APPENDIX 2.1

Record of Main Activities from July 2004 to July 2005

A: Improvement of Collection and Transportation

APPENDIX 2.1 RECORD OF MAIN ACTIVITIES FROM JULY 2004 TO JULY 2005

A: IMPROVEMENT OF COLLECTION AND TRANSPORTATION

A-1: Practice of Solid Waste Collection at Model Areas

A-1.1: Practice of Source-Separated Collection in BKM

Date	Venue	Participants	Activities	Remarks
July 9, 2004	BKM	JICA Study Team Mr. Shungo Soeda Ms. Toshiko Shimada Nepalese C/P *BKM;* Mr. Badrinath Ghimire Mr. Laxman Kishiju Mr. Dinesh Rajbhandari Mr. Moti Bhakta Shrestha	***Kick off Meeting*** 1) Brief explanation of Pilot Project 2) Confirmation of Focal Points 3) Introduction of local consultant and NGO 4) Discussion of source - separated collection activity 5) Discussion of public participation activity 6) Discussion of data collection at composting facility 7) Confirmation of schedule	Responsibility of each focal point of BTM was clarified. The criteria for selection of the model area and core group were discussed.
July 16, 2004	BKM	JICA Study Team Mr. Toshiyuki Ujiie Mr. Shungo Soeda Ms. Toshiko Shimada Ms. Sachiko Suwa Nepalese C/P *BKM;* Mr. Badrinath Ghimire Mr. Laxman Kishiju Mr. Dinesh Rajbhandari Mr. Moti Bhakta Shresta	***Meeting on with BKM*** - Presentation by a focal point about the selection of model area with the following criteria 1) Homogenous in occupation, socio-economic aspect 2) Attitude (positive) of community 3) Fixed boundary (peripheral boundary, open/closed area) 4) Collection route – short/easy – frequency of point of view 5) Close to existing composting plant area 6) Educational parameters	During the meeting 18 of candidate area were selected in the municipality. These candidate will be prioritized and from which 2 or 3 areas will be finalized as the model area by BKM and introduced at the Public Hearing
July 25, 2004	BKM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *BKM;* Mr. Dinesh Rajbhandari	***Meeting on with BKM*** - Explanation of three selected model area from 18 candidate area - Discussion about source separation methods and collection frequency	The Focal Point has surveyed all 18 candidate area by foot and by digital map for preparation of the plan
August 16, 2004	BKM	JICA Study Team Mr. Toshiyuki Ujiie Ms. Sachiko Suwa Nepalese C/P *BKM;* Mr. Badrinath Ghimire Mr. Laxman Kisiju Mr. Dinesh Rajbhandari Mr. Moti Bhakta Shrestha Mr. Dilip Kumar Suwal	***Meeting on with BKM*** 1) Structure of ward wise awareness raising groups- each ward group will be a mixed group- teachers, children, youth, women etc. 2) ECCA will train a total of 20-21 ward group representatives from ward nos. 14, 15 and17. - The trained members will assist to form 1 to 2 nature clubs in selected	-Trainings will be held ward wise and not target group wise as planned earlier. -BKM will hold 3rd P/H on the August 23 at the BKM Chamber of Commerce. The

Date	Venue	Participants	Activities	Remarks
		Mr. Krishna Prasad Suwal Others *ECCA;* Mr. Binod Shrestha *Kathmandu 2020;*	schools for each tole. - Nature club members (students) will promote waste management activities in their respective toles by making door-to-door visits.	JICA Study Team, ECCA and CEN will also be presenting during the public hearing in addition to BKM
September 12, 2004	BKM	JICA Study Team Mr. Toshiyuki Ujiie Mr. Shungo Soeda Ms. Sachiko Suwa Nepalese C/P *BKM;* Mr. Badrinath Ghimire Mr. Laxman Kishiju Mr. Dinesh Rajbhandari Mr. Moti Bhakta Shresta	***Meeting on with BKM*** - Formulation of core group, which is youth group, at the selected three model area	BKM complained the procedure of the group formulation by NGO
November 5, 2004	LDTA	JICA Study Team Mr. Shungo Soeda Mr. Vikram Basyal Nepalese C/P *BKM;* Mr. Dinesh Rajbhandari	***Meeting on with BKM*** - Progress of preparation for bins and other materials for implementing the activity	Specification of bins was agreed but BKM still have to prepare the brochure and labels
January 21, 2005	LDTA	JICA Study Team Mr. Shungo Soeda Nepalese C/P *BKM;* Mr. Dinesh Rajbhandari	***Meeting on with BKM*** - Progress of preparation for bins and other materials for implementing the activity, and detail work plan	Detail work plan was discussed.
January 30, 2005	BKM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *BKM;* Mr. Dinesh Rajbhandari	***Meeting on with BKM*** - Confirming the target area	Detail work plan was discussed in the field
February 2, 2005	BKM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *BKM;* Mr. Dinesh Rajbhandari	***Meeting on with BKM*** - Confirming the remaining activity by BKM during the absence of Mr. Soeda	Detail work plan was discussed.
April 20, 2005	BKM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *BKM;* Mr. Dinesh Rajbhandari Mr. Dilip Kumar Suwal	***Meeting on with BKM*** - Confirming the progress and plan of the activity	Work plan was revised based on the early morning collection shift
May 2, 2005	BKM	JICA Study Team Mr. Shungo Soeda Mr. Vikram Basyal Nepalese C/P *BKM;* Mr. Badrinath Ghimire Mr. Laxman Kisiju Mr. Dinesh Rajbhandari Mr. Moti Bhakta Shrestha Mr. Dilip Kumar Suwal Mr. Krishna Prasad Suwal	***Meeting on with BKM*** - analyzing why the project was not started	It was pointed out that BKM confused the demarcation between local consultant and municipality.

Date	Venue	Participants	Activities	Remarks
May 27, 2005	BKM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *BKM;* Field staff	***Observation of Source Separated collection activity***	
May 29, 2005	BKM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *BKM;* Field staff	***Observation of Source Separated collection activity***	
May 31, 2005	BKM	JICA Study Team Mr. Shungo Soeda Ms. Sachiko Suwa Nepalese C/P *BKM;* Field staff	***Observation of Source Separated collection activity***	
June 18, 2005	BKM	JICA Study Team Mr. Shungo Soeda Ms. Sachiko Suwa Nepalese C/P *BKM;* Mr. Dinesh Rajbhandari Mr. Dilip Kumar Suwal Mr. Krishna Prasad Suwal	***Observation of Source Separated collection activity and Clean up campaign***	
June 20, 2005	BKM	JICA Study Team Mr. Shungo Soeda Mr. Vikram Basyal Nepalese C/P *BKM;* Mr. Badri Nath Ghimire Mr. Laxman Kisiju Mr. Moti Bhakta Shrestha Mr. Dinesh Rajbhandari Mr. Dilip Kumar Suwal Mr. Krishna Prasad Suwal	***Follow up meeting*** *(See Appendix 2.3)*	

A-1.2: Practice of Collection and Transportation in MTM

Date	Venue	Participants	Activities	Remarks
August13, 2004	MTM	JICA Study Team Mr. Toshiyuki Ujiie Nepalese C/P *MTM;* Mr. Satya Narayan Shah Mr. Tulsi Bhakta Tako Ms. Krishna Kumari Shrestha	***Meeting on with MTM*** Discussion of basic plan for carrying out waste collection as pilot project 1) Location/Area: Bakha bazaar-Chapacho- Naya Thimi 2) Waste collection and transportation system: use hand carts to collect waste from side streets and collect it along the main street to be picked up by the new vehicle procured by JICA. 3) Landfill site selection	A meeting will be held this/next week with ward chairpersons and other stakeholders to decide possible short term dumping site. MTM is considering Teku, Hanumante or a site in Thimi along the collection route. Tentative start date: January, 2005. Budget is subject to approval by the end of next week. An operating cost of Rs 700,000 has been proposed for waste collection pilot project (hiring a new driver, fuel costs etc)
September 15, 2004	MTM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *MTM;* Mr. Satya Narayan Shah Mr. Shiva Man Shrestha	***Meeting on with MTM*** - Discussion for MTM's responsibility for the Pilot Project 1) Driver and loader 2) Budget for fuel 3) Destination of transported waste	MTM agreed to take a necessary actions. MTM has a plan of transfer point near TB hospital
November 11, 2004	MTM	JICA Study Team Mr. Shungo Soeda Mr. Vikram Basyal Nepalese C/P *MTM;* Mr. Satya Narayan Shah Mr. Shiva Man Shrestha	***Meeting on with MTM*** - Draft idea of implementation of Pilot Project - Discussion regarding Procedure and Schedule for Procurement of collection truck - Discussion regarding the presentation at municipal council	Detail procurement procedure should be confirmed with JICA Nepal. MTM requested JICA expert to be at the council
November 15, 2004	JICA Nepal Office, Meeting Room	JICA Study Team Mr. Shungo Soeda Mr. Vikram Basyal Nepalese C/P *MTM;* Mr. Satya Narayan Shah JICA Nepal Office Mr. Sourab Rana	***Meeting on with JICA Nepal and MTM*** - Discussion regarding Procedure and Schedule for Procurement of collection truck	JICA Nepal confirmed the procedure with concerned people after the meeting and informed it to MTM
November 19, 2004	LDTA, Team Leader Room	JICA Study Team Mr. Shungo Soeda Mr. Vikram Basyal Nepalese C/P *MTM;* Mr. Satya Narayan Shah	***Meeting on with MTM*** - Discussion regarding the presentation at municipal council	MTM will try to hold the council by November 26, 2004

Date	Venue	Participants	Activities	Remarks
January 31, 2005	MTM	JICA Study Team Mr. Shungo Soeda Mr. Vikram Basyal Nepalese C/P *MTM;* Mr. Satya Narayan Shah Mr. Surendra Shrestha	***Meeting on with MTM*** - Discussion regarding the work plan including the procurement of vehicle and collection method.	Detail work plan was discussed, It was recognized that it might quite difficult to purchase the vehicle by March 2005
May 27, 2005	MTM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *MTM;* Mr. Satya Narayan Shah Mr. Surendra Shrestha	***Meeting on with MTM*** - Discussion regarding the revised work plan based on the early morning collection including the procurement of vehicle and collection method.	
May 29, 2005	MTM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *MTM;* Mr. Bhuwan Prasad Bista (CEO) Mr. Satya Narayan Shah Mr. Tulsi Bhakta Tako	***Meeting on with MTM*** - Discussion about the preparation of the activity	
June 2, 2005	MTM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *MTM;* Mr. Satya Narayan Shah Ms. Krishna Kumari Shrestha Mr. Tulsi Bhakta Tako Mr. Surendra Shrestha Mr. Shiva Man Shrestha	***Site observation for commencement of the project***	Route and collection points were tentatively determined.
June 15, 2005	MTM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *MTM;* Ms. Krishna Kumari Shrestha Mr. Tulsi Bhakta Tako Mr. Surendra Shrestha	***Actual start day of the activity***	
June 16, 2005	MTM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *MTM;* Mr. Satya Narayan Shah Ms. Krishna Kumari Shrestha Mr. Tulsi Bhakta Tako Mr. Surendra Shrestha	***Observation of the collection activity***	
June 17, 2005	MTM	JICA Study Team Mr. Shungo Soeda_ Nepalese C/P *MTM;* Mr. Satya Narayan Shah Ms. Krishna Kumari Shrestha Mr. Tulsi Bhakta Tako Mr. Surendra Shrestha	***Observation of the collection activity***	

Date	Venue	Participants	Activities	Remarks
June 19, 2005	MTM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *MTM;* Mr. Satya Narayan Shah Ms. Krishna Kumari Shrestha Mr. Tulsi Bhakta Tako Mr. Surendra Shrestha	***Observation of the collection activity***	
June 24, 2005	MTM	JICA Study Team Mr. Shungo Soeda Nepalese C/P *MTM;* Mr. Bhuwan Prasad Bista (CEO) Mr. Satya Narayan Shah Ms. Krishna Kumari Shrestha Mr. Tulsi Bhakta Tako Mr. Surendra Shrestha	***Observation of the collection activity and Clean up campaign***	

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

Date	Venue	Participants	Activities	Remarks
January 28, 2005	KMC	Nepalese C/P *KMC;* Mr. Indra Man Suwal Mr. Rajesh Manandhar Others *DMI;* Mr. Deep Rajkarnikar Mr. Rajendra Giri	Meeting to identify the Municipality's need in the fields of public Private Partnership in Solid Waste Management. Following needs were identified: 1) Policy guideline for PPP in SWM. 2) Round Table meeting for getting feedback on the policy and 3) PPP working guideline	
February 2 2005	KMC	Nepalese C/P *LSMC;* Mr. Indra Man Suwal Mr. Rajesh Manandhar Mr. Rabin Man Shrestha Others *DMI;* Mr. Deep Rajkarnikar	Discussion on PPP policy guideline and fixation of date for Round Table meeting. KMC has decided to hold round table meeting for collecting feedback on PPP policy guideline. And schedule a meeting on 4th Feb. for finalizing the list of participants for Round Table meeting	.
February 4 2005	KMC	Nepalese C/P *KMC;* Mr. Rajesh Manandhar Mr. Rabin Man Shrestha Others *DMI;* Mr. Deep Rajkarnikar	Finalize the list and fix the date for Round table meeting on PPP policy guideline. The date for Round table meeting was fixed for 8th February 2005 It was decided to invite the representatives from the following organization in the Round Table meeting - Five municipalities - Private sectors - Ex-ward Chairpersons - PPPUE - NGOs and CBOs - Resource - Mobilization center - MOLD - MOPE and - Media	
February 22. 2005	KRM	JICA Study Team Ms. Minako Nakatani Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan Others *DMI;* Mr. Deep Rajkarnikar	PPP in SWM consultation meeting for considerations in partnership Arrangements- Municipality's opinion Following were the major concerns of KRM regarding PPP in SWM: - Elements that should be included in the contractual arrangement - Partnership Arrangement started to become out of municipal control because of lack of guiding Frame - Lack review and monitoring of partners performance - Delay to response to Unique Group's request for land for compost plant due to complicated government process for such arrangement.	

Date	Venue	Participants	Activities	Remarks
February 23. 2005	KMC	JICA Study Team Ms. Minako Nakatani Nepalese C/P *KMC;* Mr. Indra Man Suwal Mr. Rajesh Manandhar Mr. Rabin Man Shrestha Others *DMI;* Mr. Deep Rajkarnikar	PPP in SWM consultation meeting for considerations in partnership Arrangements- KMC's opinion Following were the major concerns of KMC regarding PPP in SWM: - Agreement with existing private operators - Establishment of PPP review and Monitoring Committee with stakeholders. - establishment of PPP Unit in KMC structure - Appointed Mr. Rabin Man Shrestha as a PPP Focal point	
March 1, 2005	KMC	Nepalese C/P *KMC;* Mr. Rabin Man Shrestha Mr. Rajesh Manandhar Mr. Indra Man Suwal Others *DMI;* Mr. Deep Rajkarnikar	Discussion on the structure of the PPP operational Handbook and PPP in SWM products and services. The following were the results - Solid waste collection (Sweeping, door-to-door collection and transportation) is the product for PPP - structure for PPP Handbook * Planning * Pre-feasibility * TOR, Proposal Format * Procurement of PPP * implementation of PPP project.	
March 7, 2005	KRM	Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Sanu Babu Pariyar Others *DMI;* Mr. Deep Rajkarnikar	Discussion on the structure of the PPP operational Handbook and PPP in SWM products and services.	
March 13, 2005	KMC	Nepalese C/P *KMC;* Mr. Indra Man Suwal Mr. Rajesh Manandhar Mr. Rabin Man Shrestha Others *DMI;* Mr. Deep Rajkarnikar	Briefing about the PPP in SWM Operational Handbook and asked for the comment and Feedback Discussed about the possible content for PPP contractual agreement and TOR	
March 17, 2005	KRM	Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Sujindra Maharjan Others *DMI;* Mr. Deep Rajkarnikar	Briefing about the PPP in SWM Operational Handbook and asked for the comment and Feedback Discussed about the possible content for PPP contractual agreement and TOR	
March 23, 2005	LSMC	Nepalese C/P *LSMC;* Mr. Prabin Shrestha	Briefing about the PPP in SWM Operational Handbook and asked for the comment and Feedback	

Date	Venue	Participants	Activities	Remarks
		Mr. Pradeep Amatya Others *DMI;* Mr. Deep Rajkarnikar Mr. Rajendra Giri	Discussed about the possible content for PPP contractual agreement and TOR	
April 1, 2005	KMC	Nepalese C/P *KMC;* Mr. Rabin Man Shrestha Mr. Rajesh Manandhar Others *DMI;* Mr. Deep Rajkarnikar	Briefed the PPP Contractual Agreement and asked for feedback	
April 5, 2005	KRM	Nepalese C/P *KRM;* Mr. Anuj Pradhan Mr. Sujindra Maharjan Others *DMI;* Mr. Deep Rajkarnikar	Briefed the PPP Contractual Agreement and asked for feedback	
April 28, 2005	KRM, KMC, and LSMC	Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Sujindra Maharjan *KMC;* Mr. Rabin Man Shrestha Mr. Rajesh Manandhar *LSMC;* Mr. Prabin Shrestha Others *DMI;* Mr. Deep Rajkarnikar Mr. Rajendra Giri	Discussed about the future action plan prepared in the PPP orientation Program held on 26 April 2005 The following were the concerns of the municipalities: KRM - Finalization of Contractual document and initiate SWM through Private Operator -seeks support from CKV for PPP initiation KMC -Finalization of Contractual document - Seeks help to develop TOR, Prepare Public notice and Format for technical and financial proposal. LSMC - Finalize the contractual document	
May 12, 2005	KRM	Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Sujindra Maharjan Others *DMI;* Mr. Deep Rajkarnikar	Conduct Point-wise discussion on Prototype PPP contractual agreement to give final shape.	
May 17, 2005	KMC	Nepalese C/P *KMC;* Mr. Rajesh Manandhar Mr. Rabin Man Shrestha Others *DMI;* Mr. Deep Rajkarnikar	Conduct Point-wise discussion on Prototype PPP contractual agreement to give final shape.	

