

## CHAPTER 8 FUTURE FRAMEWORK FOR ACTION PLAN

### 8.1 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 (2058/59<sup>1</sup>)-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 (DUDB) 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 8.1-1.

---

<sup>1</sup> Nepalese Year

**Table 8.1-1 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

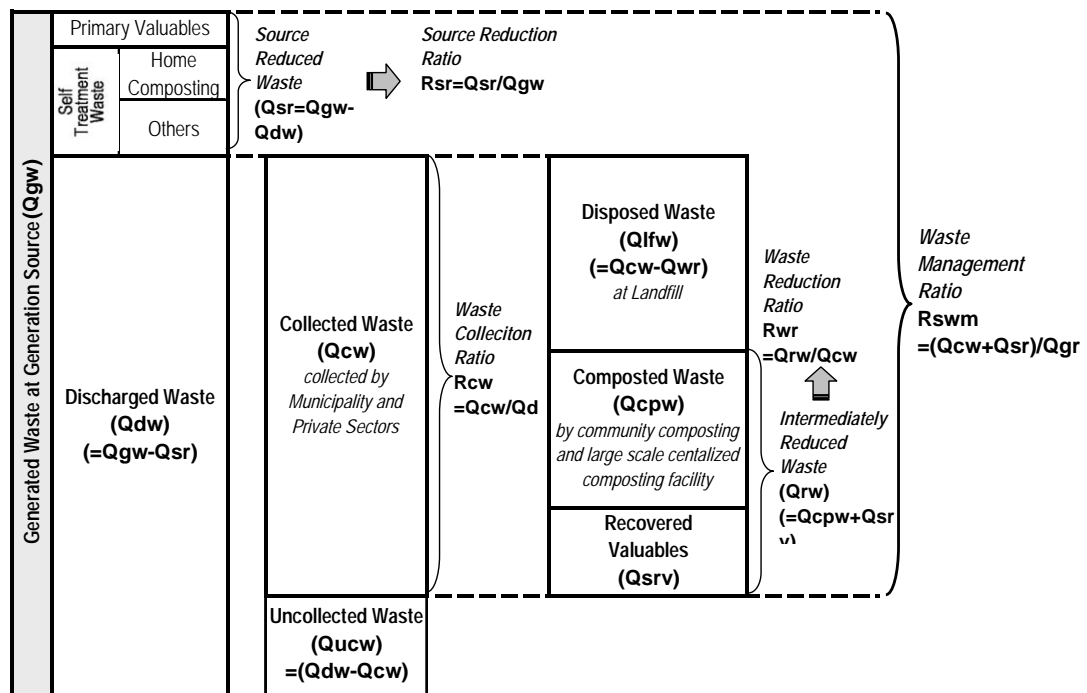
Source: Draft Kathmandu Valley Development Plan 2020, KVTDC, July 2000

JICA Study Team

## 8.2 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 8.2-1.

- a) Generated waste: Material that has become useless and valueless for the owner if it is to keep it at the source
- b) Discharged waste: Part of generated waste that is discharged out from the owner's territory
- c) Self treatment waste: Part of generated waste that is treated, disposed of or utilized within the owner's territory
- d) Collected waste: Part of discharged waste that is collected by the municipality or a private sector operator
- e) Uncollected waste: Part of discharged waste but not collected and disposed of somewhere
- f) Disposed waste: Part of collected waste that is disposed of at the designated final disposal site
- g) 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.
- h) 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 8.2-1 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.

### 8.3 Projection of Future Generation of Solid Waste

#### 8.3.1 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 8.2-1 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

### 8.3.2 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 Study<sup>2</sup> 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.*

<sup>2</sup> 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 9 UMBRELLA CONCEPT FOR FORMULATION OF ACTION PLAN

### 9.1 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 9.1-1 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).

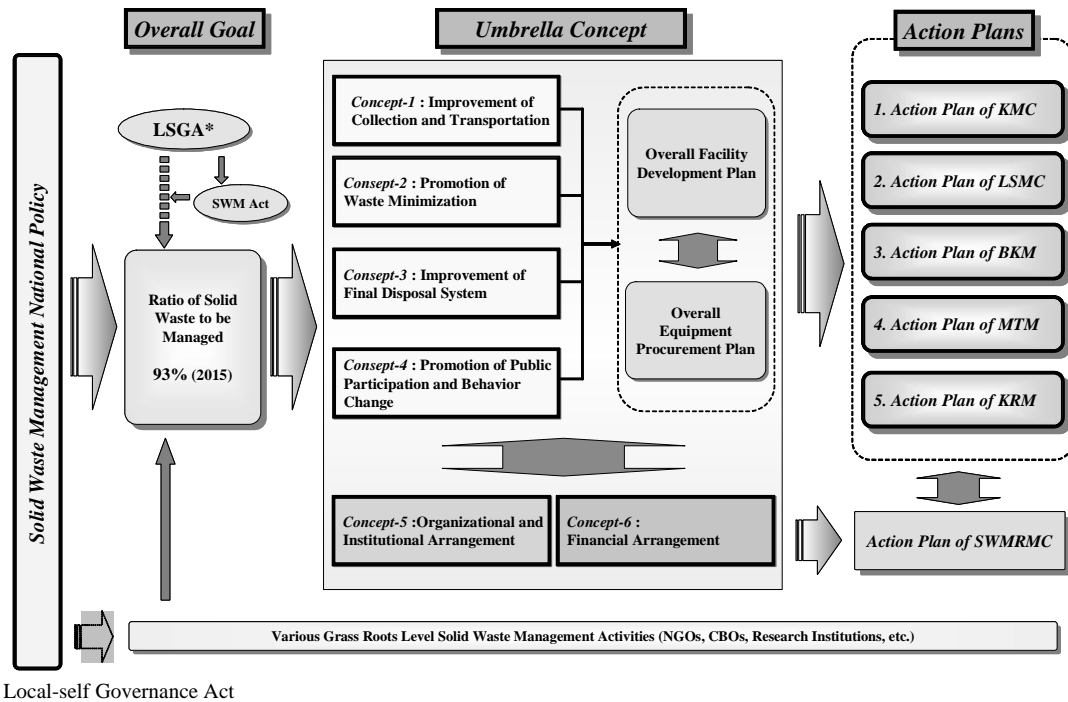
**Table 9.1-1 Components of Action Plans**

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 9.1-1.



