alternatives 3a and b provide three landfills, and once more Alt. 3b is an offshoot of Alt. 3a but without WPFs. Alternative 4 has each individual municipality developing its own SWM facilities in the absence of the Umbrella Concept. Figure 4.6-1 shows the locations of these facilities.

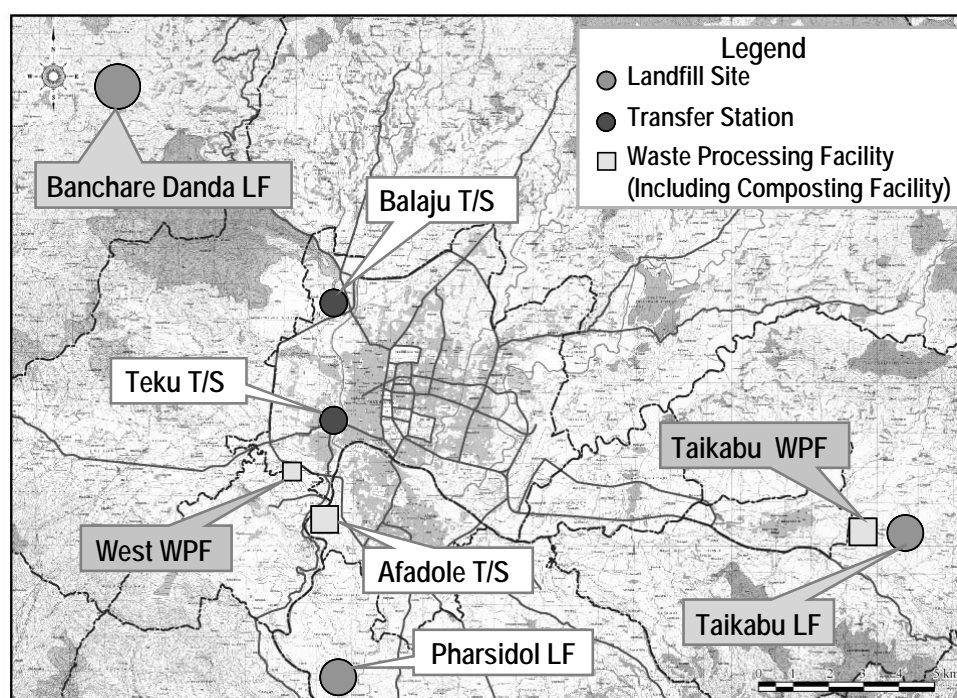


Figure 4.6-1 Facilities Incorporated in the Alternatives 1-3

The developed alternatives are described in the following Table 4.6-1.

Table 4.6-1 Alternatives Formulation

Alt	LF	WPF	T/S	Comments
1a	Okharpauwa	West Taikabu	Teku Balaju Taikabu	<u>Alt. 1a:</u> examines one landfill for the total valley, located outside the valley and the effect of waste reduction by two composting facilities. Three transfer stations are required.
1b	Taikabu	West Taikabu	Teku Balaju	<u>Alt. 1b:</u> locates one landfill within the valley at Taikabu LF candidate site which is under EIA process. WPF is proposed on an unidentified site west of the two cities to reduce transfer haul distances.
1c	Pharsidol	West Taikabu	Teku Balaju	<u>Alt. 1c:</u> locates the sole landfill for the valley at a site proposed in the Pharsidol area, Pharsidol of LSMC, and close to the municipalities.
2a	Okharpauwa Taikabu	West Taikabu	Teku Balaju	<u>Alt. 2a:</u> proposes two landfills, in Okharpauwa outside the valley and Taikabu. Two WPFs are also proposed.
2b	Taikabu Pharsidol	West Taikabu	Teku Balaju	<u>Alt. 2b:</u> proposes two landfills, Taikabu and Pharsidol, both located within the valley, and two composting facilities.
2c	Taikabu Pharsidol		Teku Balaju West	<u>Alt. 2c:</u> is an offshoot of Alt. 2B without WPFs, in order to study the effect of waste reduction.
3a	Okharpauwa Taikabu Pharsidol	West Taikabu	Teku Balaju	<u>Alt. 3a:</u> proposes three landfills and two WPFs.
3b	Okharpauwa Taikabu Pharsidol		Teku Balaju Afadole	<u>Alt. 3b:</u> is an offshoot of Alt. 3A without the WPFs, in order to study the effect of waste reduction.
4	Okharpauwa Taikabu Pharsidol Thimi Kirtipur	Aletar Afadole Taikabu Thimi Kirtipur	Teku Balaju	<u>Alt. 4:</u> proposes that each municipality achieves its targets through construction of its individual composting facility and sanitary landfill.

Source: JICA Study Team

The main comparison items considered were:

- SWM aspects: How the alternative reflected the proposed waste hierarchy and satisfied the “Proximity Principle”²
- Transportation aspects: The transfer haul costs represent the largest portion of the O&M cost and this is reflected in the ton • km produced by each alternative

4.6.3 Overall Facility Development Plan in the Kathmandu Valley

Since the analysis indicated that two landfills and two WPFs would provide stable and sustainable SWM service for the Kathmandu Valley, Alt. 2b or 2a should be considered.

² The principle whereby waste should be treated and disposed of nearby the generation area as much as possible to nourish responsibility of the waste generator for its management, uphold environmental justice, and decrease transportation costs

In terms of waste transportation and related costs; Alt. 2a would entail an added O&M cost of Rs. 278.9 million over the period of 2007 to 2015 or average Rs.24.9 million annually. On the other hand Alt. 2a holds an edge over Alt. 2b in terms of the site allocation. Out of the two sites required to be identified, EIA for Taikabu site is already in process and barring any unforeseen circumstances is expected to be found suitable for construction of the landfill there. This study has narrowed the candidates for the remaining landfill site to two sites; in Pharsidol and the Banchare Danda site in Okharpauwa.

Pharsidol north site was preferred over Banchare Danda in view of the shorter transport distance and other factors. However three major issues may delay the development of this site. These are the Pharsidol wellfields, the direction of Tribhuvan Airport runway and the close proximity of the culturally important village of Khuipa. A long time may be required to resolve these issues. On the other hand the major advantage that Banchare Danda site has is the commitment of the Central Government to develop this site as a landfill (as underlined in the Government's National Plan). Social and cultural issues are much less critical here and development is expected to be much faster. However the Government needs to carefully discuss with the beneficiaries of the site, namely KMC and LSMC on how to bridge the high haulage costs. The Overall Facility Plan (OFP), therefore, has been developed based on Alt. 2a in order to expedite the process of developing long-term landfill by building on all the effort that has been applied so far and also to clarify the costs incurred.

Accordingly the OFP is discussed in Zone A (KMC, LSMC and KRM) and Zone B (BKM and MTM) as shown in Table 4.6-2.

Table 4.6-2 Overall Facility Plan under the Umbrella Concept

Facilities		Descriptions
ZONE A – KMC, LSMC and KRM		
1	Sisdol LF	
	(1) Valley 1	Valley 1 will be operated for about 12-14 months
	(2) Valley 2	Valley 2 to be developed and operated for about 12 months
	(3) Post closure	Upon completion of disposal operations at Sisdol proper site closure will be implemented and environmental monitoring will continue until as required
2	Bagmati River Dumping Site	Bagmati River dumping site will cease operation once the new transfer trucks arrive (around Oct. 2005) and all the waste is transported to Sisdol LF. For a couple of years thereafter, safe closure works will be implemented along the Bagmati River banks where waste has been deposited.
3	Banchare Danda L/T-LF	This LF is expected to be developed within the next three years. It will be operated as a Level 3, semi-aerobic landfill.
4	West WPF	A WPF, basically for compost production but that will also include recyclable materials separation facilities to be developed west of KMC and LSMC and within 7-10 Km distance. The facility will be developed in three phases, starting with an input capacity of 100 t/d and reaching 300 t/d. Residues will be transported from the plant to the landfill
5	Teku T/S	Teku T/S has been improved with a capacity of 200 t/d (40 t at peak hour). Tipping at the station will continue to be mixed with some loading by wheel loaders.
6	Balaju T/S	Balaju T/S will be developed on the allocated land within 2006. It will be a split level unloading system without compaction. It will have a capacity of 120 t/d.
7	Afadole Temporary T/S	For the first 2-3 years of the Action Plan period, a temporary T/S will be developed for LSMC waste at Afadole. Upon completion of the waste processing facility the LSMC waste will be transported there.

Facilities		Descriptions
Zone B – BKM and MTM		
1	Hanumante River dumping site	For the next 2-3 years waste will continue to be dumped at Hanumante River bank, with the application of cover soil.
2	MTM temporary LF	The solid waste collected in the central area will be transported to Teku T/S, while remaining waste will be disposed of a temporary landfill with the application of cover soil.
3	Taikabu LF	The Taikabu LF will be developed within the next 2-3 years as a Level 3, semi-aerobic landfill.
4	Taikabu WPF	Within the same Taikabu LF site, a compost plant will also be developed. The plant will have an initial capacity of 10 t/d and expand to 15 t/d.

Source: JICA Study Team

4.6.4 Facility Operation Schedule and Cost Estimation

Bearing in mind that Sisdol LF has a short life of around 3 years, the operation schedule for the facilities has been prepared. Figure 4.6-2 shows the operation schedule, while the estimated costs for the period of 2005 to 2015 are shown in Table 4.6-3.

YEAR		Short-term			Mid-term		Long-term				
		2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
ZONE A - KMC, LSMC and KRM											
1	Sisdol S/T-LF										
	(1) Valley 1										
	(2) Valley 2										
2	Banchare Danda L/T Sanitary LF										
3	West Waste Processing Facility										
	(1) Phase 1 (100 t/d)										
	(2) Phase 2 (200 t/d)										
	(3) Phase 3 (300 t/d)										
4	Teku T/S										
5	Balaju T/S										
6	LSMC Temporary T/S (Afadole)										
ZONE B - BKM and MTM											
1	Hanumante River Dumping Site (BKM)										
2	Temporary LF (MTM)										
3	Taikabu LF										
4	Taikabu WPF										
	(1) Phase 1 (10 t/d)										
	(2) Phase 2 (15 t/d)										

Figure 4.6-2 Operation Schedule of Overall Facility in the Kathmandu Valley

Source: JICA Study Team

Table 4.6-3 Estimated Costs of the Facility Plan (million Rs)

SN	Facility	Investment Costs
1	Improvement/Development of Transfer Station	
	1.1 Teku T/S (Improvement)	2.0
	1.2 Balaju T/S	44.2
	1.3 Afadol Temporary T/S	19.7
	Sub-total 1	65.9
2	Development of Waste Processing Facility	
	2.1 West WPF (including equipment)	219.8
	2.2 Taikabu WPF (including equipment)	80.2
	Sub-total 2	300.0
3	Development/Closure of Landfill	
	3.1 Sisdol LF (Closure of Valley I and development of Valley II)	26.4
	3.2 Banchare Danda LF (including equipment)	906.1
	3.3 Taikabu LF (including equipment)	272.0
	Sub-total 3	1,204.5
4	Closure of Dumping Site	
	4.1 Bagmati River dumping site (Closure)	5.0
	4.2 Hanumante River dumping site (Closure)	0.5
	4.3 MTM temporary LF (Closure)	0.2
	Sub-total 4	5.7
TOTAL		1,576.1

Source: JICA Study Team

4.7 Overall Equipment Procurement Plan in the Kathmandu Valley

4.7.1 Basic Concept of Overall Equipment Procurement Plan

The equipment to be procured for implementing the OFP is mainly divided into the equipment for secondary transportation, LF operation, T/S operation, WPF operation and there is maintenance for that equipment.