Date	Venue	Participants	Activities	Remarks
May 26, 2005	KRM	Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Sujindra Maharjan Others *DMI;* Mr. Deep Rajkarnikar	Briefed about TOR for Collection service in solid waste management. Asked for comment on TOR Date for point wise discussion on TOR is set for 30 May 2005 (to be reconfirmed with CEO)	
May 30, 2005	KRM	JICA Study Team Ms. Minako Nakatani Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Sujindra Maharjan Mr. British Singh Mr. Naresh Regmi Others *DMI;* Mr. Deep Rajkarnikar	Conduct point-wise discussion on TOR for solid waste collection service and finalized it. Outcome of the discussion was later briefed to CEO Mr. Naresh Regmi.	
June 10, 2005	KRM	JICA Study Team Ms. Minako Nakatani Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Sujindra Maharjan Others *DMI;* Mr. Deep Rajkarnikar *Unique;* Mr. Swadesh Maharjan	Objective of the meeting was to build up common understanding on PPP initiation between the Kirtipur municipality and the private Operator (Unique Group Kirtipur). The following were the common understanding 1) There will be two contracts, one for solid waste collection, sweeping and transportation, and another for compost plant establishment. 2) Municipality will principally support continue Unique Group's work in the area where it is presently working. For new area the municipality will go for open bidding process. 3) Since establishing composting plant will take bit long time doing EIA and or IEE study and getting approval from the ministries, both the Process of contraction out of the PPP should start immediately and in parallel. 4) For transportation of waste to Teku after October (by that time dumping at Bagmati River bank will be stopped) until the composting plant starts, the cost incurred should either be included in the PPP project itself or the municipality should subsidize the transportation work. 5) Municipality and the Unique will	

Date	Venue	Participants	Activities	Remarks
			estimate the cost of transportation of waste from Kirtipur to Teku with in a week and discuss the matter. 6) Meeting for comparison of cost estimation is schedule for 17 June 2005 in the municipality office.	
June 26, 2005	KRM	Nepalese C/P *KRM;* Mr. Naresh Regmi Mr. Bal Krishna Maharjan Mr. Sanu Babu Pariyar Mr. Anuj Pradhan Mr. Sujindra Maharjan Mr. British Singh Others *DMI;* Mr. Deep Rajkarnikar	Following were the major objective of the meeting: - to follow-up the previous (10th June) meeting - to identify further steps in solid waste management through PPP initiation in KRM Result of the meeting were; 1) The meeting agreed to get approval of the municipal board to implement SWM through PPP. 2) The meeting also decided draft public notice for Invitation for proposal 3) Regarding Unique Group and Nepco, Municipality agrees to give priority to the existing private operators, 4) Next meeting will be held on 30 June 2005 on Thursday in the municipality office for finalization of public notice	
July 1, 2005	KRM	Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Sujindra Maharjan Mr. British Singh Others *DMI;* Mr. Deep Rajkarnikar	The objective of the meeting was to finalize the public notice for launching Partnership procurement for solid waste collection service. The result of the meeting were; 1) The meeting finalized the PPP notice for solid waste collection service. 2) The meeting also decided that the next step in the process would be to identify the project location/service area. For this an intensive meeting needs to hold with the technical people of the municipality. 3) The meeting also decided to hold talk with Unique and NEPCO before publishing PPP notice in the newspaper. 4) Next meeting will be held on 5th July 2005 on Tuesday Thursday in the municipality office for at 12:00 to select project location and discuss with Unique and NEPCO.	
July 1, 2005	KRM	Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan	General objective of the meeting was to inform the existing private operators about the PPP initiatives in solid waste	

Date	Venue	Participants	Activities	Remarks
		Mr. Anuj Pradhan Mr. Naresh Kimar Regmi Mr. Sanubabu pariyar Mr. Surjiendra Maharjan Others *DMI;* Mr. Deep Rajkarnikar *Unique Group;* Mr. Swodesh Maharjan *NEPCO;* Mr. Surendra Aryal	management. Result of the meeting: - municipality will provide necessary support to POs to make the PPP initiative a successful event. - Proposal format and evaluation criteria, it will be design in such a way that it gives clear picture of POs capability and understanding of the proposed project, and financially sustainable and growing project. - Role and responsibility of the municipality and the POs will be clearly mentioned in contractual agreement.	
July 8, 2005	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Vikram Basyal Nepalese C/P *KMC;* Mr. Rajesh Manandhar Mr. Rabin Man Shrestha Mr. Robert Dongol *BKM;* Mr. Prabesh Kumar Chalise Mr. Suresh Chandra Bajracharya Mr. Revid Kusma *MTM;* Krishna Kumari Shrestha *KRM;* Mr. Anuj Pradhan Mr. British Singh Mr. Sujindra Maharjan	***Workshop of Public Private Partnership on SWM***	

A-3: Training/Practice of Transfer Station (Teku T/S)

Date	Venue	Participants	Activities	Remarks
June 24, 2004	KMC	JICA Study Team Mr. Mahmoud Riad Nepalese C/P *KMC;* Mr. Rajesh Manandhar Mr. Kiran Ulak	Discussion on contents of TOR for Teku T/S Improvement Soil and Topography Surveys and DD Pilot Project	Contents were acceptable to KMC
July 11, 2004	Teku/ KMC	JICA Study Team Mr. Mahmoud Riad Nepalese C/P *KMC;* Mr. Rajesh Manandhar Mr. Purusotam Shakya Other *CEMAT;* Mr. B. R. Shakya Mr. S. R. Shrestha Mr. Poudhal Topography team	KMC confirmed that the Compost facility and sewage treatment tanks (beds) must remain. Locations of permanent bench marks decided. Preliminary analysis of alternatives by CEMAT shows that the one directional above ground alternative is the best in terms of cost and construction time.	
July 12, 2004	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Mahmoud Riad Mr. Shungo Soeda Nepalese C/P *KMC;* Mr. Kiran Ulak Mr. Purusotam Shakya *LSMC;* Mr. Rudra Gautam Mr. Pradeep Amatya Other *CEMAT;* Mr. B. R. Shakya Mr. S. R. Shrestha	Theme 1: Planning of transfer haul Theme 2: Concept design for T/S improvement Discussions covered required number of un-loading stations, main facilities, storage requirement for three days, working area for scavengers and waste hauled in by trucks w/o tipping, and suitability of one-directional above ground option. Theme 3: Future workshops program Visit to Teku and Balaju Balaju visit shows need to improve the access road before this plot of land can be developed as transfer station.	Some discussion was also made for Sundarighat and the requirements there as well.
July 16, 2004	KMC	JICA Study Team Mr. Mahmoud Riad Nepalese C/P *KMC;* Mr. Rajesh Manandhar Other *CEMAT;* Mr. B. R. Shakya Mr. S. R. Shrestha	Proceedings of July 12 work shop explained to Mr. Rajesh Manandhar who agreed with the work shop conclusions. Work plan discussed and approved with some modifications. Water storage tank (around 1,000m^3) may be required to provide water for truck washing. Concrete floor in parking area built under KVMP and EU agreement may be necessary before construction of unloading platform there. Tipping floor area should allow for 3 days waste storage.	KMC is studying introducing registering system for scavengers active in Teku.
July 22, 2004	KMC	JICA Study Team Mr. Mahmoud Riad Mr. Shungo Soeda Nepalese C/P	Brief explanation on the Teku improvement plan to the Environmental Dept. chief. KMC and JICA team provided CEMAT	

Date	Venue	Participants	Activities	Remarks
		Mr. Indra Man Suwal Mr. Rajesh Manandhar Mr. Kiran Ulak Mr. Purusotam Shakya Other *CEMAT;* Mr. B. R. Shakya Mr. S. R. Shrestha	with the dimensions for the transfer trucks and collection trucks. JICA Team provided CEMAT with information on the truck scale foundation required. KMC will arrange a meeting with CEO to explain the optimum alternative. KMC mentioned that it may not be necessary to receive EU approval after all.	
July 29, 2004	KMC	JICA Study Team Mr. Toshiyuki Ujiie Mr. Mahmoud Riad Nepalese C/P *KMC;* Chief Executive Officer Mr. Indra Man Suwal Mr. Rajesh Manandhar Other *CEMAT;* Mr. B. R. Shakya Mr. S. R. Shrestha Mr. Poudhal	Progress of the PP and the analysis of various improvement alternatives were explained to KMC CEO. The detailed design and soil investigation to proceed based on one-directional above ground platform. KMC Board will be formally informed of this PP once it is possible to convene the Board. This is a formality and shall not effect the detailed design. EU will be informed as a formality of this project. This will be done by KMC.	
July 31, 2004	Teku/ KMC	JICA Study Team Mr. Mahmoud Riad Nepalese C/P *KMC;* Mr. Rajesh Manandhar Other *CEMAT;* Mr. B. R. Shakya Mr. S. R. Shrestha	Discussion with KMC focused on the suitable location for the weighbridge.	
August 26, 2004	CEMAT	JICA Study Team Mr. Toshiyuki Ujiie Mr. Mahmoud Riad Nepalese C/P *SWMRMC;* Mr. Ram Sharan Maharjan Other *CEMAT;* Mr. B. R. Shakya Mr. S. R. Shrestha Mr. Poudhal	Discussion on construction cost estimates for Teku T/S PP	
August 28, 2004	KMC	JICA Study Team Mr. Toshiyuki Ujiie Mr. Mahmoud Riad Nepalese C/P *KMC;* Chief Executive Officer Mr. Indra Man Suwal Mr. Rajesh Manandhar Other *CEMAT;* Mr. B. R. Shakya	Teku T/S improvement pilot project explained to the new Acting CEO.	

Date	Venue	Participants	Activities	Remarks
August 31, 2004	Teku TS	JICA Study Team Mr. Toshiyuki Ujiie Mr. Mahmoud Riad Nepalese C/P *SWMRMC;* Mr. Ram Sharan Maharjan *KMC;* Mr. Rajesh Manandhar JICA Advisory Committee Dr. Isamu Yokota Dr. Ayako Tanaka	Both members of the monitoring committee visited the Teku site and reflected on the elements of the pilot project design. Various comments were received from the Monitoring Committee members to improve the pilot project design.	Fear of residents complaint from odor and future of scavengers at Teku discussed with KMC
September 13, 2004	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Mahmoud Riad Nepalese C/P Total 12 members Other *MOPE, East, CEMAT, ENPHO, etc;* Total 16 people *(See Appendix 2.2)*	Teku detailed design presented to the participants and discussions held on elements of the design. *(See Appendix 2.2)*	
September 14, 2004	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Mahmoud Riad Nepalese C/P *SWMRMC;* Mr. Surya Man Shakya Mr. Ram Sharan Maharjan *KMC;* Mr. Indra Man Suwal Mr. Rajesh Manandhar Other *CEMAT;* Mr. B. R. Shakya Mr. S. R. Shrestha Mr. Poudhal	Discussions on long list of general contractors and developing evaluation criteria for preparing a short list.	Three general contractors, Class A, were short listed
September 20, 2004	LDTA and Teku	JICA Study Team Mr. Toshiyuki Ujiie Mr. Mahmoud Riad Nepalese C/P *SWMRMC;* Mr. Surya Man Shakya Mr. Ram Sharan Maharjan *KMC;* Mr. Indra Man Suwal Mr. Rajesh Manandhar Others *CEMAT;* Mr. B. R. Shakya Mr. S. R. Shrestha Mr. Poudhal	Tender call and visit to Teku site for site explanation.	Three contractors invited to submit bids.
October 4 and 5	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Mahmoud Riad Nepalese C/P	Commenced negotiations with SNS contractor, which submitted the best tender out of three tenders.	All outstanding issues clarified and SNS to be selected subject to

Date	Venue	Participants	Activities	Remarks
		SWMRMC; Mr. Surya Man Shakya Mr. Ram Sharan Maharjan *KMC;* Mr. Indra Man Suwal Mr. Rajesh Manandhar Other *CEMAT;* Mr. B. R. Shakya Mr. S. R. Shrestha Mr. Poudhal *SNS;* General Contractor		JICA approval
November 13, 2004	Teku Site	JICA Study Team Mr. Toshiyuki Ujiie Mr. Mahmoud Riad Mr. Shungo Soeda Nepalese C/P *KMC;* CEO Mr. Indra Man Suwal Mr. Rajesh Manandhar Mr. Kiran Ulak Others *CEMAT;* Site Inspector *SNS;* Project Director	KMC CEO inspected the work progress. Shuttering and reinforcement under preparation for concreting the un-loading platform	Acting CEO voiced satisfaction at the work progress
January 13, 2005	KMC office	JICA Study Team Mr. Mahmoud Riad Nepalese C/P *SWMRMC;* Mr. Ram Sharan Maharjan *KMC;* Mr. Indra Man Suwal Mr. Rajesh Manandhar Others *CEMAT;* Mr. B. R. Shakya Mr. S. R. Shrestha Mr. Poudhal *SNS;* General Contractor	Program of KMC to complete their works	
April 28, 2005	KMC	JICA Study Team Mr. Mahmoud Riad Mr. Shungo Soeda Nepalese C/P *KMC;* Mr. Rajesh Manandhar	Discussion on the operation of the transfer station in coordination with the shift to night time collection and available transfer trucks	
June 7, 2005	Teku Site	JICA Study Team Mr. Mahmoud Riad Nepalese C/P *KMC;* Mr. Rajesh Manandhar	Observing the transfer station operation using the JICA rented trucks	

APPENDIX 2.2

Records of Workshop/ Training under the Pilot Project A

APPENDIX 2.2 RECORDS OF WORKSHOP/ TRAINING UNDER THE PILOT PROJECT A

Subject: **Training for Planning of Transfer Station (1)**
Date: July 12, 2004
Time: 10:00 - 16:00
Venue: Local Development Training Academy Meeting Room
Participants:

KMC	Mr. Kiran Ulak, Engineer, Solid Waste Management Section
	Mr. Purusotam Shakya, Section Chief, Mechanical Section
LSMC	Mr. Pradeep Amatya, Section Chief, Environment and Sanitation Section
JICA Study Team	Mr. Toshiyuki Ujiie
	Mr. Mahmoud Riad
	Mr. Shungo Soeda
CEMAT	Mr. Bhupendra Man Shakya, Project Manager
	Mr. Sarad Raj Shrestha, Civil/ Environmental Engineer

1. Agenda:

No.	Time	Program	Facilitator
1	**10:00 – 11:00**	**Theme 1 - Planning of Transfer Haul**	**Mr. Soeda**
	10:00 – 10:30	- Review of waste transportation - Necessity of waste transfer hauls - Cost of waste transfer haul - Types of secondary transfer equipment - Case study of waste transfer haul - Location of waste transfer station - EIA/ IEE requirements for T/S construction - Possibility of utilization of private sector	
	10:30 – 11:00	Discussion	
2	**11:00 – 12:00**	**Theme 2 - Concept Design for T/S Improvement**	**Mr. Riad**
	11:00 – 11:30	- Types of transfer station - Size and capacity - Facilities in T/S (KMC) - Teku T/S description and issues (CEMAT) - TOR for Teku PP - Teku Layout options (CEMAT) - Balaju Site Drawing	
	11:30 – 12:00	Discussion	
3	**12:00 – 12:30**	**Theme 3 – Future Workshops Program**	**Mr. Riad**
4	**13:30 – 14:30**	**Teku T/S visit**	
		Appreciation of current site conditions Consideration of alternatives	
5	**15:00 – 16:00**	**Balaju T/S candidate site visit**	
		Appreciation of site surroundings Preparation of schematic design	

2. Records

(1) Transfer Station Systems - Discussion 1:

A. Open Top	B. Open Top with Surge Pit (or Tipping floor)	C. Compactor System
1. Simple technology 2. Low capital costs 3. Hastens operation	1. Waste storage reducing transfer truck requirements 2. Waste checking, separation, bulky waste, etc easier to handle	1. Higher efficiencies for waste transfer
1. Waste checking and resource recovery difficult 2. Delays for collection trucks may occur	1. Large space required 2. Large construction cost for two split level 3. Pit presents work hazards	1. High capital and maintenance costs 2. Leachate treatment system may be required
(1) Optimum system for Teku T/S improvement PP? The Open Top with an area for tipping floor is recommended. (2) Optimum system for Sundarihgat temporary T/S? The same as above. (3) Optimum system for Balaju T/S? The same as above.		

(2) T/S Scale Estimations - Discussion 2:

Estimate of required number of re-loading stations for Sundarighat

a	Daily waste amount	Design period (2005-2008)	70 t/d
b	Peak hour waste amount	20% x Daily waste amount LSMC to confirm the peak hourly volume rate using the data they have for truck arrivals.	14 t/hr
c	Required number of transfer trips	14 t/hr x 1/(Transfer truck capacity 15m3 x 0.4 t/m3)	2.3 trips
d	Loading time for each transfer truck		15 min/truck
e	Number of re-loading stations	2.3 x (15 min/ 60 min)	0.6 stations

Therefore for LSMC's temporary T/S at Sundarighat, 1 re-loading station is sufficient.