\* Local-self Governance Act

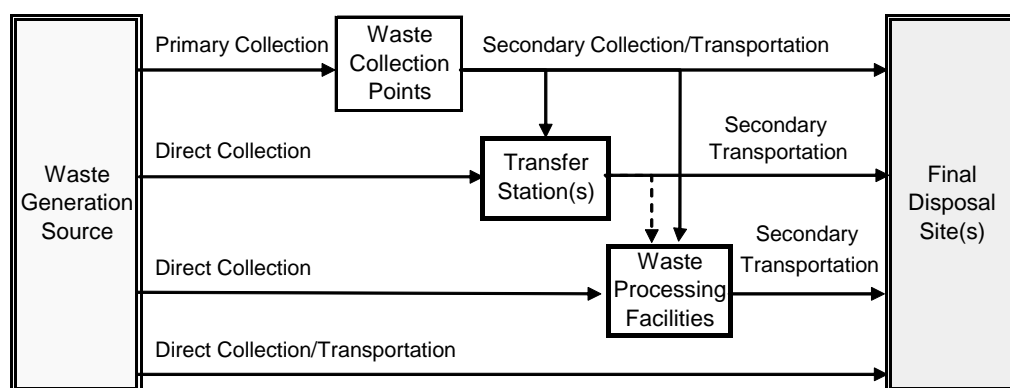
**Figure 9.1-1 Overall Framework of the Umbrella Concept of the Kathmandu Valley**

Source: JICA Study Team

## 9.2 Basic Concept for Improvement of Collection and Transportation

### 9.2.1 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 9.2-1.



**Figure 9.2-1 Definition of Collection and Transportation**

Source: JICA Study Team

Accordingly, a basic concept for improvement of collection and transportation are summarized in the Table 9.2-1.

**Table 9.2-1 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

## 9.2.2 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 Afadole and then should utilize a waste processing facility as a transfer station.

## 9.3 Basic Concept for Promotion of Solid Waste Minimization

### 9.3.1 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

### 9.3.2 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 9.3-1.

**Table 9.3-1 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

### **9.3.3 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

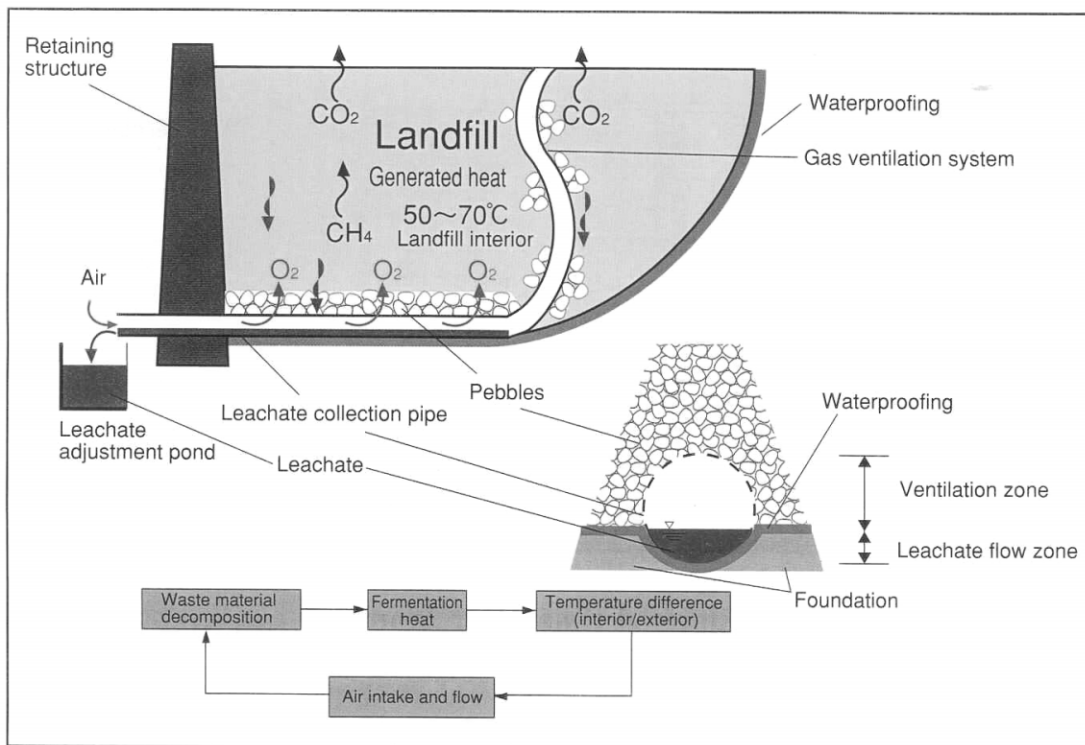
## **9.4 Basic Concept for Improvement of Final Disposal System**

### **9.4.1 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 9.4-1.



**Figure 9.4-1 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 9.4-1. 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 9.4-1 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 (+).

#### 9.4.2 Post Closure Management of Landfill Sites

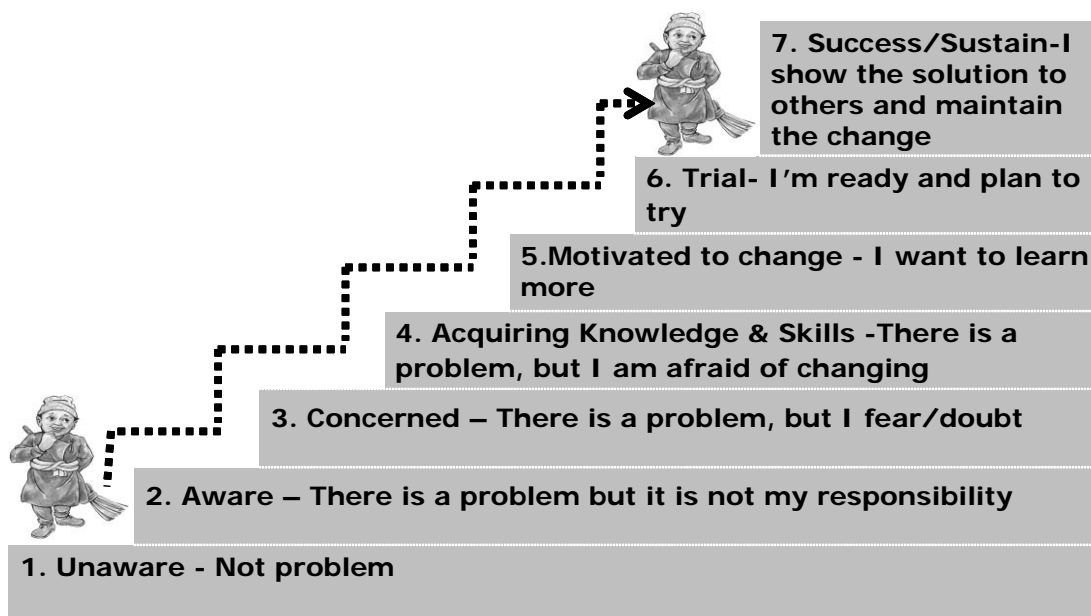
Management aspects with respect to closed landfills include collection and monitoring of landfill gas and leachate, landfill settlement, land use and access control and dissemination of information on the use of the site as a landfill.

