MINISTRY OF LOCAL DEVELOPMENT
HIS MAJESTY'S GOVERNMENT OF NEPAL

JAPAN INTERNATIONAL
COOPERATION AGENCY

# THE STUDY
# ON
# THE SOLID WASTE MANAGEMENT
# FOR THE KATHMANDU VALLEY

## Final Report
## Volume III: Supporting Report I

**September 2005**

**NIPPON KOEI CO., LTD.**

**YACHIYO ENGINEERING CO., LTD.**

## LIST OF VOLUMES



**- Exchange Rate; Rs 1 = USD 0.0133 = JPY 1.476**
**USD 1 = JPY 111.50**
***As of August 31, 2005***

**- Fiscal Year; July 16 to July 15 (the year of grace)**
**Shrawan to Ashadha (Nepalese)**

# Volume III : Supporting Report I

## Table of Contents

## List of Figures

**List of Tables**

## Abbreviations

**<Organizations>**

| | |
|---|---|
| BKM | Bhaktapur Municipality |
| CBO | Community Based Organization |
| CDS | Community Development Section |
| CDSS | Community Development and Sanitation Section |
| CEN | Clean Energy Nepal |
| CMU | Community Mobilization Unit |
| ECCA | Environmental Camps for Conservation Awareness |
| ENPHO | Environment and Public Health Organization |
| HMG/N | His Majesty's Government of Nepal |
| JICA | Japan International Cooperation Agency |
| KMC | Kathmandu Metropolitan City |
| KRM | Kirtipur Municipality |
| LSMC | Lalitpur Sub-Metropolitan City |
| MOLD | Ministry of Local Development |
| MTM | Madhyapur Thimi Municipality |
| NEPCEMAC | Nepal Pollution Control and Environment Managing Center |
| NEPCO | National Environment Pollution Control |
| NEREPA | Nepal Recycle Producer Association |
| NHRC | Nepal Health Research Council |
| OSLSMCC | Okharpauwa Sanitary Landfill Site Main Coordination Committee |
| PEOC | Public Event Organizing Committee |
| PSMC | Pokhara Sub-Metropolitan City |
| SOUP | Society for Urban Poor |
| ST/C | Steering Committee |
| SWMS | Solid Waste Management Section (KMC) |
| SWMRMC | Solid Waste Management and Resource Mobilization Center |
| T/F | Task Force |
| TWG | Technical Working Group |
| UNDP | United Nations Development Programme |
| WEPCO | Women Environment Preservation Committee |
| WEG | Women Environmental Group |
| WEID | Women's Initiative for Environment and Development |

**<Metric Units>**

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

| | |
|---|---|
| t/d | ton per day |
| t/y | ton per year |
| $^{o}$C | Centigrade |

**<Currency>**

| | |
|---|---|
| JPY | Japanese Yen |
| Rs | Nepalese Rupee |
| US$ | US Dollar |

**<Others>**

| | |
|---|---|
| A/P | Action Plan |
| BCC | Behavior Change Communication |
| BOD | Biochemical Oxygen Demand |
| CBO | Community Based Organization |
| CDPMT | Conservation and Development Programme in MTM |
| CEO | Chief Executive Officer |
| CKV | Clean Kathmandu Valley |
| COD | Chemical Oxygen Demand |
| CP | Cleaner Production |
| C/P | Counter Part |
| CRC | Community Recycling Center |
| CSO | Civil Society Organization |
| CTC | Counselor Training Camp |
| DfA/P | Draft Action Plan |
| DF/R | Draft Final Report |
| EIA | Environmental Impact Assessment |
| F/R | Final Report |
| FY | Fiscal Year |
| GIS | Geographic Information System |
| G.V.W | Gross Vehicle Weight |
| HH | Household |
| HRD | Human Resource Development |
| IC/R | Inception Report |
| IEC | Information, Education and Communication |
| IEE | Initial Environmental Examination |
| IT/R | Interim Report |
| KAP | knowledge, attitude and practice |
| LF | Landfill |
| L/T | Long-term |
| LFS | Landfill site |
| M&E | Management and Evaluation |
| NGO | Non Governmental Organization |
| OD | Organizational Development |
| ODA | Official Development Assistance |
| OFP | Overall Facility Plan |
| OJT | on the job training |
| O&M | Operation and Maintenance |
| OVI | Objectively Verifiable Indicators |
| PCM | Project Cycle Management |
| PDM | Project Design Matrix |
| PSO | Private Sector Organization |

| | |
|---|---|
| P/H | Public Hearing |
| PP | Pilot Project |
| PPP | Public Private Partnership |
| PPPUE | Public Private Partnership for the Urban Environment |
| PR | Public Relations |
| PSO | Private Sector Organization |
| S/T | Short-term |
| S/T-LFS | Short-term Landfill site |
| STV | secondary transportation vehicle |
| SW-C | Solid Waste Compost |
| SWM | Solid Waste Management |
| TNA | Training Needs Analysis |
| TOR | Terms of References |
| TOT | Training of Trainers |
| T/S | Transfer Station |
| UGR | unit generation rate |
| VDC | Village Development Committee |
| WPF | waste processing facility |

# CHAPTER I

# *PILOT PROJECTS OF THE STUDY*

# CHAPTER 1 PILOT PROJECTS OF THE STUDY

## 1.1 Overall Objective of Pilot Projects

Pilot Projects have been conducted aiming at the following based on the formulated Draft Action Plans (DfA/Ps) of each of the five municipalities.

- Objective I: To establish and enhance the essential capabilities (technical and operational area) of SWMRMC/MOLD as well as each of the five municipalities in order to practice the activities to be determined in their Action Plan (A/P)
- Objective II: To obtain baseline data as well as lesson learned in order to obtain feedback to A/Ps
- Objective III: To put into practice some of short-term activities of DfA/Ps which are recognized as more urgent ones

The Pilot Projects have been envisaged by combining selected various short-term activities and associated requirements (e.g. human resource development) for the activities' steady implementation. The important criteria for selecting activities were given as: i) contribution and effectiveness toward capacity development and human resource development to practice DfA/Ps, and ii) high priority activities which were required to be implemented urgently among the short-term ones of DfA/Ps.

Considering the major findings obtained and contents of DfA/Ps, and opinions exchanged intensively among the CKV Study Team members, the Pilot Projects were discussed in line with each approach integrated into DfA/Ps clarifying their background and necessity. Consequently, a series of five broad Pilot Projects have been envisaged as shown in Table 1.1-1.

**Table 1.1-1 Summary of Background of Five Broad Pilot Projects**

| Pilot Projects | Background of Pilot Projects |
|---|---|
| A. Improvement of Collection and Transportation | - When Sisdol short-term Landfill site (LFS) commences operation, effective transportation of waste becomes taking important especially for Kathmandu Metropolitan City (KMC) and Lalitpur Sub-Metropolitan City (LSMC). Construction of a new transfer station (T/S) and/or improvement of the existing T/S are necessitated in parallel with expansion of transfer haul capacity.<br>- Most of municipalities have intention to introduce or enhance the Public Private Partnership (PPP) into primary collection services. However, the experience and know-how of municipalities to involve private sector are insufficient.<br>- In Madhyapur Thimi Municipality (MTM) and Bhaktapur Municipality (BKM), introduction of effective and practical primary collection is prerequisite to improve sanitary conditions in urban area as well as to enhance resource recovery. |
| B. Promotion of Waste Minimization | - In response to determination of Sisdol utilization among the probable beneficiaries, reduction of waste to be transported to final disposal becomes very important from the viewpoints of budgetary availability as well as of prolonging LFS's life-time. Strategy from two fronts is necessary for reduction of waste, meaning large-scale (concentrated intermediate treatment) and small scale (community-based activities). |

| Pilot Projects | Background of Pilot Projects |
|---|---|
| C. Improvement of Final Disposal Planning and Operation | - As soon as Bagmati River dumping is discontinued, Sisdol is the site most ready for receiving the solid waste. Although Sisdol is being prepared as a sanitary landfill site, the experience and technical know-how of Nepalese side are very limited for facility design, construction and O&M.<br>- The preparation of site for long-term LFSs is one of major short-term activities in DfA/P of each municipality. Thus technical transfer for reasonable site selection and environmental/social considerations including EIA process is very demanding for the Nepalese side. |
| D. Promotion of Public Awareness and Behavior Change Communication/ Education | - All of municipalities have recognized the importance of public awareness on solid waste management (SWM) and listed various activities in their DfA/Ps. It is very significance to demonstrate the good practices and learn lessens on how to realize the mobilization of the public into SWM-related activities. |
| E. Development of Operation and Management Capacities | - Various training needs were identified by Training Needs Analysis (TNA). Some of these needs are covered by the above using OJT. Other needs such as monitoring and evaluation (M&E), and budget/expenditure management are also decisive factors to achieve sustainable SWM-related activities. Besides, Country Focused Training Course in Japan is to be an integral part of SWM capacity development. |

Source: JICA Study Team

## 1.2 Design of Pilot Projects

The project purpose, which was the specific objective expected to be achieved by the time a Pilot Project is completed, was set for each Pilot Project as shown in Table 1.2-1. The Pilot Projects were mainly designed to strengthen the capabilities of five broad components of waste management (Objective I) with a series of trainings and practices, while some of the Pilot Projects also aimed at achieving Objectives II and III consequentially.

**Table 1.2-1 Outlines of Five Broad Pilot Projects**

| Pilot Projects | Project Purposes | Main Activities | Objectives |
|---|---|---|---|
| A. Improvement of Collection and Transportation | Capabilities of relevant staff of five municipalities and SWMRMC regarding waste collection and transportation are strengthened. | A-1: Practice of solid waste collection in model areas | I, II |
| | | A-2: Training for public private partnership (PPP) on SWM | I, III |
| | | A-3: Training/Practice of transfer station (Teku T/S) | I, III |
| B. Promotion of Waste Minimization | Capabilities of relevant staff of five municipalities and SWMRMC regarding waste minimization are strengthened. | B-1: Training of waste minimization facility | I, III |
| | | B-2 Practice of local level waste minimization activities | I, II |
| C. Improvement of Final Disposal Planning and Operation | Capabilities of relevant staff of five municipalities and SWMRMC regarding final disposal planning and operation are strengthened. | C-1: Training for final disposal planning | I |
| | | C-2: Training/Practice of Semi-aerobic landfill (Sisdol Short-term Landfill site) | I, III |

| Pilot Projects | Project Purposes | Main Activities | Objectives |
|---|---|---|---|
| D. Promotion of Public Awareness and Behavior Change Communication / Education | Capabilities of relevant staff of five municipalities and SWMRMC regarding public awareness and behavior change communication/ education are strengthened. | D-1: Training for community mobilization activities | I |
| | | D-2: Practice of mass communication and education | I, II, III |
| | | D-3: Practice of interpersonal communication and education | I, II |
| E. Development of Operation and Management Capacities | Capabilities of relevant staff of five municipalities and SWMRMC regarding technical and operational management on solid waste are strengthened. | E-1: Training of Action Plan operational management | I |
| | | E-2: Practice of solid waste data management | I |
| | | E-3: Training of solid waste management policy and technology | I |

Source: JICA Study Team

Based on the above, the Pilot Projects were designed as shown in Table 1.2-2. The targets of each of the Pilot Projects depended on the background as discussed in Table 1.1-1. For smooth implementation, local consultants, NGOs, local resource persons (specialists/experts) and assistants were involved in addition to the supports and instructions by the JICA Study Team.

**Table 1.2-2 Contents of Pilot Projects of the Study**

| Projects | Project Purpose | Targets | Main Activities | Implementation |
|---|---|---|---|---|
| **A. Improvement of Collection and Transportation** | Capabilities of relevant staff of the five municipalities and SWMRMC regarding waste collection and transportation are strengthened. | **A-1**<br>A-1.1:<br>BKM staff<br>A-1.2:<br>MTM staff<br><br>**A-2:**<br>Staff of KMC, LSMC and KRM<br>**A-3:**<br>KMC staff (SWMRMC, LSMC) | **A-1: Practice of Solid Waste Collection at Model Areas**<br>A-1.1: Practice of source-separated collection in BKM<br>A-1.2: Practice of collection and transportation in MTM<br>**A-2: Training for Public Private Partnership (PPP) on Solid Waste Management**<br><br>**A-3: Training/Practice of Transfer Station (Teku T/S)**<br>A-3.1: Training for planning of T/S<br>A-3.2: Training for designing of T/S<br>A-3.3: Training for construction supervision of T/S<br>A-3.4: Practice of O&M of T/S | **A-1**<br>A-1.1: Guidance by the JICA Study Team<br>A-1.2: ditto<br>**A-2:** Guidance by JICA Study Team and local consultants<br><br>**A-3:**<br>A-3.1: Guidance by the JICA Study Team<br>A-3.2: Guidance by the JICA Study Team, supported by local consultants<br>A-3.3: ditto<br>A-3.4: Guidance by the JICA Study Team |
| **B. Promotion of Waste Minimization** | Capabilities of relevant staff of the five municipalities and SWMRMC regarding waste minimization are strengthened. | **B-1:**<br>Staff of KMC, LSMC and SWMRMC<br><br>**B-2:**<br>B-2.1:<br>KMC staff<br>B-2.2:<br>KMC staff<br>B-2.3:<br>LSMC staff<br>B-2.4:<br>KRM staff | **B-1: Training for Waste Minimization Facility**<br>B-1.1: Training for facility planning<br><br>**B-2: Practice of Local Level Waste Minimization Activities**<br>B-2.1: Practice of community-based waste minimization activities at a model area (in KMC)<br>B-2.2: Practice of medium-scale vermi-composting (in KMC)<br>B-2.3: Practice of promotion of home composting (in LSMC)<br>B-2.4: Practice of plastic separation (in KRM) | **B-1:** Guidance by the JICA Study Team, supported by local consultants and resource persons<br><br>**B-2:**<br>B-2.1: Guidance by JICA Study Team, supported by NGOs and local resource person<br>B-2.2: ditto<br>B-2.3: ditto<br>B-2.4: ditto |

| Projects | Project Purpose | Targets | Main Activities | Implementation |
|---|---|---|---|---|
| **C. Improvement of Final Disposal Planning and Operation** | Capabilities of relevant staff of the five municipalities and SWMRMC regarding planning and operation of final disposal are strengthened. | **C-1:** Staff of five municipalities and SWMRMC<br>**C-2:** Staff of SWMRMC, KMC, LSMC (BKM) | **C-1: Training for Final Disposal Planning**<br>C-1.1: Training for site selection<br>C-1.2: Training for environmental/social considerations on landfill site<br>**C-2: Training/Practice of Semi-aerobic Sanitary Landfill (Sisdol Short-term LFS)**<br>C-2.1: Training for planning<br>C-2.2: Training for designing<br>C-2.3: Training for construction supervision<br>C-2.4: Practice of O&M including environmental monitoring | **C-1:**<br>C-1.1: Guidance by the JICA Study Team, supported by local consultants and resource persons<br>C-1.2: ditto<br>**C-2:**<br>C-2.1: Guidance by the JICA Study Team, supported by local consultants<br>C-2.2: ditto<br>C-2.3: ditto<br>C-2.4: ditto |
| **D. Promotion of Public Awareness and Behavior Change Communication/ Education** | Capabilities of relevant staff of the five municipalities and SWMRMC regarding public awareness and behavior change communication/ education are strengthened. | **D-1:** Staff of five municipalities and SWMRMC<br>**D-2:** Staff of five municipalities and SWMRMC<br>**D-3:** BKM staff | **D-1: Training for Community Mobilization Activities**<br>**D-2: Practice of Mass Communication and Education**<br>**D-3: Practice of Interpersonal Communication and Education** | **D-1:** Guidance by the JICA Study Team, supported by local experts<br>**D-2:** Guidance by the JICA Study Team supported by NGO<br>**D-3:** Guidance by the JICA Study Team supported by NGO |
| **E. Development of Operation and Management Capacities** | Capabilities of relevant staff of the five municipalities and SWMRMC regarding technical and operational management on solid waste are strengthened. | **E-1:** Staff of five municipalities<br>**E-2:** Staff of five municipalities and SWMRMC<br>**E-3:** Staff of five municipalities and SWMRMC | **E-1: Training for Action Plan Operational Management**<br>**E-2: Practice of Solid Waste Data Management**<br>E-2.1: Practice of solid waste quality and quantity survey<br>E-2.2: Practice of data managing for SWM<br>**E-3: Training for Solid Waste Management Policy and Technology** | **E-1:** Guidance by the JICA Study Team, supported by local consultant<br>**E-2:**<br>E-2.1: Guidance by the JICA Study Team, supported by local consultant<br>E-2.1: ditto<br>**E-3:** JICA Country Focused Training |

Source: JICA Study Team

## 1.3 Project Design Matrix (PDM) of Pilot Projects

Project Design Matrix (PDM) shows the logical interrelationship among the components of a project, such as the objectives, activities, and inputs, as well as the important assumption related to the Pilot Project, and objectively verifiable indicators (OVIs) for monitoring progress, which ensures consistent management throughout the project cycle. A PDM format is similar to that of the Logical Framework employed by other donor agencies, and therefore can be commonly used worldwide.

In order to conduct the Pilot Projects effectively, PDMs were developed by the CKV Study Team for the five broad Pilot Projects. The project purposes, targets and main activities were written in the respective PDMs. In order to monitor and evaluate achievement levels of each Pilot Project, OVIs were set for the project purpose of each Pilot Project which was described in respective PDMs.