There was discussion by Kiran (KMC) on the 20% ratio for peak hour. He mentioned that it may be small considering that so many trucks arrive during the period of 7 – 9 AM at Bagmati and Teku. The JICA Study Team replied that the ratio quoted here is from KMC and is for one hour. Sometimes 30 minutes interval is adopted and the design is made for that. Other times 1 hour is used. So it is better to check the ratio during the one peak hour. The data available at KMC may be used for that purpose.

(3) Main facilities - Discussion 3:

The facilities considered to be required by each transfer station are shown in the following table:

Facility	T	B	S	Facility	T	B	S	Facility	T	B	S
In weighbridge	O	O	O	Admin. Bldg.	X	O	O	Parking; transfer	O	O	O
Out weighbridge	X	X	X	Drop-off center	X	X	X	Parking; collection	O	X	X
Guardhouse	X	O	O	Reloading facility	O	O	O	Parking; private veh.	X	X	X
Tire washing	X	X	X	Tipping floor	O	O	O	Rainwater drainage	O	X	X

Facility	T	B	S	Facility	T	B	S	Facility	T	B	S
Vehicle washing	O	O	O	Green belt	O	X	X	Environmental monitoring	X	X	X
Workshop	X	X	X	Fence	X	O	O	Utilities	O	O	O
Water well/ tank	O	X	X	Leachate treatment	X	X	X	Flooring	X	O	O
Fuel station	X	X	X	Leachate storage	X	O	O	Ramp Structure	RC	E	E

Guardhouse: Available at Teku. In case of Balaju it is necessary to re-construct.

Vehicle Washing: The present system of using jet stream water for washing the collection trucks at Teku is not convenient. KMC requested to consider provision of some washing facility for the trucks in the detailed designs.

Water well/ tank: KMC explained that the present water source available in Teku T/S does not satisfy their requirements. This will be reviewed in the detailed design.

Administrative Building: KMC expects to use space in the building used by the KVMP. We explained the importance of securing space for administration of the transfer station and if an agreement can be reached with the present users of that building then it may be the best alternative. For Sundarighat, because of its temporary nature a small administrative space shall be considered.

Green belt: For Teku it is possible to consider the construction of a green belt along the east road. However the trees/plants selected for the green belt should be suitable for the disposal site conditions. KMC once tried to plant Sakura trees near an old landfill but the trees did not grow.

Fence: The fence surrounding the Teku T/S is considered to be enough. For Balaju the existing fence needs to be repaired in some sections. And for Sundarighat a new fence will be required.

Leachate storage: For Teku T/S, KMC considered that leachate storage is not required. In the case of the other two T/Ss, the drainage of the leachate generated from the stored waste may become a problem. Because it should not be drained in the nearby river, for both T/Ss it may be better to consider at the time of concept design the provision of a leachate retention pond for storage purposes until transferred by tanker. However if the tanker will discharge into the river then this is meaningless.

Rainwater drainage: The rainwater drainage system at Teku appears to be functioning well and KMC reported that there have been no past problems of flooding at the site. For both Balaju and Sundarighat the rainwater drainage systems are expected to discharge into the nearby rivers.

Utilities: KMC desires that at Teku a review or required utilities should be made by the pilot project. If it is desirable to operate Teku T/S at night the present lighting system is not adequate.

Flooring: This is an item that was added. For Sundarighat T/S, LSMC suggested to avoid PC or RC floor construction because of the temporary nature of the facility and the old disposal of waste at the site and continued settlement of the waste there. LSMC proposed application of gravel pavement.

Ramp structure: For Teku ramp RC structure will be considered. But for the other two sites because of the difficulty of providing foundations, earth embankment ramps shall also be considered. In the case of Sundarighat this is the only solution because of the temporary nature of the facility there and the presence or relatively new waste deposited there.

(4) Issues related to Teku T/S Improvement Project - Discussion 4:

Subject	Issue	Resolution
1. Space limitation	Usable area 0.6 ha.	Compost area (Keep. KMC considered the possibility of including the compost plant in the PP. We explained that compost making did not succeed at Teku because of surrounding residents' complaint on the smell. KMC reported that the reason for past failure was due to the poor quality of compost. We explained that in principle it is better to have the compost plants at a distance from the residential area in order to keep the inevitable bad odor from the residents. Because of this it is considered inadvisable to re-operate the compost plant. Also the present compost plant will require extensive repairs.), Incinerator (Keep), Sewage treatment (Keep), Garden (Keep)
2. Scavengers activities	80-100 scavengers, recycling rate	a) Abolish ( ), Maintain w/ control (Preferable option. Scavengers shall be controlled through registration system. The number of scavengers and control of the collection trucks shall be done by KMC and not the scavengers.) b) (Adopt present rate of waste hauled by collection trucks without dumping. This rate to be provided by KMC. It was suggested that KMC also make a survey for say one week of the incoming waste and waste being transferred to Bagmati in order to make some estimates of recycling amount.) c) Revise Unloading stations number (The unloading stations number was estimated on the basis that 200 t/d would be transported to the T/S and un-loaded into transfer trucks by the stations. It is expected that for a couple of years some part of the arriving waste will be diverted to the tipping floor for the scavengers. However the number of un-loading stations will not be revised considering that in the future the scavengers may go to a new processing plant at Chobar.)
3. Collection trucks w/o dumping	Share of waste collected (This rate shall be provided by KMC)	a) More than b) above? The rate of waste to be diverted to the tipping floor (for scavengers) shall not exceed the share of waste collected by trucks w/o dumping function. b) Less than b) above? c) Tipping floor area requirement? CEMAT explained their estimation for the area requirement, assuming a 40% of waste entering the transfer station to be diverted to the tipping floor, 3 days storage capacity, waste height of 1.4 meters and an added 30% to that area (for scavengers working space). KMC agreed to limit the storage space to 3 days and will provide the more accurate diversion rate based on the actual rate of waste collected by trucks w/o dumping.
4. Medical waste incinerator	Daily amount	a) Need to isolate trucks access (It was agreed to isolate a "corridor" for the access of collection trucks carrying medical waste to the incinerator.) b) Disposal of ash from incinerator (KMC reported that the incinerator has not been continuously operated since its construction. Therefore KMC cannot answer at present on the ash disposal system.)
5. East perimeter road	Narrow	a) Utilize east gate (Although the east perimeter road is narrow, it was agreed to use the east gate. The east perimeter road is presently used by two-wheel vehicles.)
6. Surrounding residents	Odour, waste scattering, pests attraction	a) Waste storage duration (The waste storage capacity shall be limited to 3 days.) b) Green belt (The PP should include the installation of a green belt. Plantation should be selected to survive the conditions generated by the waste disposal operations.)

Subject	Issue	Resolution
		c) Benefits to community (For Teku one idea would be to open the garden for use by the community. Flea market activities may be arranged there. KMC reported that access is not so easy by the surrounding residents. Some consideration may be done in the PP to facilitate access to the site. For the other two sites of Sundarighat and Balaju there was no good idea raised for providing benefits to the surrounding community through the site use.)

(5) Requirements for the detailed design - Discussion 5:

The following requirements were confirmed during the discussions.

Issue	Resolution
1) Requirements for detailed design	a) Collection trucks specifications b) Transfer trucks specifications c) Specifications for other facilities (Specifications of other facilities considered important by KMC such as washing system for the new secondary trucks.)
2) Decision on selected option	a) Time frame, by when? b) Decision maker; by whom? (The selected option shall be decided within KMC. It is not considered a problem that there is no mayor. Decision can be made at a lower level. The Teku land belongs to KMC so the decision on the building will be theirs.)
3) Approvals of detailed design drawings	a) Approval process prior to construction (The detailed drawings shall be approved by KMC before construction. There is no further process required.)
4) Qualified contractors for construction	a) JICA tender conditions b) Nepal conditions c) Long listed contractors These issues will be dealt with at a later stage. We stressed that it is important that the selected contractor be of sufficient capability to complete the works satisfactorily and within the limited construction period.

(6) Discussion related to the options - Discussion 6:

Opinions on the following options were discussed.

A. LAYOUT OPTIONS	One-directional	Two-directional
1) Space utilization	More space required for two ramps	More space required for turning on platform
2) Traffic circulation	Smooth flow – East gate to be utilized	Traffic conflict points – East gate use may be avoided
TEKU T/S	This is the preferable option by the attendants because it limits the traffic conflicts and allows for the use of the East Gate.	

Concerning the structural options CEMAT prepared some preliminary analysis which was discussed. Based on their analysis the above ground option is superior in both construction period as well as construction cost.

B. STRUCTURAL OPTIONS	Above ground	Below ground	Combined
1) Construction period	Shortest	Longest	
2) Construction cost	Lowest	Largest	
3) Maintenance requirements	Low	High	Medium
4) Collection trucks operation	Dump trucks	All truck types + wheel loaders	Dump trucks
TEKU T/S	Most recommendable		

Opinion was expressed that the one-directional, above-ground structure was the optimum one for Teku transfer station. However we also said that it is not necessary to take an immediate decision on this matter now.

Concerning Sundarighat temporary transfer station, one-directional flow is also preferred with above ground structure. However the construction of embankment ramp and re-loading platform may be considered because of the difficulty of constructing structural foundations over the reclaimed waste there.

In the case of Balaju, soil investigation would determine the selection of suitable structure. The one-directional, above ground structure is preferred here as well. There was a site visit to Balaju after the work shop. The poor conditions of the access road into the site were observed. It is imperative to consider surrounding access road improvement along with this transfer station construction project. Also alternative site study may be required.

KMC reported also that there may be social unrest when transfer station construction is initiated.

Concerning Sundarighat T/S, discussion lead to the adequacy of constructing a temporary transfer station there if a new waste processing plant is to be constructed nearby in such an area as Chobhar. That new plant would include both processing function for a portion of the waste and transfer station for the remainder of the waste. Once that plant is ready, LSMC can transport the wastes there and there will be no need to construct a separate transfer station. This will obviously depend on the location of the plant.

3. Distributed/ Used Materials:

1. Presentation Materials from the JICA Study Team
- Planning of Transfer Haul
- Concept Design for T/S Improvement

Subject:	**Training for Planning of Transfer Station (2)**	
Date:	September 13, 2004	
Time:	14:00-16:15	
Venue:	Local Development Training Academy Meeting Room	
Participants:	SWMRMC	Mr. Surya Man Shakya, General Manager
		Mr. Ram Sharan Maharjan, Civil Engineer
		Mr. Nirmal Darshan Acharya, Civil Engineer
	KMC	Mr. Rajesh Manandhar, Section Chief, SWM Section
		Mr. Kiran Ulak, Engineer, SWM Section
		Mr. Prasanna Pradhan
	LSMC	Mr. Rudra Pd. Gautam, Division Chief, Public Construction Division
		Mr. Pradeep Amatya, Section Chief, Environment and Sanitation Section
	BKM	Mr. Laxman Kisiju, Section Chief, Planning and Technical Section
		Mr. Dinesh Rajbhandari, Sanitation Engineer, Planning and Technical Section
	KRM	Mr. Bal Krishna Maharjan, Chief, Planning and Technical Section
		Mr. Gyan Bazra Maharjan, Assistant, SWM/ Accounting
	JICA Study Team	Mr. Toshiyuki Ujiie
		Mr. Mahmoud Riad
		Mr. Vikram Basyal
	MOPE	Mr. V. Janwali, J. S.
		Mr. M. P. Khanal, V. S.
	CEDS/TU	Mr. Suman Man Shrestha, Lecturer
	CEMAT Consultant	Mr. B. M. Shakya, Project Manager
		Mr. Sarad Shrestha, Engineer
		Mr. Niranjan Poudel, Structural Engineer
	East Consult	Mr. A. B. Gurung, Director
		Mr. Ashok Ratna Tuladhar, Consultant Engineer
		Mr. Somraj Gurung, Environmental Engineer
		Mr. Suresh Shrestha, Engineer
		Mr. Sushil Rajbhandari, Managing Director
		Mr. Lokendra Raj K. C., Geotech Engineer
	ENPHO	Mr. Dipak Shrestha, Environmental Scientist, ENPHO
	IRDS	Ms. Pramila Subedi, Hydrogeologist
	Saitama Package-D	Mr. Mahesh R. Gautam, Civil & Environmental Engineer
	Saitama University	Mr. Dinesh Chandra Devkota, Environmental Engineer

1. AGENDA

Time	Program	Facilitator
PART 2 – TRANSFER STATION PILOT PROJECT – TEKU TRANSFER STATION IMPROVEMENT		
14:00 – 14:10	Outline of Teku TS Improvement PP	Mr. Riad
14:10 – 14:30	Existing Operational Aspects	Mr. Rajeesh Manandhar, KMC
14:30 – 15:10	Detailed design review	Mr. BM Shakya, CEMAT
15:10 – 15:30	Considerations on Operational Aspects	Mr. Riad, JICA Study Team
15:30 – 16:00	Discussions	

2. Record of the Training

A. Contents of LF PP WS 1

Three main themes were covered in the work shop as follows:

1) Outline of Teku TS Package 1
2) Existing Operational Aspects
3) Detailed design review
4) Considerations on Operational Aspects

The work shop proceedings were conducted by giving a lecture on each of the topics described above. After the lectures a discussion session was held.

A summary of the discussions is given in Part B hereafter.

B. Memo of Presentation and discussions

(1) Opening Remarks by Mr. Surya Man Shakya, GM, SWMRMC

Mr. Shakya explained that preparatory works for both Sisdol semi-aerobic landfill site and Teku Transfer Station improvement have been in progress for a long time now. There was not much more time so he requested the members to provide any comments that they might have at this time. A long term solution is also urgently required, he reminded the participants. Many times the issue of waste had been raised but always there was a failure to solve it. It is a burning issue. He stressed that before being Consultants, the participating members from consulting firms were citizens of Nepal, so it was their responsibility to work honestly before thinking about financial gains. Nepal was also receiving much support from JICA. He emphasized that the participants should be serious and work towards concluding the project successfully. Now it was the stage of do or die. Consultants will receive support from everywhere, so Mr. Shakya asked them to make their best efforts. Finally he wished the participants all the best.

(2) Outline of the Pilot Project

Mr. Riad briefly outlined the pilot project to date. The concept, planning and design stages have been completed, and we were now entering the construction phase. Two more workshops would be held to coincide with the construction and operation phases of the project.

(3) Existing Operational Aspects

Mr. Rajesh Manandhar of KMC explained the history and operational aspects of this transfer station, the only one currently operating in KMC, since 1986.

In his explanation Mr. Manandhar referred to the compost plant that was set up at the station and had a split level platform to load the produced compost. However this split level platform could not be used for the transfer station improvement because of the location of the platform outside the station and KMC's desire to maintain the compost plant facility as it is for possible use in the future.

Mr. Manandhar analyzed the problems associated with the existing station such as multiple handling of the waste, working hazards, lack of Weigh Bridge, generation of odor and varmints, and open access. The recommendations made by Mr. Manandhar for

improvement of Teku TS included introduction of direct transfer, access control, organizing recycling activities, odor control and development of emergency plans including good public relations. Many of these recommendations are covered in this pilot project.

(4) Detailed Design Explanation

Mr. B. M. Shakya of CEMAT explained the detailed design for the site.

Firstly he detailed the site topography and soil features. He then explained the various layout alternatives that were studied (as reviewed in Workshop 1) and detailed later and the selection of the optimum alternative. This was a one directional traffic flow with two ramps and the un-loading platform above the ground.

The structural design components included foundations for the ramp and un-loading platform, un-loading platform structure, ramps, truck scale foundations and scale house. After explaining the design criteria and loading conditions, Mr. Shakya then showed slides of typical reinforcement for the said components.

Other works covered in the detailed design, and explained by Mr. Shakya included traffic circulation plan, storm water drainage system, identification of structures requiring removal, preparation of BOQ and cost estimates, and construction schedule.

Mr. Shakya also presented a layout showing a concept for the utilization of the tipping area designated for scavengers' activities. Mr. Riad further stressed that this concept may be used by KMC in preparing their final plans and designs for the optimum use of that area.

(5) Operational Aspects

Although this workshop is dedicated to design aspects, and a separate workshop will be held for the operational aspects later on, Mr. Riad gave a brief introduction of some operational conditions that need to be considered for transfer stations in general and aspects particular to Teku as well.

Of particular concern to Teku is the traffic control along the roads leading into the station as well as the improvement of the perimeter road. Mr. Riad also mentioned that KMC should consider in its collection fleet renewal plans, to expand the trucks having tipping capability. Presently the share of waste collected by this truck type is 45-50%. And the split level system cannot serve the trucks without this capability. Also KMC should start as soon as possible to prepare the scavengers plan. Lastly KMC needs to consider where and how the future transfer stations would be constructed.

Discussions

After the completion of the presentations the participants were invited to make their comments or pose their questions.

Comment: It is important to consider the nature of the present transfer station activities when preparing the construction plan for the pilot project. Also there should be no destruction to the existing garden during the construction activities.

Comment: The tipping area for the scavengers should be clearly defined. And system for storage of the separated materials needs to be considered.

Comment: It may be helpful to have a "control tower" to manage the transport system within the station.

Q. One question was raised on the propriety of accepting scavengers' activities at the site and whether this activity should not be discontinued.

A. It is difficult to suddenly discontinue the scavengers' activities at the site. So for the time being some measures to make their work less dangerous and more out of the way of the transfer operations shall be devised.

Q. There is a need to supply enough water to wash the vehicles.

A. The detailed design has found sufficient groundwater for the washing of trucks and a water tank has been designed. However its construction is not included in the pilot project components and needs to be borne by the Nepalese side. Water supply is also important in order to wash the ground to minimize the lingering odor.