Considering that operation has already commenced at Sisdol S/T-LF, the first priority should be given to the procurement of secondary transportation equipment because no suitable large-capacity vehicles are presently available for effective operation. As for the equipment for landfill operation, the current equipment may be utilized in Sisdol S/T-LF. Therefore, the immediate priority for procurement of this equipment is a little bit lower than for the secondary transportation vehicles, although in the near future replacement of that aging equipment will be necessary.

4.7.2 Secondary Transportation Vehicle

The total transportation requirement increases explosively up to about 9,000 ton-km per day when the Sisdol S/T-LF starts accepting all collected waste from KMC and LSMC. The requirement then decreases step by step by shortening the transportation distance or reducing the waste quantity by each facility's operation as shown in Figure 4.7-1. From the second quarter of 2007, the upper curve shows the ton.km produced in case of Banchare Danda LF

while the lower graph depicts the ton.km in case of Pharsidol North LF. In the case of Banchare Danda LF, 25 secondary transportation vehicles (STVs) are required.

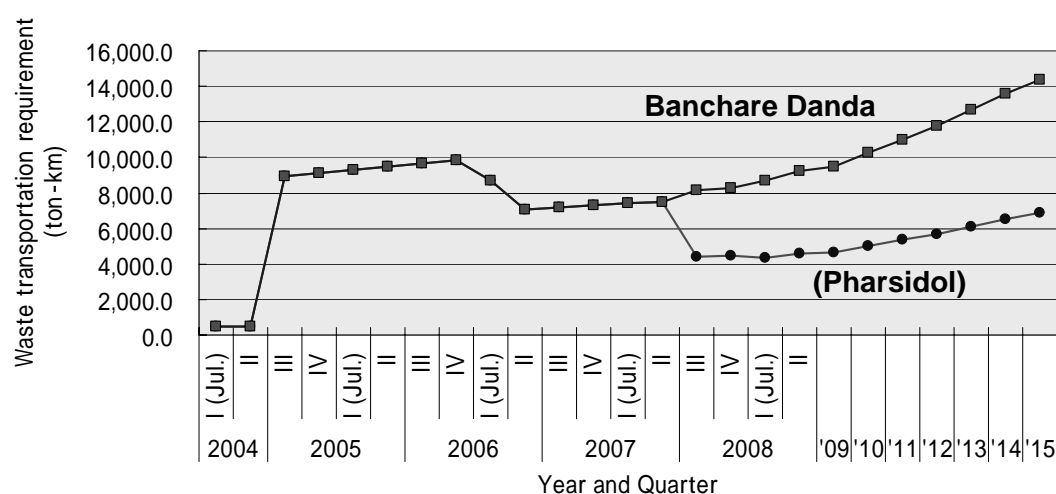


Figure 4.7-1 Future Projection of Transportation Requirement

Source: JICA Study Team

4.7.3 Heavy Equipment for Landfill and Transfer Station Operation

The equipment available in KMC and LSMC and required for the landfills to be developed under the OFP, such as compactor (one unit), dozers (two units) and excavator (one unit), are very old and were procured over 16 years ago (with the exception of one dozer procured over 9 years ago). On the other hand wheel loaders, required for the transfer stations and WPFs are relatively new and may be used in the new facilities to be developed under the OFP. Therefore, KMC and LSMC should concentrate on procurement of dozer and compactor for the landfills.

4.7.4 Workshop Equipment

Daily or regular maintenance and minor repair work of light vehicles such as tractor trailer and tippers are implemented at the KMC mechanical workshop, while repair or maintenance work for large vehicles or heavy equipment are carried out outside. However, because the LSMC mechanical workshop is not adequate to maintain all vehicles and equipment, some major maintenance work for LSMC should be considered to be entrusted to KMC. As for STVs, as special devices such as hydraulic parts are not available at the KMC workshop, such special work may be entrusted to the private sector or the STV manufacturers.

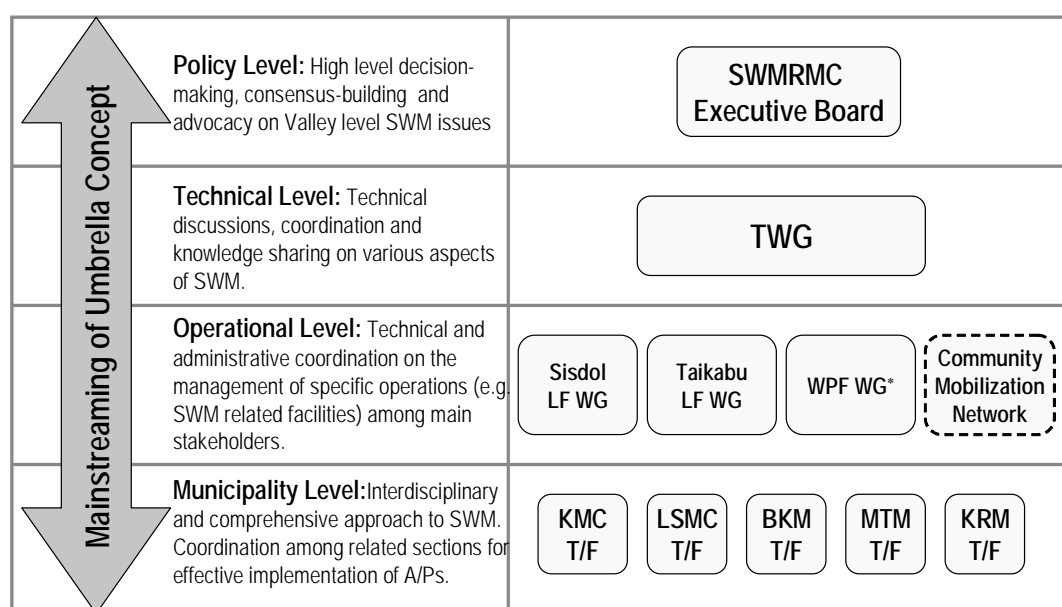
4.8 Basic Concept for Organizational and Institutional Arrangement

Institutionalization of the Umbrella Concept is critical in ensuring the sustainability of its operation, and subsequently its implementation. It is worthy to highlight those issues of

lack of institutional mandates and unclear demarcation of responsibilities among SWMRMC, KMC, and LSMC that are some of the major constraints that lead astray policy dialogue on SWM for over a decade. The principles of the Basic Concept for Organizational and Institutional Arrangement for the Umbrella Concept are:

- Institutional/organizational arrangements should build on existing organizational set up.
- There should be clarity in the mandate and terms of reference for each of the institutions.
- Linkages among various levels of institutions should be identified.
- The specific role and mandate of SWMRMC should be determined.

The basic concept is conceptualized in Figure 4.8-1. Institutional and organizational arrangement is divided into four levels, each with specific significance in guaranteeing the smooth implementation of the Umbrella Concept.



* In case of adoption of public-private partnership approach in development and operation of WPF, this WG will be responsible for Supervision and Management of operations.

Figure 4.8-1 Basic Concept for Institutional and Organizational Arrangement as Umbrella Concept

Source: JICA Study Team

For not only monitoring the implementation of the Umbrella Concept but also preparing the A/Ps based on reliable data, formulation of the solid waste data management system should be quite crucial with the following Basic Concept.

- At the commencement stage, a semi-manual system should be introduced, and then it will be gradually upgraded to an online system or other advanced system
- Each municipality and SWMRMC should modify the common database program based on the data that should be managed respectively
- The data at each municipality should be finally concentrated at SWMRMC to monitor the overall SWM progress and to prepare the SWM white paper

4.9 Basic Concept for Financial Arrangement

4.9.1 Estimated Cost to be Allocated for Umbrella Concept

Costs for the Umbrella Concept consist of investment cost and incremental operation and maintenance (O&M) cost which are estimated separately by each zone and summarized in Table 4.9-1. The total cost until FY2014/15 is estimated at Rs 2,559 million; consisting of Rs 1,742 million on investment and Rs 817 million on incremental O&M.

Table 4.9-1 Estimated Cost for the Umbrella Concept (million Rs)

Cost Items	Zone	2005/06 (2062/63)	2006/07 (2063/64)	2007/08 (2064/65)	2008/09 (2065/66)	2009/10 (2066/67)	2010/11 (2067/68)	2011/12 (2068/69)	2012/13 (2069/70)	2013/14 (2070/71)	2014/15 (2071/72)	Total
I. Investment Cost	A	129.0	859.4	141.2	78.8	89.1	18.4	0.0	17.6	13.0	5.0	1351.5
	B	298.3	34.1	18.0	3.8	2.1	3.2	6.4	24.5	0	0	390.4
	Total	427.3	893.5	159.2	82.6	91.2	21.6	6.4	42.1	13.0	5.0	1,742.0
1. Collection & Transportation	A	6.3	59.9			33.8	7.2		8.4		5.0	120.5
	B			17.7	3.8	2.1	3.2	6.4	4.3			37.5
	Total	6.3	59.9	17.7	3.8	36.0	10.4	6.4	12.6	0	5	158.1
2. Transfer Station	A	65.9										65.9
	B											0
	Total	65.9	0	0	0	0	0	0	0	0	0	65.9
3. Waste Processing Facility	A	14.3	150.4		45.9				9.2			219.8
	B	80.2										80.2
	Total	94.5	150.4	0	45.9	0	0	0	9.2	0	0	300.0
4. Landfill (including closure works)	A	34.8	649.1	141.2	32.9	55.3	11.2			13.0		937.6
	B	218.1	34.1	0.3					20.2			272.7
	Total	252.9	683.2	141.5	32.9	55.3	11.2	0	20.2	13.0	0	1210.2
5. Workshop	A	7.8										7.8
	B											0
	Total	7.8										7.8
II. Incremental O & M Cost	A	45.5	56.1	59.2	74.7	78.2	70.2	77.2	78.7	72.1	75.0	686.8
	B	2.8	9.7	13.9	14.7	15.4	14.4	14.8	15.2	14.6	15.2	130.6
	Total	48.3	65.8	73.0	89.4	93.7	84.6	92.0	93.9	86.7	90.1	817.5
1. Collection & Transportation	A	27.8	36.8	43.2	58.7	63.9	57.0	63.6	67.1	60.1	63.0	541.1
	B	2.3	2.6	6.8	7.7	8.4	7.7	8.0	8.5	7.9	8.4	68.2
	Total	30.0	39.4	50.0	66.4	72.2	64.7	71.6	75.6	68.0	71.4	609.3
2. Transfer Station	A	3.2	4.9	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	36.5
	B											0.0
	Total	3.2	4.9	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	36.5
3. Waste Processing Facility	A			-1.6	-1.6	-3.3	-3.3	-3.3	-4.9	-4.9	-4.9	-27.9
	B		-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-5.6
	Total	0	-0.6	-2.3	-2.3	-3.9	-3.9	-3.9	-5.5	-5.5	-5.5	-33.5
4. Landfill	A	12.4	12.4	12.0	12.0	12.0	12.0	12.4	12.0	12.4	12.4	122.3
	B	0.0	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	64.3
	Total	12.4	19.6	19.2	19.2	19.2	19.2	19.6	19.2	19.6	19.6	186.6
5. Public Awareness /Community Mobilization	A	1.8	1.8	1.8	1.8	1.8	0.9	0.9	0.9	0.9	0.9	13.5
	B	0.4	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.2	3.0
	Total	2.2	2.2	2.2	2.2	2.2	1.1	1.1	1.1	1.1	1.1	16.5
6. Institutional/ Organizational Strengthening	A	0.3	0.3	0.3	0.3	0.3						1.3
	B	0.2	0.2	0.2	0.2	0.2						0.8
	Total	0.4	0.4	0.4	0.4	0.4	0.0	0.0	0.0	0.0	0.0	2.0
III. Total (= I + II)	A	174.5	915.5	200.4	153.5	167.3	88.6	77.2	96.3	85.1	80.0	2038.3
	B	301.1	43.8	31.8	18.5	17.6	17.6	21.2	39.7	14.6	15.2	521.1
	Total	475.6	959.3	232.2	172.0	184.9	106.2	98.4	136.0	99.7	95.1	2559.4