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.

### 9.5 Basic Concept for Public Participation and Behavior Change

#### 9.5.1 Public Awareness and Behavior Change for Effective SWM

A successful SWM requires various forms of community mobilization and participation. The following Figure 9.5-1 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 9.5-1 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 steps<sup>1</sup> 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

## 9.5.2 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

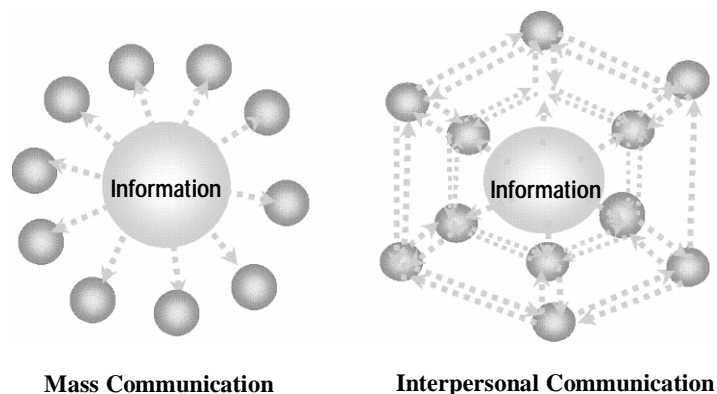
<sup>1</sup> These steps have been developed by FHI (“BCC for HIV/AIDS A Strategic Framework, FHI/USAID, 2002) and adopted by a number of BCC programs and projects in the world. Since they can be applied to SWM programs, Interpersonal Communication and BCC Skill Training conducted as part of Pilot Project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

### 9.5.3 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 9.5-2 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 9.5-2 Difference between Mass Communication and Interpersonal Communication**

Source: JICA Study Team

## 9.6 Overall Facility Plan in the Kathmandu Valley

### 9.6.1 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.

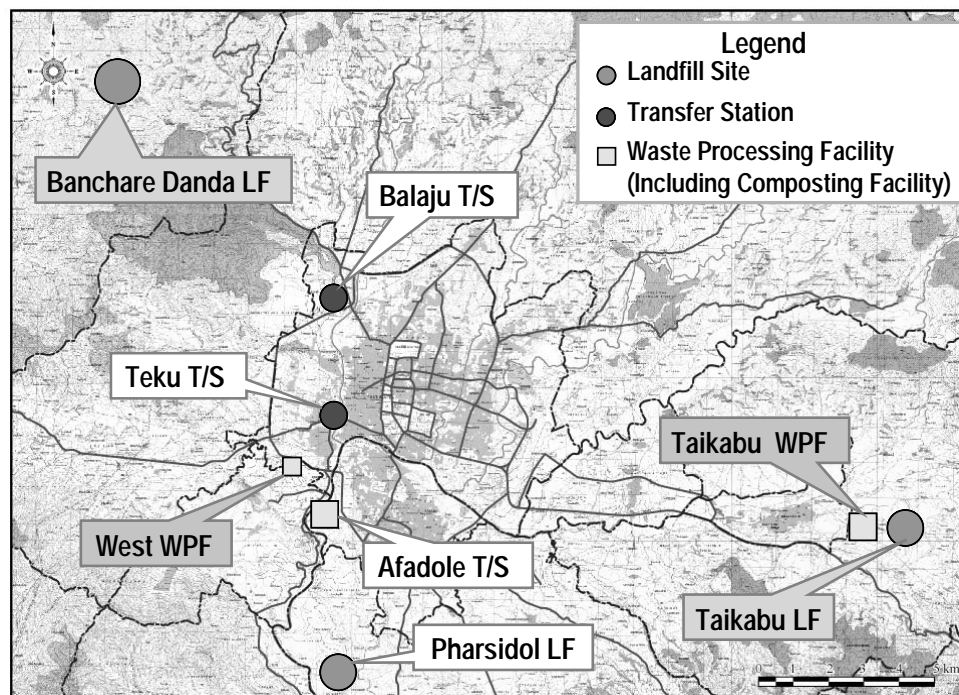
Principle 2 : Sustainable Facilities; Facilities should be sustainable both financially and technically and should suit the existing Nepalese conditions.

**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.

### 9.6.2 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 Banchare Danda, 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 9.6-1 shows the locations of these facilities.



**Figure 9.6-1 Facilities Incorporated in the Alternatives 1-3**

The developed alternatives are described in the following Table 9.6-1.

**Table 9.6-1 Alternatives Formulation**

Alt	LF	WPF	T/S	Comments
1a	Banchare Danda	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	Banchare Danda 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	Banchare Danda Taikabu Pharsidol	West Taikabu	Teku Balaju	<u>Alt. 3a:</u> proposes three landfills and two WPFs.
3b	Banchare Danda 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	Banchare Danda 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”<sup>2</sup>
- 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

### 9.6.3 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.

<sup>2</sup> 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 Banchara Danda site in Okharpauwa.

Pharsidol north site was preferred over Banchara 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 Banchara 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 9.6-2.

**Table 9.6-2 Overall Facility Plan under the Umbrella Concept**

Facilities		Descriptions
<b>ZONE A – KMC, LSMC and KRM</b>		
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
-	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.
2	Banchara 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.
3	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
4	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.
5	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.
6	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
<b>Zone B – BKM and MTM</b>		
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 areas 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 WPF 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

### 9.6.4 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 9.6-2 shows the operation schedule, while the estimated investment costs for the period of 2005 to 2015 are shown in Table 9.6-3.