However, in order to show a clear direction for the whole Kathmandu Valley as an umbrella concept, an overall common goal was set as a result of consolidation of the achievements of project purposes as shown below:

"SWM Service of Respective Municipalities is Improved
through Capacity Development"

The OVI for the overall goral is the level of solid waste management ratio, and e OVIs of overall goal of HRD framework is the level of capacities to collect and manage SWM data as discussed.

Since the Pilot Projects launched, many discussions on the detail contents and plan of operation (PO) of the Pilot Projects had been made through Technical Working Group (TWG) and Task Force (T/F) meetings and workshops which were implemented as part of activities of Pilot Project E-1: Training for Action Plan Operational Management. In general, the design of the Pilot Projects took shapes gradually through the activities involving the various parties concerned, and was refined and improved in the process. After the commencement of the Pilot Projects, the design was often modified to adjust to changes in circumstances such as delays on activities due to the "banda" or "curfew" and the addition of a new output which was not incorporated in the original design.

In the Pilot Project case, some modifications of the design were made in order to make the Pilot Projects more suitable for the objectives or the situation of each municipality. As the design had been modified at the above-mentioned meetings and workshops as well as during the implementation, the PDMs were updated by incorporating improvements and other changes. As original PDM could be defined as $PDM_0$, PDM with a version number was prepared as $PDM_1$ and version number of PDM advanced from 0 to N. The modified PDMs, i.e. $PDM_2$, are attached in Appendix 1.

## 1.4 Implementation Framework of Pilot Projects

### 1.4.1 Assignment of Focal Points

As a first step for the implementation of Pilot Projects, Focal Points of each broad Pilot Project (A-E) who were/would be in charge of these fields, were assigned as shown in Table 1.4-1 with consideration of respective specialties, backgrounds and potions. At the beginning, some Focal Points were not member of T/F. However, as they had been involved in each Pilot Project intensively, they were finally assigned as T/F members of each municipality. Those who participated the Country Focus Training in Japan in 2003 were assigned mainly as Focal Points of Pilot Project C: Landfilling because their backgrounds were civil engineering and they learned a lot about semi-aerobic landfill system which was recommended to be applied in Nepal. On the other hand, those who had been involved in the works relating to community development/mobilization were assigned as Focal Points of Pilot Project D: Promotion of Public Awareness and Behavior Change and/or Pilot Project B: Waste Minimization, especially community or local level waste minimization. Their daily work experiences for community mobilization for SWM were expected to be utilized and enhanced through this Pilot Project component.

**Table 1.4-1 Focal Points of the Pilot Projects Implementation**

| Focal Points | A. Collection and Transportation (Inc.Data Management) | B. Waste Minimization (Composting, Recycling) | C. Landfilling (Inc.Env. Monitoring) | D. Public Awareness and Behavior Change | E. Operational Management |
|---|---|---|---|---|---|
| KMC | Mr. Rajesh | Mr. Rajesh (Large)/ Ms. Shriju*(Community) | Mr. Kiran Mr. Deepak* | Ms. Shriju*/ Ms. Sanu* | Mr. Rajesh |
| LSMC | Mr. Pradeep | Mr. Pradeep (Large)/ Ms. Laxmi /Ms. Sabina* (Community) | Mr. Rudra | Ms. Laxmi / Ms. Sabina* | Mr. Rudra |
| BKM | Mr. Dinesh | Mr. Moti | Mr. Laxman | Mr. Dilip Mr. Krishna | Mr. Laxman |
| MTM | Mr. Satya | Mr. Surendra*/ Ms. Krishna | Mr. Satya/ Mr. Shiva | Mr. Tulsi/ Ms. Krishna | Mr. Tulsi |
| KRM | Mr. British* | Mr. Gyan | Mr. Bal | Mr. Anuj | Mr. Bal |
| SWM RMC | Mr. Nirmal(Data)/ Mr. Ram (T/S) | Mr. Ashok | Mr. Ram | Mr. Nirmal | Mr. Ashok |

Note: * became T/F members later
Source: JICA Study Team

### 1.4.2 Basic Implementation Framework of Pilot Projects

In principle, the technology and know-how on SWM were transferred directly from the JICA Study Team as part of the activities of the Pilot Projects. However, it was also effective to make the most of local resources including local consultants and local NGOs since training and other kind of activities could be implemented based on the actual local conditions as well as in Nepalese language. The technology and know-how on SWM could also be transferred to the local consultants and resources in this case so that they would be able to support the central and local bodies on SWM continuously. The activities of the Pilot Projects, therefore, were implemented basically in two ways as shown in Figures 1.4-1 and -2.

In case of Type I implementation framework, the activities were implemented by target group (Focal Points, TWG and T/F members or other related persons) directly with necessary support from the JICA Study Team or through the instruction and management of the local resources so as to engender ownership for the Nepalese side. In either case, it was expected that lessons would be learned by this type of implementation. On the other hand, in case of Type II, a series of training sessions such as discussion meetings and workshops were facilitated or provided by the JICA Study Team or through local resources. The Nepalese side personnel was requested to perform as main actors in the course of the Pilot Projects' implementation, while the JICA Study Team members acted as supporters to the Nepalese side.

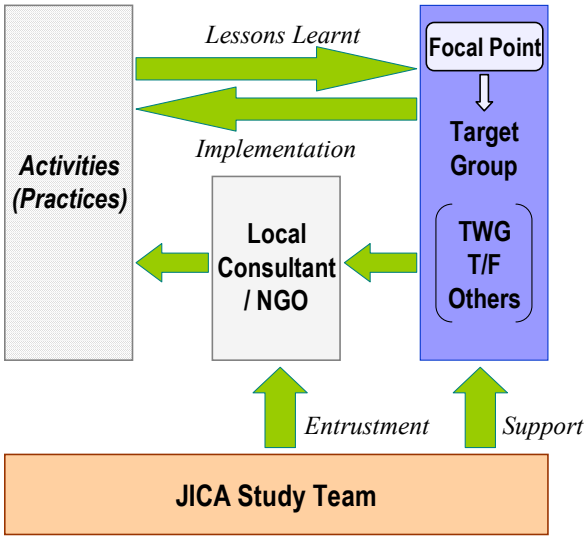


**Figure 1.4-1 Implementation Framework of Pilot Projects (Type I)**

Source: JICA Study Team

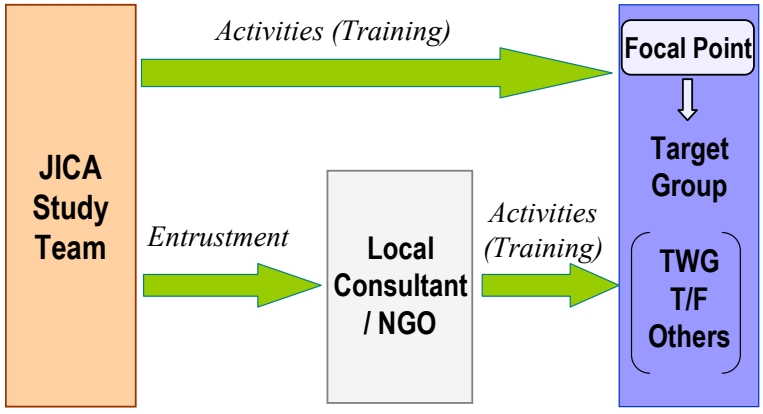


**Figure 1.4-2 Implementation Framework of Pilot Projects (Type II)**

Source: JICA Study Team

### 1.4.3 Selected Local Consultants, Contractors and NGOs

In order to support the activities of the Nepalese side and technology transfer by the JICA Study Team, local consultants, contractors and NGOs were selected as follows.

**Table 1.4-2 Selected Local Consultants, Contractors and NGOs**

| Pilot Projects | Activities Supported | Selected Local Consultants, Contractors and NGOs |
|---|---|---|
| A: Improvement of Collection and Transportation | A-2: Training for Public Private Partnership on SWM | DMI Pvt. Ltd. |
| | A-3: Training/Practice of Transfer Station (Teku T/S)<br>(1) Detailed Design of Improvement of Teku Transfer Station<br>(2) Implementation of Improvement of Teku Transfer Station | <br><br>(1) CEMAT Consultants (P.) Ltd.<br><br>(2) SWACHCHHANDA NIRMAN SEWA Pvt. Ltd. |
| B: Promotion of Waste Minimization | B-1: Training for Waste Minimization Facility<br>(1) Market Survey of Compost Products<br>(2) Data Collection at Bhaktapur Composting Facility. | <br><br>(1) MEH Consultant (P.) Ltd.<br>(2) SILT Consultants (P.) Ltd. |
| | B-2: Practice of Local Level Waste Minimization Activities<br>(1) Vermi-Composting<br>(2) Compost Quality Survey<br>(3) Plastic Storehouse | <br><br>(1) Pesticide Monitor of Nepal (PEMON)<br>(2) MEH Consultant (P.) Ltd.<br>(3) Lucky Construction Company (P.) Ltd. |
| C: Improvement of Final Disposal Planning and Operation | C-1: Training for Final Disposal Planning<br>(1) EIA practice at Taikabu landfill site<br>(2) IEE practice at long-term candidate sites | <br><br>(1) EAST Consult (P.) Ltd.<br>(2) GEOCE Consultants (P.) Ltd. |
| | C-2: Practice of Semi-aerobic Sanitary Landfilling (Sisdol S/T-LFS)<br>(1) Detailed Design of Improvement of Sisdol S/T Landfill Site as Semi-Aerobic System<br>(2) Implementation of Improvement of Sisdol S/T Landfill Site<br>(3) Environmental Monitoring of Sisdol S/T Landfill Site | <br><br>(1) EAST Consult (P.) Ltd.<br><br><br>(2) BHAIRAB Construction Company (P.) Ltd.<br>(3) Environment and Public Health Organization (ENPHO) |
| D: Promotion of Public Awareness and Behavior Change Communication/ Education | D-2: Practice of Mass Communication and Education | Clean Energy Nepal (CEN) |
| | D-3: Practice of Interpersonal Communication and Education | Environmental Camps for Conservation Awareness (ECCA) |
| E: Development of Operation and Management Capacities | E-1: Training for Action Plan Operational Management | DMI Pvt. Ltd. |
| | E-2: Practice of Solid Waste Data Management | SILT Consultants (P.) Ltd. |

Source: JICA Study Team

## 1.5 Evaluation of Pilot Projects

The achievement levels of project purposes and outputs of the Pilot Projects were discussed based on how the OVIs were achieved at first, and then the CKV Study Team conducted a final evaluation of the Pilot Projects from the view point of the following criteria.

**Table 1.5-1 Evaluation Criteria of Pilot Projects**

| Evaluation Criteria | Main Considerations |
|---|---|
| Efficiency | • How can the amounts of "inputs" be cut back to produce the same "outputs"?<br>• Are the inputs being utilized properly to produce "outputs"? |
| Effectiveness | • To what extent has the "project purpose" been achieved?<br>• Is the "project purpose" expected to be achieved by the end of the cooperation period?<br>• Are there any "outputs" that need boosting to achieve the "project purpose"? Conversely, can any "outputs" be cut back without jeopardizing the achievement of the "project purpose"? |
| Impact | • Is the project producing any negative effects? If so, how can they be minimized? |
| Relevance | • Are "project purpose" and "overall goal" still compatible with the needs of the beneficiaries, priorities of the recipient country and the local social environment? If there are discrepancies, can any changes be made to the project to rectify them? |
| Sustainability | • Are the implementing organization, key implementation personnel and others on the recipient-country side developing technical expertise, operation/management skills and financial capability to carry on the project activities independently after the expiry of the cooperation period?<br>• To ensure self-reliance after the withdrawal of cooperation, what aspects of the project need to be strengthened in the remaining cooperation period and to what extent? |

Source: Project Cycle Management, Monitoring and Evaluation Based on the PCM Methods, Foundation for Advanced Studies on International Development (FASID), March 2000

The relative importance of the above five evaluation criteria changes with the structure of PDM as shown in Table 1.5-2. For example, efficiency is mainly evaluated focusing on outputs and inputs, while effectiveness focuses on project purpose and outputs. Sustainability is evaluated from overall goal to inputs. Evaluation mainly focuses on what effects a pilot project has had, rather than how it was implemented. Namely, it aims to ascertain its impacts and achievements, make recommendations on the future course of the activities and draw lessons for other activities.

**Table 1.5-2 Basic Ideas of Five Evaluation Criteria of Pilot Projects**

<table>
<tr><th>Evaluation Criteria</th><th>Efficiency</th><th>Effectiveness</th><th>Impact</th><th>Relevance</th><th>Sustainability</th></tr>
<tr><td>Overall goal</td><td rowspan="2"></td><td></td><td rowspan="2">What positive and negative effects, either direct or indirect, has the implementation of the pilot project had?</td><td rowspan="2">Are the "project purpose" and "overall goal" still meaningful as objectives at the time of evaluation?</td><td rowspan="4">To what extent will the recipient country's organizations be able to retain the positive effects of the pilot project after the withdrawal of cooperation?</td></tr>
<tr><td>Project Purpose</td><td rowspan="2">Whether the "project purpose" has been achieved, and how much contribution did "outputs" make?</td></tr>
<tr><td>Outputs</td><td rowspan="2">To what extent have "inputs" been converted to "outputs"?</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>Inputs</td><td></td></tr>
</table>

Source: Project Cycle Management, Monitoring and Evaluation Based on the PCM Methods, Foundation for Advanced Studies on International Development (FASID), March 2000

# APPENDIX 1

## *Project Design Matrix of the Pilot Projects*

# APPENDIX 1 (1) PROJECT DESIGN MATRIX ($PDM_2$)

Project name: Improvement of Collection and Transportation — Duration: July, 2004 to June, 2005

Project areas: KMC, LSMC, BKM, MTM, KRM — Target groups: Staff of the five Municipalities and SWMRMC — Date: March 21, 2005

| Narrative Summary | Objective Verifiable Indicators | Means of Verification | Important Assumptions |
|---|---|---|---|
| 【Overall Goal】<br>• SWM service of respective municipalities is improved through capacity development (solid waste management ratio is increase) | 1. The consolidated waste management ratio of the five municipalities reaches 93% (or 718 ton/day) by the end of 2015 from the current level of 76 % (or 331 ton/day). | 1 Consolidated waste management ratio and quantity of the five municipalities | • Political stability<br>• No drastic change in the availability of financial resources.<br>• Decentralization of SWM responsibilities is not reversed by HMG/N. |
| 【Project Purpose】<br>• Capabilities of relevant staff of the five municipalities and SWMRMC regarding waste collection and transportation are strengthened. | • By the end of June 2005, the amount of transported waste to the designated landfill site(s) is increased. | 1. Pilot Project report<br>2. Daily record of collected waste quantity or volume<br>3. Daily record of transported and disposed of waste quantity or volume | • Budget allocation is ensured to implement waste data management based on Action Plan on SWM. |
| 【Outputs】<br>1. Basic knowledge and experience about efficient primary collection with measures such as source-separated collection are obtained among the relevant officials in municipalities.<br><br>2. Practical guideline for public private partnership for SWM is prepared.<br><br>3. Basic knowledge and experience regarding transfer station are obtained | 1-1. By the end of the Pilot Project, separated collection is implemented at 500 households at the specified areas in BKM<br><br>1-2. By the end of the Pilot Project, households at the specified areas in MTM receive collection service<br><br>2. By the end of the Pilot Project, a set of contract/agreement forms is prepared as guideline<br><br>3. By the end of the Pilot Project, Teku T/S is improved and tentative transfer haul practices are started | 1-1. Pilot Project report<br><br>1-2. Pilot Project report<br><br>2. Pilot Project report<br><br>3. Project document/report (including as built document of Teku T/S) | • Each municipality transports collected waste to the designated final disposal site |

| 【Activities】 | 【Inputs】 | 【Inputs】 | 【Preconditions】 |
|---|---|---|---|
| 1. Practices of Solid Waste Collection at Model Areas<br>1-1. Practice of source-separated collection in BKM<br>1-2. Practice of collection and transportation in MTM<br>2. Training for Public Private Partnership (PPP) for Solid Waste Management<br>2-1. Review of the existing PPP activities<br>2-2. Study of an appropriate contract/agreement forms between municipality and private sectors<br>2-3. Preparation of handbook for Public Private Partnership<br>3. Training/Practice of Transfer Station (Teku T/S)<br>3-1. Training for planning of T/S<br>3-2. Training for designing T/S<br>3-3. Training for construction and supervision of improvement of T/S<br>3-4. Practice of operation of T/S | Japan<br>(1) Personnel<br>• Members of the JICA Study Team<br>- Collection and Transportation<br>- Public Involvement/ Social Consideration<br>- Organizational and Institution Strengthening<br>- Facility Plan<br>• Local consultants<br>(2) Equipment<br>- Waste bins for source-separation (BKM)<br>- Waste collection vehicle (3.5m$^3$) (MTM)<br>(3) Improvement works of Teku T/S | Nepal<br>(1) Personnel<br>• Counterparts and other relevant staff<br>- SWMRMC<br>- KMC<br>- LSMC<br>- BKM<br>- MTM<br>- KRM<br>(2) Site arrangement in Teku T/S and O&M of Teku T/S | • Trained staff continue working in municipalities and SWMRMC<br><br>• Political and security conditions are not worsen.<br>• Stakeholders do not oppose the Pilot Project |