Source: JICA Study Team

4.9.2 Concept for Cost Sharing Among the Organizations Concerned

(1) Concept for Cost Sharing between Municipality and Government

The municipalities are continuously facing financial difficulties because the revenue amount is not enough to satisfy the increasing costs of municipality services. In addition, the

municipalities may face serious financial problems when the Local Development Tax fades out by December 2013. Although KMC and LSMC have started to strengthen their revenue systems, much remains to be done. Accordingly the Government (SWMRMC) is required to bear the costs for development of landfill, transfer station, waste processing facility and closure of LF. On the other hand, municipalities should bear the rest of the costs from their own revenues, i.e. equipment procurement and O&M costs. The costs for public participation and behavior change, and institutional and organizational arrangement should also be borne by the respective municipalities.

Consequently, the cost sharing concept under the Umbrella Concept is summarized as shown in Table 4.9-2, but external financial support may be expected for some areas.

Table 4.9-2 Cost Sharing Concept under the Umbrella Concept

Action Plan	Component	Municipality	Government	Ref: External Sources
Transport & Haulage	Vehicles and Container Carrier	Full	-	Expected
	Container	Full	-	-
	O&M	Full	-	-
Transfer Station	Construction	-	Full	-
	Improvement works	-	Full	-
	Equipment	Full	-	Expected
	O&M	Full	-	-
Compost Plant	Land acquisition	-	Full	-
	Construction	-	Full	-
	Equipment	Full	-	Expected
	O&M	Full	-	-
Landfill	Land acquisition	-	Full	-
	Construction	-	Full	Expected
	Equipment	Full	-	Expected
	Closure	-	Full	-
	O&M	Full	-	-
Workshop	Facilities	Full	-	-
	Machinery & equip.	Full	-	-
Public Awareness/community mobilization		Full	-	-
Institutional/organizational strengthening		Full	-	-

Note: Full means full share, and Expected means financial aid to be expected

Source: JICA Study Team

Based on the above concept, the costs to be shared by SWMRMC and the municipalities can be estimated as shown in Table 4.9-3. SWMRMC should bear 56% of the total cost, while 44% should be borne by the municipalities.

Table 4.9-3 Costs for SWMRMC and Municipalities (million Rs)

Zone	Activities	SWMRMC	Municipalities		
		Facilities	Equipment	O&M	Total
A	Transportation	-	120.5	541.1	661.6
	Transfer Station	65.8	-	36.5	36.5
	WPF	203.8	16.0	-27.9	-11.9
	Landfill	892.4	45.2	122.3	167.5
	Workshop	-	7.8	-	7.8
	Public Awareness	-	-	13.5	13.5
	Institutional	-	-	1.3	1.3
	Total	1,162.0	189.5	686.8	876.3
B	Transportation	-	37.5	68.2	105.7
	WPF	38.2	42.0	-5.6	36.4
	Landfill	218.8	53.9	64.3	118.2
	Public Awareness	-	-	3.0	3.0
	Institutional	-	-	0.8	0.8
	Total	257.0	133.4	130.7	264.1
Total		1,419.0	322.9	817.5	1,140.4

Source: JICA Study Team

(2) Concept for Cost Sharing among the Municipalities

In principle, equipment procurement cost and incremental O&M cost become burdens on municipalities. Each municipality has to bear the cost originally generated by the municipality itself. Meanwhile, the costs generated by joint work among municipalities should be principally discussed and decided among the municipalities concerned. However, the costs generated by joint work is proposed to be separated to each municipality concerned on the basis of solid waste amount transported from the municipality to the destinations of transfer station, WPF and landfill.

4.9.3 Concept for Necessary Financial Procurement of Each Municipality

Judging from the actual financial capacity of municipalities, it is difficult to expect municipalities to cover the entire costs. The municipalities need to develop sources of funds as follows:

- 1) Enhancement of revenue generation capability especially on Property Tax
- 2) Utilization of the Reserve Fund
- 3) Other alternatives
 - Introduction of Public Private Partnership on SWM to reduce the SWM cost
 - Introduction of new charges on SWM services

CHAPTER 5 ACTION PLAN ON SOLID WASTE MANAGEMENT OF KATHMANDU METROPOLITAN CITY

5.1 Solid Waste Stream for Action Plan

The most elementary but indispensable process to develop the Action Plan (A/P) on solid waste management is “to clarify the solid waste stream” as well as “to clarify the solid waste amount”. Under the Umbrella Concept for the solid waste management in the Kathmandu Valley, there are some remarkable turning points, i.e. facilities development such as waste processing facilities and long-term landfill sites, up to the target year of 2015, which should be taken into consideration in preparation of waste stream flow. In order to formulate the A/P, solid waste flow of KMC was prepared as per attached in Appendix 2. The waste management ratios were set as main targets of the A/Ps based on the solid waste stream flows.

5.2 Vision and Target

The vision of KMC has been determined as “**Clean, Green Kathmandu City**”. As for the target, KMC have adopted management ratio in terms of quantity as an objectively verifiable indicator (OVI) aiming to reduce the amount of unmanaged waste as shown in Table 5.2-1.

Table 5.2-1 Target of KMC

Present Situation	Targets		
	Short-term	Mid-term	Long-term
	C: 2005/06 – 2007/08	2008/09 – 2010/11	2011/12 – 2014/15
	N: 2062/63 – 2064/65	2065/66 – 2067/68	2067/68 – 2071/72
Management ratio (Amount): 81% (250 t/d)	Management ratio (Amount): 85% (308 t/d)	Management ratio (Amount): 90% (381 t/d)	Management ratio (Amount): 95% (521 t/d)

Source: KMC Task Force

5.3 Approaches, Strategies and Necessary Activities

The approaches, strategies and necessary activities established by KMC are shown in Table 5.3-1 and implementation schedule of short-term activities is shown in Table 5.3-2.

Table 5.3-1 Strategies and Necessary Activities (KMC)

Approaches	Strategies	Necessary Activities		
		Short-term (2005/06-2007/08)	Mid-term (2008/09-2010/11)	Long-term (2011/12 – 2014/15)
		(2062 Shrawan – 2065 Ashadh)	(2065 Shrawan – 2068 Ashadh)	(2068 Shrawan – 2072 Ashadh)
A: Improvement of Collection and Transportation	A-1: Establishment of efficient solid waste collection system (by private sector participation, and by KMC itself)	A-1-S1: Establishment of rules for private sector collection and its monitoring system A-1-S2: Promotion of private sector participation in door to door collection for <u>25%</u> of households	A-1-M1: Revision of rules for private sector collection and its monitoring system A-1-M2: Promotion of private sector participation in door to door collection <u>40%</u> of households	A-1-L1: Revision of rules for private sector collection and its monitoring system A-1-L2: Promotion of private sector participation in door to door collection for <u>60%</u> of households
		A-1-S3: Preparation of equipment replacement plan and pilot test for a few types of collection vehicles, and commencement of replacement of tractors (for <u>25% collection</u>)	A-1-M3: Procurement of collection vehicle for replacing tractors (for <u>50% collection</u>)	A-1-L3: Procurement of collection vehicle for replacing tractors (for <u>100% collection</u>)
		A-1-S4: Preparation of source separation and collection plan for introduction of waste processing facility	A-1-M4: Introduction of source separate collection for operation of waste processing facility	A-1-L4: Extension of source separate collection areas
		A-1-S5: Introduction of recycling garbage bins to public/tourism areas (<u>1,000 bins per year</u>)	A-1-M5: Monitoring and maintenance of recycling garbage bins at public/tourism areas and extension them if necessary	A-1-L5: Monitoring and maintenance of recycling garbage bins at public/tourism areas and extension them if necessary.
		A-1-S6: Introduction of GIS system for development of a ward and rout-wise collection plan A-1-S7: Improvement of collection and transportation system taking into consideration waste transportation to Sisdol landfill site	A-1-M6: Continuous improvement of collection and transportation system based on the ward and rout-wise collection plan	A-1-L6: Continuous improvement of collection and transportation system based on the ward and rout-wise collection plan
	A-2: Establishment of efficient waste transportation system (by transfer station, by direct transportation)	A-2-S1: Establishment of effective operation system for Teku transfer station A-2-S2: Plan (design), construction and operation of Balaju transfer station (including necessary revision of primary collection route)	A-2-M1: Preparation of a few other transfer points (spots) and their land acquisition	A-2-L1: Commencement of operation of a few other transfer points (spots).
		A-2-S3: Procurement of new direct and secondary transportation vehicles	A-2-M2: Procurement of new direct and secondary transportation vehicles	A-2-L2: Procurement/replacement of direct and secondary transportation vehicles.
		A-2-S4: Establishment of rules and system for transportation of waste from VDCs		
	A-3: Establishment of appropriate maintenance system of equipment and facilities	A-3-S1: Renovation of existing mechanical workshop including replacement of old equipment and establishment of efficient parts stock system A-3-S2: Preparation of new separated workshop for regular service in Teku	A-3-M1: Procurement of necessary equipment for new types of collection and transportation vehicles including training	A-3-L1: Upgrading of mechanical workshops and extension of their service to the private sector.
	A-4: Minimization of illegal open dumping activity	A-4-S1: Clean-up of illegal dumping areas with improvement of primary collection system (along the Bishnumati River)	A-4-M1: Clean-up of illegal dumping areas with improvement of primary collection system (along the Bishnumati River and other Rivers)	A-4-L1: Clean-up of illegal dumping areas with improvement of primary collection system (other areas).
B. Promotion of Waste Minimization	B-1: Development of a central level waste processing facility (WPF) which can receive mixed waste (by private sector participation)	B-1-S1: Cooperation with SWMRMC to proceed development of a central level WPF (<u>50-100 t/d</u>) at appropriate place - Final site selection - Site surveys - Concept design - Feasibility study including market study - Land acquisition - EIA - Detail design - Construction - Others B-1-S2: Cooperation with SWMRMC for commencement of operation of WPF B-1-S3: Monitoring and evaluation of the operation of WPF by the private sector	B-1-M1: Expansion of WPF up to <u>200-300 t/d</u> B-1-M2: Monitoring and evaluation of the operation of WPF by the private sector B-1-M3: Assistance to private sector for necessary marketing and establishment of a national policy	B-1-L1: Implementation of study on another WPF B-1-L2: Examination of the possible recycling technologies