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
<b>ZONE A - KMC, LSMC and KRM</b>										
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)									
<b>ZONE B - BKM and MTM</b>										
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 9.6-2 Operation Schedule of Overall Facility in the Kathmandu Valley**

Source: JICA Study Team

**Table 9.6-3 Estimated Costs of the OFP (million Rs)**

SN	Facility	Investment Costs
<b>1</b>	<b>Improvement/Development of Transfer Station</b>	
	1.1 Teku T/S (Improvement)	2.0
	1.2 Balaju T/S	44.2
	1.3 Afadole Temporary T/S	19.7
	<b>Sub-total 1</b>	<b>65.9</b>
<b>2</b>	<b>Development of Waste Processing Facility</b>	
	2.1 West WPF (including equipment)	219.8
	2.2 Taikabu WPF (including equipment)	80.2
	<b>Sub-total 2</b>	<b>300.0</b>
<b>3</b>	<b>Development/Closure of Landfill</b>	
	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
	<b>Sub-total 3</b>	<b>1,204.5</b>
<b>4</b>	<b>Closure of Dumping Site</b>	
	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
	<b>Sub-total 4</b>	<b>5.7</b>
	<b>TOTAL</b>	<b>1,576.1</b>

Source: JICA Study Team

## 9.7 Overall Equipment Procurement Plan in the Kathmandu Valley

### 9.7.1 Basic Concept of Overall Equipment Procurement Plan

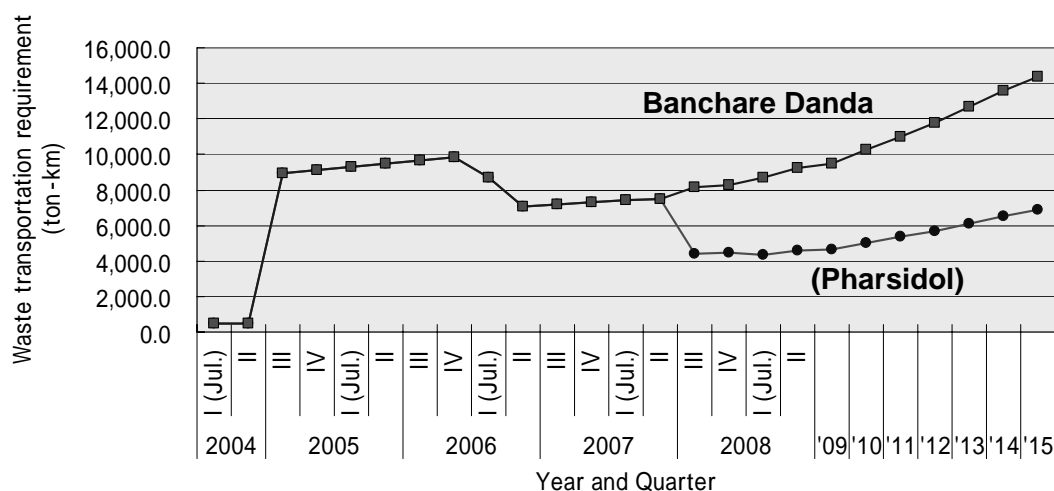
The equipment to be procured for implementing the OFP is mainly divided into the equipment for secondary transportation, LF operation, T/S operation, WPF operation and there is maintenance for that equipment.

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.

### 9.7.2 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 9.7-1. 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 9.7-1 Future Projection of Transportation Requirement**

Source: JICA Study Team

### 9.7.3 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.

### 9.7.4 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.

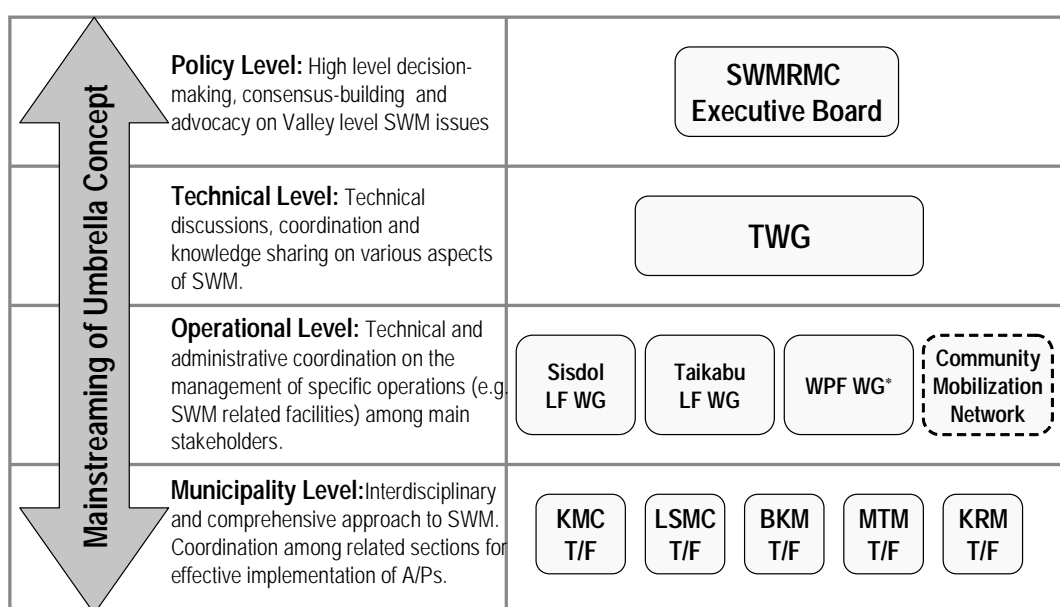
## 9.8 Basic Concept for Organizational and Institutional Arrangement

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 9.8-1. 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 9.8-1 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

## 9.9 Basic Concept for Financial Arrangement

### 9.9.1 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 9.9-1. 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 9.9-1 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

### 9.9.2 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 9.9-2, but external financial support may be expected for some areas.

**Table 9.9-2 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	-	-
Waste Processing Facility	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 9.9-3. SWMRMC should bear 56% of the total cost, while 44% should be borne by the municipalities.

**Table 9.9-3 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
	Total	<b>1,419.0</b>	322.9	817.5	<b>1,140.4</b>

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.

### 9.9.3 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 10 ACTION PLAN ON SOLID WASTE MANAGEMENT

### 10.1 Formulation of Action Plan on Solid Waste Management

#### 10.1.1 Process for Action Plan Formulation

The Study has been focusing on the study process including pilot project activities. In order to formulate Action Plans (A/Ps) on solid waste management, Draft Action Plans (DfA/Ps) were formulated in Phase 2. Based on lessons learned from the Pilot Projects in Phase 3 that address various components of solid waste management, DfA/Ps were finalized as A/Ps on solid waste management.

A series of discussions was held at the Technical Working Group (TWG) meetings and respective Task Force (T/F) meetings of the five municipalities as part of the development process of the A/Ps. Decision-makers such as mayor, deputy mayor and chief executive officer (CEO) of each municipality participated in these meetings on an ad hoc basis. Since the participatory approaches were adopted in preparing the A/Ps, the A/Ps can be said to be the outcomes of extended consultation participated in by a large number of stakeholders at the Public Hearings (P/Hs) and seminars. The inclusion of a logical framework and adoption of objectively verifiable indicators (OVIs) are also some of the important features of the Study. These procedures for formulation of the A/Ps were taken as part of capacity development.