# APPENDIX 1 (2) PROJECT DESIGN MATRIX ($PDM_2$)

Project name: Promotion of Waste Minimization — Duration : June, 2004 to June, 2005

Project areas: KMC, LSMC, BKM, MTM, KRM — Target groups : Staff of the five Municipalities and SWMRMC — Date: March 21, 2005

| Narrative Summary | Objective Verifiable Indicators | Means of Verification | Important Assumptions |
|---|---|---|---|
| **【Overall Goal】**<br>• SWM service of respective municipalities is improved through capacity development (solid waste management ratio is increase) | 1. The consolidated waste management ratio of the five municipalities reaches 93% (or 718 ton/day) by the end of 2015 from the current level of 76 % (or 331 ton/day). | 1 Consolidated waste management ratio and quantity of the five municipalities | • Political stability<br>• No drastic change in the availability of financial resources.<br>• Decentralization of SWM responsibilities is not reversed by HMG/N. |
| **【Project Purpose】**<br>• Capabilities of relevant staff of the five municipalities and SWMRMC regarding waste minimization are strengthened. | • By the end of June 2005, more than 1,200 households are newly involved waste minimization activities | 1. Pilot Project report | • Each municipality continues and distribute pilot activities |
| **【Outputs】**<br>1. The waste minimization facility is planned<br><br>2. Local level waste minimization activities are strengthened | 1. By the end of Pilot Project, a new waste minimization facility is planned.<br><br>2. By the end of Pilot Project, local level waste minimization activities (home composting, separation collection of plastic) are implemented | 1. Planning report for waste minimization facility<br><br>2. Pilot Project report | • Waste management conditions (collection, transportation and disposal) in the Katmandu Valley do not become worse than actual conditions. |

| 【Activities】 | 【Inputs】 | 【Inputs】 | • Trained staff continue working in municipalities and SWMRMC |
|---|---|---|---|
| 1. Training for Waste Minimization Facility<br>1-1 Verification of existing technology for waste minimization<br>1-2 Data collection at BKM waste processing facility<br>1-3 Marketing survey of compost product<br>1-4 Development of basic plan of a large scale waste processing facility<br>1-5 Pre-feasibility examination on a large scale waste processing facility<br>1-6 Study tour in India<br>2. Practice of Local Level Waste Minimization Activities<br>2-1 Practice of community-based waste minimization activities in a model area (in KMC)<br>2-2 Practice of medium-scale vermi composting (in KMC)<br>2-3 Practice of promotion of home composting (in LSMC)<br>2-4 Practice of plastic separation and home composting (in KRM) | Japan<br>(1) Personnel<br>• Members of the JICA Study Team<br>- Recycling system<br>- Public involvement/Social consideration<br>• Local consultants<br>• Local NGOs, resource persons and assistants<br>(2) Study tour<br>(3) Recycling center, vermin-composting shed, home compost bins, suiro and cotton bag, manuals, plastic store house and stationeries for training | Nepal<br>(1) Personnel<br>• Counterparts and other relevant staff<br>- SWMRMC<br>- KMC<br>- LSMC<br>- BKM<br>- MTM<br>- KRM<br>• Existing composting facility operators in Bhaktapur<br>(2) Facilities<br>Necessary land, buildings and equipment | 【Preconditions】<br>• The policy of the Nepalese Government remains same regarding the solid waste management<br>• Stakeholders do not oppose the Pilot Project. |

# APPENDIX 1 (3) PROJECT DESIGN MATRIX ($PDM_2$)

Project name: Improvement of Final Disposal Planning and Operation — Duration : June, 2004 to June, 2005

Project areas: KMC, LSMC, BKM, MTM, KRM — Target groups : Staff of the five Municipalities and SWMRMC — Date: March 21, 2005

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumptions |
|---|---|---|---|
| **【Overall Goal】**<br>• SWM service of respective municipalities is improved through capacity development (solid waste management ratio is increase) | 1. The consolidated solid waste disposal ratio to sanitary landfill site(s) of the five municipalities reaches 100% of the colleted waste by the end of 2015 from the current level of 0%. | 1. Consolidated waste management ratio and quantity of the five municipalities | • •Political stability<br>No drastic change in the availability of financial resources.<br>Decentralization of SWM responsibilities is not reversed by HMG/N. |
| **【Project Purpose】**<br>• Capabilities of relevant staff of the five municipalities and SWMRMC regarding final disposal planning and operation are strengthened. | • By the end of June 2005, sanitary landfilling activities (soil covering, leachate control, environmental monitoring) are implemented at Sisdol Valley I | 1. Pilot Project repot | • Budget allocation is ensured to develop sanitary landfill sites |
| **【Outputs】**<br>1. Basic knowledge for planning of final disposal is obtained.<br><br>2. Basic knowledge and experiences are obtained on planning, designing, construction and O&M of semi-aerobic sanitary landfilling manners. | 1-1. By the end of Pilot Project, the candidates for L/T-LFS are selected<br>1-2. By the end of Pilot Project, environmental and social consideration for landfill site is compiled<br><br>2-2. By the end of Pilot Project, sanitary landfill site with semi aerobic system is developed at Sisdol Valley I | 1. Pilot Project report<br><br>2. Pilot Project repot (including as built document of Sisdol) | • Staff is assigned to Sisdol S/T-LF Valley I by KMC and LSMC<br>• KMC and LSMC together with SWMRMC transport the collected solid waste to Sisdol S/T-LF |

| 【Activities】 | 【Inputs】 | 【Inputs】 | |
|---|---|---|---|
| 1. Training for Final Disposal Planning | Japan | Nepal | • Trained staff continue working in municipalities and SWMRMC |
| 1-1. Training for site selection | (1) Personnel | (1) Personnel | |
| 1-2. Training for environmental/social consideration on landfill site | • Members of the JICA Study Team<br>- Facility plan<br>- Environment<br>- Public Involvement/ Social Consideration<br>- Organizational and Institutional Strengthening<br>- Human Resource Development | • Counterparts and other relevant staff<br>- SWMRMC<br>- KMC<br>- LSMC<br>- BKM<br>- MTM<br>- KRM | |
| 2. Training/Practice of Semi-aerobic Sanitary Landfill (Sisdol S/T-LFS) | • Local consultants, local contractor, local resource persons (training, facilities design, construction, environmental monitoring) | (2) Cost<br>- Sisdol S/T-LF preparation except semi-aerobic manner<br>- Access road improvement and maintenance | 【Preconditions】<br>• Political and security conditions are not worsen.<br>• Stakeholders do not oppose the Pilot Project |
| 2-1. Training for planning | | | |
| (1) Site visit to Pokhara | | | |
| (2) Site visit to Malaysia | (2) Study tour | | |
| 2-2. Training for design | | | |
| 2-3. Training for construction supervision | | | |
| (1) Joint site visit to Sisdol | | | |
| 2-4 Practice of O&M including environmental monitoring | (3) Improvement waste of Sisdol S/T-LFS | (3) Equipment for Sisdol S/T-LF operation and for transportation | |
| (1) OJT on O&M | | | |
| (2) Environmental monitoring and monitoring committee | | | |

# APPENDIX 1 (4) PROJECT DESIGN MATRIX ($PDM_2$)

Project name: Promotion of Public Awareness and Behavior Change Communication/Education — Duration : July, 2004 to June, 2005

Project areas: KMC, LSMC, BKT, KRM, MTM — Target groups : Staff of the five Municipalities and SWMRMC — Date: March 21, 2005

| Narrative Summary | Objective Verifiable Indicators | Means of Verification | Important Assumptions |
|---|---|---|---|
| 【Overall Goal】<br>• SWM service of respective municipalities is improved through capacity development (solid waste management ratio is increase) | 1. The consolidated waste management ratio of the five municipalities reaches 93% (or 718 ton/day) by the end of 2015 from the current level of 76 % (or 331 ton/day). | 1 Consolidated waste management ratio and quantity of the five municipalities | • Political stability<br>• No drastic change in the availability of financial resources.<br>• Decentralization of SWM responsibilities is not reversed by HMG/N. |
| 【Project Purpose】<br>• Capabilities of relevant staff of the five municipalities and SWMRMC regarding public awareness and behavior change communication/ education are strengthened. | • The strategies regarding awareness and public education are formulated and incorporated into Action Plan on SWM in each municipality by the end of June 2005. | 1. Action Plan on SWM in each municipality (physical verification)<br>2. Result of rapid self-assessment sheet (to be distributed to relevant municipality officials before and after the Pilot Project)<br>3. Result of rapid competency rating sheet (to be made and marked by the Japanese members of Study Team before and after the Pilot Project) | • Budget allocation is ensured to implement awareness and public education based on Action Plan on SWM. |
| 【Outputs】<br>1. Basic knowledge about community mobilization including public education in SWM is gained among relevant officials in municipalities.<br>2. Know-how of mass communication and education approach is transferred. | 1-1. 80% of target groups participate in training by the end of Pilot Project.<br>1-2. The meetings on awareness and public education are jointly organized by target groups three times by the end of Pilot Project<br>2. Educational event is implemented by target groups in each municipality by the end of Pilot Project. | 1-1. Pilot Project document/report<br>1-2. Pilot Project document/report<br>2. Pilot Project document/report | • The importance of public education and awareness on SWM is recognized by high-level officials in municipalities. |

| | | | |
|---|---|---|---|
| 3. Know-how of interpersonal communication and education approach is transferred. | 3. The level of knowledge, attitude, and practice regarding SWM is improved among targeted children or communities. | 3. Project document/report (The results of baseline and impact surveys) | |
| **【Activities】**<br>1. Training for Community Mobilization<br>Activities<br>1-1. Training for community mobilization and public education/awareness on SWM, and hold sharing meetings<br>1-2. Study tour to Hetauda<br>2. Practice of Mass Communication and Education<br>2-1 Selection of mascot of CKV Study and distribute stickers<br>2-2 Undertaking of educational events &exhibition<br>2-3 Broadcasting of radio commercial<br>2-4 Wall painting<br>2-5 Implementation of clean up in the community<br>3. Practice of Interpersonal Communication and Education<br>3-1 To conduct baseline survey regarding knowledge, attitude and practice on SWM<br>3-2 To provide counselor training camp for youth and teachers who support children's activities<br>3-3 To conduct camp and establish "Nature Club" and support small scale SWM activities<br>3-4 To conduct workshop on resource material development, printing and paper making<br>3-5 To hold sharing and exchanging meetings<br>3-6 To conduct impact survey | **【Inputs】**<br>Japan<br>(1) Personnel<br>• Members of the JICA Study Team<br>- Public Involvement/ Social Consideration<br>- Public Relations<br>- Organizational and Institutional Strengthening/Human Resources Development<br>• Local consultants, NGOs<br>(2) Operational cost<br>- Professionals of art, broadcast<br>- Study tour to Hetauda<br><br>Nepal<br>(1) Personnel<br>• Counterparts and other relevant staff<br>- SWMRMC<br>- KMC<br>- LSMC<br>- BKM<br>- MTM<br>- KRM<br><br>(2) Facilities<br>Land, buildings and materials | | • Trained staff continue working in municipalities and SWMRMC<br><br>**【Preconditions】**<br>• Political and security conditions are not worsen. |

# APPENDIX 1 (5) PROJECT DESIGN MATRIX ($PDM_2$)

Project name: Development of Operation and Management Capacities — Duration : July, 2004 to June, 2005

Project areas: KMC, LSMC, BKT, KRM, MTM — Target groups : Staff of the five Municipalities and SWMRMC — Date: March 21, 2005

| Narrative Summary | Objective Verifiable Indicators | Means of Verification | Important Assumptions |
|---|---|---|---|
| 【Overall Goal】<br>• SWM service of respective municipalities is improved through capacity development (solid waste management ratio is increase) | 1. The consolidated waste management ratio of the five municipalities reaches 93% (or 718 ton/day) by the end of 2015 from the current level of 76 % (or 331 ton/day). | 1 Consolidated waste management ratio and quantity of the five municipalities | • Political stability<br>• No drastic change in the availability of financial resources.<br>• Decentralization of SWM responsibilities is not reversed by HMG. |
| 【Project Purpose】<br>• Capabilities of relevant staff of the five municipalities and SWMRMC regarding technical and operational management on solid waste are strengthened. | • By the end of June 2005, annual work plan of five municipalities of next fiscal year with finical plan are developed based on reliable data | 1. Pilot Project report | • Commitment to of municipalities to SWM capacity building trained staff stay within the system. |
| 【Outputs】<br>1. Municipalities acquire necessary capacities to operationalize Action Plans | 1. By the end of Pilot Project, working items with responsible persons and budget (financial plan) are developed. | 1. Pilot Project report | • Staff is made available for the training. |
| 2. Municipalities acquire the skills and knowledge to collect and manage SWM data | 2. By the end of Pilot Project, solid waste database of each municipality is developed. | 2-1. SWM database<br>2-2. Pilot Project report | • Computer literacy for staff responsible for data management. |

| 【Activities】 | 【Inputs】 | 【Inputs】 | • Staff are willingness to attend training programs.<br>• Staff are willing to apply new learning to practice |
|---|---|---|---|
| 1 Training for Action Plan Operational Management<br>1-1 Transfer of planning and data collection know how from the JICA Study Team<br>1-2 Monthly management training sessions<br>1-3 Operationalization of Action Plans<br>1-4 Monthly monitoring of training results<br>1-5 Self-evaluation exercise<br>2 Practice of Solid Waste Data Management<br>2-1 Practice for solid waste quality and quantity survey<br>2-2 Practice of solid waste data management for SWM<br>3 Training for SWM Policy and Technology<br>3-1 Participation of JICA Country Focus Training | Japan<br>(1) Personnel<br>• Members of the JICA Study Team<br>- Collection and transportation<br>- Organization and institution Strengthening<br>- Financial Analysis<br>• Local consultants<br>(2) Equipment<br>- Sets of computer and printer<br>(3) Country Focus Training Program | Nepal<br>(1) Personnel<br>• Counterparts and other relevant staff<br>- SWMRMC<br>- KMC<br>- LSMC<br>- BKM<br>- MTM<br>- KRM<br>(2) Facility<br>- Venue for training | 【Preconditions】<br>• Municipalities are interested in improving their SWM services. |

# CHAPTER 2

## ***PILOT PROJECT A***

## *IMPROVEMENT OF COLLECTION AND TRANSPORTATION*

# CHAPTER 2 A: IMPROVEMENT OF COLLECTION AND TRANSPORTATION

## 2.1 Background and Strategy

As a matter of course, one of fundamental policy for solid waste management is to develop the appropriate waste stream, which is to collect the waste from the generation source, transport the collected waste to the designated waste disposal site(s), and disposed of the transported waste at the disposal site(s). Especially, as the collection and transportation of generated waste is much closed to beautification and sanitation of the municipalities including the daily life of people, various options such as "door to door collection", "bell collection", "source separated collection" or "transfer haul" are experienced by not only the municipalities but also private sector in the Kathmandu Valley. However, it could be said that each municipality was still groping in the dark for the appropriate collection and transportation system, respectively. For example, in Bhaktapur Municipality (BKM), the solid waste was collected and transported to the municipal composting facility by the municipality without any segregation at source because BKM had failed to introduce source-separated collection several times before. Madhyapur Thimi Municipality (MTM) was disposing of the solid waste once collected by the municipal sweepers in their backyard unwillingly because of no waste transportation vehicle.

On the other hand, most municipalities had intention to introduce or enhance the public private partnership (PPP) into collection and transportation services. However, the experiences and know-how of municipalities to involve private sector were still very insufficient.

Furthermore, when Sisdol short-term Landfill (S/T-LF) will be fully operated after closing Bagmati River dumping site, effective transportation of the collected solid waste becomes taking importance especially for Kathmandu Metropolitan City (KMC) and Lalitpur Sub-Metropolitan City (LSMC). Arrangement of a new transfer station (T/S) and/or improvement of the existing T/S are strongly necessitated in parallel with expansion of transfer haul capacity.

Therefore, the Pilot Project on improvement of collection and transportation (Pilot Project A) was carried out under the Study with the strategy of both direct improvement of the existing collection and transportation capacity and trial for future introduction of technically and economically effective and practical collection systems. Full involvement of Focal Points themselves from the selected municipalities to plan and implement the activities could contribute the ownership to the municipality for future activity.

## 2.2 Basic Plan

### 2.2.1 Project Purpose

The purpose of the Pilot Projects A was identified as "Capabilities of relevant staff of the five municipalities and SWMRMC regarding waste collection and transportation are strengthened."

### 2.2.2 Outputs

In order to achieve the project purpose, there were three outputs in this Pilot Project A.

| | |
|---|---|
| **Output 1** | Basic knowledge and experience about efficient primary collection with measures such as source-separated collection are obtained among the relevant officials in the municipalities. |
| **Output 2** | Practical guideline for private public partnership (PPP) for SWM is prepared. |
| **Output 3** | Basic knowledge and experience regarding transfer station are obtained. |

### 2.2.3 Activities

Activities to obtain Output 1 were carried out at target municipalities, i.e. BKM and MTM. In BKM, in order to improve the operating efficiency of the existing composting plant, source-separated collection was attempted in the selected model areas in the municipality. Relevant municipality staff who were responsible for primary collection and also transportation, composting and community mobilization in BKM were involved. The model areas and core groups for promoting this Pilot Project activity were selected, and then detail collection methods were planned by the municipality considering the past experiences of failure. The JICA Study Team supported to provide the garbage bins, which were two color of plastic buckets, green for organic waste and red for inorganic waste.