Approaches	Strategies	Necessary Activities		
		Short-term (2005/06-2007/08)	Mid-term (2008/09-2010/11)	Long-term (2011/12 – 2014/15)
		(2062 Shrawan – 2065 Ashadh)	(2065 Shrawan – 2068 Ashadh)	(2068 Shrawan – 2072 Ashadh)
	B-2: Promotion of home and community composting and recycling	B-2-S1: Review of the existing home and community composting and recycling activities B-2-S2: Production of home compost bins and home vermi-compost kits and their distribution B-2-S3: Operation of Community Recycling Center (CRC) in Ward 21 and its extension to other Wards (with support from NEREPA)	B-2-M1: Promotion of home bin or vermi-composting to reach total of <u>5,000 households</u> B-2-M2: Operation of community compost bins in several wards B-2-M3: Operation of CRCs in 18 Wards (50% of wards)	B-2-L1: Promotion of home bin or vermi-composting to reach total of <u>10,000 households</u> B-2-L2: Operation of at least one community compost bin in each ward B-2-L3: Operation of CRCs in all 35 Wards
	B-3: Operation and expansion of medium-scale vermi-composting	B-3-S1: Operation and expansion of medium-scale vermi-composting B-3-S2: Implementation of a sales campaign together with a marketing study	B-3-M1: Expansion of medium-scale vermi-composting B-3-M2: Marketing of compost as a salable product.	B-3-L1: Establishment of another medium-scale vermi composting facility B-3-L2: Marketing of compost as a salable product.
C. Improvement of Final Disposal System	C-1: Operation of sanitary landfill site	C-1-S1: Operation of Sisdol sanitary landfill site	C-1-M1: Operation of Sisdol sanitary landfill site including receive of rejects from WPF (30-40 t/day)	
	C-2: Development of long-term landfill site	C-2-S1: Conducting of survey for possible long-term landfill sites C-2-S2: Cooperation with SWMRMC to proceed establishment of a long-term landfill site - Site surveys - Concept design - Feasibility study - Land acquisition - EIA - Detail design - Construction - Others	C-2-M1: Continuous cooperation with SWMRMC to proceed establishment of the long-term landfill site C-2-M2: Cooperation with SWMRMC for commencement of operation of the long-term landfill site C-2-M3: Procurement of necessary heavy equipment for landfilling	C-2-L1: Operation of the long-term landfill site
	C-3: Appropriate closure of used landfill site	C-3-S1: Rehabilitation and landscaping works of the Bagmati (Balkhu) dumping site	C-3-M1: Continuous rehabilitation and landscaping works of the Bagmati (Balkhu) dumping site C-3-M2: Cooperation with SWMRMC for closure of Sisdol landfill site	C-3-L1: Cooperation with SWMRMC for closure of Sisdole Landfill site
D. Promotion of Public Participation and Behavior Change	D-1: Expansion of “BABA Program-children as effective agents of social changes”	D-1-S1: Establishment of 50 more Nature Clubs D-1-S2: Development of training packages on - Solid Waste Management - Greenery Promotion - Culture and Heritage Conservation - Communication - Nature club management	D-1-M1: Establishment of 100 more Nature Clubs	D-1-L1: Establishment of 200 more Nature Clubs and reach 400 in total
	D-2: Support of community initiatives working with community groups, NGOs/CBOs and private sector	D-2-S1: Development of a database of community groups, NGOs/CBOs and private sector, and selection of the best ones for long term works D-2-S2: Review and evaluation of the existing Ward Environmental Committee (WEC) and formation of active WECs in 10 Wards D-2-S3: Provision of training on SWM and community mobilization for WECs D-2-S4: Provision of technical and financial assistance to best community initiatives of WECs D-2-S5: Provision of annual award to best WEC	D-2-M1: Formation of WECs in 20 more Wards D-2-M2: Implementation of regular interaction and exchange visits among WECs D-2-M3: Provision of technical and financial assistance to best community initiatives of WECs D-2-M4: Regular follow-up of WECs	D-2-L1: Provision of technical and financial assistance to best community initiatives of WECs D-2-L2: Implementation of regular interaction and exchange visits among WECs D-2-L3: Regular follow-up of the WECs

Approaches	Strategies	Necessary Activities		
		Short-term (2005/06-2007/08)	Mid-term (2008/09-2010/11)	Long-term (2011/12 – 2014/15)
		(2062 Shrawan – 2065 Ashadh)	(2065 Shrawan – 2068 Ashadh)	(2068 Shrawan – 2072 Ashadh)
	D-3: Mobilization of City Volunteers (CVs) as a linkage between KMC and citizen	D-3-S1: Mobilization of City Volunteers (CVs) to support BABA program D-3-S2: Implementation of closed camps for capability building and raising team spirit of each batch D-3-S3: Mobilization of CVs in other programs such as promotion of household composting, research, and WEC activities D-3-S4: Recruiting and training of new batch of CVs every year	D-3-M1: Mobilization of CVs in other programs such as promotion of household composting, research, recycling, and WEC activities D-3-M2: Review the past batch and if demand is higher two batches can be managed	D-3-L1: Recruit new batch of 100 CVs every year from different academic backgrounds D-3-L2: Review the past batch and if demand is higher two batches can be managed
	D-4: Implementation of mass communication education programs	D-4-S1: Production of CMU's promotional materials (flyers, brochures, posters, stickers, etc.)	D-4-M1: Setting up of displays and information on SWM as an environmental park in Teku transfer station	D-4-L1: Review and continue the media campaign programs
	D-5: Strengthening of Community Mobilization Unit (CMU)	D-5-S1: Recruiting of a BABA coordinator D-5-S2: Recruiting of assistant level staff for administration D-5-S3: Provision of adequate office space, equipment and financial resources	D-5-M1: Upgrading of CMU with Environmental Information, Education and Communication Section D-5-M2: Provision of specialists' service in community mobilization, children's program, waste management, mass education, etc.	D-5-L1: Well established section in the department providing public services on environment management as a whole.
E Organizational and Institutional Arrangement	E-1: Rationalize organization and institution arrangements	E-1-S1: Implementation of the reorganization plan of the Environment Department	E-1-M-2: Transfer of PPP administrative matters to PPP Specialized Department within the Municipality.	E-1-L1: Monitor and regularly review organizational arrangements to correspond with changing institutional needs.
	E-2: Strengthening of management practices	E-2-S1: Establishment of a monitoring and evaluation system in alignment with the Action Plan E-2-S2: Mainstreaming of program-based budgeting system and expenditure monitoring for a more efficient use of resources E-2-S3: Improvement of information flow and management by encouraging regular coordination meetings and sharing of experiences	E-2-M1: Implementation of a mid-term evaluation on the progress of the Action Plan implementation E-2-M2: Continuous implementation of program-based budgeting system and expenditure monitoring E-2-M3: Continuous implementation of information flow and management by regular coordination meetings and sharing of experiences	E-2-L1: Implementation of a final evaluation on the results achieved from the Action Plan implementation E-2-L2: Continuous implementation of program-based budgeting system and expenditure monitoring E-2-L3: Continuous implementation of information flow and management by regular coordination meetings and sharing of experiences
		E-2-S4: Introduction of systematic collection and analysis of SW data by database	E-2-M4: Continuous collection and analysis of SW data by database	E-2-L4: Continuous collection and analysis of SW data by database
	E-3: Appropriate staffing arrangement	E-3-S1: Preparation of TORs for each unit delineating tasks and responsibilities to be undertaken during Action Plan implementation E-3-S2: Reassignment of necessary staff (Taking into consideration future human resource demands such as for facilities development)	E-3-M1: Establishment of a more effective staff performance evaluation system E-3-M2: Establishment of staffing system based to "assign the right person to the right position" using objective criteria such as staff performance evaluation. E-3-M3: Reassignment of necessary staff. (Taking into consideration future human resource demands such as for facilities development)	E-3-L1: Continuation of mid-term activities E-3-L2: Continuation of mid-term activities E-3-L3: Continuation of mid-term activities

Approaches	Strategies	Necessary Activities		
		Short-term (2005/06-2007/08)	Mid-term (2008/09-2010/11)	Long-term (2011/12 – 2014/15)
		(2062 Shrawan – 2065 Ashadh)	(2065 Shrawan – 2068 Ashadh)	(2068 Shrawan – 2072 Ashadh)
	E-4: Strengthening institution to be systematic and sustainable	E-4-S1: Development of a staffing plan based on HRD program and its application E-4-S2: Assignment of a Learning Manager for HRD, and maintain an inventory of staff skills knowledge, and training history E-4-S3: Strengthening of knowledge-sharing mechanism and peer-training sessions for full utilization of existing human resources.	E-4-M1: Development of mid to long-term HRD program and its application in line with HRD program E-4-M2: Implementation of in-house training modules systematically designed for staff development E-4-M3: Appointment of full time human resource management staff within Environment Department	E-4-L1: HRD program regularized and opened to external partners for resource mobilization.
F. Others	F-1: Development of a medical waste management system	F-1-S1: Dissemination of Medical Waste Management Guidelines F-1-S2: Operation of a medical waste treatment facility at Teku F-1-S3: Procurement of additional equipment (autoclave) F-1-S4: Training for staff of KMC, private sector and medical institutions F-1-S5: Handing over the responsibility to the private sector for the operation F-1-S6: Monitoring & evaluation of the system	F-1-M1: Establishment of a central level medical waste treatment facility F-1-M2: Continue awareness programs F-1-M3: Continue monitoring & evaluation	F-1-L1: Continuous treatment of medical waste
	F-2: Development of a hazardous waste management system		F-2-M1: Implementation of study on hazardous waste management	F-2-L1: Development of hazardous waste management system (Computers, Batteries, Industrial waste, etc.)
	F-3. Gradual and effective privatization with special consideration to the sweeper population.	F-3-S1: Review of working conditions of the sweeper population and provision of measures to improve their performance. F-3-S2: Regularize privatization procedures applying open bidding process F-2-S3: Establishment of regular coordination mechanisms with various private operators	F-3-M1: Increased coverage by private sector (Up to 50% of collection coverage, without any drastic decrease of sweeper population)	F-3-L1: Increased coverage by private sector. (Up to 60% of collection coverage, without drastic decrease of sweeper population)