Q. LSMC representative, Mr. Rudra explained the steps taken by LSMC to secure their own transfer capacity through construction of a transfer station at Dhobighat. LSMC has secured some budget for this purpose however the EIA is not progressing because of political problems and opposition by the surrounding community. He asked if JICA can provide some funds to assist LSMC in this matter, similar to their action taken for Teku? And also what structure may be appropriate at Dhobighat given the nature of the site on reclaimed waste?

A. Various replies and opinions were voiced regarding LSMC's transfer options as follows:

- From structural viewpoint it is possible to construct an earthen ramp at Dhobighat but a concrete or steel ramp would entail excessive foundation works.
- It is possible to operate Dhobighat as a one-level station using wheel loader, because of the reclaimed site condition, lower waste amounts and temporary nature.
- One possibility that may be looked into is to allow LSMC waste to be transferred via Teku transfer station for a certain time while KMC develops its tipping vehicles fleet. To this proposal KMC raised the concern that if the transfer trucks are operated separately by KMC and LSMC, then LSMC would occupy one of the two re-loading stations and thereby delay smooth transfer station operation. Another fear of KMC was the increased waste that would enter the site and the objections of the surrounding residents to LSMC waste passing through their area.

APPENDIX 2.3

Record of Evaluation Meeting on Pilot Project A-1.1 in BKM

APPENDIX 2.3 RECORD OF EVALUATION MEETING ON PILOT PROJECT A-1.1 IN BKM

Subject:	**Evaluation Meeting**	
Date:	June 22, 2005	
Time:	14:00 - 16:00	
Venue:	BKM Meeting Hall	
Participants:	BKM	Mr. Badrinath Ghimire, CEO
		Mr. Laxma Kisiju, Chief, Planning and Technical Section
		Mr. Dinesh Rajbhandari, Sanitation Engineer, Planning and Technical Section
		Mr. Moti Bhakta Shrestha, Chief, Social Welfare & Sanitation Section
		Mr. Krishna Prasad Suwal, Assistant, Social Welfare & Sanitation Section
		Other staff
	JICA Study Team	Mr. Shungo Soeda
		Mr. Vikram Basyal
	Local community from target and non target area	
	Farmer's group (IPM)	

Program was started by welcome of Mr. Moti. He told that total 350 are the target houses. This is a ten years plan. Ward 17 and 14 has already started source segregation and Ward 15 will start very soon. He added that to make the program successful all the local peoples help and support is required. In new fiscal year, we are planning to expand our program in other areas also and want to coordinate with farmer's group.

Mr. Dinesh presented the topics "Pilot project on practice of improvement of primary collection (source separated)". He requested to the participants for the comments and suggestions on his presentation.

Mr. Moti told that in the past municipality was not successful to mobilize the community properly but now with the help of the JICA Study Team, BKM has initiated on this matter.

Then Mr. Krishna Suwal presented his paper on community mobilization. He described how the Wards 14, 15 and 17 were selected for the target areas. He request to encourage the use of compost and discourage chemical fertilizer for the farming. He added that for better quality of compost segregation is necessary. He also request to the farmer's group to adopt the source segregation.

Then the program inter in the commentary session which are pointed out as follows:

Comments from participants:

- The time of collection (6 to 7 am) is OK.
- To stop the stealing, there should be numbering system in the bucket.
- Housewife needs training rather than to the students because students go to the school for whole day.
- Many people have farming land. If they get training they will make and use compost by themselves and no need to collect the waste by municipality.
- All the three wards of PP are near to each other. We should select the wards of different places to make the program more interesting.

- We have to increase the intensity of the local people to cooperate and support the municipal activities.
- There should be clear definition of the decomposable and non decomposable waste and it should be well informed to each house.
- Notice letter and information of municipality reaches very slowly in the community.
- CEO told that that information can be transferred by phone to the ward secretary and he will spread to their ward.
- To make work fast, any officer of the BKM can sigh and send the letter to the community and no need of CEO's signature.
- Otherwise a notice board can be placed in each ward and all the required information can be past or write on this, said by CEO.
- In a PP area one side of the road is covered in the Pilot Project while other side of the road is not covered so the segregated and non segregated waste is collecting from the same road side, which looks peculiar.
- The horn system is no so practical because when people with waste come from their house after listing the horn, waste collector already lefts the house.
- A recorded notice like "waste collector has arrived, please bring your waste here" can also be announced from some specific area.
- Mr. Krishna Suwal told that it is not practical to go to collect the waste from each house. If one house takes two minutes then 100 houses will take 200 minutes. There should be some specific area to collect the waste and each house should have to deposit their waste in that place.
- The wt. of the Riksha is heavy due to the metal body so it should be made up of light body.
- CEO has queried about how we can go to another area with same types of the program.
- Local people of Ward 17 have expressed their desire to get the training of composting so that they can make compost by themselves.
- Local people told that majority of people are farmer and they want to make compost by themselves. In such situation municipality do not have to collect decomposable waste and save the money for collection and transportation of the waste.
- CEO request to the local people that we all should focus on the composting.
- One local person commented on the video presented by Mr. Soeda about the safety of waste handlers, as they are collecting waste without hand gloves.

Finally, Mr. Laxman said that the main achievement of the meeting was participation of the farmer's group in this meeting. He added that we were just in the initial phase of implementation of source segregation, we were doing by learning.

Selected Photo of Activities

- Pilot Project A -

Selected Photo of Activities - Pilot Project A -

A-1.1: Practice of Source-separated Collection in BKM Ward 17 (June, 2005)

A-1.1: Practice of Source-separated Collection in BKM Ward 17 (June, 2005)

A-1.1: Practice of Source-separated Collection in BKM Ward 17 (June, 2005)

A-1.1: Evaluation Meeting in BKM (June, 2005)

A-1.2: Practice of Collection and Transportation in MTM (June, 2005)

A-1.2: Practice of Collection and Transportation in MTM (June, 2005)

A-2: Training for Public Private Partnership
(June, 2005）

A-2: Training for Public Private Partnership
(June, 2005）

A-3: Workshop for Transfer Station (1)
(July, 2004)

A-3:Topography Survey in Teku
(August, 2004)

A-3: Construction for Improvement of Teku T/S
(November, 2004)

A-3: Discussion with C/P at Teku
(November, 2004)

A-3: Construction for Improvement of Teku T/S (November, 2004)

A-3: Completion of Improvement of Teku T/S (March, 2005)

A-3: Practice of Operation ofTeku T/S (April, 2005)

A-3: Opening Ceremony at Teku T/S (June, 2005)

A-3: Operation of Teku T/S (June, 2005)

A-3: Operation of Teku T/S (June, 2005)

CHAPTER 3

PILOT PROJECT B

PROMOTION OF

WASTE MINIMIZATION

CHAPTER 3 B: PROMOTION OF WASTE MINIMIZATION

3.1 Background and Strategy

In response to the decision to use Sisdol short-term Landfill site by the Nepalese side, minimization of the amount of solid waste to be transported to the landfill site has become very important from the viewpoints of budgetary availability as well as prolonging the life time of the landfill site. Two pronged strategies are considered necessary for reduction of solid waste to be collected, transported and disposed of; large scale (centralized waste processing activities) and small scale (local level or community-based activities) treatments.

Solid Waste Management and Resource Mobilization Center (SWMRMC) and Kathmandu Metropolitan City (KMC) had concluded the contract with Luna Chemical Fertilizer Pvt. Ltd. once to establish a large scale composting facility at Alter in Okharpauwa. However, nothing had happened although SWMRMC had arranged the land for the facility and the contract has been terminated already. In the past, a composting plant operated at Teku Transfer Station (T/S) was closed down mainly due to the public opposition against offensive odor and low quality of the produced compost. In order to avoid the repeat of the past mistakes, the CKV Study Team decided to conduct a pilot project on training for waste minimization facility for the centralized waste processing activities so that the relevant staff of the five municipalities and SWMRMC would be able to arrange a large-scale waste processing facility by stages.

For the local level community-based activities, the CKV Study Team selected three target municipalities, KMC, Lalitpur Sub-Metropolitan City (LSMC) and Kirtipur Municipality (KRM). Practices of distribution of home compost bins to the local people in model areas in KMC and LSMC were tacked as local level waste minimization activities. In the past experiences, various efforts had been made by deferent types of compost bins with different distribution manners. In this Pilot Project, considering lessons learned from the past efforts, new attempts were made by revised uniform bins and manners. In KMC case, they also tried to practice community based waste minimization activities such as promotion of recycling activities by means of establishment of a Recycling Center in addition to home composting in a model area. Vermi-composting was one of major concerns in the Kathmandu Valley because this composting method was being believed to produce relatively better quality compost product which could be sold with higher price. Since this composting method with middle scale had not been applied in Nepal, KMC tried to conduct this activity for promotion of waste minimization.

On the other hand, despite of a dominance of agricultural area, KRM was not free from the problems of plastic, and KRM decided to launch the Pilot Project for Plastic Separation together with home composting by focusing on active participation of local youth and women. Under this Pilot Project, KRM intended to collect separate plastic by mobilizing existing youth groups as well as formulating women's groups to be mobilized and facilitated by same youth groups which were familiar to the local area.

3.2 Basic Plan

3.2.1 Project Purpose

The project purpose of the Pilot Project B was identified as "Capabilities of relevant staff of five municipalities and SWMRMC regarding waste minimization are strengthened."

3.2.2 Outputs

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

Output 1	The waste minimization facility is planned.
Output 2	Local level waste minimization activities are strengthened.

3.2.3 Activities

In order to achieve the outputs set above, the following activities were implemented as the Pilot Project B.

Activities 1 (Pilot Project B-1: Training for Waste Minimization Facility)	
1-1	Verification of existing technology for waste minimization
1-2	Data collection at BKM composting facility
1-3	Market research of compost products
1-4	Development of a basic plan of large scale composting facility
1-5	Pre-feasibility examination on large scale composting facility
1-6	Study tour to composting facilities in India
Activities 2 (Pilot Project B-2: Practice of Local Level Waste Minimization Activities)	
2-1	Practice of community-based waste minimization activities at a model area(KMC)
2-2	Practice of medium-scale vermi-composting (KMC)
2-3	Practice of promotion of home composting (LSMC)
2-4	Practice of plastic separation (KRM)

3.2.4 Plan of Operation

The plan of operation the Pilot Project B is shown in Figure 3.2-1.

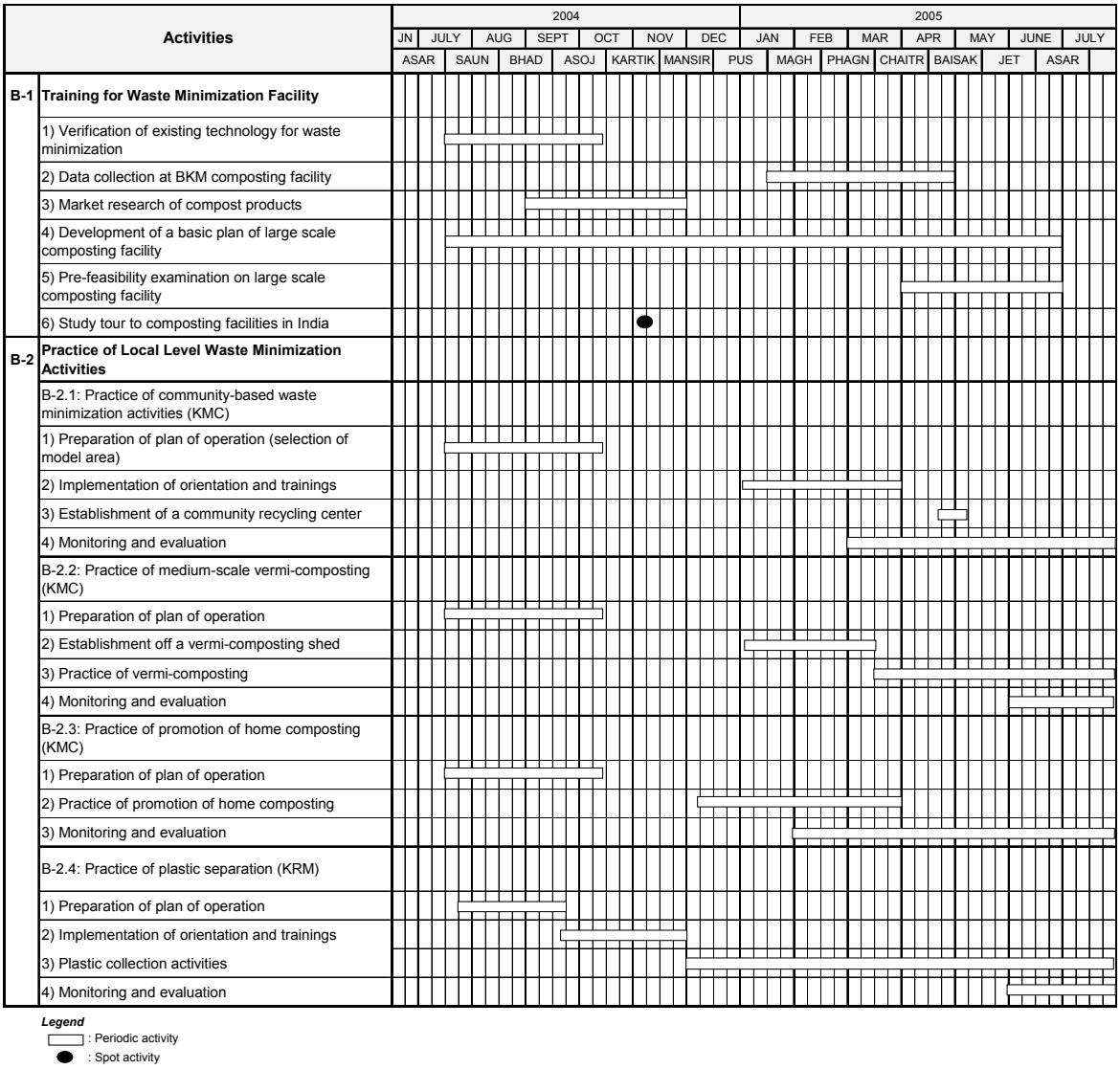


Figure 3.2-1 Plan of Operation of Pilot Project B (Actual)

Source: JICA Study Team

3.2.5 Inputs and Implementation Organization

The inputs provided from both Japanese and Nepalese sides for the Pilot Project B are shown below:

Japan	Nepal
(1) Personnel • Members of the JICA Study Team - Recycling system - Public involvement/Social consideration • Local consultants • Local NGOs and resource person and assistants (2) Study tour (3) Recycling center, vermi-composting shed, home compost bins, suiro and cotton bag, store house, manuals and stationeries for training	(1) Personnel • Counterparts and other relevant staff - SWMRMC - KMC - LSMC - BKM - MTM - KRM • Existing composting facility operators at Bhaktapur (2) Facilities Necessary land, buildings and equipment

The Pilot Project B was conduced by the following implementation organizations.

Output	Implementation Organizations
Output 1 (Pilot Project B-1)	Focal Points of Pilot Project B and relevant staff of the five municipalities and SWMRMC and the JICA Study Team members in collaboration with SILT Consultants Pvt. Ltd. and MEH Consultants Pvt. Ltd.
Output 2 (Pilot Project B-2)	Focal Points of Pilot Project B and relevant staff of KMC, LSMC and KRM and the JICA Study Team members in collaboration with local NGOs, i.e. SOUP, WEPCO, PEMON and B. R. Lucky construction

3.2.6 Preconditions and Important Assumptions

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

Preconditions	▪ The policy of the Nepalese Government remains same regarding the solid waste management. ▪ 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 B are described below.

Important Assumptions that might affect the Outputs	▪ Trained staff continue working in municipalities and SWMRMC.

Important assumptions that might affect the Project Purpose of the Pilot Project B are as follows:

Important Assumptions that might affect the Project Purpose	▪ Waste management conditions (collection, transportation and disposal) in the Kathmandu Valley do not become worse than actual condition.

3.3 Results of the Activities

The main activities conducted under the Pilot Project B are summarized in Appendix 3.1, while the records of workshops are summarized in Appendix 3.2.

3.3.1 B-1: Training for Waste Minimization Facility

The Pilot Project B-1 were, first of all, that discussions and confirmations of various matters regarding a large-scale composting facility among the Focal Points such as the existing technology including lessons learned from the study tour in India. In addition, information collection at a composting facility in Bhaktapur was carried out and the analysis also was conducted with the Focal Points and the various data for market research for compost products were collected. Finally pre-feasibility examination on a large-scale composting facility was conducted according to the conditions decided by themselves.

(1) Activities Implemented

1) Review of Existing Technology of Large-scale Composting Facility

The existing technology for a large-scale composting facility was reviewed in a series of workshops organized by the JICA Study Team. Then the following matters were discussed and confirmed among the Focal Points and relevant staff of the five municipalities and SWMRMC.

- Composting rate in the world
- Large-scale composting facilities in India and Egypt
- Main specification of a composting facility in Alexandria constructed by Japanese Grant Aid
- Examination of the past proposals for composting facility in the Kathmandu Valley

2) Data Collection at BKM Composting Facility

Necessary data, which can be used for development of a basic plan of a large-scale waste processing (composting facility), was collected at the existing BKM Composting Facility. The following secondary data were collected.