On the other hand in MTM, because it could not be made for MTM to procure a waste collection truck with capacity of 3-3.5 $m^3$ that was selected by discussion based on the other municipality's experiences by the reason of complicated procedure for tax exemption, the JICA Study Team hired one rental truck for one month from mid-June to mid-July 2005 for implementing the project. According to this, MTM determined the target collection area, collection time, and collection methods including recording the activity data.

| **Activities 1 (Pilot Project A-1: Practice of Solid Waste Collection in Model Areas)** | |
|---|---|
| 1-1 | To practice source-separated collection in BKM |
| 1-2 | To practice collection and transportation in MTM |

The activities for Output 2 aimed to prepare the practical guideline for utilizing private sector for the solid waste management. These activities were targeting the municipality staff that were in charge of collection and transportation planning by utilizing the private sector. A operational handbook with Prototype Terms of Reference (TOR) for PPP and others were prepared based on the experiences and analysis of the existing activities by some private sectors in KMC, LSMC and Kirtipur Municipality (KRM).

| **Activities 2 (Pilot Project A-2: Training for Public Private Partnership for SWM)** | |
|---|---|
| 2-1 | To review the existing Public Private Partnership (PPP) activities |
| 2-2 | To study an appropriate contract/agreement forms between municipality and private sector |
| 2-3 | To prepare handbook for Public Private Partnership |

The activities for Output 3 were directly targeted to the Solid Waste Management Section of KMC and SWMRMC through the improvement work for the existing Teku Transfer Station

(T/S). However, in addition to KMC, LSMC and other municipalities were also involved in the activities so that the experiences through the Pilot Project activities could be reflected to another plan of construction of new T/Ss in the future at each municipality. In details of technical matter, the JICA Study Team hired a local consultant/assistant for detail designing and construction supervising, and a contractor for improvement construction work. The major activities are shown below.

| **Activities 3 (Pilot Project A-3: Training/Practice of Transfer Station (Teku T/S))** | |
|---|---|
| 3-1 | Training for planning of T/S |
| 3-2 | Training for designing T/S |
| 3-3 | Training for construction and supervision of improvement of T/S |
| 3-4 | Practice of operation of T/S |

### 2.2.4 Plan of Operation

The plan of operation of the Pilot Project A is indicated below.

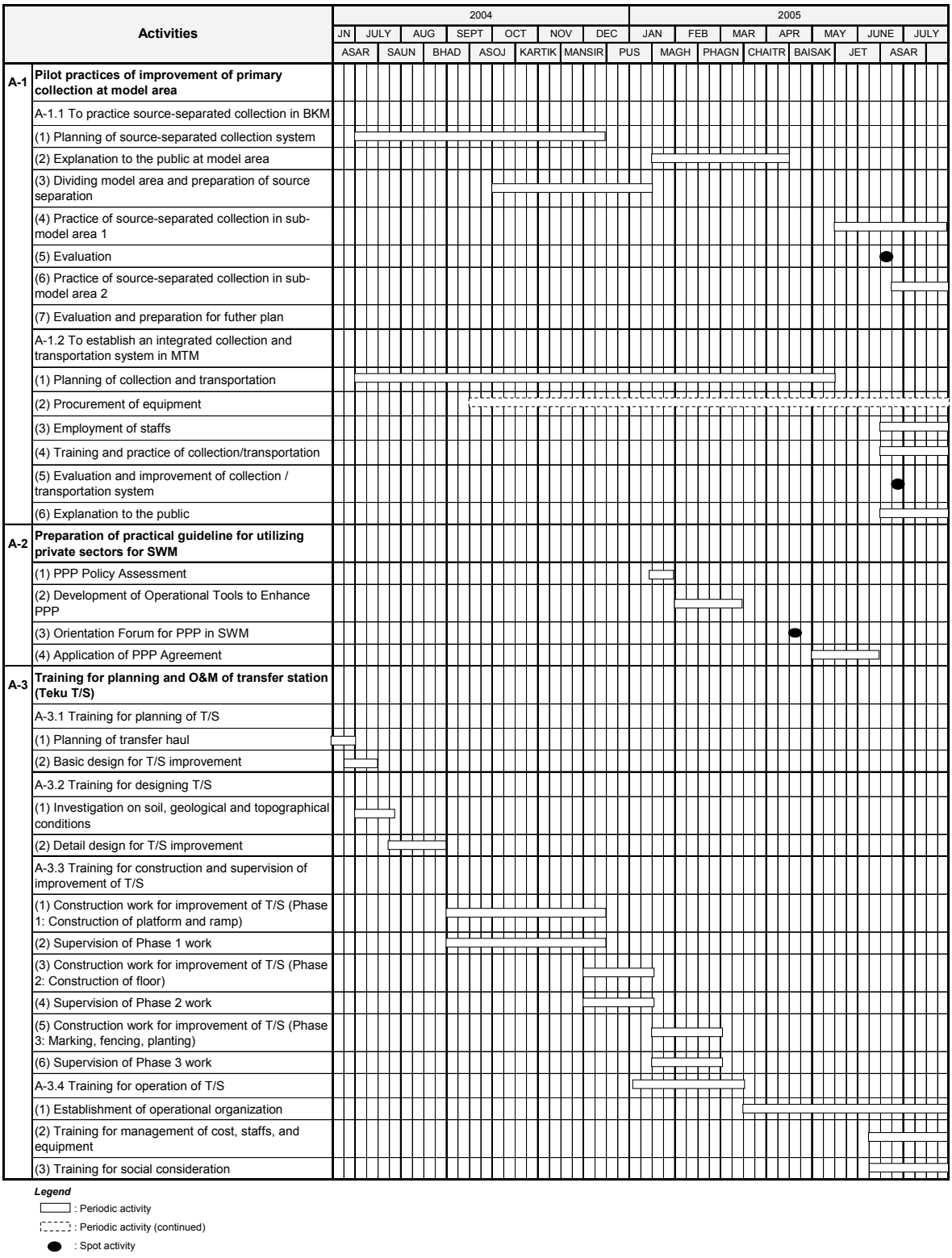


**Figure 2.2-1 Plan of Operation of the Pilot Project A (Actual)**

## 2.2.5 Inputs and Implementation Organization

The inputs provided from both the Japanese and Nepalese sides were shown below.

| Japan | Nepal |
|---|---|
| (1) Personnel<br>• Members of the JICA Study Team:<br>- Collection and Transportation<br>- Public Involvement and Social Consideration<br>- Organizational and Institution Strengthening<br>- Facility Plan<br>• Local consultants<br>• Local supporting assistants<br>(2) Equipment<br>- Waste bins for source-separation (BKM)<br>- A waste collection vehicle (3.5$m^3$) (MTM)<br>(3) Improvement works of Teku T/S | (1) Personnel<br>• Counterparts and other relevant staff<br>- SWMRMC<br>- KMC<br>- LSMC<br>- BKM<br>- MTM<br>- KRM<br><br>(2) Site arrangement in Teku T/S and O&M of Teku T/S<br>- KMC |

The each component of the Pilot Project A was conduced by the following implementation organizations.

| Outputs | Implementation Organizations |
|---|---|
| Output 1<br>(Pilot Project A-1) | Focal Points of Pilot Project A and relevant staff of BKM and MTM, the JICA Study Team members |
| Output 2<br>(Pilot Project A-2) | Focal Points of Pilot Project A, relevant staff of the five municipalities, and the JICA Study Team members in collaboration with Development Management Institute (DMI) |
| Output 3<br>(Pilot Project A-3) | Focal Points of Pilot Project A, revenant staff of the five municipalities and SWMRMC, and the JICA Study Team members in collaboration with Civil, Electrical, Mechanical and Transport Consultants (CEMAT) and Swachchhanda Nirman Sewa Pvt. Ltd. (SNS). |

### 2.2.6 Preconditions and Important Assumptions

The preconditions referring to the conditions that had to be met before the Pilot Project A was begun are as follows.

| | |
|---|---|
| **Preconditions** | ▪ Political and security conditions are not worsen.<br>▪ Stakeholders do not oppose the project. |

Important assumptions referring to external factors that were beyond control but would affect the Outputs of the Pilot Project A were described below.

| | |
|---|---|
| **Important Assumptions that might affect the Outputs** | ▪ Each municipality transports collected waste to the designated final disposal site<br>▪ Trained staff continue to work in the municipalities and SWMRMC |

Important assumptions that might affect the Project Purpose of the Pilot Project A were as follows.

| | |
|---|---|
| **Important Assumptions that might affect the Project Purpose** | ▪ Budget allocation is ensured to implement the improvement of collection and transportation systems based on Action Plan on SWM |

## 2.3 Results of the Activities

The activities conducted until July 2005 under the Pilot Project A are summarized in Appendix 2.1, while the records of workshops are summarized in Appendix 2.2.

### 2.3.1 A-1: Practice of Solid Waste Collection in Model Areas

(1) A-1.1: Practice of Source-separated Collection in BKM

1) Activities Implemented

A kickoff meeting was held on July 9, 2004 to discuss and confirm the purpose and contents of the Pilot Project A and relationship to other Pilot Project activities, implementation bodies and schedule, and possible measures to be taken in the project. All participants including BKM staff and the JICA Study Team members recognized that one of the most important steps to implement these Pilot Project activities was the determination of sample size and selection of model areas. Based on this discussion, the Focal Point prepared a work plan for this project, which intended to practice a source-separated collection in target areas by phasing with people's participation for formulating target groups of youth, children, and women at local level. At the same time, plastic bins/buckets for source separation were distributed to every householder in those target areas through formulated target groups in coordination with the municipality staff.

The works were planned to raise awareness about source separation introducing 3R (Reduce, Reuse & Recycle) among target people through target groups in target areas, to encourage the target people for separating waste at household level by making proper use of plastic buckets, to improve the quality of Municipal Composting, to improve the existing collection system adopting separated collection system, and to promote the vital and dynamic roles of the target groups (Youth, Children &Women) in solid waste management activities at local community levels.

Contents of the work plan included the following steps;

- **Planning of the Activity:** in this step, selection of model areas, planning of collection schedule, defining of methods of collection, and allocation/ arrangement of collection points were carried out.
- **Formation of Target Groups:** youth group was formulated at each model area as a target group in this step.
- **Mobilization of Target Groups:** field visit was organized for the representatives of youth groups and municipality's staff to LSMC in order to know Community Development

Section's activities, and 2 days' training for target groups were also held to discuss the practical activities for separation at source.

- **Preparation Work:** as preparation works, necessary tools/equipments such as plastic buckets, instruction labels for bucket, explanation brochures were examined with the discussion between target groups and municipality. After finalization, those tools/equipments were distributed to the all households at the model areas.

In addition, the abovementioned plan was disclosed and discussed at the 3rd Public Hearing on August 23, 2004.

For implementing this activity, BKM set up the roles and responsibilities of each concerned organizations as follows.

**Bhaktapur Municipality:**

- Entire management, planning, implementation & monitoring/ evaluation of the Project
- Coordination & support (technical & financial) for the target groups
- Trainings for Municipal employees involving in the Pilot Project

**Target Groups (Youth)**

- Coordination with the BKM
- Implementation of the Pilot Project supported jointly by BKM & JICA Study Team
- Formation, coordination & necessary support for the Children's and/or Women's groups in the target areas on behalf of the BKM staff
- Holding meetings & necessary orientations at target areas for raising awareness to practice source separation
- Guidance & facilitation for the children's and/or women's group
- Following up and monitoring of the activities, and reporting

**JICA Study Team**

- Support for the activities of the Pilot Projects of BKM
- Suggestions/recommendations

The Figure 2.3-1 shows the relationship of above mentioned organizations.

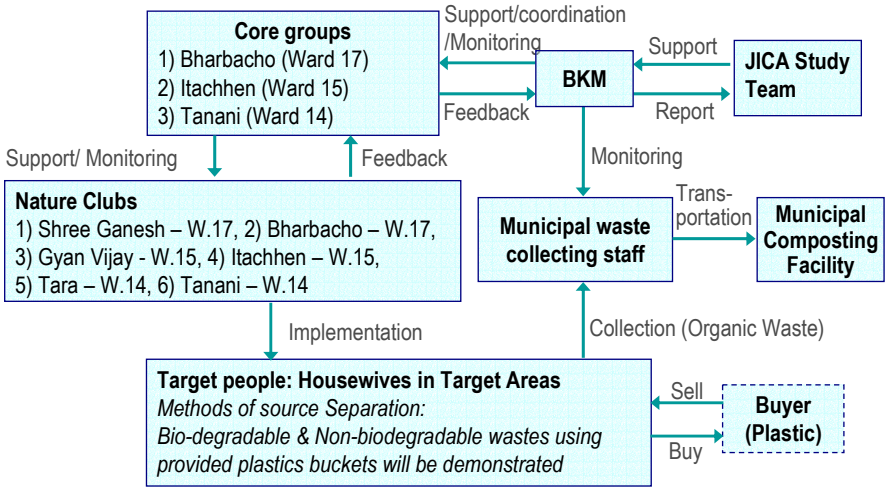


**Figure 2.3-1 Organizational Structure for Source-Separated Collection in BKM**

Source: BKM

Actual work schedule developed for preparation and implementation of the Pilot Project A-1.1 is summarized below.

| SN | Activities | 2004 | | | | | | 2005 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Kick off Meeting | ● | | | | | | | | | | | | |
| 2 | Preparation Meeting | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | | |
| 3 | Community Meeting | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | | |
| 4 | Preparation of Work Plan | ▨ | ▨ | ▨ | | | | | | | | | | |
| 5 | Distribution of buckets | | | | | | | | | | ● | | | |
| 6 | Distribution of brochures | | | | | | | | | | | ● | | |
| 7 | Procurement of tricycle | | | | | | | | | | ● | | | |
| 8 | Announcement at Public Event | | | | | | | | | | | ● | | |
| 9 | Operation of project | | | | | | | | | | | ▨ | ▨ | |
| 10 | Interim evaluation meeting | | | | | | | | | | | | ● | |
| 11 | Final evaluation meeting | | | | | | | | | | | | | ● |

**Figure 2.3-2 Implemented Work Schedule of Source-Separated Collection in BKM**

Source: JICA Study Team

Three model areas were selected by BKM as follows from 18 candidate areas considering homogeneousness in occupation, socio-economic aspect, attitude of community, fixed boundary, collection route – short/easy – frequency of point of view, distance to existing composting facility, and educational parameters.

**Selected Model Area:**

| Selected Model Area: | Target No. of Household |
|---|---|
| Tanani (Ward 14) | 50 |
| Itachhen (Ward 15) | 136 |
| Bharbacho (Ward 17) | 138 |
| Total | 324 |

The location of selected model area is shown in the following figures. In each area, the youth groups were formulated in order to support implementing the Pilot Project activities.

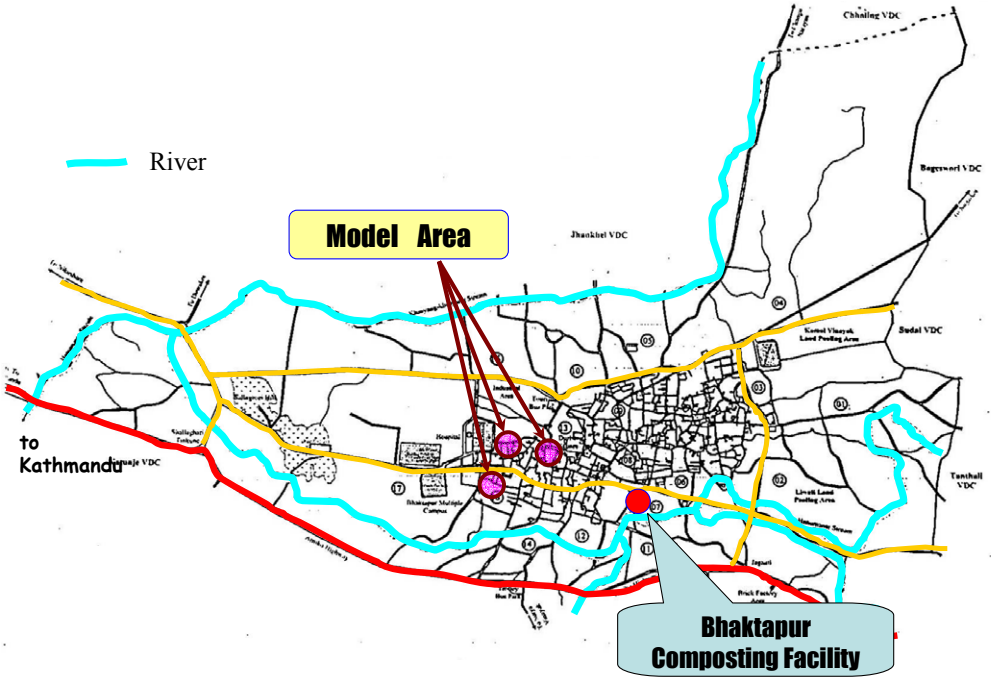


**Figure 2.3-3 Selected Model Area for Source-separated Collection in BKM**

Source: BKM

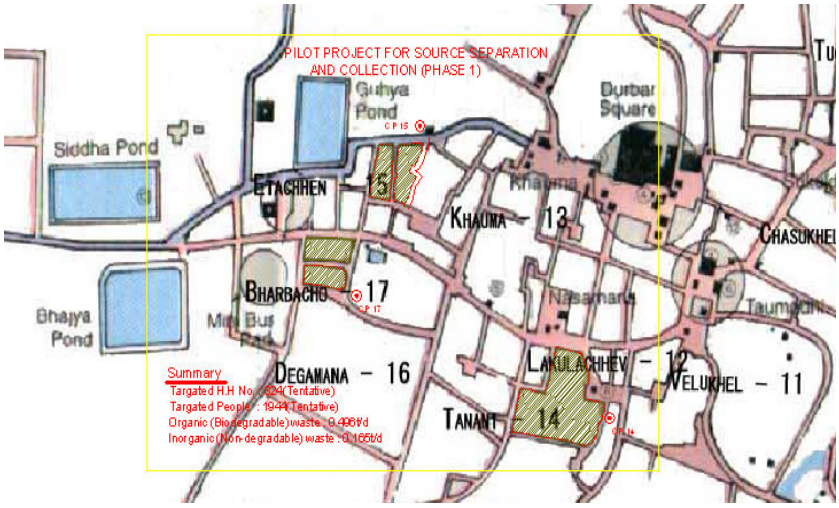


**Figure 2.3-4 Detail Model Area for Source-separated Collection in BKM**

Source: BKM

It was decided to use two colors of buckets of 15 liter capacity with lid for source separation, one was green bucket for organic waste and the other was red one for in-organic waste. Each bucket had small holes of about one inch diameter on the low side to prevent from being used for other purposes at the house. Instruction label was also designed with some visual instruction such as pictures so that the people could easily understan P d what types of waste should be put into which bucket. Bucket with label was delivered to the ward office and some households in the target area. In addition, BKM prepared a brochure in order to explain method of source-separated collection to the target households.