Source: KMC Task Force

Table 5.3-2 Implementation Schedule of Short-Term Activities (KMC)

Strategies	Short-Term Activities	Responsible Department, Section (Unit)	Related Organizations (Department, Section, NGO/CBO)	2005/2006				2006/2007				2007/2008			
				I (July 16)	II	III	IV (July 16)	I (July 17)	II	III	IV (July 16)	I (July 17)	II	III	IV (July 15)
				2062/2063				2063/2064				2064/2065			
				Shrawan			Ashadh	Shrawan			Ashadh	Shrawan			Ashadh
A-1: Establishment of efficient solid waste collection system (by private sector participation and by KMC itself)	A-1-S1: Establishment of rules for private sector collection and its monitoring system	SWMS	private sector												
	A-1-S2: Promotion of private sector participation in door to door collection for 25% of households	SWMS	private sector												
	A-1-S3: Preparation of equipment replacement plan and pilot test for a few types of collection vehicles, and commencement of replacement of tractors (for 25% collection)	SWMS	Mechanical Sec.												
	A-1-S4: Preparation of source separation and collection plan for introduction of waste processing facility	SWMS	SWMRMC, CMU, NGO/CBO, private sector												
	A-1-S5: Introduction of recycling garbage bins to public/tourism areas (1,000 bins per year)	SWMS	Authorities regarding tourism												
	A-1-S6: Introduction of GIS system for development of a ward and rout-wise collection plan	SWMS													
	A-1-S7 Improvement of collection and transportation system taking into consideration waste transportation to Sisdol landfill site	SWMS	Private Sector												
A-2: Establishment of efficient waste transportation system (by transfer station, by direct transportation)	A-2-S1: Establishment of effective operation system for Teku transfer station	SWMS	Mechanical Sec.												
	A-2-S2: Plan (design), construction and operation of Balaju transfer station (including necessary revision of primary collection route)	SWMS	Ward offices												
	A-2-S3: Procurement of new direct and secondary transportation vehicles	SWMS	Mechanical Sec.								● Replacement of Multi Packer (phase 1)			● (phase 2)	
	A-2-S4: Establishment of rules and system for transportation of waste from VDCs	SWMS	VDCs												
A-3: Establishment of appropriate maintenance system for equipment and facilities	A-3-S1: Renovation of existing mechanical workshop including replacement of old equipment and establishment of efficient parts stock system	Mechanical Sec.	SWMS, SWMRMC												
	A-3-S2: Preparation of new separated workshop for regular service in Teku	Mechanical Sec.	SWMS, SWMRMC												
A-4: Minimization of illegal open dumping activity	A-4-S1: Clean-up of illegal dumping areas with improvement of primary collection system (along the Bishnumati River)	SWMS	CMU, NGO/CBO												




Strategies	Short-Term Activities	Responsible Department, Section (Unit)	Related Organizations (Department, Section, NGO/CBO)	2005/2006				2006/2007				2007/2008			
				I (July 16)	II	III	IV (July 16)	I (July 17)	II	III	IV (July 16)	I (July 17)	II	III	IV (July 15)
				2062/2063				2063/2064				2064/2065			
				Shrawan			Ashadh	Shrawan			Ashadh	Shrawan			Ashadh
B-1: Development of a central level waste processing facility (WPF) which can receive mixed waste (by private sector participation)	B-1-S1: Cooperation with SWMRMC to proceed development of a central level WPF (50-100 t/d) at appropriate place - Final site selection - Site surveys - Concept design - Feasibility study including market study - Land acquisition - EIA - Detail design - Construction - Others	SWMS	MOLD/SWMRMC, LSMC, KRM												
B-2: Promotion of home and community composting and recycling	B-2-S1: Review of the existing home and community composting and recycling activities B-2-S2: Production of home compost bins and home vermi-compost kits and its distribution B-2-S3: Operation of Community Recycling Center (CRC) in Ward 21 and their extension to other Wards (with support from NEREPa)	SWMS (CMU)	NGO/CBO												
B-3: Operation and expansion of medium-scale vermi-composting	B-3-S1: Operation and expansion of medium-scale vermi-composting B-3-S2: Implementation of a sales campaign together with a marketing study	SWMS (CMU)	Tribhuvan University, NGP/CBO												
C-1: Operation of sanitary landfill site	C-1-S1: Operation of Sisdol sanitary landfill site	SWMS	SWMRMC, LSMC												
C-2: Development of long-term landfill site	C-2-S1: Conducting of survey for possible long-term landfill sites C-2-S2: Cooperation with SWMRMC to proceed establishment of a long-term landfill site - Site surveys - Concept design - Feasibility study - Land acquisition - EIA - Detail design - Construction - Others	SWMS	SWMRMC, LSMC, KRM												
C-3: Appropriate closure of used landfill site	C-3-S1: Rehabilitation and landscaping works of the Bagmati (Balkhu) dumping site	SWMS	SWMRMC, LSMC, KRM												

Strategies	Short-Term Activities	Responsible Department, Section (Unit)	Related Organizations (Department, Section, NGO/CBO)	2005/2006				2006/2007				2007/2008			
				I (July 16)	II	III	IV (July 16)	I (July 17)	II	III	IV (July 16)	I (July 17)	II	III	IV (July 15)
				2062/2063				2063/2064				2064/2065			
				Shrawan			Ashadh	Shrawan			Ashadh	Shrawan			Ashadh
D-1: Expansion of "BABA Program children as effective agents of social changes"	D-1-S1: Establishment of 50 more Nature Clubs	SWMS (CMU)	Nature Club coordinator (to be recruited), schools												
	D-1-S2: Development of training packages on - Solid Waste Management - Greenery Promotion - Culture and Heritage Conservation - Communication - Nature club management	SWMS (CMU)	Nature Club coordinator (to be recruited), schools												
	D-1-S3: Training for Nature Clubs members on the above five areas of works	SWMS (CMU)	Nature Club coordinator (to be recruited), schools												
	D-1-S4: Regular interaction between Nature Clubs and local communities to reach out to society as a whole	SWMS (CMU)	Nature Club coordinator (to be recruited), schools												
D-2: Support of community initiatives working with community groups, NGOs/CBOs and private sector	D-2-S1: Development of a database of community groups, NGOs/CBOs and private sector, and selection of the best ones to long- term work	SWMS (CMU)													
	D-2-S2: Review and evaluation of the existing Ward Environmental Committee (WEC) and formation of active WECs in 10 Wards	SWMS (CMU)	Ward offices												
	D-2-S3: Provision of training on SWM and community mobilization for WECs	SWMS (CMU)													
	D-2-S4: Provision of technical and financial assistance to best community initiatives of WECs	SWMS (CMU)													
	D-2-S5: Provision of annual award to best WEC	SWMS (CMU)													
D-3: Mobilization of City Volunteers (CVs) as a linkage between KMC and citizen	D-3-S1: Mobilization of City Volunteers (CVs) to support BABA program	SWMS (CMU)													
	D-3-S2: Implementation of closed camps for capability building and raising team spirit of each batch	SWMS (CMU)													
	D-3-S3: Mobilization of CVs in other programs such as promotion of household composting, research, and WEC activities	SWMS (CMU)													
	D-3-S4: Recruit and training of new batch of CVs every year.	SWMS (CMU)													

Strategies	Short-Term Activities	Responsible Department, Section (Unit)	Related Organizations (Department, Section, NGO/CBO)	2005/2006				2006/2007				2007/2008			
				I (July 16)	II	III	IV (July 16)	I (July 17)	II	III	IV (July 16)	I (July 17)	II	III	IV (July 15)
				2062/2063		Ashadh		2063/2064		Ashadh		2064/2065		Ashadh	
D-4: Implementation of mass	D-4-S1: Production of CMU's promotional materials (flyers, brochures, posters, stickers, etc.)	SWMS (CMU)													
	D-4-S2: Setting up of hoarding boards on SWM in prime locations of the city.	SWMS (CMU)	NGO												
	D-4-S3: Setting up of self-explanatory displays on SWM at CMU and other key locations for wider publicity.	SWMS (CMU)	Other sections in KMC												
	D-4-S4: Regular featuring and reporting on SWM on TV program "Hamro Kathmandu"	SWMS (CMU)	NGO												
	D-4-S5: Design and maintenance of the web page on SWM	SWMS (PMU)													
	D-4-S6: Implementation of community exhibition and events regularly	SWMS (CMU)					● ●		●		●		●		●
D-5: Strengthening of CMU	D-5-S1: Recruiting of BABA coordinator	SWMS (CMU)			●										
	D-5-S2: Recruiting of assistant level staff for administration	SWMS (CMU)		●											
	D-5-S3: Provision of adequate office space, equipment and financial resources	SWMS (CMU)													
E-1: Rationalize organizational and institutional arrangements	E-1-S1: Implementation of the reorganization plan of the Environment Department	Environment Dept.													
E-2 Strengthening of management practices	E-2-S1: Establishment of a monitoring and evaluation system in alignment with the Action Plan	Environment Dept.													
	E-2-S2: Mainstreaming of program-based budgeting system and expenditure monitoring for a more efficient use of resources	Environment Dept.													
	E-2-S3: Improvement of information flow and management by encouraging regular coordination meetings and sharing of experiences	Environment Dept.													
	E-2-S4: Introduction of systematic collection and analysis of SW data by database	SWMS													
E-3: Appropriate staffing arrangement	E-3-S1: Preparation of TORs for each unit delineating tasks and responsibilities to be undertaken during Action Plan implementation	Environment Dept.													
	E-3-S2: Reassignment of necessary staff (Taking into consideration future human resource demands such as for facilities development)	Environment Dept.													