The CKV Study Team took the following steps to develop the A/Ps:

- 1st Step : **Review** of current situation of SWM, problem analysis, discussion of environment and social consideration
- 2nd Step : **Setting** of future framework
- 3rd Step : **Setting** of vision and target
- 4th Step : **Consideration** of approaches, strategies and necessary activities to outline DfA/P
- 5th Step : **Consultation** of outline of DfA/Ps with the public
- 6th Step : **Preparation** of DfA/P
- 7th Step : **Revision** of DfA/P for finalization of A/P based on the lessons learned from the Pilot Projects
- 8th Step : **Preparation** of the A/P together with the Annual Work Plan

At the outset, the TWG members agreed to the basic structure and components of the A/P of each municipality as follows:

- Part I : Current Situation
- Part II : Future Framework
- Part III : Vision and Target
- Part IV : Action Plan (Approaches, Strategies, Necessary Activities, Implementation Schedule, Financial Plan)



### 10.1.2 Preparation of Solid Waste Stream flow for Formulation of Action Plan

The most elementary but indispensable process to develop the A/Ps on solid waste management is “to clarify the solid waste stream” as well as “to clarify the solid waste amount”. Since social conditions such as population, economic growth or people’s life style, pattern of consumption may be correlated closely with solid waste generation, such social factors were considered when municipalities analyzed the solid waste amount for their A/Ps. On the other hand, solid waste is the material that is inevitably generated by human activities and that should have its own destination at the end of its material life. 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 flows. In order to formulate the A/Ps, solid waste flows of each municipality were prepared as per attached in Appendix 3. The waste management ratios were set as main targets of the A/Ps based on the respective solid waste stream flows.

## 10.2 Action Plans of Five Municipalities

### 10.2.1 Vision and Target

The vision and target of the five municipalities has been determined as shown in Table 10.2-1. The management ratio in terms of quantity are adopted as objectively verifiable indicators (OVIs) aiming to reduce the amount of unmanaged waste.

**Table 10.2-1 Vision and Target of Each Municipality**

City	Vision	Present Situation	Target at the end of each term		
			Short-term	Mid-term	Long-term
			2005/06 – 2007/08* <sup>1</sup>	2008/09 – 2010/11	2011/12 – 2014/15
			2062/63 – 2064/65* <sup>2</sup>	2065/66 – 2067/68	2067/68 – 2071/72
KMC	Clean, Green Kathmandu City	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)
LSMC	Clean City through Efficient Management of Waste Collection on Streets, Public Places and Households [by means of involvement of the private sector as much as possible to make the municipal resources sustainable in the long run and to let make the city dwellers feel responsible and more aware for city cleanliness & the environment]	Management ratio (amount) : 70 % (52 t/d)	Management ratio (amount) : 80 % (70 t/d)	Management ratio (amount) : 85 % (88 t/d)	Management ratio (amount) : 90 % (121 t/d)

City	Vision	Present Situation	Target at the end of each term		
			Short-term	Mid-term	Long-term
			2005/06 – 2007/08* <sup>1</sup>	2008/09 – 2010/11	2011/12 – 2014/15
			2062/63 – 2064/65* <sup>2</sup>	2065/66 – 2067/68	2067/68 – 2071/72
BKM	To Support the Promotion of Bhaktapur City as a Tourist Destination through Better Solid Waste Management	Management ratio (amount) : 75% (19 t/d) Collection ratio (area) : 25% Population Served : 78% Disposal ratio to SLF site:0%	Management ratio (amount) : 80% (24 t/d) Collection ratio (area) : 35% Population Served : 82% Disposal ratio to SLF site:0%	Management ratio (amount) : 85% (30 t/d) Collection ratio (area) : 50% Population Served : 86% Disposal ratio to SLF site:72 %	Management ratio (amount) : 90% (42 t/d) Collection ratio (area) : 65% Population Served : 90% Disposal ratio to SLF site:72%
MTM	Madhyapur Thimi City Co-existing with a Sound Environment and Organic Agriculture	Management ratio (amount) : 35% (5 t/d)	Management ratio (amount) : 40% (7 t/d)	Management ratio (amount) : 50% (10 t/d)	Management ratio (amount) : 70% (20 t/d)
KRM	Neat, Clean, Pollution Free City, Kirtipur Municipality	Management ratio (amount) : 35 % (4 t/d)	Management ratio (amount) : 50% (7 t/day)	Management ratio (amount) : 70% (10 t/day)	Management ratio (amount) : 80% (15 t/day)
Total five municipalities		Management ratio (amount) : <b>76 %</b> (330 t/d)	Management ratio (amount) : 82 % (416 t/d)	Management ratio (amount) : 87 % (519 t/d)	Management ratio (amount) : <b>93 %</b> (719 t/d)

Note: \*1 Christian Year, \*2 Nepalese Year

Source: Task Force of each Municipality

## 10.2.2 Approaches, Strategies and Necessary Activities

The approaches, strategies and necessary activities established by the respective municipalities are shown in Table 10.2-2 - 6.

Table 10.2-2 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-M1: Revision of rules for private sector collection and its monitoring system	A-1-L1: Revision 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-M2: Promotion of private sector participation in door to door collection <u>40%</u> of households	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%</u> collection)	A-1-M3: Procurement of collection vehicle for replacing tractors (for <u>50%</u> collection)	A-1-L3: Procurement of collection vehicle for replacing tractors (for <u>100%</u> collection)	
		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-S3: Training for Nature Clubs members on the above five areas D-1-S4: Regular interaction between Nature Clubs and local communities to reach out to society as a whole	D-1-M1: Establishment of 100 more Nature Clubs D-1-M2: Training for Nature Club members on the five areas of work D-1-M3: Regular interaction between Nature Clubs and surrounding communities to reach out to the society as a whole	D-1-L1: Establishment of 200 more Nature Clubs and reach 400 in total D-1-L2: Training for Nature Club members on the five areas of work D-1-L3: Regular interaction between Nature Clubs and surrounding communities to reach out to the society as a whole
	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-S2: Setting up of hoarding boards on SWM in prime locations of the city D-4-S3: Setting up of self-explanatory displays on SWM at CMU, and other key locations for wider publicity D-4-S4: Regular featuring and reporting on SWM on TV program "Hamro Kathmandu" D-4-S5: Design and maintenance of the web page on SWM D-4-S6: Implementation of community exhibition and event regularly	D-4-M1: Setting up of displays and information on SWM as an environmental park in Teku transfer station D-4-M2: Hosting Web Site on SWM and update the site D-4-M3: Review and continuation of the other media campaign programs (same as short-term activities)	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-M2: 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 10.2-3 Strategies and Necessary Activities (LSMC)