**Figure 2.3-5 Buckets for Source Separation**

Source: BKM

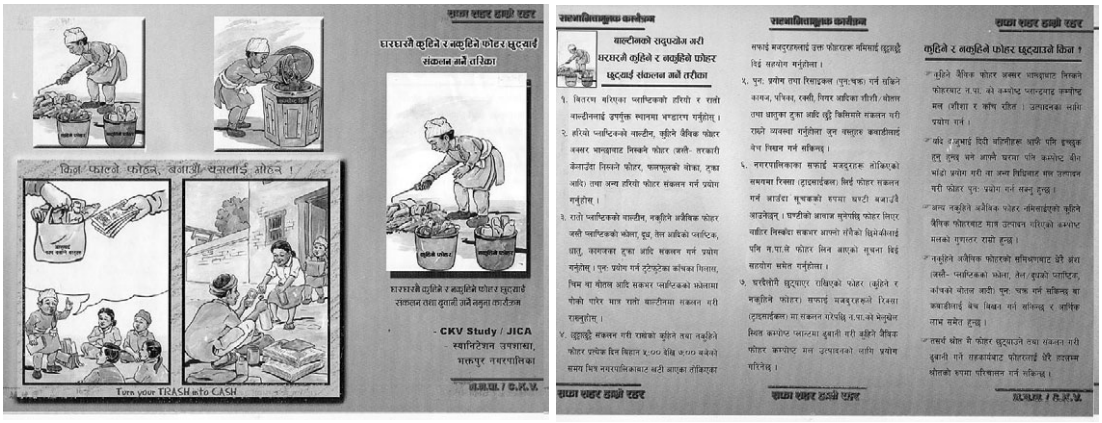

**Figure 2.3-6 Distributed Brochure for Source Separation**

Source: BKM

BKM tentatively set up collection frequency for source-separated collection on every-day basis for both organic and inorganic waste by a tricycle with two operators. The first trial started from 134 households at Bharbacho in Ward 17 in May 22, 2005. After that, BKM expanded the collected area to Tanani in Ward 14 from June 1, 2005 as step by step.

2) Results of Activities

After one month implementation of source-separated collection in BKM, BKM held an interim evaluation meeting with participation of core group members on June 22, 2005. The opinions and comments raised at the evaluation meeting are summarized as follows, while the meeting memo is attached in Appendix 2.3.

- Stickers are missing.
- Brochures are not yet available to some households.

- Few households have not properly separated waste: on site training and instruction are required.
- Numbering of distributed buckets with permanent marker is suggested to improve and make daily record keeping more simplified.
- Organic waste is becoming free of broken pieces of glasses, blades, pins which are nuisance to compost.
- Average collection time in Ward 17 is 1 hour and 30 minute
- Periodic consultation/interaction with the target people for identifying problematic issues.

Based on these facts, the following suggestions were made by BKM staff.

- Once in a 2/3 days' collection.
- Classification of decomposable organic waste and non-degradable inorganic waste should be more clear.
- Provision of a notice board at the model areas for effective information dissemination regarding meetings, workshops, etc.
- For efficient collection of source separated waste, either provision of collection point or meticulous horn is suggested.
- Arrangement for provision of globes, mask and special uniform for waste collectors.
- House numbering or bucket numbering.
- The Pilot Project is well appreciated by participated housewives from Bharbacho – 17

BKM kept the operation record of the activities. Summary of activity result is shown in Table 2.3-1 and low data is shown in Table 2.3-2 to 2.3-4.

**Table 2.3-1 Result of the Source-Separated Collection (average per day)**

| Week | No. of HH | Organic | Inorganic | Total |
|---|---|---|---|---|
| Bharbacho Tole (Ward 17) | | | | |
| May 22 - May 28 | 54 | 45.9 kg | 15.7 kg | 61.2 kg |
| May 29 - June 4 | 54 | 59.1 kg | 11.8 kg | 70.9 kg |
| June 5 - June 11 | 47 | 44.1 kg | 7.9 kg | 52.0 kg |
| June 12 - June 18 | 52 | 45.9 kg | 13.2 kg | 59.1 kg |
| June 19 - June 25 | 49 | N.R. | 11.9 kg | - |
| June 26 - July 2 | 43 | N.R. | 11.1 kg | - |
| July 3 - July 9 | 40 | N.R. | 10.2 kg | - |
| July 10 - July 15 | 38 | N.R. | 9.7 kg | - |
| Tanani Tole (Ward 14) | | | | |
| June 15 - June 18 | 22 | 11.1 kg | 4.2 kg | 15.3 kg |
| June 19 - June 25 | 21 | 12.2 kg | 5.2 kg | 17.7 kg |
| June 26 - July 2 | 17 | 10.8 kg | 4.5 kg | 15.3 kg |
| July 3 - July 9 | 16 | 10.4 kg | 4.8 kg | 15.2 kg |
| July 10 - July 15 | N.R. | 12.3 kg | 4.7 kg | 17.0 kg |

Note: N.R.- Not recorded by BKM
Source: BKM

## Table 2.3-2 Low Data of the Source-Separated Collection (Ward 17: May/June [Jestha])

| S.No. (1) | Date (2) | Green Bucket No. (3) | Red Bucket No. (4) | Dry Waste (5) | | | Density of Org. Waste | Inorg waste (6a) | | Classfied inorganic waste kg/ton (6b) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Vol. (m3) (5a) | Kg / ton (5b) | Percent of Org. (%) | ton/m3 | Kg / ton | Percent of Inorganic( %) | Paper | Ceramics or bricks | Glass | Metal | Textile | Plastic recyclable | Plastic Non-recyclable | Sum of Inorganic waste (Kg) |
| 1 | May 22 | | | 0.258 | 67.00 | 77.46 | | 19.5 | 22.5 | 4 | 3 | 1 | | 2 | 4.3 | 1 | 15.30 |
| 2 | May 23 | | | 0.161 | 43.00 | 77.48 | 0.267 | 12.5 | 22.5 | 1 | 3 | 1 | | 1.5 | 4 | 1 | 11.50 |
| 3 | May 24 | | | 0.215 | 52.00 | 68.97 | 0.242 | 23.4 | 31.0 | 1.2 | 9.5 | 7 | | 0.5 | 2.4 | 1 | 21.60 |
| 4 | May 25 | 40 | 33 | 0.161 | 43.50 | 79.67 | 0.270 | 11.1 | 20.3 | 1.5 | 1.5 | 1.5 | | 1 | 2.2 | 0.6 | 8.30 |
| 5 | May 26 | 37 | 21 | 0.129 | 33.50 | 63.69 | 0.260 | 19.1 | 36.3 | 2.4 | 9.2 | 2.6 | | 2.4 | 1 | 1.4 | 19.00 |
| 6 | May 27 | 55 | 43 | 0.140 | 36.36 | 77.43 | 0.260 | 10.6 | 22.6 | 1.4 | 3.8 | 0.6 | | 1 | 0.9 | 1.2 | 8.90 |
| 7 | May 28 | 40 | 35 | | | | | 13.5 | | 3 | 4.9 | 1.6 | | 1.3 | 1 | 0.7 | 12.50 |
| 8 | May 29 | 47 | 32 | 0.194 | 50.38 | 70.58 | 0.260 | 21 | 29.4 | 1.2 | 14 | 1.1 | | 1.2 | 1.3 | 1.5 | 20.30 |
| 9 | May 30 | 64 | 52 | 0.45 | 116.87 | 92.26 | 0.260 | 9.8 | 7.7 | 1.3 | 2.5 | 1.4 | | 2 | 1.1 | 0.5 | 8.80 |
| 10 | May 31 | 40 | 33 | 0.222 | 57.66 | 81.14 | 0.260 | 13.4 | 18.9 | 1.7 | 2.9 | 1.6 | | 4.5 | 1.6 | 1.1 | 13.40 |
| 11 | June 1 | 40 | 33 | 0.148 | 38.44 | 83.49 | 0.260 | 7.6 | 16.5 | 2.1 | 1.2 | 1.5 | | 0.3 | 0.7 | 0.7 | 6.50 |
| 12 | June 2 | 49 | ++ | 0.226 | 58.69 | 85.44 | 0.260 | 10 | 14.6 | 1.2 | 1.4 | 0.7 | | 3.3 | 1.1 | 0.6 | 8.30 |
| 13 | June 3 | 40 | 35 | 0.148 | 38.44 | 86.69 | 0.260 | 5.9 | 13.3 | 1 | 1.7 | 1.1 | | 0.3 | 0.9 | 1.3 | 6.30 |
| 14 | June 4 | 50 | 43 | 0.204 | 52.98 | 78.05 | 0.260 | 14.9 | 22.0 | 3.1 | 1 | 1.2 | | 7 | 0.6 | 0.7 | 13.60 |
| 15 | June 5 | 32 | 32 | 0.13 | 33.76 | 84.49 | 0.260 | 6.2 | 15.5 | 1.2 | 2 | 1.1 | | 1.4 | 0.8 | 1 | 7.50 |
| 16 | June 6 | 45 | 43 | 0.19 | 49.34 | 80.18 | 0.260 | 12.2 | 19.8 | 2.3 | 2.6 | 0.5 | | 1.5 | 3.5 | 0.6 | 11.00 |
| 17 | June 7 | 34 | 27 | 0.13 | 33.76 | 73.46 | 0.260 | 12.2 | 26.5 | 1 | 7.7 | 0.6 | | 1 | 1.2 | 0.5 | 12.00 |
| 18 | June 8 | 46 | 31 | 0.22 | 57.14 | 92.70 | 0.260 | 4.5 | 7.3 | 0.8 | 0.4 | 1 | | 0.4 | 0.9 | 0.8 | 4.30 |
| 19 | June 9 | 40 | 35 | 0.16 | 41.55 | 92.64 | 0.260 | 3.3 | 7.4 | 1.6 | 1 | 0.6 | | 1 | 0.6 | 0.5 | 5.30 |
| 20 | June 10 | 39 | 39 | 0.15 | 38.96 | 80.73 | 0.260 | 9.3 | 19.3 | 3.1 | 0.6 | 1.6 | | 0.7 | 1.1 | 0.8 | 7.90 |
| 21 | June 11 | 48 | 39 | 0.209 | 54.28 | 87.44 | 0.260 | 7.8 | 12.6 | 1 | 1.9 | 0.8 | | 1 | 1.7 | 0.6 | 7.00 |
| 22 | June 12 | 58 | 46 | 0.22 | 57.14 | 78.12 | 0.260 | 16 | 21.9 | 1.9 | 7.3 | 1 | | 1.8 | 2 | 1.7 | 15.70 |
| 23 | June 13 | 39 | 38 | 0.13 | 33.76 | 75.26 | 0.260 | 11.1 | 24.7 | 2.8 | 2.2 | 1 | | 1.8 | 2.3 | 1.2 | 11.30 |
| 24 | June 14 | 45 | 42 | 0.18 | 46.75 | 78.90 | 0.260 | 12.5 | 21.1 | 1.9 | 4.5 | 1 | | 0.9 | 1.5 | 1.5 | 11.30 |
| **Average** | | **44.4** | **36.7** | **0.19** | **49.36** | **80.33** | **0.260** | **12.0** | **19.7** | | | | | | | | |
| **Total** | | | | | **1135.26** | | | **287.4** | | **43.7** | **89.8** | **33.1** | | **39.8** | **38.7** | **22.5** | **267.60** |

Source: BKM

## Table 2.3-3 Low Data of the Source-Separated Collection (Ward 17: June/July [Ashar])

| S.No. (1) | Date (2) | Green Bucket No. (3) | Red Bucket No. (4) | Dry Waste (5) | | | Density of Org. Waste | Inorg waste (6a) | | Classfied inorganic waste kg/ton (6b) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Vol. (m3) (5a) | Kg / ton (5b) | Percent of Org. (%) | ton/m3 | Kg / ton | Percent of Inorganic( %) | Paper | Ceramics or bricks | Glass | Metal | Textile | Plastic recyclable | Plastic Non-recyclable | Sum of Inorganic waste (Kg) |
| 1 | June 15 | 43 | 43 | | | | | | | | | | | | | | |
| 2 | June 16 | 54 | 43 | | | | | | | | | | | | | | |
| 3 | June 17 | 49 | 40 | | | | | | | | | | | | | | |
| 4 | June 18 | 53 | 47 | | | | | | | | | | | | | | |
| 5 | June 19 | 45 | 38 | | | | | | | | | | | | | | |
| 6 | June 20 | 42 | 36 | | | | | | | | | | | | | | |
| 7 | June 21 | 43 | 40 | | | | | | | | | | | | | | |
| 8 | June 22 | 42 | 43 | | | | | | | | | | | | | | |
| 9 | June 23 | 75 | 69 | | | | | | | 1.1 | 0.8 | 0.9 | | 2.8 | 1.5 | 0.8 | |
| 10 | June 24 | 41 | 35 | | | | | | | 2.5 | 2.8 | 1.5 | | 2.5 | 2.4 | 2 | |
| 11 | June 25 | 28 | 29 | | | | | | | 0.6 | 9.2 | 0.4 | | 0.8 | 1.2 | 0.6 | |
| 12 | June 26 | 32 | 24 | | | | | | | 2 | 0.2 | 1.2 | | 1.2 | 2.2 | 0.8 | |
| 13 | June 27 | 31 | 31 | | | | | | | 1.1 | 2.4 | 1.2 | | 1 | 1.6 | 0.6 | |
| 14 | June 28 | 49 | 47 | | | | | | | 1.3 | 4.6 | 1.4 | | 1 | 1.4 | 0.4 | |
| 15 | June 29 | 44 | 42 | | | | | | | 1.3 | 24 | 0.3 | | 2.1 | 1.2 | 0.5 | |
| 16 | June 30 | 44 | 42 | | | | | | | 1 | 2.4 | 2.5 | | 0.8 | 1.2 | 0.8 | |
| 17 | July 1 | 32 | 31 | | | | | | | 1.2 | 1.4 | 1.6 | | 1.2 | 0.9 | 0.6 | |
| 18 | July 2 | 38 | 36 | | | | | | | 1.3 | 0.2 | 0.3 | | 0.9 | 1.1 | 0.4 | |
| 19 | July 3 | 36 | 35 | | | | | | | 1.2 | 3.5 | 0.1 | | 1.7 | 0.9 | 0.4 | |
| 20 | July 4 | 39 | 38 | | | | | | | 1.3 | 13.4 | 3.1 | | 1 | 1.3 | 0.5 | |
| 21 | July 5 | 44 | 37 | | | | | | | 1.4 | 2.5 | 2 | | 1.8 | 1.5 | 1 | |
| 22 | July 6 | 26 | 28 | | | | | | | 0.9 | 0.2 | 1.1 | | 0.8 | 0.9 | 0.6 | |
| 23 | July 7 | 34 | 29 | | | | | | | 1.5 | 2.6 | 1.1 | | 1.5 | 1.2 | 0.9 | |
| 24 | July 8 | 31 | 34 | | | | | | | 1.5 | 4.3 | 0.7 | | 1.1 | 1.6 | 0.8 | |
| 25 | July 9 | 39 | 32 | | | | | | | 1.7 | 1.3 | 0.6 | | 0.5 | 1.7 | 0.9 | |
| 26 | July 10 | 24 | 32 | | | | | | | 1.4 | 0.9 | 2 | | 1 | 3.3 | 1.4 | |
| 27 | July 11 | 33 | 29 | | | | | | | 1.9 | 0.8 | 1.5 | | 2.8 | 1.7 | 1 | |
| 28 | July 12 | 35 | 36 | | | | | | | 2.5 | 3.1 | 0.5 | | 1.8 | 2.2 | 0.6 | |
| 29 | July 13 | 32 | 36 | | | | | | | 1.6 | 1.1 | 1.4 | | 1.9 | 2 | 0.8 | |
| 30 | July 14 | 27 | 30 | | | | | | | 1 | 0.1 | 2.5 | | 0.3 | 0.6 | 0.9 | |
| 31 | July 15 | 34 | 36 | | | | | | | 1.1 | 0.6 | 0.5 | | 1.9 | 1.5 | 0.6 | |
| **Average** | | **39.3** | **37.0** | | | | | | | | | | | | | | |
| **Total** | | | | | | | | | | **32.4** | **82.4** | **28.4** | | **32.4** | **35.1** | **17.9** | |