Strategies	Short-Term Activities	Responsible Department, Section (Unit)	Related Organizations (Department, Section, NGO/CBO)	2005/2006				2006/2007				2007/2008			
				I (July 16)	II	III	IV (July 16)	I (July 17)	II	III	IV (July 16)	I (July 17)	II	III	IV (July 15)
				2062/2063				2063/2064				2064/2065			
				Shrawan			Ashadh	Shrawan			Ashadh	Shrawan			Ashadh
E-4: Strengthening institution to be systematic and sustainable	E-4-S1: Development of a staffing plan based on HRD program and its application	Environment Dept.													
	E-4-S2: Assignment of a Learning Manager for HRD, and maintain an inventory of staff skills and knowledge, training history	Environment Dept.													
	E-4-S3: Strengthening of knowledge-sharing mechanism and peer-training sessions for full utilization of existing	Environment Dept.													
F-1: Development of a medical waste management system	F-1-S1: Dissemination of Medical Waste Management Guidelines	SWMS (SMWU, CMU)	SWMRMC, MOHP, Hospitals, Clinics												
	F-1-S2: Operation of a medical waste treatment facility at Teku	SWMS (SWMU)	SWMRMC, MOHP, Hospitals, Clinics												
	F-1-S3: Procurement of additional equipment (autoclave)	SWMS (SWMU)	SWMRMC, MOHP												
	F-1-S4: Training for staff of KMC, private sector and medical institutions	SWMS (SWMU)	SWMRMC, MOHP												
	F-1-S5: Handing over the responsibility to the private sector for the operation	SWMS (SWMU)	SWMRMC, MOHP, Private sector												
	F-1-S6: Monitoring & evaluation of the System	SWMS (SWMU)	SWMRMC, MOHP, Private sector												
F-3: Gradual and effective privatization with special consideration to the sweeper population.	F-3-S1: Review of working conditions of the sweeper population and provision of measures to improve their performance.	SWMS													
	F-3-S2: Regularize privatization procedures applying open bidding process	SWMS													
	F-2-S3: Establishment of regular coordination mechanisms with various private operators	SWMS													

Legend

-  : Continuous activity
 : Intermittent activity
 : Spot activity

SWMS : Solid Waste Management Section
 PMU : Planning and Monitoring Unit
 CMU : Community Mobilization Unit
 SWMU : Special Waste Management Unit

5.4 Financial Plan

As shown in Table 5.4-1, the total SWM cost for Action Plan implementation, summing up the current SWM cost and Action Plan cost, amounts to Rs 1,835 million over the period until the target year of 2015 (2072). On the other hand, total own revenue, summing up actual revenue and projected revenue increase, amounts to Rs 6,503 million. Thus, the ratio of total SWM cost to total own revenue results in 28%, which is slightly higher than current ratio of 23%. Consequently, it is suggested that KMC bears entire Action Plan cost to cope with growing demand on SWM services in the municipality.

Table 5.4-1 Ratio of SWM Cost to Municipality Own Revenue (KMC)
(million Rs)

Items	2005/06 2062/6	2006/07 2063/6	2007/08 2064/6	2008/09 2065/6	2009/10 2066/6	2010/11 2067/6	2011/12 2068/6	2012/13 2069/7	2013/14 2070/7	2014/15 2071/72	Total
I. Own Revenue	559.2	594.8	632.6	660.8	692.5	694.0	683.6	673.1	662.6	652.2	6,505.3
1. Actual Revenue	525.9	525.9	525.9	525.9	525.9	525.9	525.9	525.9	525.9	525.9	5,259.0
2. Projected Revenue Increase	33.3	68.9	106.7	134.9	166.6	168.1	157.7	147.2	136.7	126.3	1,246.3
II. SWM Cost	174.1	209.3	179.5	173.9	208.5	182.8	173.4	183.0	178.8	171.7	1,835.1
1. Current SWM	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	1,200.0
2. Action Plan	54.1	89.3	59.5	53.9	88.5	62.8	53.4	63.0	58.8	51.7	635.1
III. Ratio (= II/I)	31%	35%	28%	26%	30%	26%	25%	27%	27%	26%	28%

Note: 1) Actual revenue is amount of FY2004/05 (2061/62) which is assumed to continue the same amount, 2) Projected revenue increase consists of Local Development Fee, Gov. subsidy and Property Tax, 3) Current SWM cost is the cost presented in Chapter 3 which is assumed to continue the same amount.

Source: JICA Study Team

5.5 Monitoring and Evaluation Plan for Action Plans

The A/P is a long-term strategic plan to be implemented starting fiscal year 2005/06 (2062/63) to 2014/15 (2071/2072). In order to ensure that the Action Plan is implemented in an effective and sustainable manner, monitoring and evaluation systems need to be put in place that bind together both individual and collective achievements of SWMRMC and the five municipalities. Such systems should be installed both at the municipal level, as well as the Valley level, in line with the institutional arrangements as discussed under the Umbrella Concept.

In the case of the A/Ps, OVIs were identified with target for the year 2015. Through the implementation of the A/Ps, collectively, the municipalities and SWMRMC will aim to increase the total solid waste management rate from existing 76% to 93%. Each municipality's target, solid waste management ratio, is as specified within the respective A/Ps.

Monitoring: Monitoring of A/P implementation should be conducted at two levels. First, the solid waste management ratio should be calculated at individual municipalities, to measure the effectiveness of SWM activities as indicated in the targets of the respective A/Ps. It is suggested that each municipality's benchmark the target solid waste management ratio that they should achieve by the end of short, medium and long term activities of the A/Ps. Every three or four years, the actual percentage of the solid waste management rate should be measured against the benchmarked target ratio to assess progress.

The second level of monitoring of the A/Ps should be conducted when each municipality formulate their respective annual work plans, which in fact is a breakdown of activities as identified for short, medium, and long term. Based on the existing policy priorities, availability of resources, influences from external factors, and lessons learned from the past implementation of activities, the contents of A/Ps themselves should be reviewed and modified. This process should allow enough flexibility so that the activities stipulated in the A/Ps could be changed, dropped or added insofar as the overall effect of the SWM program would increase the solid waste management ratio. Furthermore, this exercise would serve to update the A/Ps so that it would enhance the relevance of the A/Ps for continued sustainability. The linkage between the Action Plan monitoring system and Annual Work Plan is as illustrated in Figure 5.5-1.

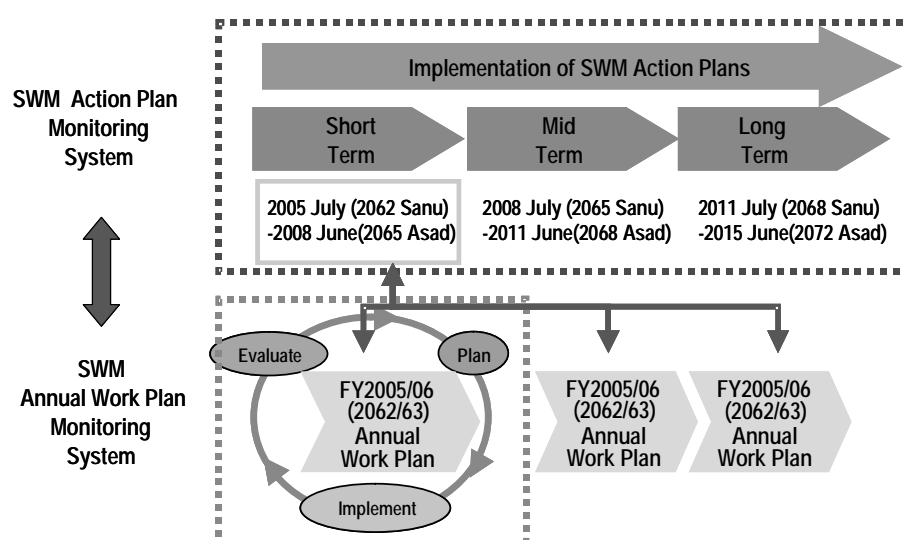


Figure 5.5-1 Linkage between Action Plan Monitoring System and Annual Work Plan

Source: JICA Study Team

Evaluation: During the benchmarked years of 2008 and 2011, which are also the final fiscal years within short and mid terms, respectively, end of term evaluations are recommended to holistically review the A/Ps implementation from the perspectives such as relevance, effectiveness, efficiency, impact and sustainability of municipal activities. In 2015, the final evaluation should be conducted to examine whether the ultimate target of 93% solid waste management ratio was achieved, and to draw best practices and lessons learned for future SWM programs.

For the end of term evaluations, it is envisaged that a joint evaluation team be formed for each municipality among the representatives from municipal T/Fs, SWMRMC, and MOLD. The results of the evaluations should be disclosed and shared with other municipalities at TWG and other forums so that the major lessons learned and recommendations could be shared with a wider audience.

APPENDICES

- APPENDIX 1 Members of Technical Working Group and Task Force
- APPENDIX 2 Solid Waste Stream Flow of KMC (Current and Future)
- APPENDIX 3 Annual Work Plan of Fiscal Year of 2005/06 (2062/63)
Proposed by Task Force (KMC)

APPENDIX 1

Members of Technical Working Group and Task Force

APPENDIX 1 MEMBER OF TECHNICAL WORKING GROUP AND TASK FORCE

Technical Working Group (Total 18 members)

As of July 20, 2005

Organizations	Name	Designation / Organizational Position
MOLD	Mr. Babu Ram Gautam (Mr. Prem Raj Giri up to Nov, 2004)	Under Secretary
SWMRMC	Mr. Surya Man Shakya (Chairperson up to June 23, 2005)	Former General Manager
	Mr. Ashok Shahi (Chair person after June 24, 2005)	Acting General Manager
	Mr. Ram Sharan Maharjan	Civil Engineer
	Mr. Nirmal Darshan Acharya	Civil Engineer
KMC	Mr. Rajesh Manandhar	Chief, Solid Waste Management Section
	Mr. Kiran Ulak	Engineer, Solid Waste Management Section
	Mr. Purusotam Shakya	Chief, Mechanical Section
LSMC	Mr. Rudra Prasad. Gautam	Chief, Public Works Division
	Mr. Pradeep Amatya	Chief, Environment and Sanitation Section
BKM	Mr. Laxman Kisiju	Chief, Planning and Technical Section
	Mr. Moti Bhakta Shrestha	Chief, Social Welfare & Sanitation Section
	Mr. Dinesh Rajbhandari	Sanitation Engineer, Planning and Technical Section
MTM	Mr. Satya Narayan Shah	Chief, Planning and Technical Section
	Ms. Krishna Kumari Shrestha	Assistant, Community Development and Sanitation Section
	Mr. Surendra Shrestha	Junior Engineer, Planning and Technical Section
KRM	Mr. Anuj Pradhan	Chief, Solid Waste Management Unit
	Mr. Gyan Bazra Maharjan	Assistant, Solid Waste Management Unit/Accounting

Task Force of KMC (Total 15 members)

As of July 20, 2005

Name	Designation / Organizational Position
Mr. Indra Man Suwal	Head, Environment Department
Mr. Rajesh Manandhar	Chief, Solid Waste Management Section
Mr. Kiran Ulak	Engineer, Solid Waste Management Section
Mr. Purusotam Shakya	Chief, Mechanical Section
Ms. Shriju Pradhan	Community Mobilization Unit
Ms. Sanu Maiya Maharjan	Community Mobilization Unit
Mr. Deepak Kansakar	Engineer, Solid Waste Management Section
Mr. Krishna P. Kafle	Department of Mines and Geology
Mr. Puskar L. Shrestha	LIUD (NGO)
Mr. Basu Upreti	Kathmandu Mahanagar SWM Services
Mr. Padma S. Joshi	IOE/TU
Mr. Shirish Singh	ENPHO (NGO)
Mr. Prakash M. Sharma	PROPUBLIC
Mr. Drona Raj Ghimire	Nefeej
Mr. Shankar Raj Kandel	Head, International Cooperation and Coordination Department