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: Promotion of private sector collection	A-1-S1: Review of existing policy of LSMC and establishment of strong bylaws (and rules) interacting with all stakeholders and its publication (focus on private sector involvement, paying system and assurance of municipal sweeper's job guarantee while handing over to private sector) A-1-S2: Preparation of standard TOR and agreement for PPP concept A-1-S3: Introduction of a new pilot project for waste collection from shops by private sector A-1-S4: Newly introduction of door to door collection for <u>25% houses</u> at the outside the city core area by private sector (by the end of 2007)	A-1-M1: Revision of rules for private sector based on the short-term activities (from pilot projects). A-1-M2: Development of effective account system to control revenue from private sector to office A-1-M3: Expansion of pilot projects in other areas of city with correction of weakness. A-1-M4: <u>50 %</u> door to door collection by private sector (Some municipal old vehicles to be handed over to private sector under leased TOR) A-1-M5: Preparation of a plan for private sector transportation (PPP as an alternative)	A-1-L1: Revision of rules for private sector based on the mid-term activities. A-1-L2: <u>70 %</u> door to door collection by private sector A-1-L3: Initiation of transportation of collection points to transfer station by private sector
	A-2: Improvement of collection and transportation system	A-2-S1: Implementation of Time and Motion study A-2-S2: Introduction of new collection routes. A-2-S3: Implementation of transportation and maintenance cost analysis A-2-S4: Implementation of vehicle capacity analysis and plan for procurement of new vehicles	A-2-M1: Continuous review and improvement of collection and transportation system	A-2-L1: Continuous review and improvement of collection and transportation system
	A-3: Arrangement of a temporary transfer station	A-3-S1: Arrangement of a temporary transfer station (in Afadole) and commencement of temporary transferring	A-3-M1: Closure of the temporary transfer station	
B. Promotion of Waste Minimization	B-1: Development of a waste processing facility (WPF)	B-1-S1: Cooperation with SWMRMC and KMC for development of WPF (development, commencement of operation)	B-1-M1: Transportation of waste to WPF	
	B-2: Promotion of home composting activities	B-2-S1: Distribution of 1,200 home compost bins	B-2-M2: Distribution of 1,200 home compost bins	B-2-L1: Distribution of 1,200 home compost bins
	B-3 Promotion of 3Rs practices	B-3-S1: Promotion of 3Rs practices by local people	B-3-M1: Promotion of recycle centers at community level and individual level for minimization of waste at source. B-3-M2: Establishment of bulky waste recycling system by promoting establishment of second hand shops	B-3-L1: Establishment of recycle centers for 3Rs with PPP concept for waste pickers and promotion of plastic bag and paper recycling B-3-L2: Establishment of a medium-scale recycle centre near T/S.
C. Improvement of Final Disposal System	C-1: Operation of sanitary landfill site	C-1-S1: Operation of Sisdol LF with KMC C-1-S2: Cooperation with SWMRMC and KMC for development of long term landfill site C-1-S3: Closure of Bagmati dumping site	C-1-M1: Operation of Sisdol sanitary landfill site with KMC C-1-M2: Continuous coordination with SWMRC and KMC for development of long term landfill site	C-1-L1: Operation of long term landfill site
D. Promotion of Public Participation and Behavior Change	D-1: Implementation of mass communication and education	D-1-S1: Implementation of public awareness/education activities - Regular mechanism for awareness materials. Journal publication, drama, community interactions, reward, prize, visit, observation, establishment of SWM day.	D-1-M1: Continuous implementation of public awareness/education activities - Regular mechanism for awareness materials. Journal publication, drama, community interactions, reward, prize, visit, observation, establishment of SWM day.	D-1-L1: Continuous implementation of public awareness/education activities - Regular mechanism for awareness materials. Journal publication, drama, community interactions, reward, prize, visit, observation, establishment of SWM day.
	D-2: Formulation and mobilization of various groups for SWM	D-2-S1: Formation and mobilization of Ward Environment Conservation Committee (WECC) on a pilot basis D-2-S2: Formation and mobilization of Nature/Eco Clubs among children D-2-S3: Mobilization of youth as City Volunteers (CVs) D-2-S4: Strengthening of women groups for SWM	D-2-M1: Formation of 44 community groups in some wards for awareness raising and composting focusing on child education involving retired persons. Community development section will handle these groups	D-2-L1: Formation of 100 community groups in all wards for awareness raising and composting focusing on child education involving retired persons

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. Organizational and Institutional Arrangement	E-1: Implementation of HRD program	E-1-S1: Plan for HRD and monitoring including municipal staff/NGOs/CBOs/TLOs	E-1-M1: Proper available HRD management and monitoring. Establishment of motivating working environment.	E-1-L1: Establishment of HRD and Database Section in SWM division
	E-2: Preparation of annual work plan on SWM	E-2-S1: Announcement of SWM overall yearly plan of LSMC at beginning of each fiscal year.	E-2-M1: Announcement of SWM overall yearly plan of LSMC at beginning of each fiscal year.	E-2-L1: Announcement of SWM overall yearly plan of LSMC at beginning of each fiscal year.
	E-3: Clarification of responsibility and promotion of coordination between SWM relating divisions and sections	E-3-S1: Review of SWM organization (Environment Dept.) and appoint responsible persons as a focal point to coordinate all dimensions of SWM with motivating environment	E-3-M1: Review of responsibility overlaps and decision-making simplification. E-3-M2: Establishment of 24 hr hot line for receiving complains	
	E-4: Setting up tariff system	E-4-S1: Implementation of study on tariff system to introduce paying system	E-4-M1: Revision of effectiveness of paying system. Review of tariff. Make punishment system.	E-4-L1: "Enact Municipal SWM law" from national government. E-4-L2: Preparation of municipal ordinance E-4-L3: Dissemination of those laws and ordinance to public, TLOs and NGOs
	E-5: Management of solid waste database system	E-5-S1: Collection and arrangement of solid waste data in database E-5-S2: Implementation of waste quantity and quality survey twice a year (wet and dry seasons)	E-5-M1: Continuous arrangement of solid waste data by database system E-5-M2: Continuation of implementation of waste quantity and quality surveys twice a year (wet and dry seasons)	E-5-L1: Continuous arrangement of solid waste data by database system E-5-L2: Continuity of waste quantity and quality surveys twice a year (wet and dry seasons).
F. Others	F-1: Promotion of special waste management system	F-1-S1: Examination of medical waste treatment system	F-1-M1: Establishment of a common and centre level medical waste treatment facility (incinerator)	F-1-L1: Effective use of medical waste treatment system.