Source: BKM

**Table 2.3-4 Low Data of the Source-Separated Collection (Ward 14: June/July [Ashar])**

| S.No. (1) | Date (2) | Green Bucket No. (3) | Red Bucket No. (4) | Dry Waste (5) | | | Density of Org. Waste | Inorg waste (6a) | | Classfied inorganic waste kg/ton (6b) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Vol. (m3) (5a) | Kg / ton (5b) | Percent of Org. (%) | ton/m3 | Kg / ton | Percent of Inorganic( %) | Paper | Ceramics or bricks | Glass | Metal | Textile | Plastic recyclable | Plastic Non-recyclable | Sum of Inorganic waste (Kg) |
| 1 | June 15 | 14 | 18 | | 12.5 | | | 18.6 | | 0.2 | 0.7 | 0.6 | | 0.5 | 0.3 | 0.5 | 15.8 |
| 2 | June 16 | 16 | 23 | | 6.9 | | | 13.3 | | 0.8 | 0.3 | 0.5 | | 0.4 | 0.2 | 0.4 | 10.7 |
| 3 | June 17 | 18 | 27 | | 9.8 | | | 17.7 | | 1.0 | 1.4 | 0.5 | | 0 | 0.4 | 0.3 | 14.1 |
| 4 | June 18 | 17 | 19 | | 15 | | | 25.2 | | 0.7 | 2.4 | 0.7 | | 0.6 | 0.3 | 0.3 | 20.2 |
| 5 | June 19 | 19 | 22 | | 12.1 | | | 22.8 | | 0.7 | 2.2 | 0.6 | | 0.3 | 0.4 | 0.2 | 18.4 |
| 6 | June 20 | 19 | 16 | | 12.7 | | | 20 | | 0.9 | 1.1 | 0.3 | | 0.7 | 0.3 | 0.2 | 16.5 |
| 7 | June 21 | 17 | 15 | | 6 | | | 17.1 | | 0.8 | 3 | 0.1 | | 0.7 | 0.7 | 0.2 | 11.6 |
| 8 | June 22 | 24 | 24 | | 14 | | | 25.6 | | 1.7 | 0.8 | 0.7 | | 0.5 | 1.3 | 0.6 | 20 |
| 9 | June 23 | 23 | 16 | | 18 | | | 30.6 | | 1.3 | 2.2 | 0.4 | | 0.8 | 1.2 | 0.3 | 24.4 |
| 10 | June 24 | 12 | 13 | | 10.5 | | | 16.1 | | 0.9 | 0.2 | 0.5 | | 0.3 | 0.6 | 0.3 | 13.3 |
| 11 | June 25 | 21 | 19 | | 18.5 | | | 32.2 | | 0.7 | 0.4 | 0.2 | | 4.8 | 0.5 | 0.2 | 25.4 |
| 12 | June 26 | 13 | 10 | | 8 | | | 13.8 | | 0.6 | 0 | 1.2 | | 0.2 | 0.7 | 0.2 | 10.9 |
| 13 | June 27 | 20 | 21 | | 11 | | | 20.3 | | 0.6 | 0.3 | 0.6 | | 2.4 | 0.4 | 0.3 | 15.7 |
| 14 | June 28 | 18 | 16 | | 12 | | | 22.1 | | 0.9 | 2.2 | 0.1 | | 0.2 | 0.7 | 0.1 | 17.9 |
| 15 | June 29 | 16 | 14 | | 10 | | | 16.4 | | 0.5 | 0.8 | 0.2 | | 0.7 | 0.8 | 0.1 | 13.3 |
| 16 | June 30 | 17 | 12 | | 13.2 | | | 25.5 | | 0.6 | 2.1 | 1.5 | | 1 | 0.7 | 0.2 | 19.4 |
| 17 | July 1 | 16 | 18 | | 10.5 | | | 18.1 | | 1.2 | 0.7 | 0.3 | | 0.3 | 0.8 | 0.4 | 14.4 |
| 18 | July 2 | 14 | 13 | | 11 | | | 17.3 | | 0.4 | 1.5 | 0 | | 0.5 | 0.5 | 0.2 | 14.2 |
| 19 | July 3 | 16 | 13 | | 7.6 | | | 13 | | 0.5 | 0.7 | 0.5 | | 0.4 | 0.5 | 0.1 | 10.3 |
| 20 | July 4 | 16 | 13 | | 6.8 | | | 12.1 | | 0.5 | 0.3 | 0.6 | | 0.4 | 0.4 | 0.4 | 9.5 |
| 21 | July 5 | 18 | 18 | | 8 | | | 18.9 | | 0.9 | 2.3 | 0.8 | | 0.3 | 0.8 | 0.2 | 13.6 |
| 22 | July 6 | 18 | 17 | | 13.2 | | | 32.5 | | 1.3 | 4.5 | 2.1 | | 0.6 | 0.8 | 0.3 | 22.9 |
| 23 | July 7 | 16 | 12 | | 7 | | | 13.7 | | 0.9 | 0.7 | 0.2 | | 0.6 | 0.6 | 0.2 | 10.5 |
| 24 | July 8 | 20 | 12 | | 20 | | | 29.6 | | 1.7 | 0.3 | 0.8 | | 0.7 | 0.5 | 0.8 | 24.8 |
| 25 | July 9 | 18 | 15 | | 10.3 | | | 14.6 | | 0.6 | 0.2 | 0.5 | | 0.2 | 0.3 | 0.2 | 12.6 |
| 26 | July 10 | 14 | 1 | | 10 | | | 15.1 | | 1.2 | 0 | 0 | | 0.3 | 0.7 | 0.2 | 12.7 |
| 27 | July 11 | 13 | 10 | | 8 | | | 14.8 | | 0.3 | 1.5 | 0 | | 0.9 | 0.5 | 0.2 | 11.4 |
| 28 | July 12 | 14 | 13 | | 19.5 | | | 34.1 | | 0.7 | 5.9 | 0 | | 0.2 | 0.3 | 0.2 | 26.8 |
| 29 | July 13 | 18 | 19 | | 15.2 | | | 30.4 | | 1 | 4 | 0 | | 0.9 | 0.6 | 0.8 | 23.1 |
| 30 | July 14 | 12 | 13 | | 10.5 | | | 15.4 | | 0.4 | 0.5 | 0.6 | | 0.2 | 0.4 | 0.1 | 13.2 |
| 31 | July 15 | 17 | 16 | | 10.5 | | | 17.3 | | 1.1 | 0.2 | 0.2 | | 0.3 | 0.6 | 0.3 | 14.6 |
| **Average** | | **16.9** | **15.7** | | **11.6** | | | **20.5** | | | | | | | | | |
| **Total** | | | | | **358.30** | | | **634.2** | | **25.6** | **43.4** | **15.3** | | **20.9** | **17.8** | **9.0** | **502.2** |

Source: BKM

(2) A-1.2: Practice of Collection and Transportation in MTM

1) Activities Implemented

In the beginning, MTM implemented two kind activities in parallel, one was to determine what type of collection vehicle was suitable and the other was to prepare a work plan.

In terms of the study of specification of the vehicle, MTM staff asked other municipality's experiences at the TWG meeting, and also visited LSMC and KMC to see the existing vehicle's condition on August 20, 2004.

A work plan was prepared by MTM with objectives that were to manage the waste properly by developing waste collection system, to strengthen the capacity of the municipality, to raise awareness about waste collection system introducing 3R (Reduce, Reuse & Recycle) among local people, and to make the city environmentally safe and clean. This work plan was positively discussed at the municipal board as well as at the public hearings with the participation of local people. The contents of the work plan included the following steps;

- **Selection of Target Area:** The target area was determined from the view point of most effective and easiest way by using the existing sweeping service by 20 municipal sweepers.
- **Planning of Collection Schedule:** Collection schedule was examined considering the existing primary collection schedule.
- **Defining of Collection Methods:** Improvement of the existing primary collection system was considered to optimize the total efficiency from primary collection to transportation of waste with the vehicle.

- **Allocation and Arrangement of Collection Points and Route:** Suitable collection points and route were discussed by not only municipality staff but also other stakeholders such as residents near by those points.
- **Determination of Destination of Collected Waste:** Most appropriate and practical destination for the collected waste was discussed and determined.
- **Preparation Work:** Institutional improvement, a garage for the vehicle, a driver and loaders, other necessary tool/equipment for waste loading, road maintenance and collection data management system were prepared.

MTM set up the roles and responsibilities of each concerned organization as follows:

**Madyapur Thimi Municipality:**

- Entire management, planning, implementation, monitoring/evaluation of the activities
- Coordination and support to the local communities
- Training for municipal employees to be involved in the activities
- Public awareness program about the method of collection of waste and its benefit to local people and appeal for the cooperation with the municipality

**JICA Study Team:**

- Support for the activities
- Transportation equipment support
- Suggestions/recommendations

The actual work schedule for preparation and implementation of the Pilot Project A-1.2 is summarized below.

| SN | Activities | 2004 | | | | | | 2005 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Kick off Meeting | | ● | | | | | | | | | | | |
| 2 | Preparation Meeting | | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | | |
| 3 | Preparation of Work Plan | | | ▨ | ▨ | ▨ | | | | | | | | |
| 4 | Arrangement of Rental Truck | | | | | | | | | | | ▨ | ▨ | |
| 5 | On-site preparatory meeting | | | | | | | | | | | | ● | |
| 6 | Consultation with KMC | | | | | | | | | | | | ● | |
| 7 | Operation of project | | | | | | | | | | | | ▨ | ▨ |
| 8 | Interim evaluation meeting | | | | | | | | | | | | | ● |
| 9 | Final evaluation meeting | | | | | | | | | | | | | ● |

**Figure 2.3-7 Implemented Work Schedule of Collection Practice in MTM**

Source: JICA Study Team

MTM decided the type and specification of the collection vehicle considering advises from other municipalities such as KMC and LSMC as follow.

- Type: Open type dump truck
- G.V.W[1]: Not less than 6,500 kg
- Max. Loading Capacity: Not less than 3,000 kg
- Tipping Capacity: Not less than 3 $m^3$

[1] Gross Vehicle Weight

However, it had taken a long time to take a necessary procedure regarding the tax exemption for a collection truck procurement, and the prospects for this procedure was still far from certain as for June 2005. Therefore, the JICA Study Team decided to hire a rental truck for implementing the collection activity for one month at the last moment and the collection activity was finally launched on June 14, 2005. The rental truck had similar specification except the tipping capacity only with 2.4 $m^3$.

**Figure 2.3-8 Truck Rented for Pilot Project**

Source: JICA Study Team

The target areas for the collection were determined by MTM in the core area of the municipality being covered by municipal sweeping service (Core Area) and in the area along the Kathmandu-Bhaktapur (Arniko) Highway (Highway Area), respectively. Collection points were also determined and confirmed at the on-site preparatory meeting on June 2, 2005 as shown below.

| | |
|---|---|
| Core Area: | 1) Bhimsen Sthan, 2) Chapacho, 3) Hatiman Kal, 4) Dui Pokhari, 5) Balkumari, 6) Naya Thim |
| Highway Area: | 7) Gatthaghar,8) Kausaltar, 9) Lokanthali |

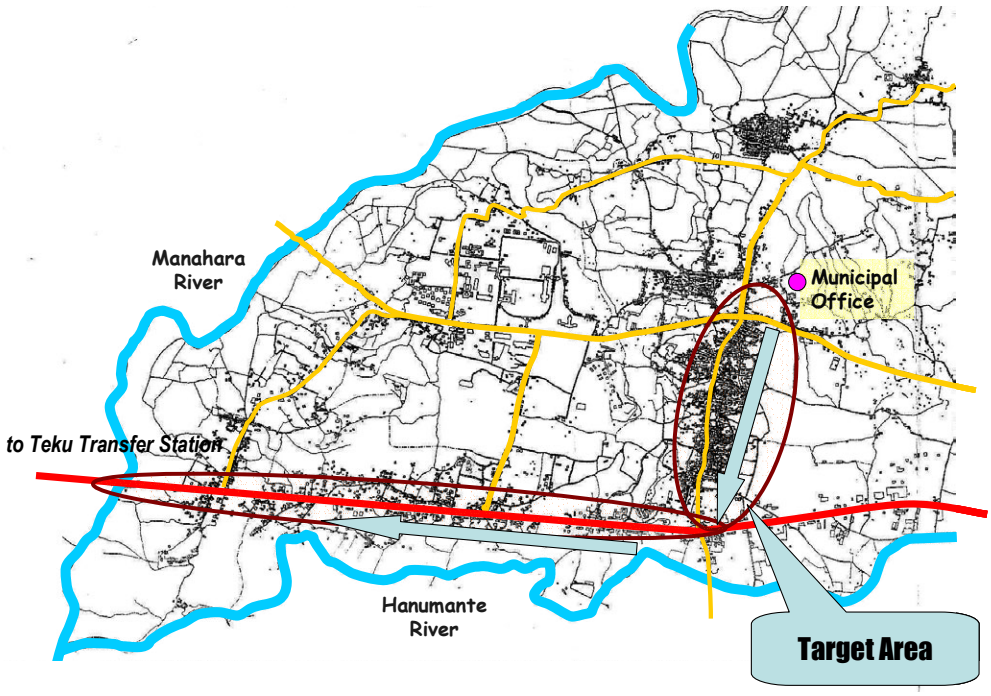


**Figure 2.3-9 Selected Model Area for Practice of Collection and Transportation**

Source: MTM

At the first stage, the collection methods were determined as below.

- Starting date : June 14, 2005 (Jestha 31)
- Collection time : 6:00 to 7:00 am
- Publicity through microphone and local FM
- No. of household covered in route : 2,105
- Estimated waste generated in covered route : 3.5 t
- Total waste collection : 2.0 ton per day
- No. of collector involved : 11
- No. of handcarts : 11
- No. of loader : 2
- No. of vehicle : 1(Rental by JICA Study Team)

2) Results of the Activities

First follow-up meeting was held on June 19, 2005 and the current problems and future activities were discussed. The opinions and comments raised at the follow-up meeting are summarized as follows;

*Improved Situation*

- Fixed place for collection point
- Fixed time
- Assurance for public regarding waste collection
- Raising in awareness towards SWM

*Current Problem*

- Dispute of collection point
- Unequipped and untrained labor

- Lack of awareness
- Unmanaged collection point
- Lack of manpower

*Future Activity*

- Development of a well platform
- Social survey
- Rule for the disposal and collection system

MTM kept the operation record of the activities. The result of the activity of the first week is shown in Table 2.3-5. Then MTM established the data recording format. Collected data is shown in Table 2.3-6 as the summary and Table 2.3-7 to 2.3-8 as low data.