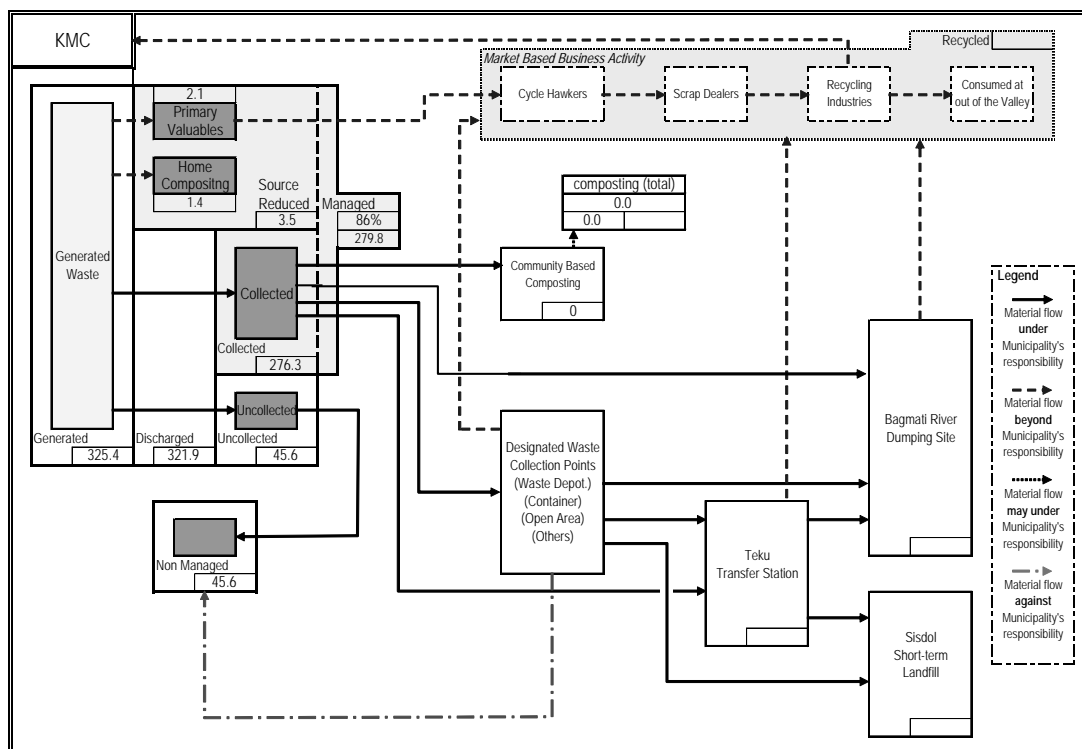
APPENDIX 2

Solid Waste Stream Flow of KMC (Current and Future)

APPENDIX 2 SOLID WASTE STREAM FLOW OF KMC (CURRENT AND FUTURE)

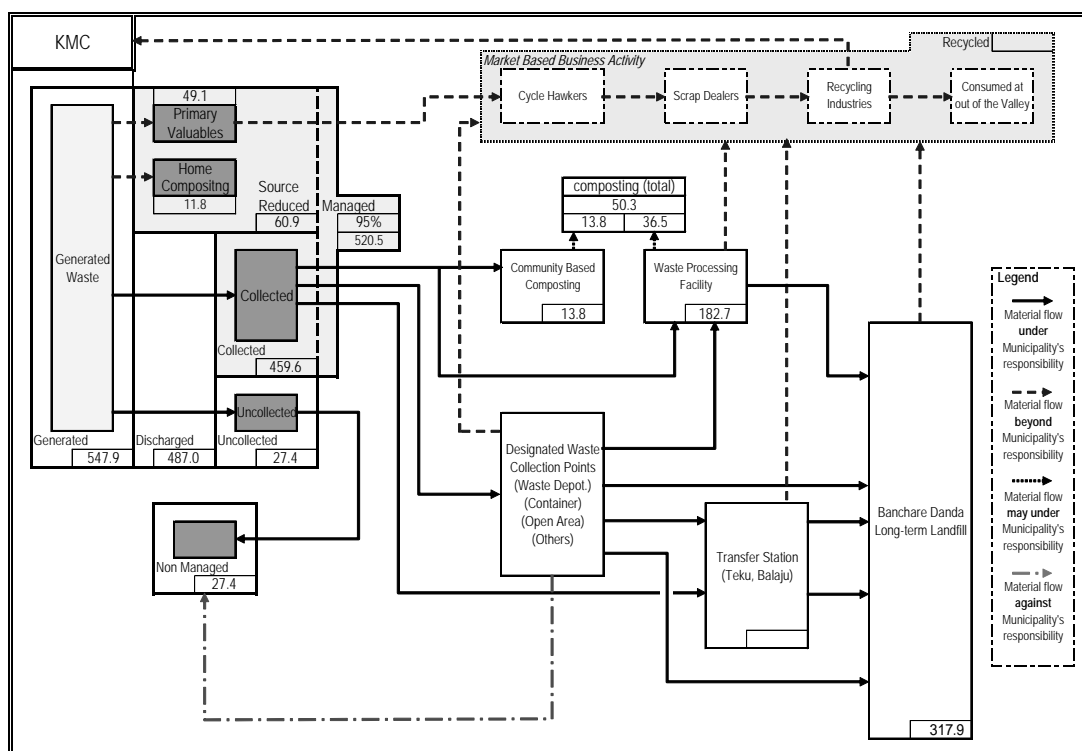
Existing Solid Waste Stream (2005)

Unit: t/day



Future Solid Waste Stream (2015)

Unit: t/day



APPENDIX 3

***Annual Work Plan of
Fiscal Year of 2005/06 (2062/63)
Proposed by Task Force (KMC)***

Table A.3 Annual Work Plan of Fiscal Year of 2005/06 (2062/63) Proposed by Task Force (KMC)

SN	Shor-term Activities to be Conducted in FY2005/06 (2062/2063)	Responsible Person (Department, Section)	Proposed Budget (NRs)	2005												2006																				
				July	August			September			October			November			December			January	February			March			April			May			June			July
				III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I		
				2062												2063																				
Shrawan		Bhadra			Aswin			Kartik			Mangsir			Poush			Magh			Falgun			Chaitra			Baisak			Jesiha			Ashadh				
A-1-S1	Establishment of rules for private sector collection and its monitoring system																																			
1	Preparation of agreement and TOR for PPP	SWMS/Rajesh Manandhar																																		
A-1-S2	Promotion of private sector participation in door to door collection for 25% of HHs																																			
1	Agreement with private sector	SWMS/Rajesh Manandhar																																		
A-1-S3	Preparation of equipment replacement plan and pilot test for a few types collection vehicles and commencement of replacement of tractors (for 25% collection)																																			
1	Preparation of an equipment replacement plan	MS/Purusotam Shakya																																		
2	Procurement of Compactor Truck or Tipper with cover	Environment Dept./MS	1,400,000																																	
3	Replacement of tractors purchasing 4 vehicles	Environment Dept./MS	5,500,000																																	
A-1-S6	Introduction of GIS System for waste collection plan																																			
1	Preparation of an inventory of sweeping areas	SWMS/Rajesh Manandhar																																		
2	Time and Motion survey of core areas	SWMS/Rajesh Manandhar	11,000																																	
3	Record data of sweeping areas inventory into the GIS system	SWMS/Rajesh Manandhar	50,000																																	
4	Record data of Time and Motion survey of core areas	SWMS/Rajesh Manandhar																																		
A-1-S7	Improvement of collection and transportation system taking into consideration waste transportation to Sisdol landfill site																																			
1	Plan and implement direct collection system in 2 Wards as pilot basis	SWMS/Rajesh Manandhar	20,000																																	
2	Preparation of new collection plan (core areas)	SWMS/Rajesh Manandhar																																		
A-2-S1	Establishment of effective operation system of Teku transfer station																																			
1	Preparation of an effective operation plan of Teku transfer station	SWMS/Rajesh Manandhar																																		
2	Construction and laying RCC of 1,000 sq meter	SWMS/Rajesh Manandhar	700,000																																	
3	Infrastructure for night time operation (lighting system)	SWMS/Rajesh Manandhar	200,000																																	
4	Drainage management	SWMS/Rajesh Manandhar	500,000																																	
5	Upgrading servicing situation (vehicle washing)	SWMS/Rajesh Manandhar	400,000																																	

SN	Shor-term Activities to be Conducted in FY2005/06 (2062/2063)	Responsible Person (Department, Section)	Proposed Budget (NRs)	2005						2006														
				July	August	September	October	November	December	January	February	March	April	May	June	July								
				III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I						
				2062						2063														
Shrawan		Bhadra		Aswin		Kartik		Mangsir		Poush		Magh		Falgun		Chaitra		Baisak		Jesiha		Ashadh		
6	Weight bridge operation	SWMS/Rajesh Manandhar	50,000																					
A-2-S2	Plan (design), construction and operation of Balaju transfer station (including necessary revision of primary collection route)																							
1	Preparation of a plan together with design of Balaju transfer station	SWMS/Rajesh Manandhar																						
2	Implementation of public consultation	SWMS/Rajesh Manandhar																						
3	Implementation of IEE study	SWMS/Rajesh Manandhar																						
A-3-S1	Renovation of existing mechanical workshop including replacement of old equipment and establishment of efficient parts stock system																							
1	Renovation of mechanical workshop	MS/Purusotam Shakya	1,000,000																					
2	Procurement of official facilities (computer and steel racks)	MS/Purusotam Shakya	400,000																					
3	Store database software package and management training	MS/Purusotam Shakya	400,000																					
4	Mechanics training	MS/Purusotam Shakya	100,000																					
B-1-S1	Cooperation with SWMRMC to proceed development of a central level WPF (50-100 t/d) at appropriate place																							
1	Final site selection	SWMS/Rajesh Manandhar																						
2	Site surveys	SWMS/Rajesh Manandhar																						
3	Concept design	SWMS/Rajesh Manandhar																						
4	Feasibility study including market study	SWMS/Rajesh Manandhar																						
5	EIA	SWMS/Rajesh Manandhar																						
B-2-S1	Review of the existing home and community composting and recycling activities																							
1	Implementation of reviewing activities	CMU/Shriju																						
B-2-S2	Production of home compost bins and home vermi-compost kits and their distribution																							
1	Compost bin set distribution	CMU	700,000																					
2	Vermi-composting kits development and provision of subsidy	CMU	40,000																					
3	Recycling sets for Nature Clubs	CMU	200,000																					