Source: LSMC Task Force



Table 10.2-4 Strategies and Necessary Activities (BKM)

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: Revision of collection system	A-1-S1: Procurement of a garbage tipper and tricycles	A-1-M1: Revision of waste collection route and extension of collection service areas to new urban settlements out of the core area	A-1-L1: Continuation of mid-term activities A-1-L2: Operation of transfer station
	A-2: Promotion of source separated collection (by community mobilization)	A-2-S1: Promotion of source separation and collection of organic kitchen waste by formulating users groups at local household level A-2-S2: Promotion of source separation and collection from hotels and restaurants	A-2-M1: Promotion of source separation and collection of organic kitchen waste at source by formulating users groups at local level and facilitated, bound with terms and conditions by the Municipality	A-2-L1: Continuation of mid-term activities
B. Promotion of Waste Minimization	B-1: Improvement and extension of existing composting facility (inclusive of transfer station)	B-1-S1: Procurement of a 10 t/d capacity excavator or backhoe loader, and waste sorting device B-1-S2: Land acquisition of extension area B-1-S3: Infrastructure development (open trussed shade, garage, parking area, weighbridge, sorting area, screening area, etc.)	B-1-M1: Commencement of operation of extended municipal composting facility (Phase I) along with marketing of compost produced with informative packing system	B-1-L1: Commencement of operation of extended municipal composting facility (Phase II) along with marketing of compost produced with informative packing system
	B-2: Waste minimization by community mobilization (community based solutions towards SWM)	B-2-S1: Promotion of waste minimization by making people well known with various methods of waste reduction at sources (e.g. home compost bins and vermi-composting, gift and educational training tools for school children from waste) B-2-S2: Installation of small scale bins/container at or nearby open waste collection spots or nearby ward office for keeping unusable broken glass, bulbs, tube lights etc. which are nuisance to municipal compost, and monitoring and operation by the local people	B-2-M1: Continuation of short-term activities	B-2-L1: Continuation of mid-term activities
	B-3: Trial of community level composting	-	B-3-M1: Introduction of closed chamber composting in new urban settlements out of the core area on pilot basis (Tole/Ward Basis) by formulating users groups at local level	B-3-L1: Continuation of mid-term activities
C. Improvement of Final Disposal System	C-1: Development of sanitary landfill site	C-1-S1: Topographical survey and soil investigation C-1-S2: Completion of EIA procedure C-1-S3: Detail design of the site with mitigation measures as recommended by EIA study - including waste processing facility within the landfill site along with leachate treatment facility and buffer zone C-1-S4: Land acquisition and resettlement of the directly affected dwellers in and nearby the site C-1-S5: Construction of the access road	C-1-M1: Completion of the access road construction C-1-M2: Completion of the site construction (Phase I area) C-1-M3: Formulation of the Environmental Monitoring Committee for the regular/periodic monitoring of the site C-1-M4: Commencement of Operation & Management of the site (Phase I area) along with waste processing facility	C-1-L1: Completion of the site construction (Phase II area) C-2-L2: Commencement of Operation & Management of the site (Phase II area) along with waste processing facility C-1-L3: Follow up of the Environmental Monitoring Committee's Activities regularly and periodically for proper Operation & Management of the site
	C-2: Procurement of equipment and vehicles for the operation of the site		C-2-M1: Procurement of heavy equipment (Garbage Tipper, Backhoe Loader, Roller, Mini -excavator, waste-sorting device, weighbridge, etc.)	
	C-3: Involvement of affected people in the development works of the site	C-3-S1: Establishment of local committee for social consensus for the development of the site C-3-S2: Consideration of community development works	C-3-M1: Implementation of community development works	C-3-L1: Continuous implementation of community development works

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)
	C-4: Implementation of research study	C-4-S1: Implementation of research study to define the leachate quality of the dumped waste at the current dumping site & the past dumping site for comparative analysis (on contamination of natural water body by solid waste disposal & liquid waste)	C-4-M1: Continuation of short-term activities	
D. Raising of Public Participation and Behavior Change	D-1: Implementation of public awareness and education on SWM	D-1-S1: Development of training tools/materials for community participation	D-1-M1: Continuation of short-term activities	D-1-L1: Continuation of short-term activities
		D-1-S2: Dissemination of information regarding SWM inclusive collection system (leaflets, brochures, calendars, advertisements in halls before starting of film show)	D-1-M2: Continuation of short-term activities	D-1-L2: Continuation of mid-term activities
		D-1-S3: Implementation of mass communication and education program (distribution of stickers, posters, drama play, competition among children group-drama, original stage drama during Gaijatra festival, drawing wall paintings, cleansing at the local communities)	D-1-M3: Continuation of short-term activities	D-1-L3: Continuation of mid-term activities
			D-1-M4: Periodic orientation classes on community based SWM in various schools in BKM D-1-M5: Mass meeting and procession at least once a year on Environment Day (June 5)	D-1-L4: Periodic orientation classes on community based SWM in various schools in BKM D-1-L5: Mass meeting, procession at least once a year on Environment Day (June 5)
	D-2: Promotion of interpersonal communication and education on SWM	D-2-S1: Promotion of Interpersonal Communication and Education program with arrangement of agreement with NGO such as selection of target communities, orientation workshop, baseline information survey in regard to existing knowledge, attitude, practices on SWM, counselor training camp for youth, teachers who support children's activities on SWM at the targeted communities	D-2-M1: Continuation of short-term activities	D-2-L1: Continuation of mid-term activities
E. Organizational and Institutional Arrangement	E-1: Organizational restructuring and strengthening	E-1-S1: Implementation of training on SWM based on the TNA E-1-S2: Finalization of organizational restructuring for SWM	E-1-M1: Recruit desired manpower for long-term SLF for proper management & operation E-1-M2: Establishment of Mechanical Section (MS)/Subsection (MSS)	E-1-L1: Extension of Mechanical Workshop Facilities
	E-2: Management of solid waste data by database	E-2-S1: Collection of relating data for SWM E-2-S2: Arrangement of the collected data in the database	E-2-M1: Establishment of data collection system E-2-M2: Continuous solid waste data arrangement in the database	E-2-L1: Continuous solid waste data arrangement by database
F. Others	F-1: Delegation of authority to communities and private sector	F-1-S1: Involvement of CBOs in collection and transportation of organic waste from households, hotels & restaurants on pilot basis (on Tole/Ward basis)	F-1-M1: Involvement of CBOs in collection and transportation of organic waste from households, hotels and restaurants (on Tole/Ward basis)	F-1-L1: Involvement of CBOs in collection and transportation of organic waste from households, hotels and restaurants (on Tole/Ward basis)
	F-2: Optimization of management efficiency and establishment of cost-effective SWM	F-2-S1: Commencement of private sector participation in SWM on pilot basis with different approaches - Case I: Only street sweeping by community level workers - Case II: Door to Door service - Case III: Both I & II - Case IV: Collection of Organic Waste from Hotels & Restaurants - Case V: Collection, transportation & Sale of Recyclable/Reusable Waste	F-2-M1: Expansion of private sector participation in SWM	F-2-L1: Expansion of private sector participation in SWM with different approaches