**Table 2.3-5 Result of First Week of MTM Collection Practice**

| Collection point | Volume of waste collection | House hold thrown | No. of sweeper on collected point | Distance |
|---|---|---|---|---|
| Municipality road | 0.36 cum | included | 1 | |
| Bhimsensthan chowk | 0.75 cum | included | 1 | 350 m |
| Chapacho | 0.72 cum | included | 1 | |
| Hatimahakal | 0.90 cum | included | 1 | |
| Duipokhari | 0.54 cum | included | 1 | |
| Balkumari | 0.72 cum | included | 2 | |
| Sankhadhar chowk | 0.54 cum | included | 1 | 1,130 m |
| Gathaghar | 0.18 cum | No | 1 | 1,132 m |
| Kausaltar | 0.18 cum | No | 1 | 905 m |
| Lokanthali | 0.18 cum | No | 1 | 480 m |
| Total | 5.07 cum | - | 11 | 3,997 m |

Source: MTM

**Table 2.3-6 Summary of Result of MTM Collection Practice (average per day)**

| Week | Trip No. (trip/week) | First Trip (tons/week) | Second Trip (tons/week) | Total (tons/week) | Average (tons/trip) |
|---|---|---|---|---|---|
| July 2 - July 8 | 8 | 4.2 | 2.3 | 6.5 | 0.82 |
| July 9 - July 15 | 4 | 3.4 | 0.0 | 3.4 | 0.85 |
| July 16 - July 22 | 7 | 6.0 | 0.0 | 6.0 | 0.86 |
| July 22 - July 29 | 7 | 7.4 | 0.0 | 7.4 | 1.06 |
| July 30 - Aug 6 | 7 | 8.6 | 0.0 | 8.6 | 1.23 |
| Aug 6 – Aug 12 | 6 | 7.1 | 0.0 | 7.1 | 1.18 |
| Total | 39 | 36.7 | 2.3 | 39 | 1.00 |

Note: Collection activity was started from June 14 but data was started to be recorded from July 2.
Data was provided by Teku Transfer Station of KMC.
Source: MTM

**Table 2.3-7 Low Data of MTM Collection Practice (June/July [Ashar])**

| Date | Vehicle | Vehicle Wt. | Trip I (kg) | | | Trip 2 (kg) | | | Trip 3 (kg) | | | Total Trip | Total wt. (ton) | Avg. w t./trip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Trip I | G. Wt. | Net. Wt. | Trip 2 | G. Wt | Net. wt. | Trip 3 | G. Wt | Net. wt. | | | |
| July 2 | 3511 | 4,580 | 1 | 5,500 | 920 | 1 | 5,450 | 870 | 0 | | | 2 | 1.79 | 0.90 |
| July 3 | 3511 | 4,580 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | 0.00 | 0 |
| July 4 | 3511 | 4,580 | 1 | 5,330 | 750 | 1 | 5,340 | 760 | 0 | | 0 | 2 | 1.51 | 0.76 |
| July 5 | 3511 | 4,580 | 1 | 5,450 | 870 | 0 | | 0 | 0 | | 0 | 1 | 0.87 | 0.87 |
| July 6 | 3511 | 4,580 | 1 | 5,465 | 885 | 1 | 5,250 | 670 | 0 | | 0 | 2 | 1.56 | 0.78 |
| July 7 | 3511 | 4,580 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | 0.00 | 0 |
| July 8 | 3511 | 4,580 | 1 | 5,395 | 815 | 0 | | 0 | 0 | | 0 | 1 | 0.82 | 0.82 |
| July 9 | 3511 | 4,580 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | 0.00 | 0 |
| July 10 | 3511 | 4,580 | 1 | 5,220 | 640 | 0 | | 0 | 0 | | 0 | 1 | 0.64 | 0.64 |
| July 11 | 3511 | 4,580 | 1 | 5,625 | 1,045 | 0 | | 0 | 0 | | 0 | 1 | 1.05 | 1.05 |
| July 12 | 3511 | 4,580 | 1 | 5,345 | 765 | 0 | | 0 | 0 | | 0 | 1 | 0.77 | 0.77 |
| July 13 | 3511 | 4,580 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | 0.00 | 0 |
| July 14 | 3511 | 4,580 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | 0.00 | 0 |
| July 15 | 8059 | 3,550 | 1 | 4,495 | 945 | 0 | | 0 | 0 | | 0 | 1 | 0.95 | 0.95 |
| **Total** | | | **9** | | **7,635** | **3** | | **2,300** | **0** | | **0** | **12** | **9.94** | **0.83** |

Source: MTM

**Table 2.3-8 Low Data of MTM Collection Practice (July/August [Shrawan])**

| Date | Vehicle | Vehicle Wt. | Trip I (kg) | | | Trip 2 (kg) | | | Trip 3 (kg) | | | Total Trip | Total wt. (ton) | Avg. wt./trip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Trip I | G. Wt. | Net. Wt. | Trip 2 | G. Wt | Net. Wt. | Trip 3 | G. Wt | Net. Wt. | | | |
| July 16 | 8059 | 3,550 | 1 | 4,500 | 950 | 0 | | 0 | 0 | | | 1 | 0.95 | 0.95 |
| July 17 | 8059 | 3,550 | 1 | 4,270 | 720 | 0 | | 0 | 0 | | 0 | 1 | 0.72 | 0.72 |
| July 18 | 8059 | 3,550 | 1 | 4,405 | 855 | 0 | | 0 | 0 | | 0 | 1 | 0.86 | 0.86 |
| July 19 | 8059 | 3,550 | 1 | 4,425 | 875 | 0 | | 0 | 0 | | 0 | 1 | 0.88 | 0.88 |
| July 20 | 8059 | 3,550 | 1 | 4,525 | 975 | 0 | | 0 | 0 | | 0 | 1 | 0.98 | 0.98 |
| July 21 | 8059 | 3,550 | 1 | 4,240 | 690 | 0 | | 0 | 0 | | 0 | 1 | 0.69 | 0.69 |
| July 22 | 8059 | 3,550 | 1 | 4,480 | 930 | 0 | | 0 | 0 | | 0 | 1 | 0.93 | 0.93 |
| July 23 | 8059 | 3,550 | 1 | 4,255 | 705 | 0 | | 0 | 0 | | 0 | 1 | 0.71 | 0.71 |
| July 24 | 8059 | 3,550 | 1 | 4,560 | 1,010 | 0 | | 0 | 0 | | 0 | 1 | 1.01 | 1.01 |
| July 25 | 8059 | 3,550 | 1 | 4,715 | 1,165 | 0 | | 0 | 0 | | 0 | 1 | 1.17 | 1.17 |
| July 26 | 8059 | 3,550 | 1 | 4,905 | 1,355 | 0 | | 0 | 0 | | 0 | 1 | 1.36 | 1.36 |
| July 27 | 8059 | 3,550 | 1 | 4,295 | 745 | 0 | | 0 | 0 | | 0 | 1 | 0.75 | 0.75 |
| July 28 | 8059 | 3,550 | 1 | 4,795 | 1,245 | 0 | | 0 | 0 | | 0 | 1 | 1.25 | 1.25 |
| July 29 | 8059 | 3,550 | 1 | 4,710 | 1,160 | 0 | | 0 | 0 | | 0 | 1 | 1.16 | 1.16 |
| July 30 | 8059 | 3,550 | 1 | 4,425 | 875 | 0 | | 0 | 0 | | 0 | 1 | 0.88 | 0.88 |
| July 31 | 8059 | 3,550 | 1 | 4,700 | 1,150 | 0 | | 0 | 0 | | 0 | 1 | 1.15 | 1.15 |
| Aug 1 | 8059 | 3,550 | 1 | 4,490 | 940 | 0 | | 0 | 0 | | 0 | 1 | 0.94 | 0.94 |
| Aug 2 | 8059 | 3,550 | 1 | 4,780 | 1,230 | 0 | | 0 | 0 | | 0 | 1 | 1.23 | 1.23 |
| Aug 3 | 8059 | 3,550 | 1 | 5,400 | 1,850 | 0 | | 0 | 0 | | 0 | 1 | 1.85 | 1.85 |
| Aug 4 | 8059 | 3,550 | 1 | 4,985 | 1,435 | 0 | | 0 | 0 | | 0 | 1 | 1.44 | 1.44 |
| Aug 5 | 8059 | 3,550 | 1 | 4,655 | 1,105 | 0 | | 0 | 0 | | 0 | 1 | 1.11 | 1.11 |
| Aug 6 | 8059 | 3,550 | 1 | 4,570 | 1,020 | 0 | | 0 | 0 | | 0 | 1 | 1.02 | 1.02 |
| Aug 7 | 8059 | 3,550 | 1 | 4,495 | 945 | 0 | | 0 | 0 | | 0 | 1 | 0.95 | 0.95 |
| Aug 8 | 8059 | 3,550 | 1 | 5,415 | 1,865 | 0 | | 0 | 0 | | 0 | 1 | 1.87 | 1.87 |
| Aug 9 | 8059 | 3,550 | 1 | 5,230 | 1,680 | 0 | | 0 | 0 | | 0 | 1 | 1.68 | 1.68 |
| Aug 10 | 8059 | 3,550 | 1 | 4,495 | 945 | 0 | | 0 | 0 | | 0 | 1 | 0.95 | 0.95 |
| Aug 11 | 8059 | 3,550 | 1 | 4,185 | 635 | 0 | | 0 | 0 | | 0 | 1 | 0.64 | 0.64 |
| Aug 12 | 8059 | 3,550 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | 0.00 | 0 |
| Aug 13 | 8059 | 3,550 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | 0.00 | 0 |
| Aug 14 | 8059 | 3,550 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | 0.00 | 0 |
| **Total** | | | **27** | | **29,055** | **0** | | **0** | **0** | | **0** | **27** | **29.06** | **1.08** |

Source: MTM

### 2.3.2 A-2: Training for Public Private Partnership (PPP) on Solid Waste Management

(1) Activities Implemented

The following activities were implemented under the Pilot Project A-2.

1) PPP Policy Assessment

Situation analysis on the policy environment for Public Private Partnership (PPP) and municipal needs assessment regarding PPP in SWM were conducted. Within the last two weeks of January 2005, a situation analysis was made to identify the present scenario of the following issues:

- Legal basis for implementation of Public-Private Partnership (PPP) initiatives;
- Existing policy and operational guideline for PPP; and
- PPP implementation practices of municipalities in solid waste management services

The methodology for the situation analysis was as follows:

- Study and assessment of legal documents in relation to PPP initiatives.
- Review of national PPP Policy and Operational guidelines for local bodies
- Interviews with municipal staff with responsibilities to manage PPP in SWM to identify work processes
- Interviews with main stakeholders in PPP to abstract lessons learned and best practices

Based on the findings from the above, a round of bilateral interviews was conducted with stakeholders for identifying the policy framework for enhancing PPP arrangements in SWM.

A report was compiled based on the assessment of situation analysis on the policy environment surrounding PPP. Mainly the report outlined the legal basis and requirements that need to be included in a given PPP process, as well as the gaps existing in the current policy framework.

2) Development of Operational Tools to Enhance PPP

When the Pilot Project A-2 was first conceived, it was envisioned that a policy guideline would be developed for PPP in SWM. However, based on the initial situation analysis of the policy environment conducted above, and reflecting on the comments received from consultations with MOLD and UNDP/PPPUE[2], it was agreed that the Pilot Project develop tools at the operational level in order to avoid duplication of work. The Pilot Project A-2 produced the following tools at the operational level to complement centrally issued policy guidelines.

- Operational Handbook for PPP in Solid Waste Management
- Prototype Terms of Reference for PPP Procurement Process
- Format for a Business Plan for Private Sector Organizations (PSOs)
- Formulation of Evaluation Criteria in the bidding process
- Prototype Contract Documents for both Private Enterprise and NGOs/CBOs

[2] UNDP's Public-Private Partnership for Urban Environment Program (2004-2007) aims to establish a policy and operational environment in municipalities conducive to the introduction of Public-Private partnerships for the improvement of basic urban services including SWM (see Section 3.5).

In particular, the standardization of PPP process in SWM among the five municipalities was discussed in alignment with the current legal requirements and the guideline was developed in the form of a user-friendly handbook, the Operational Handbook on PPP in SWM, with ready to use forms so that any municipal staff could manage a PPP process. The prototype contractual framework was attached with supporting tools to the handbook.

3) Orientation Forum for PPP in SWM

On April 26, 2005, a one-day orientation forum was convened inviting the Focal Points from KMC, LSMC and KRM, and representatives of PSOs operating in those municipalities selected by the municipalities. The objectives of this program was to

- Orient the key stakeholders on the various aspects of PPP that should be reflected in a contractual arrangement
- Stimulate interest among the stakeholders in formalizing PPP arrangements
- Collect comments on the PPP Prototype Contract
- Share the first draft of the Operational Guidelines for PPP in SWM.

Much higher than the initial number of participants expected, over 55 persons attended the one-day program, showing the very high interest on the part of PSOs. Many organizations which have had no partnership history with the municipalities, also attended. Within recent years, this was the first workshop that gathered together municipal staff and PSOs in SWM in all three municipalities.

During the one-day program, the participants conducted various exercises: joint assessment of the capacities of SWM service both provided by the private sector and NGOs/CBOs, analysis of the existing enabling environment for PPP, feedback session on the prototype contract, and formulation of a municipal–specific Future Course of Action for enhancing PPP in SWM. From the JICA Study Team, a step-by-step presentation was made on the process in PPP procurement, especially to orient the participants on the importance of various measures to be implemented in compliance with the various legal frameworks. The session concluded with comments from participants that the participants believed that such an orientation program should be held several more times to enhance the capacities of the municipalities and PSOs.

4) Application of PPP Agreement

KRM began discussions with UNIQUE to review their existing partnership, and renew their agreement that expired in 2004. The focus of partnership fell on two areas: collection and transportation, and development of a waste processing facility. Since more immediate needs existed in the finalization of agreement on collection and transportation, facilitating the negotiations to frame the contents of the agreement was started as part of the activities. A point of contention to be resolved was the cost-sharing arrangement for the transport of waste from KRM to Teku T/S after the expected closure of Bagmati River dumping site. UNIQUE stressed that on their own, they do not have such capacity to transfer waste any further than their current dumping area, and demanded that the municipality bear the responsibilities. Financial feasibility was conducted to assess the actual transportation costs. The negotiation process was supported to the extent that a PPP agreement could be reached between these two parties in the near future.

(2) Results of the Activities

1) PPP Policy Assessment Report

A report was compiled based on the assessment of situation analysis on the policy environment surrounding PPP. Mainly the report outlined the legal basis and requirements that need to be included in a given PPP process, as well as the gaps existing in the current policy framework.

2) Operational Handbook on PPP in SWM Developed with Supporting Tools

The Operational Handbook outlined in five stages, the necessary procedures that need to be undertaken by the municipality, as well as on the part of the private sector participants, for development of mutually beneficial and legally sound PPP in SWM. The following Table 2.3-9 summarizes the major steps required for each stage as suggested within the Operational Handbook.

**Table 2.3-9 Contents of Developed Operational Handbook for PPP in SWM**

| |
|---|
| **Preparatory Stage: Introduction to Public Private Partnership in SWM** |
| **Stage 1: Planning for Public Private Partnerships**<br>• Preparation of SWM Action Plans<br>• Conducting a Pre-feasibility Study |
| **Stage 2: Procuring Public Private Partnerships**<br>• Identifying Procurement Process<br>• Prepare Partnership procurement document<br>• Pre-qualification of the partners<br>• Invitation for bidding and Potential Partners' Seminar<br>• Opening and examination of the bid document |
| **Stage 3: Preparation and Award of Partnership Contract**<br>• Objectives and scope of services and financial requirements under the contractual agreement<br>• Identification of the parties to the agreements, and respective rights and responsibilities/ obligations<br>• Duration of the agreement and the scope for renegotiation or early termination of the agreement.<br>• Regulatory requirement and consents<br>• Identification and management of key risks<br>• Performance measurement and monitoring<br>• Payment and Consents on ownership and use of assets<br>• Dispute resolution and arbitration |
| **Stage 4: Implementation of Partnership Projects**<br>• Formation of Monitoring and Evaluation Team<br>• Development of performance standard and criteria for measurement<br>• Conducting Periodic Progress Monitoring and Evaluations<br>• Establishment of Dispute Resolution Mechanisms |

Source: JICA Study Team

3) Standardization of PPP Process in SWM

SWM has long been highlighted as one potential area in which high expectations exist for expanding the application of PPP among the municipalities. Nevertheless, no drastic increase in PPP has taken place, possibly restrained by the absence of knowledge and means

of the responsible municipal staff in regard to entering the Partnership Process. Despite the fact that policies and guidelines for PPP were endorsed by HMG/N, the municipalities did not have the tools to translate the contents of such documents to be applied within their own context. On the other hand, municipalities like KMC, LSMC, KRM, and now MTM have embarked on their own processes for PPP, but the approaches and methodologies varied greatly, reflecting the ad hoc nature of the exercises.

One major outcome from this Pilot Project was the standardization of the PPP process in SWM among the five municipalities. If the standard procedures stipulated within the Handbook are tested and embraced among the five municipalities, it may be introduced to other municipalities in Nepal in the near future.

4) Increased Overall Demand for PPP Arrangements

Various workshops in which the PPP processes were discussed, such as the orientation programs that included the PSOs, training sessions and facilitation sessions with municipalities, became opportunities to raise awareness on the benefits of entering a PPP agreement. Especially among the PSOs, strong interest was expressed, not only by former municipal contract holders, but also by new entities. On the other hand, although not as fervent as the PSOs, the municipalities also are taking advantage of the momentum created by the Pilot Project to reengage with partners to explore various PPP options.

### 2.3.3 A-3: Practice of Planning and O&M of Transfer Station

(1) Activities Implemented

As the activities of Pilot Project A-3, detail design and improvement works of Teku T/S, operation of the improved Teku T/S as well as a series of workshops on transfer station, were implemented. These activities are briefly described as follows:

1) Planning of Improvement of Teku Transfer Station

Through the series of discussions among the Focal Points, the JICA Study Team and other concerned people, the improvement concept was developed. The first workshop was held on July 12, 2004 to discuss the following:

- Confirmation of the necessity of transfer operations
- Discussion on transfer station systems such as open top, open top with surge pit and compaction systems
- Identification of scale of improvement required for Teku T/S
- Discussion of facilities to be provided at the transfer station
- Identification of issues related to the improvement of transfer station
- Discussion on layout alternatives
- Introduction of transfer stations in Japan, India and Malaysia

2) Improvement Works of Teku Transfer Station (Design and Construction Supervision)

The detailed design including technical specifications and bill of quantities was completed as per the concept discussed at the second workshop held on September 13, 2004. The main facilities, designed were unloading platform, approach and exit ramps, weighbridge and scale

house, road widening, drainage system, demolition works and road marking. Development of an area for waste picking activity was also considered. Natural conditions surveys were implemented with minor modifications in the soil surveys to deepen the investigation there as part of the detailed design.

The improvement works commenced from October 2004, and were completed in March 2005 with construction supervision by the focal point. During the improvement works, the Focal Points and other concerned people visited the site including third workshop held at the site on December 02, 2004. The progress of the improvement work was explained at that time by the focal point of KMC.

3) Practice of O&M of Teku Transfer Station

Partial operation of the improved Teku T/S commenced on June 5, 2005. Three transfer trucks were operated daily, and each made 1-2 trips per day. Records of the trips production were maintained. Speed of unloading was gradually improved.