- Design specification of the existing composting facility at BKM, capacity, area, process flow, plan drawing of the facility, processing period, designed material balance, necessary human resources for operation
- Production and sales records of compost products in the past five years
- All past compost quality data
- Comments on compost products from consumers or others
- Actual material balance
- Operational data on composting such as temperature and humidity
- Quality analysis of compost product in BKM composting facility
- Fertilization efficiency of compost product

3) Market Survey of Compost Products

Necessary information for analysis of possible market for solid waste compost (SW-C) product in the Kathmandu Valley were collected. The survey was conducted by collecting related data and interview survey as shown below:

a. Collection of Related Information

- Current agricultural condition in the Kathmandu Valley and surrounding area
- Current situation of composting activities from municipal solid waste or other organic solid waste not only in the Valley but also in whole country including the past activities and failed cases
- National standard for inorganic and organic fertilizer quality for agriculture use such as organic component, C/N ratio, total nitrogen, total phosphorus, total potassium, moisture content, electric conductivity, and pH
- Market price of fertilizer
- General information of annual production, importing/exporting, and consumption amount of fertilizer in Nepal (demand & supply) in the last five to ten years
- Critical issues on utilizing compost for agricultural use at the moment and in the past
- National policy for promotion of composting from municipal solid waste

b. Interview on Potential Market and its Demand for SW-C

Interview survey was implemented in accordance with Table 3.3-1 together with the Focal Points of the five municipalities.

Table 3.3-1 Interviews and Field Survey Method for Compost Market Survey

	Target location	Sample No.	Remarks
1	Within the Kathmandu Valley	40	Evenly at the agricultural area in the Valley
2	Outside of the Valley	20	10 samples at 2 areas outside of the Valley
Interviewed items			
Area of farmland, farm products, harvest, consumption quantity of fertilizer (annually in the last 5 years and monthly in last year), types of fertilizer, price of fertilizer, annual expenditure for fertilizer, possibility of use of compost, comments for use of compost, others			

Source: JICA Study Team

Interview and field survey on potential market and its demand for SW-C were conducted at the following places.

i) Inside the Kathmandu Valley - 40 Samples (four samples each)
   - KMC (Mulpani and Tharmasthali VDCs)
   - LSMC (Thaiba and Chanpagaon VDCs)
   - BKM (Hanumante MP and Katunge VDCs)
   - MTM (Bode and Nagadesh)
   - KRM (Kirtipur MP and Panga MP)

ii) Outside the Kathmandu Valley- 20 Samples (10 samples each)
   - Panchkhal- Kavre District
   - Naubise- Dhading District

The structure and contents of interview sheets was discussed at the workshops and finalized by the participants (Focal Points). The interrogators brought a sample of SW-C with them

so that the interviewees could understand what compost products were. The questionnaire sheet used for the interview is shown in Appendix 3.3. The results of interviews were compiled and discussed among the Focal Points at workshop.

4) Development of a Basic Plan of Large-scale Composting Facility as a Waste Processing Facility

The JICA Study Team organized total five times of workshops with the Focal Points including relevant staff of the five municipalities and SWMRMC as shown in Table 3.3-2. At the workshops, planning procedure and conditions, capacity of large-scale composting facility, compost producing system, quality of solid waste and material balance were discussed among the participants. They also examined development of a basic plan of a large-scale composting facility by utilizing the results of data collected at BKM composting facility, market survey of compost products and lessons learned from study tour to Indian composting facilities. Through the series of workshops, the participants acquired planning ability about large-scale composting activities.

Table 3.3-2 Workshops for Development of Basic Plan of Large-scale Composting Facility

No.	Date	Main Discussed Contents of Workshop
1	September 20, 2004	- Introduction of the existing technology for large-scale composting
2	October 1, 2004	- Introduction of several kinds of composting processes and systems - Discussion of survey method of compost market
3	October 11, 2004	- Finalization of compost demand interview survey items - Discussion of review of previous proposed large-scale composting facility - Discussion of basic plan of large-scale composting facility
4	May 25, 2005	- Review of necessity of large-scale composting facility - Discussion of implementation plan of pre-feasibility study of large-scale composting facility - Instruction of questionnaire on pre-feasibility study - Result of composting data collected at BKM Composting Facility - Result of market survey of compost
5	June 1, 2005	- Explanation of result of questionnaire on pre-feasibility study - Discussion on pre-feasibility study

Source: JICA Study Team

5) Pre-feasibility Examination on Large-scale Composting Facility

On the process to develop basic plan of large-scale composting facility, the pre-feasibility examination was conducted by the Focal Points together with the JICA Study Team through estimation of construction and operational cost.

6) Study Tour to Composting Facilities in India

In India, there have been several leading composting facilities including both large scale and small scale (community-based) operated by private sector, NGO or other organization in cooperation with municipality. In order to learn Indian good practices on composting activities with other solid waste management, the five-day study tour to India was carried out on November 7 to 11, 2004.

In this study tour, the Focal Points and relevant staff/official from MOLD, SWMRMC and the five municipalities (total 10 members) participated and visited several relating facilities. Due to the time constraints, the participants were divided into two groups. Nine participants visited Bangalore and Mumbai, while a Focal Point from SWMRMC with a JICA Study Team member visited Ahmedabad in addition to Bangalore and Mumbai (one day) to visit a relatively large-scale composting facility with a capacity of 500 t/day of which system could be applied in the Kathmandu Valley.

(2) Results of the Activities

1) Review of Existing Technology of Large-scale Composting Facility

The following were mainly discussed and confirmed among the Focal Points and other relevant staff of the five municipalities and SWMRMC through the workshops organized by the JICA Study Team.

The composting rates from a high one in the selected countries were confirmed as shown in Table 3.3-3.

Table 3.3-3 Composting Rate in the World (in 1995)

Country	Austria	Spain	Portugal	France	Italy
Composting rate (%)	18	17	15	10	7

Source: Waste Treatment and Disposal, Paulo T. Willia, 1995

Five large-scale waste processing facilities using composting in India were confirmed as shown in Table 3.3-4.

Table 3.3-4 Large-scale Waste Processing Facility of Composting in India (in 1995)

Location	Calcutta	Delhi	Ahmedabad	Madras	Bangalore
Capacity (t/d)	600	600	500	500	300

Source: Excel Industrial data, JICA Study Team

Main specification of a waste processing facility (composting) in Alexandria constructed by Japanese Grant Aid are discussed as shown in Table 3.3-5.

Table 3.3-5 Main Specification of Alexandria Waste Processing (Composting) Facility in Egypt

No.	Items	Description
Basic conditions	Treatment capacity	150 t/d
	Kind of receiving waste	Mixed waste
	Composting process	Aerobic fermentation in windrow
	Compost production	2,000 t/month
Equipment	Waste amount control	Weighbridge
	Sorting machine	Rotary selective pulverizing type machine
	Turning/Aeration	Self moving type exclusive machine
	Facility area	22,320 m^2
	Construction year	1998

Source: JICA Study Team

As for the result of review of the past proposals for a WPF in the Kathmandu Valley submitted to SWMRMC, the selected proponent, Luna Chemical Fertilizer Ltd., had proposed a facility with a rotary kiln of which capacity was 300 t/d, while another proponent, Excel Industries Ltd., had proposed a windrow type. These two type facilities were listed up as alternatives for development of a basic plan.

2) Data Collection at a Composting Facility in BKM

a. Outline of BKM Composting Facility

- Location: Ward 11 in BKM
- Space: 2,900 m^2
- Composting process: Window (see Figure 3.3-1)

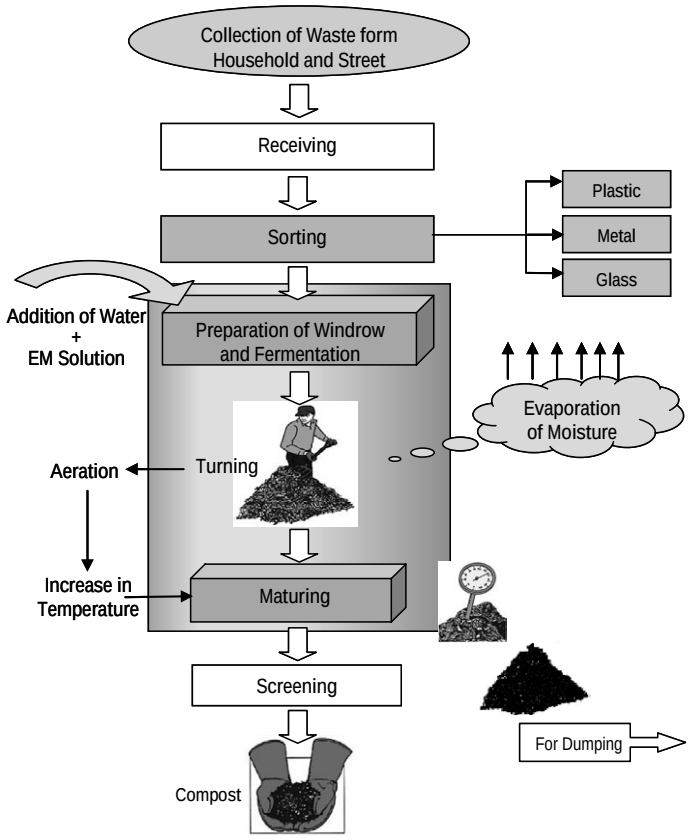


Figure 3.3-1 Process Flow of BKM Composting Facility

Source: JICA Study Team

b. Capacity

- Received waste: 1,751 t/year in 2003/2004 (approx. 6 t/d)
- Compost products: 380 t/year in 2003 (approx. 1.2 t/d)

c. Operation records and sales records of compost produced in the past 5 years

Operation and sales records of compost products in the past 5 years are shown in Table 3.3-6.

Table 3.3-6 Production and Sales Records of Compost Products

Year	1999	2000	2001	2002	2003	Average
Compost Production (t/d)	305	285	380	330	380	336
Compost Sales (t/d)	271	257	344	295	352	304

Source: JICA Study Team

d. Material balance

During this survey, the following two windrows were prepared and composting was carried out in order to get material balance.

Windrow-1: Using received waste without sorting, namely mixed waste
Windrow-2: Using received waste with sorting before composting, namely segregated waste

As a result, material flow and material balance shown in Figure 3.3-2 and in Table 3.3-7 respectively were obtained.

Table 3.3-7 Material Balance and Utility Consumption

Item	Windrow-1		Windrow-2	
	t/d	%	t/d	%
Received waste	4.50	100.0	4.46	100.0
Recycle material	0.01	0.2	0.08	1.8
Evaporation, etc.	2.00	44.9	1.37	30.7
Compost products	0.90	20.2	1.24	27.8
Residue	1.54	34.7	1.77	39.7

Source: JICA Study Team

On the other hand, annual material balance is summarized as shown in Table 3.3-8.

Table 3.3-8 Annual Material Balance in 2003/2004

Item	Received waste	Compost products	Residue
Amount (t/y)	1,751	380	993.7
Percentage (%)	100	21.7	56.8

Source: JICA Study Team

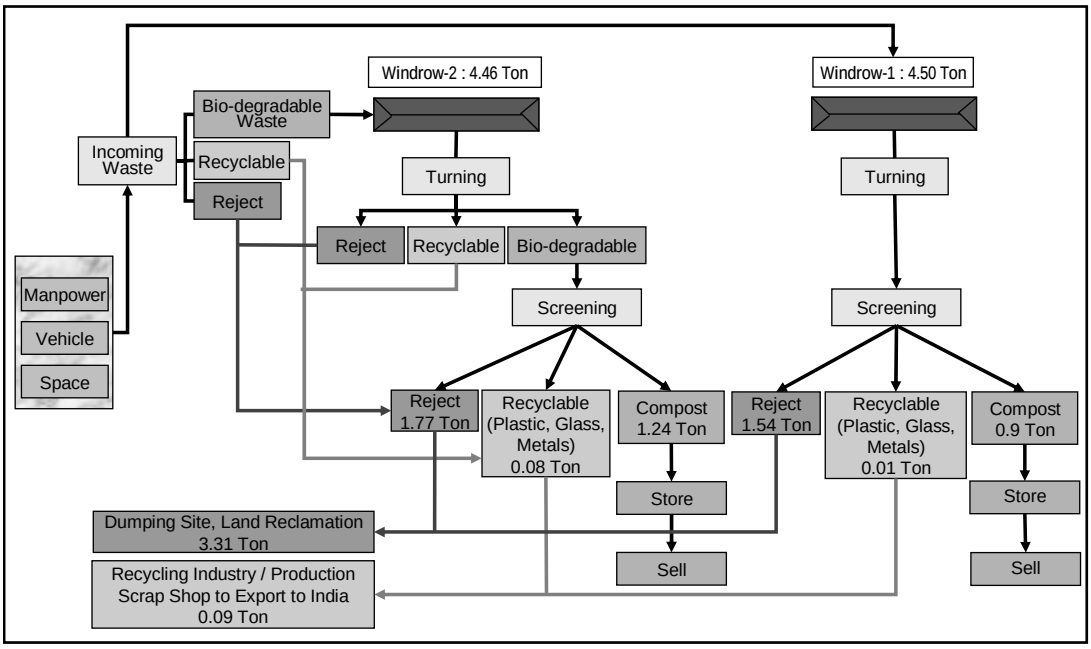


Figure 3.3-2 Process Flow and Material Balance at BKM Composting Facility

Source: JICA Study Team

e. Waste characteristic

Waste composition of received waste during this pilot project is shown in Table 3.3-9.

Table 3.3-9 Waste Composition of Treated Waste

Composition	Received Waste (%)	Received Waste (%)
Garbage/Compost	32.2	37.4
Paper	4.4	2.8
Textile	1.1	0.6
Wood	1.0	1.2
Plastic	3.3	2.1
Metal	0.1	0.0
Glass	0.8	3.5
Ceramics	23.9	12.4
Rubber/Leather	1.4	0.4
Dust (Debris)	31.8	39.6
Total	100.0	100.0

Source: JICA Study Team

The quality of compost product analyzed is presented in Table 3.3-10.

Table 3.3-10 Quality of Compost Products

Sample	pH -	N (%)	P (%)	K (%)	Organic matter (%)	Moisture (%)	C/N ratio -	EC (mS/cm)	Foreign particle (%)
Windrow-1	7.9	0.80	0.23	3.36	8.33	3.09	11.04	0.825	2.64
Windrow-2	7.2	0.88	0.17	3.59	10.01	2.04	11.37	0.9	4.36

Source: JICA Study Team

3) Market Survey of Compost Product

a. Current situation of usage of SW-C

From the market survey of compost product, it was observed that farming area for vegetable and potato was 13,730 ha as shown in Table 3.3-11, while a total of 12 households out of 60 interviewed farmers, namely 20% of farmers, were using SW-C of 2.5 ton/ha/year as shown in Table 3.3-12.

Table 3.3-11 Actual SW-C Usage in the Survey Area

District	Area in Total (ha)	Cultivated Land (ha)	Cereal Crops Area (ha)	Vegetable Area (ha)	Potato Area (ha)
Kathmandu	395	19,205	14,580	3,030	1,595
Lalitpur	385	15,296	11,391	3,055	850
Bhaktapur	119	11,106	5,906	4,150	1,050
Total	899	45,607	31,877	10,235	3,495
				13,730	

Source: JICA Study Team

Table 3.3-12 Actual SW-C Usage in the Survey Area

SW-C Users	Landholding (ha)	Operational Land (ha)	SW-C Used		
			Cropped Area (ha)	SW-C Used	
				(kg/y)	(kg/ha/y)
Ashtaman Haharjan	0.00	1.050	1.050	560	533
Ganesh Bahadur Kumal	0.35	0.350	0.400	350	875
Lok Bahadur Karki	0.50	0.510	0.500	110	220
Sangita Khanal	0.90	0.900	0.250	50	200
Bhim Bahadu Maharjan	0.13	0.280	0.255	3,650	14,314
Budhi Kumar Tyoyana	0.25	0.850	0.700	200	286
Narayan Bhakta Suwal	0.30	1.000	1.000	150	150
Shri Narayan Bhakta Bake	0.40	0.430	0.225	2,200	9,778
Shri Krishna Kumar Suwal	0.10	0.700	0.300	2,200	7,333
Tulsi Bahadur Tako	0.25	0.250	0.200	35,00	17,500
Tej Krishna Sipahi	0.35	0.350	0.225	370	16,44
Ram Bhakta Sipahi	0.25	0.250	0.275	280	1,018
Total	3.78	6.920	5.380	13,620	2,532

Source: JICA Study Team

b. Estimated SW-C demand

The demand of SW-C was estimated under the following conditions.

- 10 to 20% of farmers might use SW-C for vegetable including potato
- Farming area is 13,730 ha (see Table 3.3-11)
- SW-C used rate is 2,532 t/ha/year (see Table 3.3-12)
- SW-C would be used for substitution of 10 to 20 % of manure use
- Present manure use rate is 12,016 t/ha/year (see Table 3.3-13)

Table 3.3-13 Present Manure Use Rate in the Study Area

Seasons	Summer	Winter		Spring	Total
Crops	Vegetable	Vegetable	Bulb	Vegetable	
Area (ha)	10.47	10.06	4.22	6.87	31.62
Manure Use (kg/y)	126,132	145,246	53,712	54,857	379,947
Use Rate (kg/ha/y)	12,047	14,438	12,728	7,985	12,016

Source: JICA Study Team

The result of estimation of the demand of SW-C is shown in Table 3.3-14. The estimated demand was at around 20,000 to 40,000 t/year in the Kathmandu Valley.