Table 10.2-5 Strategies and Necessary Activities (MTM)

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 System	A-1: Procurement of collection vehicles	A-1-S1: Procurement of collection vehicle(s) and assignment of a driver, collectors and loaders	A-1-M1: Procurement of collection vehicle(s)	A-1-L1: Procurement of collection vehicle(s)
	A-2: Extension of collection area	A-2-S1: Setting “depo (s)” at new collection areas	A-2-M1: Setting “depo (s)” at new collection areas	A-2-L1: Setting “depo (s)” at new collection areas
	A-3: Introduction of systematic private sector collection	A-3-S1: Preparation of guidelines for private sector collection	A-3-M1: Introduction of privatized collection system (Wards 15, 16 and 17) as pilot project	A-3-L1: Extension of privatized collection system to other Wards
B. Promotion of Waste Minimization	B-1: Promotion of separation at source	B-1-S1: Training of local people for separation at source	B-1-M1: Continuous training of local people for separation at source	B-1-L1: Continuous training of local people for separation at source
	B-2: Promotion of plastic recycling	B-2-S1: Providing of bags and metal strings (suiros) for separation at source	B-2-M1: Continuous provision of bags and metal strings (suiros) for separation at source	B-2-L1: Continuous providing of bags and metal strings (suiros) for separation at source
	B-3: Promotion of community (tole) composting	B-3-S1: Providing 25 compost drums for communities (toles) B-3-S2: Operating community composting	B-3-M1: Providing additional 25 compost drums for communities (toles) B-3-M2: Operating community composting	B-3-L1: Providing additional 25 compost drums for communities (toles) B-3-L2: Operating community composting
C. Improvement of Final Disposal System	C-1: Discourage of current dumping practices	C-1-S1: Identification and arrangement of a temporary landfill site	C-1-M1: Closure of the temporary landfill site	-
	C-2: Transportation of waste to Taikabu LF	C-2-S1: Conclusion of agreement with BKM for development and utilization of Taikabu LF	C-2-M1: Commencement of transportation of waste to Taikabu LF	C-2-L1: Continuous transportation of waste to Taikabu LF
D. Promotion of Public Participation and Behavior Change	D-1: Promotion of public awareness and education on SWM through mass communication and education	D-1-S1: Raising of public awareness through local radio (FM) and miking D-1-S2: Implementation of public events	D-1-M1: Raising of public awareness through local radio (FM) and miking D-1-M2: Implementation of public events	D-1-L1: Raising of public awareness through local radio (FM) and miking D-1-L2: Implementation of public events
	D-2: Promotion of public awareness and education on SWM through local level activities such as woman’s club and CBOs.	D-2-S1: Development of training tools and promotion materials for community participation D-2-S2: Formation and mobilization of Eco/Nature Clubs at schools. D-2-S3: Formation and mobilization and skills development of community groups for SWM D-2-S4: Implementation of community-based clean up program D-2-S5: Mobilization of youth as city volunteers for SWM	D-2-M1: Development of training tools and materials for community participation D-2-M2: Providing tools and package programs (e.g. incentives) for school children and clubs D-2-M3: Implementation of community-based clean up program	D-2-L1: Development of training tools and materials for community participation D-2-L2: Providing tools and package programs (e.g. incentives) for school children and clubs D-2-L3: Implementation of community-based clean up program
E. Organizational and Institutional Arrangement	E-1: Organizational and institutional restructuring, and strengthening	E-1-S1: Strengthening of SWM Sub-section	E-1-M1: Setting up separate Environment and Sanitation Section	
	E-2: Management of solid waste data by database	E-2-S1: Collection of relating data for SWM E-2-S2: Arrangement of the collected data in the database	E-2-M1: Continuous data arrangement in the database	E-2-L1: Continuous data arrangement in the database

Source: MTM Task Force

**Table 10.2-6 Strategies and Necessary Activities (KRM)**

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 System	A-1: Involvement of private sector for extension of collection area	A-1-S1: Preparation of agreements with private sector (NGOs/CBOs) and conclusion of the contracts (up to two parties)	A-1-M1: Increase of involvement of private sector (up to four parties)	A-1-L1: Continuation of mid-term activities
B. Promotion of Waste Minimization	B-1: Establishment of a community composting facility	B-1-S1: Selection and arrangement of land for a community composting facility	B-1-M1: Development of a community composting facility	B-1-L1: Expansion of the established community composting facility
	B-2: Promotion of home composting	B-2-S1: Promotion of home composting program (by providing bins, bags)	B-2-M1: Promotion of home composting program (by providing bins, bags)	B-2-L1: Continuation of mid-term activities
	B-3: Promotion of proper management of plastics	B-3-S1: Continuous implementation pilot bases separated collection of plastic bags (by providing wires (suiros), etc.)	B-3-M1: Expansion of target areas for separated collection of plastic bags	B-3-L1: Continuation of mid-term activities
C. Improvement of Final Disposal System	C-1: Transportation of the waste to the nearest transfer station	C-1-S1: Coordination with KMC for utilization of Teku transfer station	C-1-M1: Procurement of a vehicle for transportation of the collected waste C-1-M2: Transportation of the collected waste to the nearest transfer station	C-1-L1: Transportation of the collected waste to the nearest transfer station
D. Promotion of Public Participation and Behavior Change	D-1: Dissemination about SWM by education program	D-1-S1: Implementation of education program on SWM for school children and households (by promoting home composting, plastic bag separation, etc.)	D-1-M1: Continuation of short-term activities	D-1-L1 Continuation of midterm activities
E. Organizational and Institutional Arrangement	E-1: Establishment of SWM unit/section	E-1-S1: Establishment of a section (unit) on SWM	E-1-M1: Strengthening of SWM unit	E-1-L1: Establishment of SWM Section
	E-2: Implementation of HRD program	E-2-S1: Implementation of staff training on SWM and other related skills	E-2-M1: Implementation of staff training on SWM and other related skills	E-2-L1: Implementation of staff training on SWM and other related skills
	E-3: Management of solid waste data by database	E-3-S1: Collection of related data for SWM from private sector E-3-S2: Arrangement of the collected data in the database	E-3-M1: Establishment of data collection system from private sector E-3-M2: Continuous data arrangement in the database	E-3-L1: Continuous data arrangement in the database
F. Others	F-1: Coordination among all SWM stakeholders	F-1-S1: Coordination with SWMRMC, neighboring municipalities and NGOs/CBOs	F-1-M1: Continuation of short-term activities	F-1-L1: Continuation of mid-term activities