4) Examination of Other Possible Transfer Stations

The new transfer station candidate site of Balaju in the north of KMC, was visited and the possibility for its development as a transfer station discussed. In addition, the site visit to the candidate site, proposed by LSMC as a transfer station indicated that the site may serve as a temporary facility, by using a storage load system. The site location, on the bank of Bagmati River, over reclaimed waste did not encourage construction of extensive facilities such as platform. An option recommended for consideration by both KMC and LSMC was to receive the waste from LSMC at the improved Teku T/S for a certain period, until perhaps the construction of the waste processing facility.

(2) Results of the Activities

Through the series of discussions at the workshops among the Focal Points, the JICA Study Team and other concerned people, the improvement concept was developed as follows:.

- The open top - direct loading system was selected for the improvement of Teku T/S.
- The scale of the improved transfer station was set at 200 t/d with two un-loading stations.
- The improved station layout selected involved one-directional traffic with the unloading stations above ground.
- Measurement was discussed on the issues identified including the odor to the surrounding residents and the activity of waste pickers.

The detailed design was completed as per the concept discussed at the workshops. A brief description of the main facilities designed is shown in the following table.

**Table 2.3-10 Main Facilities Designed for Improvement of Teku T/S**

| | |
|---|---|
| i) | Construction of a reinforced concrete unloading platform at a height of 3.2 m above ground with two unloading stations and each station having three bays for collection trucks to occupy for unloading purposes |
| ii) | Construction of approach and exit ramps to the unloading platform made of masonry walls and fill, with a width to accommodate one directional collection |

| | |
|---|---|
| | truck traffic flow |
| iii) | Installation of a weighbridge to weigh incoming primary collection vehicles and an adjacent scale house |
| iv) | Road widening at certain sections of the station to facilitate smooth traffic flow conditions |
| v) | Construction of a new drainage system at the locations of the unloading platform and ramps and improvement of the drainage system in other parts of the station |
| vi) | Demolition works of some masonry to clear areas for waste pickers' activity and vehicle parking |
| vii) | Road marking for traffic circulation and parking areas |
| viii) | Other works included main gate construction, provision of traffic signs and notice board, fencing, deep boring for provision of water source, and installation of an overhead reservoir. |
| ix) | Development of an area for waste picking activity and regulation of the waste pickers' activity through introducing a registration system and amenities to improve working conditions, such as storage areas for scavenged materials, space for placing of small weighing scales, use of the installed weighbridge for weighing of recyclable materials, etc. |

The layout of the improved Teku T/S is shown in Figure 2.3-10, while the achievements and products of this Pilot Project A-3 were summarized in Table 2.3-11.

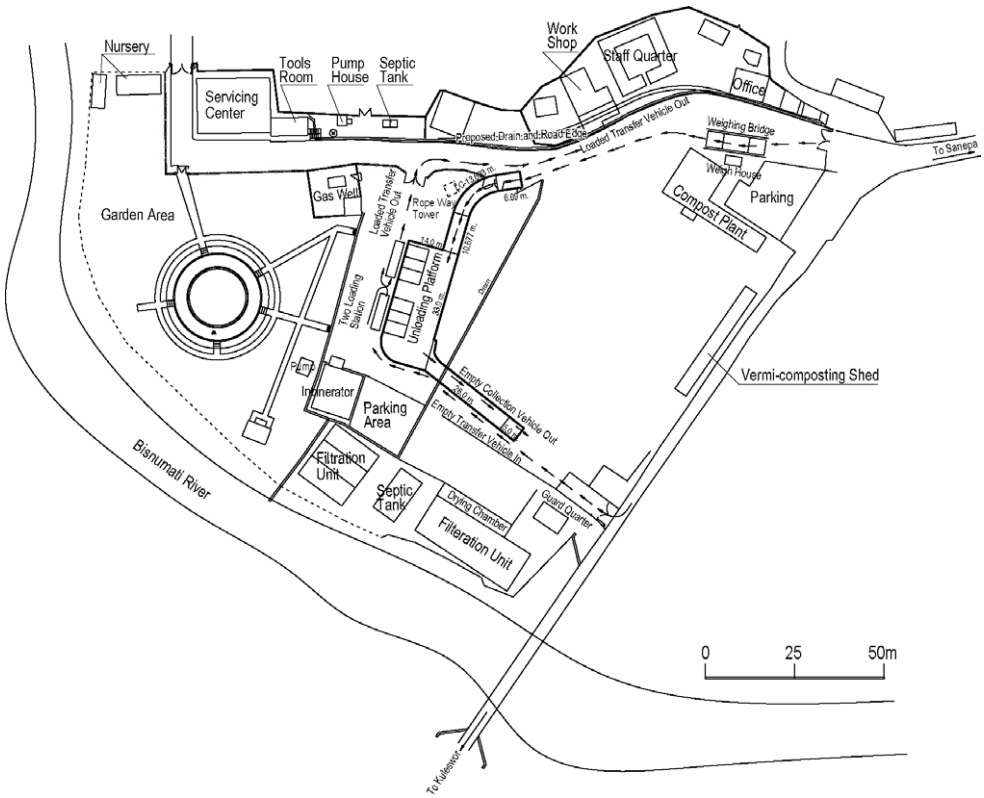


**Figure 2.3-10 Layout of Improved Teku T/S**

Source: JICA Study Team

**Table 2.3-11 Summary of Achievements and Products of Pilot Project A-3**

| Product | Comment |
|---|---|
| 1. Design Reports | Includes detailed design, Bill of Quantity (BOQ), soil and topography surveys reports |
| 2. Three work shops | Planning, design and construction, including materials discussed at the workshops |
| 3. Improved Teku Transfer Station  | Transfer haul operation started at the improved Teku transfer station on June 5, 2005. |
| 4. As-build Drawings | Prepared by the contractor as per the actual improvement works |
| 5. Weekly Construction Supervision Reports | Prepared for design and construction supervision. |

Source: JICA Study Team

## 2.4 Evaluation of Pilot Project A

### 2.4.1 Achievement Level

The achievement levels of project purposes and outputs of the Pilot Project A were discussed based on the OVIs as shown in Table 2.4-1. On the whole, most of the OVIs have been achieved during the past one year pilot project implementation period.

**Table 2.4-1 Achievement Level of the Pilot Project A**

| Project Purpose /Outputs | OVIs | Achievement Level |
|---|---|---|
| **Project Purpose**<br>▪ Capabilities of relevant staff of the five municipalities and SWMRMC regarding waste collection and transportation are strengthened. | ▪ By the end of June 2005, the amount of transported waste to the designated landfill site(s) is increased. | ▪ By the end of June 2005, the amount of transported waste to the designated landfill site (Sisdol) was increased. |
| **Outputs**<br>1 Basic knowledge and experience about efficient primary collection with measures such as source-separated collection are obtained among the relevant officials in municipalities. | 1-1 By the end of the Pilot Project, separated collection is implemented at 500 households at the specified areas in BKM<br>1-2 By the end of the Pilot Project, households at the specified areas in MTM receive collection service | 1-1 By the end of the Pilot Project, separated collection was implemented at 134 households (160 families) at the specified areas in BKM.<br>1-2 By the end of the Pilot Project, households at the specified areas in MTM receive temporary collection service. |

| Project Purpose /Outputs | OVIs | Achievement Level |
|---|---|---|
| 2 Practical guideline for public private partnership for SWM is prepared. | 2 By the end of the Pilot Project, a set of contract/agreement forms is prepared as guideline. | 2 By the end of the Pilot Project, a set of contract/agreement forms including handbook was prepared as a guideline. |
| 3 Basic knowledge and experience regarding transfer stations are obtained | 3 By the end of the Pilot Project, Teku T/S is improved and tentative transfer haul practices are started. | 3 By the end of the Pilot Project, Teku T/S was improved and tentative transfer haul practices had started. |

Source: JICA Study Team

### 2.4.2 Evaluation

**Relevancy:** The outputs from the Pilot Project A are quite relevant to the needs of the target Municipalities.

As BKM has faced difficulty in removing non-biodegradable waste from mixed collected waste at their composting facility and MTM did not have any transportation measures, the practical examination of source separated collection and the practical improvement of waste transportation capacity by provision of a truck in the Pilot Project A-1 were urgent needs for BKM and MTM, respectively.

With the increasing participation by Private Sector Organizations (PSOs) in the field of SWM, there is a sense of urgency to improve the monitoring mechanisms of the municipalities so that appropriate services are provided, and end-users are charged with equity. On the other hand, in order to address the increasing financial burden of managing solid waste among the five municipalities, PPP has drawn attention as a more efficient strategy in municipal service delivery. Due to such push factors, interest in increasing PPP arrangements in SWM remains high, and thus this pilot project was relevant to the needs of the target group, that is the T/Fs of the five municipalities.

The transportation of waste to Sisdol S/T-LF was agreed among the concerned parties because KMC and LSMC are struggling with the current waste dumping at the Bagmati River. As the transfer efficiency to speed up the transfer process is urgent, and KMC and LSMC need a solution for handling larger amounts of waste efficiently, this pilot project was relevant to the target group.

**Effectiveness:** The Pilot Project achieved its output level within the designated project implementation period and the outputs definitely contributed to achieving the overall goal of Pilot Project A.

Collection of the waste that used to be disposed of in the city area in MTM as open dumping and transportation of the waste to the designated destination has shown the incremental waste management rate grow from zero in the case of MTM. In the case of BKM, the municipality could gain the expected skills and knowledge for extending the area for source-separated collection through the pilot project. The target area for the pilot project was also very suitably selected as similar to the area covered by municipal sweepers for waste collection but disposed of at the backyard after collection in MTM. The target area in

BKM was similar to the area in which many residents were interested in environmental improvement and nature clubs were formulated.

The practical guidelines, titled Operational Handbook for PPP in SWM, has a set of prototype contracts and terms of reference that were attached for immediate use by the municipalities. Not just limited to the preparation of the Handbook, iterative consultations began with the main municipalities such as KMC and KRM from the very early stages of the Pilot Project, and created an interface with the municipal PPP Focal Points so that their feedback could be incorporated sufficiently into the Handbook. These activities overall contributed to enhancement of the Handbook itself and also paved the way to ensure its application at the target municipalities.

The platform developed at Teku T/S has contributed to speeding up the transfer process from the primary collection trucks to the secondary transfer vehicles. The platform was also developed considering the specifications of secondary transfer vehicles, which are planned to arrive in Kathmandu by the end of September 2005.

**Efficiency:** Several external factors influenced the progress of the Pilot Project. A major political change within the country occurred soon after the Pilot Project was launched in late January. Various modifications had to be made in the project design to accommodate the availability of the counterparts (Focal Points), especially the municipal SWM-related staff, who were occupied with the sudden introduction of a night waste collection system as instructed by MOLD. Moreover, with the reinforced drive promoted by the new regime, some activities were delayed, and changes were made in the project design. In MTM, due to the confusion over the tax exemption procedure, the new collection truck has not yet been procured. On the other hand, BKM couldn't have had regular preparatory meetings in a timely fashion from February to April because all collection manpower was busily occupied with the re-arrangement of the collection system to nighttime/early morning.

Under such conditions, however, Pilot Project A managed to produce major outputs with sufficient consultation among the target municipalities.

**Impact:** As positive impact on MTM it has been identified that the pilot project has reduced the direct environmental impact caused by open dumped waste in the backyard of the core area. It was very noticeable that the pilot project has generated a greater willingness to improve solid waste management by municipality staff. In BKM, people's awareness has been raised to think about what waste or environment is when they separate the waste at each source, as expected positive impact. It is also expected that the compost product will be sold at a relatively higher price because better quality compost can be produced from the separated collected waste. On the other hand, as negative impact, though it is tentative and small, the waste from MTM to Teku T/S, which has to be transported to Sisdol S/T-L/F may contribute to reducing the lifetime of the landfill.

One of the unexpected positive effects that were observed under Pilot Project A-2 is as follows:

- During the situation analysis, it was learned that UNDP's PPPUE project had started activities in KMC, setting up a PPPUE focal person at the KMC Central level, and this provided technical assistance to centralize PPP functions. In order to avoid duplication, several meetings were held to delineate responsibilities and a coordination strategy was

agreed upon that would be mutually complementary. Based on this, the Pilot Project could concentrate on intervention at the operational level, whilst the PPPUE advocated for PPP at KMC policy level.

One unexpected negative impact of Pilot Project A-2 is as follows:

- After the orientation program on April 26, 2005, a series of newspaper articles appeared in a minor local newspaper[3] that alleged that KMC Environment Department staff were receiving commissions through the privatization of SWM. Since the credibility of the newspaper is not so high, the impact of the newspaper article itself was limited. However, the fact that one orientation program leads to such articles is a manifestation of how politically sensitive and possibly damaging the discussion on PPP could be for the municipalities, if not handled in a transparent manner.

Local concerns, especially on odor, have been gradually raised along with urbanization of the surroundings of Teku T/S. The negative impact of odor could be somewhat reduced since the efficiency of unloading/loading work with the waste is improved by the new platform. Cleaning of the platform and proper management of drainage are suggested to reduce the odor. Aggravation of oil pollution and noise due to the collection/transportation vehicles going in and out are considered to be insignificant, since the increment of traffic volume is not high compared with the pre-improvement condition. On the other hand, impact on the waste picking activities will be minimal because the activities can be conducted in spite of the improvement of waste transfer speed, since the same amount of waste will be unloaded on the ground from the tricycles and tractors.

**Sustainability:** The sustainability of the effect of the pilot project could be predicted to be fairly high.

The local people involved in Pilot Project A-1 were very cooperative and they are basically willing to continue these activities. Both BKM and MTM have expressed that they would continue and expand the activities by arranging necessary budget and staff. In the case of MTM, although the procurement of a collection truck has been delayed, they will arrange a rental truck by themselves and assign the existing municipal employees as a driver and assistants. MTM has also obtained basic agreement from KMC for continuous transportation of its waste to Teku Transfer Station. On the other hand, in BKM, sustainability can be secured by more frequent communication with local people, because, in the past, the municipality failed to introduce source-separated collection as a result of loss of local people's motivation. Cost monitoring is also important for BKM in order to establish a more cost effective collection system like a designated day collection rather than the daily collection as it now is.

The coordination linkages established with MOLD regarding its PPP Policy and Guidelines as well as with the UNDP/PPPUE project, ensured that the outputs were consistent with the new paradigm of strengthening PPP in KMC. Such vertical alignments with the policy level initiatives reinforce the legitimacy of the instrument, and increase the chance of its sustainability. As for other municipalities, sustainability would be achieved most likely in municipalities with the greatest needs to implement PPP procurement procedures, which would be KRM, and more recently MTM. The sooner the Operational Handbook and other

[3] Saaptahik Awaj Newspaper " Metropolitan city and JICA planning to get commission" translated into English by JICA Study Team, 17 May 2005.

tools are utilized, while the momentum from the Pilot Project still exists, the better their experience will be, and that will be a key factor to sustain the practice. As the first case, the Pilot Project has provided advisory services to KRM in implementing their PPP Procurement process.

Since the Sisdol S/T-LF will be receiving all the collected waste from KMC, LSMC and KRM, the function of Teku T/S is expected to be best utilized as soon as the secondary transportation vehicles arrive in Kathmandu.

## 2.5 Lessons Learnt from Pilot Project A

In the early stage of the pilot project activity in BKM, it was unclear how the local people participated in the activity because the communities of BKM were said to be quite different and unique from those of other municipalities in the Kathmandu Valley. However, it could be said that people were relatively cooperative to the source separation of waste. Although some of participated households discharged the waste mixed together against the segregation rule, it was considered to be improved through the re-training of those people. One of the most remarkable progresses of this activity was that quality of compost product from the source-separated collected waste had been significantly improved as no unsuitable materials for composting such as glass and metal particles were included to the collected waste. This fact leads to produce more valuable quality of compost product and also leads to increase the production capacity by extending the source-separated collection cover area with the explanation of this successful result.

The activity in MTM was the first municipal waste collection and transportation practice. Though some of residents who are living near the new waste collection points complained about littering the street, most of the people seemed to welcome this activity. At the moment, MTM tentatively transport the collected waste to Teku T/S under the agreement between both municipalities. MTM still has the issue of securing its own designate landfill site to continue transporting the collected waste. It was clarified that MTM can carry out more efficient waste collection such as bell collection system with appropriate equipment through the continuous effort of current waste collection and transportation activity.

There were various issues in which the PPP process was discussed, such as the orientation program that included the private sector organizations (PSOs), training, and facilitation sessions with municipalities, and these became opportunities to raise awareness on the benefits of entering a PPP agreement. Especially among the PSOs, strong interests were expressed not only by former municipal contract holders, but also by new entities. The municipalities also are taking advantage of the momentum created to reengage with partners to explore various PPP options. However, in the practical stage of KRM case, it was learnt that detail demarcation of cost and responsibility between municipality and private sector should be negotiated and determined prior to the commencement of the PPP activity.

Teku T/S was improved and used partially with some rental dump trucks and KMC's compactor trucks. According to this activity, transfer efficiency was improved by using the new platform and it resulted in recognition of importance of transfer station among the municipalities. Original design condition of improvement of Teku T/S was based on the day-time waste collection and transportation system as it was before. Therefore, the appropriate arrangement between collection shift to the transfer station and transportation

shift from there to Sisdol S/T-LF is crucial issue for KMC because at present all municipalities should collect the waste at night till early morning but Sisdol S/T-LF can be only operated in day time.