Table 3.3-14 Estimated SW-C Demand

Item		Conservative	Optimistic
Farming land	Farm production	Vegetable	Vegetable
	Estimated area where compost may be used in Kathmandu Valley (ha)	13,730	13,730
SW-C	Present compost use rate (kg/ha/y)	2,532	2,532
	Estimated rate of farmer using compost (%)	10	20
	Demand-1 (t/y)	3,476	6,953
Substituted Manure	Present manure use rate (kg/ha)	12,016	12,016
	Present manure use rate (t/y)	164,980	164,980
	Estimated substitution rate (%)	10	20
	Demand-2 (t/y)	16,498	32,996
Total demand (t/y)		19,974	39,949

Source: JICA Study Team

4) Development of a Basic Plan of Large-scale Composting Facility

A basic plan of a large-scale composting facility was developed based on the results of questionnaire (see Appendix 3.4) and the workshops. Main specification decided such as capacity of composting facility, kind of waste to be treated, composting method and other information supportive for decision are shown in Table 3.3-15. In particular, the capacity of the facility was discussed and it was agreed that it should be small at the beginning and be increased to 300 t/d based on the experience of operation and management of the facility. It was concluded that the facility should be developed with a treatment capacity of 50-100 t/day in the beginning. Aerobic fermentation in windrow was agreed to be adopted because there are many successful cases of windrow in India and Nepal has an experience of similar method at the BKM composting facility even its scale is relatively smaller than that of planned.

Table 3.3-15 Proposed Main Specification for Large-Scale Composting Facility

No.	Items	Description		Specification	Basis for decision
		Question	Answer		
＜Result of questionnaire>					
1.	Facility capacity	100 t/d more	18%	50 t/d and 100 t/d to be studied as pre-F/S	In initial stage should be medium scale, not large scale
		100 t/d	6%		
		50 t/d	44%		
		30 t/d or less	32%		

No.	Items	Description		Specification	Basis for decision
		Question	Answer		
2.	Kind of waste	Separated waste	61%	Mixed waste	Source separation is too difficult at the present / near future
		Mixed waste	33%		
		Not decided	6%		
3.	Composting method	Windrow	85%	Windrow with turning machine (wheel loader)	Existing technology at BKM and Teku should be utilized.
		Vermi	10%		
		Mechanical	5%		
4.	Aeration method	Man-powered	32%	Using wheel loader	Wheel loader required for 50t/d more
		Mechanical	68%		
5.	Finishing / Refining	Screening only	72%	Screen + manual glass removal	Considering easy operation and low cost
		w/ glass removal	28%		
6.	Sales shape	Bulk	57%	Bulk with packing	Subject to customer requirement
		Packing	43%		
7.	Quality control	Standard applied	68%	C/N, pH, N, P, K	Necessary for sale
		No standard	32%		
8.	Environmental protection	Leachate Collection	29%	At least 3 items in the left should be considered.	Environmental protection is most important for construction.
		Tree planting	26%		
		Buffer zone	44%		
		Other	6%		
9.	Suitable selling price	1 Rs/kg	17%	1 NRs/kg and 100 NRs/kg to be studied as pre-F/S	Operational cost should be recovered.
		2 Rs/kg	25%		
		3 to 4 Rs/kg	16%		
		5 Rs/kg	25%		
		6 Rs/kg or more	16%		
10	Operational organization	Municipal staff/worker	6%	Municipality staff with private worker	At first step shall be operated mainly by Municipality
		Municipal with private	44%		
		Entrust to private sector	50%		
11	Management of the facility	Municipality(s)	28%	Municipality (KMC)	Municipality shall manage at first step.
		Entrust to private sector	72%		
<Other basic conditions confirmed at workshop>					
12.	Material balance	Received waste		100%	According to result of BKM data collection survey and other related data
		Recyclable material		10%	
		Composts products		20%	
		Residue		30%	
13	Location			Panga area	Away from settlement

Source: JICA Study Team

5) Pre-feasibility Examination on Large-scale Composting Facility

The pre-feasibility examination was conducted for two cases, treatment capacities of 50 t/day (Case-1) and 100 t/day (Case-2) as follows:

a. Estimation of investment cost

Investment costs of both cases (50 t/day and 100 t/day) were estimated at approximately Rs 43,400,000 and Rs 60,000,000, respectively. Breakdown of the construction costs are shown in Table 3.3-16.

Table 3.3-16 Construction Cost of Large-Scale Composting Facility

Item		Case-1: 50 t/d		Case-2: 100 t/d	
		Specification	Cost (x103Rs)	Specification	Cost (x103Rs)
Civil work	Land acquisition	1.5 ha	8,100	2.4 ha	12,960
	Foundation	for weighbridge	307	for weighbridge	307
	Access road	500 m	7,500	500 m	7,500
	Fence	500 m	525	640 m	672
	Sub-total		16,431		21,439
Building	Sorting area	300 m^2	2,400	500 m^2	4,000
	Screening area	300 m^2	2,400	400 m^2	3,200
	Admi. office	150 m^2	1,650	200 m^2	2,200
	Guard house	9 m^2	99	15 m^2	165
	Garage, Workshop	100 m^2	900	200 m^2	1,800
	Shower room	25 m^2	375	50 m^2	750
	Sub-total		7,824		12,115
Equipment	Weighbridge		2,000	30 t x 1set	2,000
	Sorting Screen	10 t/h x 1set	2,000	20 t/h x 1set	3,000
	Charging machine	1 m^3 x 1set	4,000	1 m^3 x 2sets	8,000
	Turning machine	2 m^3 x 1set	7,500	2 m^3 x 1set	7,500
	Screening equipment	3 t/h x 1set	2,000	5 t/h x 1set	4,000
	Miscellaneous	1set	875	1set	1,225
	Sub-total		18,375		25,725
Utility	Water supply	$3m^3$/d, d=50mm	150	$3m^3$/d, d=50mm	150
	Electricity supply	100KVA	500	100KVA	500
	Telephone line	1line	25	1line	25
	Drainage	$3m^3$/d, d=200mm	100	$3m^3$/d, d=200mm	100
	Sub-total		775		775
Total			43,406		60,054

Source: JICA Study Team

b. Estimation of operational costs

Annual operational costs of both cases (50 t/day and 100 t/day) were estimated at approximately Rs 5,200,000 and Rs 7,800,000, respectively. Breakdown of annual operational costs (expenditures) are shown in Table 3.3-17.

Table 3.3-17 Annual Operational Costs of Large Scale Composting Facility

Item		Unit cost	Case-1:50 t/d		Case-2: 100 t/d	
			Number	Cost (Rs/y)	Number	Cost (Rs/y)
Personnel	Manager	20,000 Rs/M	1	240,000	1	240,000
	Engineer	15,000 Rs/M	1	180,000	1	180,000
	Driver	8,000 Rs/M	3	288,000	4	288,000
	Operator	8,000 Rs/M	2	192,000	2	192,000
	Worker	7,000 Rs/M	7	588,000	13	1,092,000
	Assistance-1	6,000 Rs/M	6	432,000	10	720,000
	Assistance-2	5,000 Rs/M	6	360,000	10	600,000
	Guard	5,000 Rs/M	3	180,000	3	180,000
	Sub-total		29	2,460,000	44	3,588,000

Item		Unit cost	Case-1:50 t/d		Case-2: 100 t/d	
			Number	Cost (Rs/y)	Number	Cost (Rs/y)
Operation	Fuel	31 Rs/liter	4 liter	37,200	7.2 liter	66,960
	Electricity	9.5 Rs/kwh	360 kwh/d	1,026,000	520 kwh/d	1,482,000
	Water	250 Rs/m^3	3 m^3/d	225,000	6 m^3/d	450,000
	Sub-total			1,288,200		1,988,960
Maintenance		20 % of above		258,000		400,000
Others		30% of sub-total		1,201,860		1,796,088
Total				5,208,000		7,783,048

Source: JICA Study Team

c. Comparison between costs and benefits

As the results of above calculation, if the sales price of compost product is set at Rs 1.2/kg, both cases are in deficit, while if the sales price can be set at Rs 3.0/kg, both cases convert to surplus as shown in Table 3.3-18.

Table 3.3-18 Result of Pre-Feasibility Examination on Large-scale Composting Facility

No.	Items		Case-1		Case-2	
Capacity	Receiving waste (t/d)	(t/d)	50		100	
		(t/y) *	15,000		30,000	
	Compost product	(t/d)	10		20	
		(t/y)*	3,000		6,000	
Costs	Investment cost (Rs)		Approx. 43,400,000		Approx. 60,000,000	
	Expenditures (Rs/y): A		Approx. 5,200,000		Approx. 7,800,000	
	Expected compost sales price (Rs/kg)		1.2	3	1.2	3
	Revenue (Rs/y): B		3,600,000	9,000,000	7,200,000	18,000,000
Benefits (Rs/y): B-A			- 1,600,000	3,800,000	- 600,000	10,200,000

Note: * It is assumed that annual working days are 300 days
Source: JICA Study Team

6) Study Tour to Composting Facilities in India

The main sites visited in India are as follows:

a. Bangalore (November 8, 2004)

i. Bangalore Municipality (Dept./Section in charge of solid waste management)
ii. Karnataka Compost Development Corporation (KCDC) (see Photo below)
Waste : Mixed waste
Capacity : Approx. 350 t/d
Composting system : Windrow composting /Vermi-composting
Compost product : Approx. 70 t/d
iii. Terra Firm
Waste : Mixed waste
Capacity : Approx. 96 t/d
Composting system : Windrow composting/Vermi-composting
Compost product : Approx. 14 t/d

b. Mumbai (November 9 and 10)

i. Mumbai Municipality (Dept./Section in charge of solid waste management)

ii. Vermigold International (VI) at Dadar Pumping Station
- Waste : Mixed waste
- Capacity : Approx. 5 t/d
- Composting system : Windrow composting/Vermi-composting

iii. Green Cross
- Waste : Mixed waste
- Capacity : Approx. 8-9 t/d
- Composting system : Windrow composting

iv. Transfer Station
- Waste to transfer : 500t/day

v. Gorai Landfill Site
- Area : 15ha
- Waste disposed of : 2,000-2,200t/day

c. Ahmedabad (November 10, 2004)

i. Large scale compost plant of Excel Industries Ltd. (see Photo below)
- Waste : Mixed waste
- Capacity : Approx. 500 t/d
- Composting system : Windrow composting
- Compost product : Approx. 100 t/d

KCDC's Composting Facility in Bangalore

Excel's Composting Facility in Ahmedabad.

Large-scale Composting Facilities in India

The record of the study tour in India is summarized in Appendix 3.5.

3.3.2 B-2: Practice of Local Level Waste Minimization Activities

In this Pilot Project B-2, four broad activities were implemented and results of the activities are summarized as follows.

(1) B-2.1: Practice of Local Level Waste Minimization Activities in a Model Area in KMC

1) Activities Implemented

KMC had initiated various activities in the past for promoting community-based waste minimization, particularly household composting. These activities had included production of promotional materials, production and distribution of home compost bins and vermi-composting kits, training on home composting and education campaigns. However, these efforts had been scattered throughout the city and consequently its7 effects had watered down. Based on these lessons, Pilot Project B-2.1 aimed to concentrate efforts on community-based waste minimization activities in one particular ward so that it was easy to monitor the impacts. It was also expected that this ward became as a model ward and other wards or neighborhood would learn the experiences.

Ward 21, located in the core area of KMC, was selected as a model area, because i) there was a ready active network of local NGOs and CBOs, ii) door-to-door waste collection service by private sector were not introduced, and ii) KMC was able to supervise and monitor the activities easily thanks to a short distance from the office at Teku. Outlines of Ward 21 are as follows:

- Number of households : 4,129 (as of year 2000)
- Population : 18,244 (as of year 2000)
- Generated waste amount : 25 m^3/day

In the past initiations in waste recycling in Ward 21, the local people had showed their interest in waste composting and recycling, and several programs such as collection of recyclable materials and promotion of home composting had been initiated. This Pilot Project was designed to accelerate these activities taking into consideration of the lessons learnt from the initiatives. KMC held meetings many times with Ward 21 Area Network involving eight NGOs/CBOs for the preparation of this Pilot Project. This Pilot Project consisted of the following two activities.

a. Promotion of home composting to target 500 households
   - Training on home composting
   - Distribution of home-composting bins (CKV compost bins)
   - Promotion of home gardening to utilize compost product

b. Promotion of community recycling activities
   - Encouragement of people for separation of recyclable waste at sources
   - Establishment of a community recycling center (CRC)
   - Promotion of utilization of the CRC to people
   - Sale of recyclable waste collected at the CRC

KMC organized two-day trainings with support from local NGO for target 500 households in order to disseminate concept of community-based SWM and know-how of home composting in January-March, 2005. Home compost bins (CKV compost bin) were provided to the participants of the trainings for starting home composting activities in their house after the training. In order to make their activities sustainable, several motivators were assigned and visited each of 500 households once a week for monitoring their activities and discussing the

problems which they were being faced. KMC also conducted follow-up trainings for the household who continued home composting activity for three months in order to share the experiences and problems. Meanwhile, inorganic waste such as plastic, paper, glass and iron were collected by local people and sold to scrap dealers at the CRC which was established within the target area.

2) Results of the Activities

The activities were implemented by CMU of KMC with support of JICA Study Team and local NGO, Society for Urban Poor (SOUP). A total 500 sets of CKV compost bins (see Pilot Project B-2.3) was distributed with a series of training sessions. Motivators assigned under Pilot Project visited each of the houses using CKV compost bin and checked their composting activity. If needed, the motivators provided those who have problems and questions with necessary advice and measures. Finally, almost all households have succeeded making compost product which was used in their pot plant and/or home gardening.

In order to clarify the waste reduction effect by home composting, quantity survey was carried out for a period of 8 days starting from June 9, 2005 under Pilot Project E-2.1. There were 15 households (HHs) provided with CKV compost bins. Average per capita generation waste was 32.9 g per person per day. Similarly there were 15 households (without CKV compost bin) that were selected near to the houses with CKV compost bin. Average per capita generation waste 130.7 g per person per day.

Comparing average per capita (organic, inorganic and total) for the two cases as shown in Table 3.3-19, it is evident that households provided with CKV compost bin generated less waste than the houses without bins.

Table 3.3-19 Comparison between HHs with and without CKV Compost Bin in KMC (unit: g/day-cap.)

Day		1	2	3	4	5	6	7	avg per capita
		Thur	Fri	Sat	Sun	Mon	Tue	Wed	
With bin	org	10.3	1.7	0.4	22.5	17.9	2.6	23.7	11.3
	inorg	30.6	18.0	25.7	11.0	35.4	9.3	21.5	21.6
	total	40.9	19.6	26.0	33.5	53.3	11.8	45.2	32.9
Without bin	org	69.8	76.3	68.7	96.9	112.1	120.9	130.8	96.5
	inorg	20.8	47.0	24.8	66.9	21.0	32.1	27.2	34.3
	total	90.6	123.3	93.5	163.8	133.1	152.9	158.0	130.7

Source: JICA Study Team, Field Survey, 2005

As for the recycling activities, the CRC was set up at the core area of Ward 21 in June 2005 and immediately started receiving recyclable materials from the surrounding people. The operation of the CRC had been supported by staff of Nepal Recycle Producer Association (NEREPA). As this association can be playing as a scrap dealer, the received recyclable materials could be sold easily and this strategy would make the CRC sustainable.

(2) B-2.2: Practice of Medium-scale Vermi-Composting

1) Activities Implemented

On a small scale, in Nepal, vermi-composting has been tried at household level by using a special species of earthworms to convert kitchen waste into relatively high quality compost. KMC has been also promoting vermi-composting for several years by conducting research, providing training, promoting through the media and selling vermi-composting kits. As a result of these activities, many households in KMC had now started to conduct vermi-composting. However, although vermi-composting had become quite successful at the household level, it had not yet been used at a medium-/larger-scale.

Experience from the study tour in India in November 2004 under Pilot Project B-1, vermi-composting could be recognized to be successful on a larger scale as well, particularly in the case that the solid waste was homogenous such as the waste from a vegetable market. Since almost all the waste from the vegetable market was dumped with the other municipal waste, KMC therefore planned to start a medium-scale vermi-composting for managing market waste from the Kalimati vegetable market. The waste from this source was considered to be suitable for vermi-composting because of high percentage of soft organic matters in the waste.

The activities were implemented in two phases under this Pilot Project B-2.2. The first phase focused on setting up a vermi-composting facility. A vermi-composting shed was established at Teku T/S and it started to receive the waste from the vegetable market from March 2005. Activities conducted during the first phase are as follows:

- Review experiences in vermi-composting in Nepal and India
- Selection of the site and design of the vermi-composting shed, aerobic composting chamber and compost box
- Construction of vermi-composting shed, aerobic composting chamber, composting box and other related infrastructure
- Procurement of necessary equipment and materials including earthworms for vermi-composting

The second phase focused on operating the facility and conducting the examination to sustain the facility. The operation was made based on the suggestion of a local resource person and the JICA Study Team. KMC observed composting condition regularly with a local resource person. After commencement of operation, KMC discussed marketing strategy of vermi-composting product including venue for selling, price, package design and promotion campaign. At the final, KMC together with the JICA Study Team and local resource person produced a manual for medium-scale vermi-composting for the further activities. Activities conducted during the second phase are as follows:

- Operation of vermi-composting facility
- Quality analysis of vermi-compost
- Preparation of marketing strategy for vermi-compost
- Preparation of a vermi-composting manual

2) Results of the Activities

A vermi-composting has been conducted by KMC with support from local NGO, Pesticide Monitor Nepal (PEMON). The operational situation of vermi-composting is as shown in Table 3.3-20.

Table 3.3-20 Operational Situation of Vermi-Composting in Teku

No.	Items	Description
1.	Start of operation	March 21, 2005
2.	Planned capacity (Received waste amount)	500 kg/d
3.	Waste to be composted	Vegetable market waste from Kalimati
4.	Expected compost products	200 kg/d
5.	Expected sales price	20 Rs/kg

Source: JICA Study Team

After two to four weeks of aerobic decomposition, the solid waste had been placed in the vermi shed made from bricks and cement (see photo right). The beds are 1.0 meter wide, 0.6 meter high and 3.0 meter long. Two beds are placed next to each other and in between each set of two beds there is a passage way of about 0.6 meter.