SN	Shor-term Activities to be Conducted in FY2005/06 (2062/2063)	Responsible Person (Department, Section)	Proposed Budget (NRs)	2005												2006																								
				July	August			September			October			November			December			January			February			March			April			May			June			July		
				■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■				
				2062												2063																								
				Shrawan			Bhadra			Aswin			Kartik			Mangsir			Poush			Magh			Falgun			Chaitra			Baisak			Jesiha			Ashadh			
B-2-S3	Operation of Community Recycling Center (CRC) in Ward 21 and its extension to other Wards (with support from NEREPA)																																							
1	CRC-supporting activities	CMU	250,000																																					
2	CRC-establishment in 5 Wards	CMU	250,000																																					
B-3-S1	Operation and expansion of medium-scale vermi-composting																																							
1	Operation of medium-scale vermi-composting	CMU																																						
B-3-S2	Implementation of sales campaign together with marketing study																																							
1	Implementation of marketing study	CMU																																						
2	Preparation and Implementation of sales campaign including review and evaluation	CMU																																						
C-1-S1	Operation of Sisdol sanitary landfill site																																							
1	Procurement of heavy equipment and vehicles (1 wheel loader, 1 supervision vehicle, 1 mobile maintenance vehicle w/ tools)	MS/Purusotam Shakya	13,500,000																																					
2	Monitoring daily LF management	SWMS/Rajesh Manandhar																																						
3	Extension of gas venting pipes	SWMS/Rajesh Manandhar	100,000																																					
4	Intermediate leachate collection	SWMS/Rajesh Manandhar	600,000																																					
5	Maintenance of leachate collection and treatment facilities	SWMS/Rajesh Manandhar	300,000																																					
6	Building maintenance	SWMS/Rajesh Manandhar	300,000																																					
7	Operation of pump	SWMS/Rajesh Manandhar	600,000																																					
8	Vehicle and equipment hiring including rental trucks for 3 months (mid-July–end-Sept)	SWMS/Rajesh Manandhar	1,200,000																																					
9	Arrangement of fuel for equipment within the site	SWMS/Rajesh Manandhar	1,200,000																																					
C-2-S1	Conducting of survey for possible long-term landfill sites																																							
1	Site selection survey and public consultation	SWMS/Rajesh Manandhar																																						

SN	Shor-term Activities to be Conducted in FY2005/06 (2062/2063)	Responsible Person (Department, Section)	Proposed Budget (NRs)	2005												2006																				
				July	August			September			October			November			December			January	February			March			April			May			June			July
				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
				2062												2063																				
Shrawan			Bhadra			Aswin			Kartik			Mangsir			Poush			Magh			Falgun			Chaitra			Baisak			Jestha			Ashadh			
C-2-S2	Cooperation with SWMRMC to proceed establishment of a long-term landfill site																																			
1	Site surveys	SWMS/Rajesh Manandhar																																		
2	Concept design	SWMS/Rajesh Manandhar																																		
3	Feasibility study including market study	SWMS/Rajesh Manandhar																																		
4	EIA	SWMS/Rajesh Manandhar																																		
C-3-S1	Rehabilitation and landscaping works of the Bagmati (Balkhu) dumping site																																			
1	Planning for rehabilitation works for Balkhu	SWMS/Kiran	300,000																																	
2	Selection of contractor for rehabilitation and landscaping	SWMS/Kiran																																		
3	Rehabilitation works and landscaping (500~1,000m per year)	SWMS/Kiran	1,500,000																																	
D-1-S1	Establishment of 50 more Nature Clubs																																			
1	Establishment of 50 Nature Clubs	CMU/Shriju	25,000																																	
D-1-S2	Development of training packages on		5,000																																	
1	Solid Waste Management, Greenery Promotion, Cultural Heritage Conservation, Communication,	CMU/Shriju																																		
2	Nature Club management	CMU/Shriju																																		
D-1-S3	Training for Nature Clubs members on the above five areas																																			
1	Workshop for Guide Teachers	CMU/Umesh	50,000																																	
2	Workshop for Principals	CMU/Umesh	50,000																																	
3	Workshop for Nature clubs	CMU/Umesh	200,000																																	
4	Handover Nature clubs	CMU/Umesh	50,000																																	
5	Eco-Yatra for observation visits	CMU/Shriju	120,000																																	
D-1-S4	Regular interaction between Nature Clubs and local communities to reach out to society as a whole																																			
1	Regular interaction between Nature Clubs and local communities	CMU/Shriju																																		

SN	Shor-term Activities to be Conducted in FY2005/06 (2062/2063)	Responsible Person (Department, Section)	Proposed Budget (NRs)	2005						2006														
				July	August	September	October	November	December	January	February	March	April	May	June	July								
				III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I						
				2062						2063														
Shrawan		Bhadra		Aswin		Kartik		Mangsir		Poush		Magh		Falgun		Chaitra		Baisak		Jestha		Ashadh		
D-2-S1	Development of a database of community groups, NGOs/CBOs and private sector, and selection of the best ones for long-term work		100,000																					
1	Development of a database	CMU/Shriju																						
D-2-S2	Review and evaluation of the existing Ward Environmental Committee (WEC) and formation of active WECs in 10 Wards																							
1	Review and evaluation of the existing WECs	CMU/Shriju																						
2	Form active WECs in 5 Wards	CMU/Shriju	25,000																					
D-2-S3	Provision of training on SWM and community mobilization for WECs																							
1	Training for WECs	CMU/Sanu	50,000																					
2	Coordination and networking of WECs	CMU/Sanu	50,000																					
3	Conduct community cleanup	CMU/Sanu	50,000																					
D-2-S4	Provision of technical and financial assistance to best community initiatives of WECs																							
1	Training for NGOs/CBOs	CMU/Sanu	50,000																					
D-2-S5	Provision of annual award to best WEC																							
1	Provision of annual award	CMU/Sanu																						
D-3-S1	Mobilization of City Volunteers (CVs) to support BABA program																							
1	Mobilization of CVs	CMU/Shriju	50,000																					
D-3-S2	Implementation of closed camps for capability building and raising team spirit of each batch																							
1	Capability training camp	CMU/Shriju	160,000																					
2	City Volunteers training	CMU/Shriju	100,000																					
D-4-S1	Production of CMU's promotional materials (flyers, brochures, posters, stickers, etc.)																							
1	Promotional materials	CMU/Shriju	200,000																					
D-4-S3	Setting up of self-explanatory displays on SWM at CMU and other key locations for wider publicity																							
1	Self-explanatory displays in KMCs prime location	CMU/Shriju	50,000																					

SN	Shor-term Activities to be Conducted in FY2005/06 (2062/2063)	Responsible Person (Department, Section)	Proposed Budget (NRs)	2005												2006																						
				July	August			September			October			November			December			January			February			March			April			May			June			July
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				2062												2063																						
Shrawan			Bhadra			Aswin			Kartik			Mangsir			Poush			Magh			Falgun			Chaitra			Baisak						Jestha			Ashadh		
D-4-S4	Regular featuring and reporting on SWM on TV program “Hamro Kathmandu”																																					
1	Radio Jingles	CMU/Shriju	75,000																																			
2	Media Promotion	CMU/Shriju	50,000																																			
D-4-S5	Design and maintenance of the web page on SWM																																					
1	Web page design	CMU/Shriju																																				
2	Web page maintenance	CMU/Shriju																																				
D-4-S6	Implementation of community exhibition and event regularly																																					
1	Community Exhibition on Environment and Earth day	CMU/Shriju	300,000																																			
D-5-S1	Recruiting of a BABA coordinator		60,000																																			
1	Recruiting of a BABA coordinator	CMU/Shriju																																				
D-5-S2	Recruiting of assistant level staff for administration																																					
1	Recruiting of assistant level staff for administration	CMU/Shriju	60,000																																			
E-1-S1	Implementation of the reorganization plan of the Environment Department																																					
1	Obtain approval from the Municipal Board/ Council on the new organization structure	Environment Dept./Mr.Indra Man																																				
2	Conducting of sharing session to disseminate information about the new organization structure	Environment Dept./Mr.Indra Man	5,000																																			
E-2-S1	Establishment of a monitoring and evaluation system in alignment with the Action Plan																																					
1	Preparation of plan of operation of monitoring and evaluation	SWMS/Rajesh Manandhar																																				
2	Conducting of monitoring and review of the Annual Work Plan	Environment Dept./Mr.Indra Man																																				
3	Formulation of Annual Work Plan of FY2063/64	Environment Dept./Mr.Indra Man																																				
E-2-S2	Mainstreaming of program-based budgeting system and expenditure monitoring for a more efficient use of resources																																					
1	Conducting of expenditure monitoring of the Annual Work Plan	Environment Dept./Mr.Indra Man																																				
2	Formulation of program-based budget of FY2063/64	Environment Dept./Mr.Indra Man																																				

SN	Shor-term Activities to be Conducted in FY2005/06 (2062/2063)	Responsible Person (Department, Section)	Proposed Budget (NRs)	2005												2006																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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E-2-S3	Improvement of information flow and management by encouraging regular coordination meetings and sharing of experiences																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											</

SN	Shor-term Activities to be Conducted in FY2005/06 (2062/2063)	Responsible Person (Department, Section)	Proposed Budget (NRs)	2005								2006									
				July	August	September	October	November	December	January	February	March	April	May	June	July					
				III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
				2062												2063					
				Shrawan	Bhadra	Aswin	Kartik	Mangsir	Poush	Magh		Falgun	Chaitra	Baisak				Jestha	Ashadh		
F-1-S1	Dissemination of Medical Waste Management Guidelines																				
1	Obtain of official approval from the municipal board on the Medical Waste Management Guidelines	SWMS/Rajesh Manandhar																			
2	Planning of medical waste management system	SWMS/Rajesh Manandhar																			
F-1-S2	Operation of a medical waste treatment facility at Teku																				
1	Public consultation	SWMS/Rajesh Manandhar																			
2	Conducting a test run	SWMS/Rajesh Manandhar																			
F-1-S3	Procurement of additional equipment (autoclave)																				
1	Procurement of an autoclave	SWMS/Rajesh Manandhar	3,000,000																		
F-1-S4	Training for staff of KMC, private sector, and medical institutions																				
1	Training for KMC staff operators	SWMS/Rajesh Manandhar	60,000																		
2	Training for health care staff by national dental hospital (USAID funds)	SWMS/Rajesh Manandhar																			
F-3-S1	Review of working conditions of the sweeper population and provision of measures to improve their performance.																				
1	Establishment of a day care center	SWMS/Rajesh Manandhar																			
2	Provision of health care services to sweeper population and their children (supported by World Bank)	SWMS/Rajesh Manandhar																			

Legend

- : Continuous activity
- : Intermittent activity
- : Spot activity

SWMS: Solid Waste Management Section
MS: Mechanical Section

CMU: Community Mobilization Unit