The beds have a layer of coconut husk at the bottom to facilitate drainage and movement of earthworms. The earthworms of species *Eisenia foetida* had been released on top of the waste. Approximately 30 kg of the worms or about 100,000 worms was required for each of the vermi beds. Vermi-composting was completed for 30 to 40 days. During this time the waste was regularly monitored to ensure that the temperature did not go up, the moisture content was about 50 percent and the worms were healthy.

At the end, a manual for medium scale vermi-composting was produced (see Supporting Report II). The manual describes about vermi-composting, the process of vermi-composting and the uses of vermi-compost as well as the worms. The manual was prepared based on the experiences of the Pilot Project and will be helpful for anyone interested in replicating this pilot project.

(3) B-2.3: Practice of Promotion of Home Composting in LSMC

1) Activities Implemented

After the examination of the current situation of waste generation and activities of NGOs by LSMC, LSMC decided to promote home composting activities in collaboration with active NGOs.

a. Development of a Strategic Plan

LSMC prepared a strategic plan for promoting home composting by distributing 600 compost bins in order reduce the amount of waste to be discharged from the sources. LSMC selected target areas as Wards 1, 2, 5, 7, 8, 11, 12, and 18 because these areas are

relatively densely populated and consequently a relatively large amount of solid waste is being generated. LSMC called for supports from local NGOs for the bin distribution and training. The selected NGOs were Society for Urban Poor (SOUP) and Women Environment Preservation Committee (WEPCO). LSMC established the implementation organization as shown in Figure 3.3--3 allocating the areas to the selected NGOs, but LSMC (CDS) also had responsible wards, i.e. Wards 5, 7 and 8.

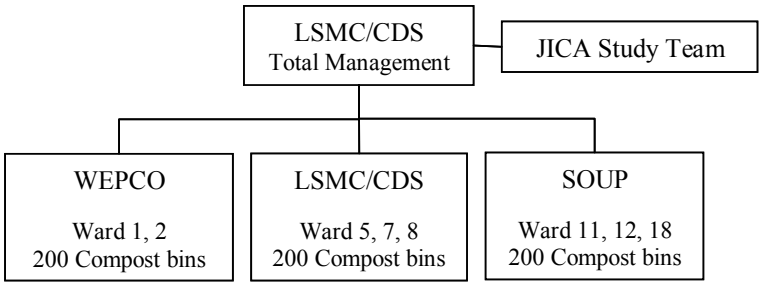


Figure 3.3-3 Implementation Organization of Pilot Project B-2.3

Source: LSMC

It was also decided that CKV compost bins would be distributed with cost shared by compost bin users so that bin users (households) would have an ownership for home composting activity.

b. Designing of CKV Compost Bin

In the course of designing of this Pilot Project, a type of home compost bin was discussed among the Focal Points from KMC, LSMC, KRM and SWMRMC, the JICA Study Team and a resource person from local NGO, Ce Pro In. As a result of the discussions, it was agreed to use unified home compost bins, namely a “CKV compost bin”, in the Pilot Project. The CKV compost bins were also to be used in Pilot Projects B-2.1 (in KMC), B-2.4 (in KRM) and D-3 (in BKM).

c. Training for Home Composting and Distribution of CKV Compost Bins

A series of training sessions, one day or two days training, including orientations for trainers, motivators, and users as well as potential users (local people) of home compost bins was conducted when CKV compost bins were distributed. A manual of "How to Use Home Compost Bin", which was prepared using Ashakaji illustrations under Pilot Project B, was also prepared and distributed to the home compost bin users (see Supporting Report II).

d. Compost Quality Analysis

In order to assess home composting activities and examine the data for further improvement of the activities, and finalize of Manuals "How to Use Home Compost Bin" and "Training of Trainers (TOT)", compost quality produced in distributed CKV compost bins was analyzed.

The compost sampling was decided selecting those houses who had aged more than three months old CKV compost bins because compost decomposition takes about three months. Samples were taken proportionately from each ward of each municipality. The collected sample was 27 from KMC, 66 from LSMC and 7 from KRM. Hundred compost samples were collected and given to Agricultural Technology Centre (ATC) for analysis. Compost samples was analysed in folowing items (componenets).

Table 3.3-21 Compost Test was Analysed in the following Items

SN	Compost Test Items
1	Moisture Content (%)
2	pH
3	Electric conductivity (EC)
4	Organic Matter (%)
5	C/N Ratio
6	Total Nitrogen (%)
7	Total Phosphorus (%)
8	Total Potassium (%)

2) Results of the Activities

a. CKV Compost Bin

The specification of the CKV compost bin was discussed based on the past experiences by KMC and NGOs, such as capacity, size and number of holes for aerobic condition, and accessories. The designed CKV compost bin is as follows, while its concept design is shown in Figure 3.3-4.

a) Goods: 100-liter compost bin with tool set

b) Specification of compost bin

- Capacity : 100 liters
- Material : Plastics
- Structure : Hexagonal
- Color : Green (except black lid)
- Weight : Bin 3.7 kg (thickness 4 mm), Lid 0.4 kg
- Tools : Fork, Spatula, Mesh

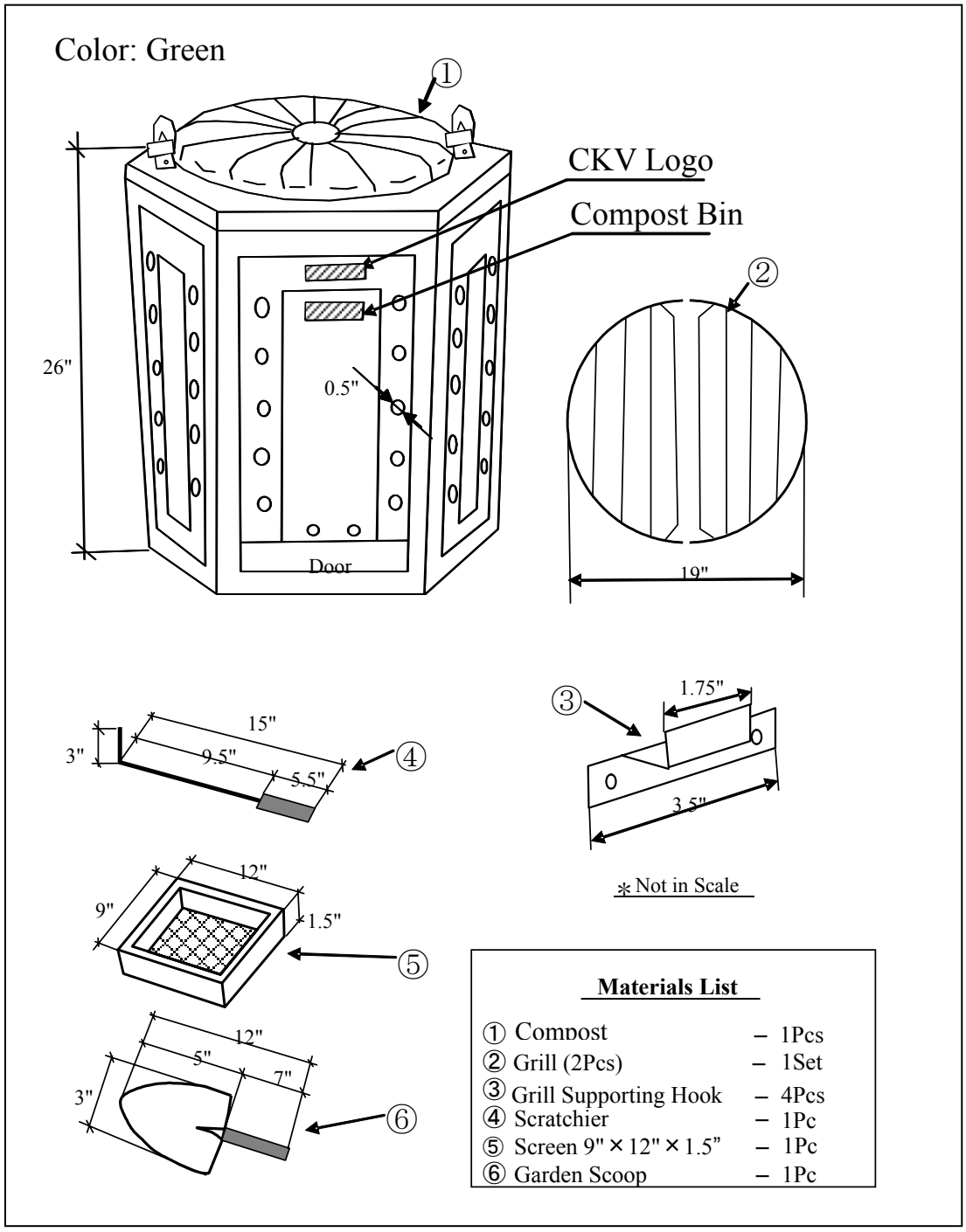


Figure 3.3-4 Developed 100-Liter CKV Compost Bin

b. Distribution of CKV Compost Bins

As a result of a series of training sessions for the local people, the participants received CKV compost bins by paying Rs 250 a bin as their contribution willingly. After the distribution, the composting activities were monitored by assigned motivators weekly by using a checklist and follow-up training (refresher training) sessions were conducted. The problems and experiences were shared at that time. Consequently, almost all households (compost bin

users) have succeeded in making compost and they were using compost product for their pot plant and/or home gardening in the same way as KMC.

CKV compost bin

Training for home composting

d. Quality of Compost Product

The laboratory results of 100 compost samples produced from CKV compost bins are presented in the Table 3.3-22. The average analysis results of KMC (27 samples), LSMC (66 samples) and KRM (7 samples) show that no great differences are observed except for Organic Matters (O.M.). The nutrients content (N, P_2O_5 and K_2O), O.M. content and pH of home compost were found better than other compost produced by different sources and reported in different reports. The main reasons of quality home compost could be that in home composting purely organic waste was used and the organic waste were mostly kitchen waste (green matters) which contains high nutrients, etc.

Table 3.3-22 Result of Laboratory Analysis of Compost Product

Municipalities	pH	Moisture (%)	O.M. (%)	Total N (%)	Total P_2O_5 (%)	Total K_2O (%)	EC{1:5 Extract} (mmhos/cm)	C/N Ratio
KMC Average	7.9	41.2	11.5	1.16	0.62	2.94	1.48	6.2
LSMC Average	7.7	39.5	12.5	1.15	0.76	3.71	1.26	7.1
KRM Average	7.8	40.2	7.8	0.83	0.52	3.49	1.35	5.6
Overall Average	7.7	40.0	11.9	1.13	0.70	3.49	1.33	6.7
Range	6.2 - 9.0	12.7 - 71.2	2.1 - 35.8	0.30 - 3.02	0.42 - 2.02	3.01 - 5.69	0.62 - >2.0	1.1 - 31.8

Note: Laboratory Analysis of compost was done in Agriculture Technology Center
Source: JICA Study Team

e. Waste Reduction Effect

Quantity survey for LSMC was carried out on the same dates as in KMC under Pilot Project E-2.2. The sample size in LSMC was 15 households provided with CKV compost bin and 15 households near to these (without CKV compost bin).

In the case of households provided with CKV compost bin, average per capita generation of waste was 92.0 g per person per day. Similarly, average per capita generation of waste was 116.7 g per person per day at the households without CKV compost bin. Comparison of average per capita (organic, inorganic and total) for the two cases was shown in Table 3.3-23.

The solid waste generated from households with CKV compost bin was less compared to the households without bin.

Table 3.3-23 Comparison between HHs with and without CKV Compost Bin in LSMC (unit: g/day-capital)

Day		1	2	3	4	5	6	7	avg per
		Thur	Fri	Sat	Sun	Mon	Tue	Wed	capita
With bin	org	115.7	5.6	24.6	42.8	30.0	25.5	18.5	37.5
	inorg	73.6	97.9	74.0	45.6	22.8	26.5	41.2	54.5
	total	**189.3**	**103.5**	**98.5**	**88.3**	**52.8**	**52.0**	**59.7**	**92.0**
Without bin	org	93.1	79.1	64.1	63.6	69.0	115.8	65.3	78.6
	inorg	41.7	44.7	24.4	17.0	60.1	40.4	38.7	38.2
	total	**134.8**	**123.8**	**88.5**	**80.6**	**129.1**	**156.2**	**104.0**	**116.7**

Source: JICA Study Team, Field Survey, 2005

(4) B-2.4: Practice of Plastic Separation in KRM

1) Activities Implemented

At first, KRM developed a work plan including implementation organization of the activity through discussions with the JICA Study Team as follows:

Objectives : to raise awareness about the 3R concept,
to collect plastic from communities by promoting suiro[1] and sales to Kabadi (scrap dealer),
to mobilize the local youth to be involved in solid waste management activities as active agents and facilitators at the local community level.

Targets : Youth group and women in Ward 1 (core area)
Youth group and women in Ward 5 (semi-market area)
Youth group and women in Ward 14 (rural area)

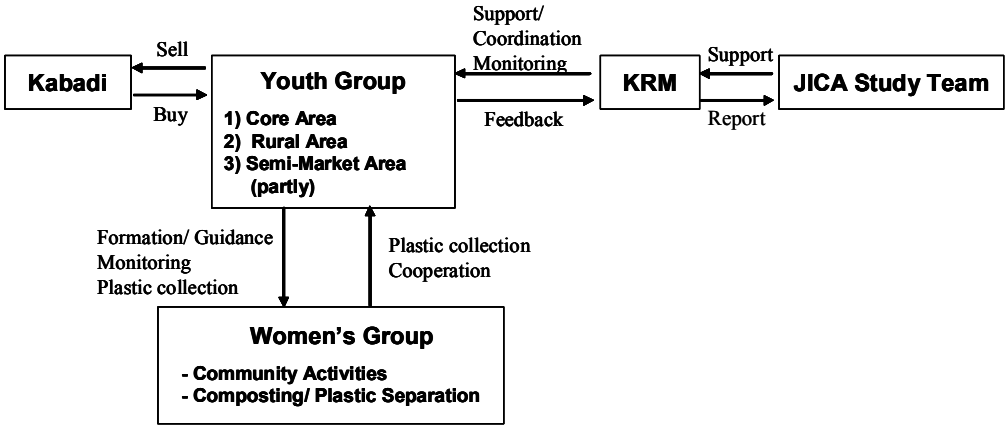


Figure 3.3-5 Implementation Organization of Plastic Separation in KRM

Note: Kabadi is the name given to scrap dealers who buy recyclable materials from cycle hawkers.
Source: KRM

Based on the work plan, KRM implemented the following activities.

[1] Suiro is a metal wire and its one side has formed sharp protrusions on which plastic bags are stuck to dry and the other side is a suitable shape to hang on the wall.

a. Training for Youth Groups and Women

As a first step, KRM organized and facilitated a three-day training for the youth group members from three target areas on September 24-26, 2004 with support from a resource person in charge of community mobilization and household composting. There were 29 participants of which 24 were young women. The training covered 3R concept, plastic collection by using "suiro" and methodology and practical exercises of home composting as follows:

- Introduction of the Study and Pilot Project
- Theoretical and conceptual aspects of solid waste
- Concept of 3R
- Plastic collection by using "suiro" including introduction of Hetauda's example[2]
- Home composting by bin, vermi and pile methods
- Planning for community-based SWM activities

Participants had a chance to try to make compost practically after the lectures. On the last session, each youth group discussed how to implement their activities and mobilize local people. Finally, each participant made commitment to implement some activities for waste minimization for their respective areas.

Following that, two-day training sessions for women in every target wards were conducted by KRM in cooperation with the local youth group on October 9-14, 2004 as shown in Table 3.3-24. There were around 25-35 housewives participated in each training session, who had had few chances to join in community based activities before.

Table 3.3-24 Two-day Training for Women in KRM

Ward	Date	Venue	Participants
Ward 1	October 13-14, 20004	Ward Community Space	Women (30), Youth group from ward 14 (observer)
Ward 5	October 11-12, 2004	Ward Community Space	Women (31)
Ward 14	October 9-10, 2004	Ward Community Space	Women, Children (30)

Source: JICA Study Team

After the lecture on 3R concept, the suiro program and composting, women were divided into several groups so as to try composting practically. At the end, suiro and cotton bags were distributed to the participants. CKV compost bins were also distributed to the people who also expressed interest in home composting activity. The distributed equipment for Pilot Project are shown in Table 3.3-25.

2 As one of the activities under Pilot Project D-1, the Study carried out the three-day study tour to Hetauda on September 8-10, 2004 in order to observe the community-based composting and plastic collection using "Suiro", plastic recycling center and municipality's initiative.

Table 3.3-25 Distributed Equipment in KRM

Equipment	Specification/Usage	Distribution	
		Target	Total
Suiro	- Made of metal - One side is formed sharp on which plastic bags are stuck to dry and the other side is a suitable shape to hang on the wall. - When the suiro becomes full with dry plastic, the plastic is put into a big bag to give to a collector.	Ward 1; 50 Ward 5; 50 Ward 14; 75	175
Cotton Bag	- Made of cotton with logo of KRM, CKV - Used to bring for shopping so as to be able to refuse plastic bags given by shops.	Ward 1; 42 Ward 5; 44 Ward 14; 40	126
CKV Compost bin	- Structure and design were finalized through discussion at the Study with support from NGOs in October, 2004.	Ward 1; 38 Ward 5; 18 Ward 14; 17	73

Source: JICA Study Team

b. Formation of Women's Groups

After the training for women, KRM proposed each of three wards to formulate women's groups in order to make community based activities sustainable, to share experience among community members. As all three wards recognized the meaning of grouping, they established their own groups and started several activities on SWM as follows.

Table 3.3-26 Formation of Women's Groups in KRM

Ward	Name	Number of Members	Own Activities
1	Thambahal Misa Puchaa	65	- Monthly meeting - Street sweeping activity
5	Sagal Mahila Puchaa	40	- Monthly meeting
14	Chovar Mahila Samuha	35	- Monthly meeting - Cleaning activities in surrounding area

Source: KRM

c. Setting up and Utilization of a Store House

Because it is necessary to store the plastic collected by youth groups till the amounts become large enough to sell to a Kabadi shop, a store-house had been set up at Ward 6 under the Pilot Project. The store-houses are taken care of by KRM so that KRM can monitor and check the amount of collected plastics and keep them till KRM sells it to a Kabadi. KRM is now planning to upgrade the store-house as a community recycling center where not only plastic but also paper and bottles are dealt with for sale.

d. Preparation and Distribution of Brochure

As a promotional material, KRM designed a brochure that mentions methods for plastic separation and collection, including its advantages. It was the first time for KRM to create a brochure. During preparation of the brochure, KRM conducted pre-testing to the Focal Points of the other municipalities in order to collect effective comments for finalization. KRM was also planning to utilize the brochure to distribute to the other untrained women in

order to extend the plastic separation and collection activities. The final products are illustrated in Figure.3.3-6.

Figure 3.3-6 Brochure for "Suiro Campaign"

Source: KRM

e. Two-day Refresher Training

Two-day Refresher Training sessions for both youth groups and women's groups of three target areas were conducted by KRM on June 6-7, 2005. There were almost 35 members participated in. The objectives of this training were to share the experience and problems with plastic collection and composting activities among participants and to visit another youth group, which was involved in the Pilot Project of home composting in KMC Ward 21, to share the experience.

2) Results of the Activities

a. Collected Plastics

KRM has collected plastic from each of three wards twice so far as shown in Table 3.3-27. In March, 2005, youth groups of each ward collected plastic which mounted up to more than 100 kg from the houses in their wards. Because there were several kinds of collected plastics, which included recyclable materials and unrecyclable materals, youth group members cooperated to separate the two kinds of plastics so that the recyclable materials, which totaled around 81 kg, was able to be sold to a Kabadi shop for Rs 745. Following that, the Focal Point visited each ward in order to share the results of plastic collection.

In June, 2005, KRM conducted a second round plastic collection. They collected a total of 82 kg of plastics, which can be sold to a Kabadi shop, and had kept the rest in the store-house.

Table 3.3-27 Result of Plastic Collection in KRM

Ward	Milk pack (kg)		Polythene Bag (kg)		Other (kg)		Total (kg)	
	March	June	March	June	March	June	March	June
No.1	4.0	6.5	5.0	9.5	6.0	4.5	15.0	20.5
No.5	9.0	10.5	5.0	7.0	5.5	1.5	19.5	19.0
No.14	26.0	14.5	12.0	16.0	8.5	12.0	46.5	42.5
Total	39.0	31.5	22.0	32.5	20.0	18.0	81.0	82.0

Source: KRM, 2005

b. Feedback and Evaluation of Training by KRM

It was the first time for KRM to hold trainings regarding SWM to the local people. Gradually, however, KRM staff had become accustomed to organize and facilitate the training sessions to the communities during the implementation of this Pilot Project. KRM also devised to acquire lessons learned from the organized training. The following table shows various kinds of feedbacks from the participants and the JICA Study Team.

Table 3.3-28 Feedback and Evaluation of Trainings by KRM

Training	Positive Points/ Impact	Necessary to Improvement
Three-day Training for Youth group (September 2004)	- Contents of the training was exhaustive - Youth groups actively participated in practical session - Participants became interested in SWM after the training and started their own activities for SWM after the training.	- Compared with contents of training, time of each session was not enough. - More support from municipality was needed to conduct the training.
Two-day Trainings for Women (October 2004)	- KRM devised to use simple word to explain SWM and composting so that women could understand easily - Youth group facilitated as coordinator. - To hold at local area was easy for women to participate in. - Women actively participated in practical session.	- Time management was needed.
Refresher Training (June 2005)	- Contents of trainings were interesting for participants. - Site visit was very effective.	- More practical discussion was better for participants to share the problem which they face - Number of participation was limited

Source: KRM Focal Points, JICA Study Team

3.4 Evaluation of Pilot Project B

3.4.1 Achievement Level

The achievement levels of project purposes and outputs of the Pilot Project B were discussed based on the OVIs as shown in Table 3.4-1. On the whole, most of the OVIs have been achieved during the past one year pilot project implementation period.

Table 3.4-1 Achievement Level of the Pilot Project B

Project Purpose /Outputs	OVIs	Achievement Level
Project Purpose ▪ 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 in waste minimization activities.	▪ By the end of June 2005, about 1,200 households were newly involved in waste minimization activities.
Outputs 1 The waste minimization facility is planned	1 By the end of the Pilot Project, a new waste minimization facility is planned.	1 By the end of the Pilot Project, a new waste minimization facility had been examined.
2 Local level waste	2 By the end of the Pilot	2 By the end of the Pilot

Project Purpose /Outputs	OVIs	Achievement Level
minimization activities are strengthened	Project, local level waste minimization activities (home composting, separation collection of plastic) are implemented.	Project, local level waste minimization activities (home composting, separation collection of plastic) had been implemented.

Source: JICA Study Team

3.4.2 Evaluation

Relevancy: As part of plans for a series of activities in Pilot Project B, a large-scale composting facility and local level waste minimization activities were proposed by target municipalities, based on their DfA/Ps. The target areas for the project were also very suitable, being selected by each municipality considering the accessibility from the municipality for monitoring, active participation of communities and comparison between the different targets.

Effectiveness: The project purpose of Pilot Project B has been successfully achieved. Although it was the first time for KRM to manage the waste from KRM by itself, it can be said that remarkable improvement has been achieved in the target areas.

Efficiency: Most of the necessary inputs have been made as planned from both the Japanese and Nepalese sides. Especially in Pilot Project B-2, the cost of the CKV compost bins, which were distributed to the target people, was shared among three parties i.e. people, municipalities and the JICA Study Team so that the bins could be distributed efficiently.

Impact: Through Pilot Project B-2, it can be said that the management ratio of target areas in KMC, LSMC and KRM has been improved because target people have started to manage their organic waste for composting, and recyclable waste for recycling activities. In the case of KRM, since there was no system to collect waste by KRM or any NGO in the target areas, the management ratio can be said to be improved from almost zero level. People's awareness of SWM has also been raised through a series of training sessions and monitoring activities and finally they have seem to have reached a point where they think that "waste" can be a resource. In addition, there have been many requests from other than target wards in KMC, LSMC and KRM to introduce the same kinds of activities, and this is also a positive impact for those three municipalities.

Sustainability: The activities conducted in Pilot Project B-2 can be said to be sustainable because KMC and LSMC have already developed a monitoring system with their experience and knowledge for community based activities. In particular, LSMC have already tried to expand their activities to other areas with the necessary budget for the activities.

In KRM, target communities have been very actively involved in the activities for SWM. However, it took time for KRM to implement the activities and/or respond to the requests from the local people, mainly due to the shortage of manpower. It is essential that KRM office should allocate necessary budget and staff for further sustainable activities.

3.5 Lessons Learnt from Pilot Project B

The proposed capacity of waste processing facility for its initial stage was 50 tons per day or 100 tons per day as the result of discussions at the workshop and other occasions. In both cases, the revenue of compost product sales could make positive profit when the unit sales price is set to be Rs 3/kg. However, it can not help stopping to be in red when the unit price is Rs 1.2/kg that is the same price as the existing low quality compost. It can be said that improvement of compost quality should be an issue to be tackled.

Introduction of home composting was considered to be difficult in Nepal at the beginning of the Pilot Projects because of religious custom that kitchen waste, which accounts 60 to 70% of the waste composition and locally called "Jutho", was socially or culturally an untouchable matter from the view of "uncleanness concept". However, against such anxiety, distribution of home composting bins was done quite smoothly and most of all participated families tried to make compost and to use it at their home garden. In fact, there were still some households who never touch their kitchen waste but majority of households can be the potential for introducing home composting activity.

Segregating plastic waste from the household was surely implemented as the activity of the Pilot Projects, but such collected plastics had to be separated again more strictly by each plastic type like HDPE, LDPE, and PVC because some of them can be sold in the market but some not. In addition, it is also learnt that the market condition to such valuable plastic is always fluctuated and needed to be monitored carefully.

On the other hand, it was confirmed that vermi-composting could be applied in the medium scale about 500kg/day through the activity. However, as lessons learnt, it was pointed out that careful temperature control should be done in each primary and secondary fermentation stage because earthworms were easily affected by the temperature change. Furthermore, careful evaluation of compost product quality with biological and chemical data should be necessary for the development of more reliable vermi-composting.

APPENDIX 3.1

Record of Main Activities from July 2004 to July2005

B: Promotion of Waste Minimization

APPENDIX 3.1 RECORD OF MAIN ACTIVITIES FROM JULY 2004 TO JULY 2005

B: PROMOTION OF WASTE MINIMIZATION

B -1: Training for Waste Minimization Facility

Date	Venue	Participants	Activities	Remarks
July 14, 2004	LDTA	JICA Study Team Mr. Shungo Soeda Nepalese C/P *SWMRMC;* Mr. Ashok Shahi *KMC;* Ms. Sanu Maiya Maharjan *LSMC;* Mr. Pradeep Amatya *BKM;* Mr. Moti Bhakta Shrestha	***Kickoff Meeting on Planning of Waste Minimization Facility and Establishment of Community-based Composting*** - Brief explanation of Pilot Project B - Explanation of DfA/P by each municipality - Discussion of waste minimization (large-scaled composting) facility plan - Discussion of community based composting facility *(See Appendix 3.2)*	
September 20, 2004	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Shungo Soeda Mr. Kiyoshi Shimizu Nepalese C/P *SWMRMC;* Mr. Ashok Shahi *LSMC;* Mr. Pradeep Amatya *BKM;* Mr. Moti Bhakta Shrestha *MTM;* Mr. Krishna Shrestha *KRM;* Mr. Gyan Bazra Maharjan	***Workshop on planning of large scale composting in Kathmandu valley of one of the pilot projects for waste minimization***. - Outline of Pilot Project B-1 - Introduction of the Existing Technology for Large-scale Composting - Discussion on planning conditions for large-scale composting such as waste amount, composting process and material balance. *(See Appendix 3.2)*	
October 1, 2004	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Kiyoshi Shimizu Nepalese C/P Total 16 participants including Focal Point of each Municipality and SWMRMC Others MEH consultant *(See Appendix 3.2)*	***Workshop on planning of large scale composting facility and compost market survey.*** - Introduction of several kinds of composting processes and systems - Discussion on review of previous proposed large-scale composting facility, rough estimated initial cost and running cost, required installation area - Discussion of survey method of compost market *(See Appendix 3.2)*	
October 11, 2004	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Kiyoshi Shimizu Nepalese C/P Total 14 participants including Focal Point of	***Workshop on planning of large scale composting facility.*** - Finalization of compost demand interview survey items - Discussion of basic plan of large-scale composting facility	

Date	Venue	Participants	Activities	Remarks
		each municipality and SWMRMC *(See Appendix 3.2)*	*(See Appendix 3.2)*	
November 7 -11, 2004	India, Bangarole, Mumbai, Ahmedabad	JICA Study Team Mr. Kiyoshi Shimizu Mr. Shungo Soeda Ms. Sachiko Suwa Nepalese C/P *MOLD;* Mr. Som Lal Subedi *SWMRMC;* Mr. Srya Man Shakya Mr. Ashok Shahi *KMC;* Ms. Shriju Pradhan *LSMC;* Ms. Sabina Maharjan Ms. Gyami Shova Maharjan *BKM;* Mr. Moti Bhakta Shrestha *MTM;* Mr. Surendra Shrestha *KRM;* Mr. Gyan Bazra Maharjan	***Site Visit in India*** Nov. 8 - Bangarole Municipality - Karnataka Compost Development Corporation (KCDC) - Terra Firm Nov. 9 - Mumbai Municipality - Dadar Pumping Station, Vermigold - Vermi-composting at official residences - Municipal Transfer Station Nov. 10 Mumbai - Municipal Gorai Landfill - Varsova, Green Cross, Composting Site Ahmedabad - Compost plant of Excel Industries Ltd *(See Appendix 3.5)*	Each participant studied and interviewed very positively depends on not only their concerned task at their organization, for example national strategy or budget system by MOLD, historical comparison by SWRMC, community participant and vermi technology by municipalities, but also partial responsibility for reporting agreed each other before the tour.
May 25, 2005	LDTA	JICA Study Team Mr. Kiyoshi Shimizu Mr. Shungo Soeda Nepalese C/P; *SWMRMC;* Mr. Ashok Shahi *KMC;* Mr. Rajesh Manandhar *LSMC;* Mr. Pradeep Amatya *BKM;* Mr. Moti Bhakta Shrestha *KRM;* Mr. Gyan Bazra Maharjan Others *SILT;* Mr. Deepak Bahadur Singh *MEH;* Mr. Navin K. Rajbhadari, Mr. Gobinda Tamrakar	***Workshop on large- scale composting facility.*** Agenda are as follows: - Review of necessity of waste minimization (Large scale composting) facility. - Introduction of implementation plan of Pre-F/S - Result of composting data collection at BKM - Result of compost market survey - Instruction for questionnaire on Pre-F/S *(See Appendix 3.5)*	Confirmed following matters; -Composting data collection at BKM has been finished. -Compost market is enough. -Questionnaire on Pre-F/S should be recovered on 30 May in next week.
June 1, 2005	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Kiyoshi Shimizu Nepalese C/P *SWMRMC;* Mr. Ashok Shahi *KMC;* Mr. Rajesh Manandhar	***Workshop on large-scale composting facility.*** Agenda are as follows: - Explanation of result of questionnaire on Pre-F/S - Discussion of Pre-F/S conditions	18 members have answered the questionnaire.

Date	Venue	Participants	Activities	Remarks
		LSMC; Mr. Pradeep Amatya *BKM;* Mr. Moti Bhakta Shrestha *KRM;* Mr. Gyan Bazra Maharjan		

B -2: Practice of Local Level Waste Minimization Activities

B -2.1: Practice of Community-based Waste Minimization in a Model Area in KMC
B -2.3: Practice of Promotion of Home Composting in LSMC

Date	Venue	Participants	Activities	Remarks
August 12, 2004	KMC	JICA Study Team Mr. Toshiyuki Ujiie Ms. Anuradha Tulachan Nepalese C/P *KMC;* Ms. Shriju Pradhan Ms. Sanu Maiya Maharjan	***Identified three potential target sites for community based composting*** 1) Balkhu 2) Kalimati 3) Opp. Shankar Dev Campus	For consultation services regarding study of the sites and setting up composting facilities, KMC has identified the following resource persons: Dr Ananda Shova Tamrakar Dr. Hari Devi Ranjeetkar
August 12, 2004	LSMC	JICA Study Team Mr. Toshiyuki Ujiie Ms. Anuradha Tulachan Nepalese C/P *LSMC;* Mr. Rudra Gautam Mr. Prabin Shrestha Mr. Pradeep Amatya Ms. Sabina Maharjan Ms. Sarina Maharjan	***Discussion of composting to be carried out under the Pilot Project.***	LSMC will decide the appropriate type and scale of composting (community based/home based) and accordingly make a basic plan (target location/ kind of facility etc).
August 18, 2004	WEPCO	JICA Study Team Mr. Toshiyuki Ujiie Ms. Anuradha Tulachan Nepalese C/P *LSMC;* Mr. Pradeep Amatya Others *WEPCO;* Ms. Sudha Poudel Ms. Bishnu Thakali	***Discussion of the pilot project activities as follows:*** 1) Community composting in case of Lalitpur faces major challenges- lack of land, difficulty to market relatively expensive compost and lack of accountability among the community. 2) Home composting more likely to succeed than community based composting (community based composting can run into marketing problems due to high cost). 3) Local people's involvement in managing waste indispensable.	A basic plan will be prepared for community/home composting to LSMC and JICA Study Team within a week.
September 10, 2004	WEPCO	JICA Study Team Mr. Toshiyuki Ujiie Nepalese C/P *LSMC;* Mr. Rudra Gautam Others *WEPCO;* Ms. Sudha Poudel Ms. Bishnu Thakali	***-Discussion of a basic plan*** ***-Discussion of compost bin size, type, subsidy amount, etc.*** 1. Two sizes of bins (small and big) should be distributed. 2. A combination program of comprising of both home and community based	- A more detailed plan will be prepared including details about training programs and compost bins to be distributed. -Distribution of compost bins is expected to start from October 1, 2004.

Date	Venue	Participants	Activities	Remarks
			composting should be considered.	
September 22, 2004	WEPCO	JICA Study Team Mr. Kiyoshi Shimizu Mr. Vikram Basyal Nepalese C/P *LSMC;* Mr. Pradeep Amatya Others *WEPCO;* Ms. Sudha Paudel	***Discussed the proposal submitted by WEPCO for home composting program at two hundred houses.***	Compost bin will be provided together for KMC and KRM.
October 7, 2004	CDS/LSMC	JICA Study Team Mr. Kiyoshi Shimizu Mr. Vikram Basyal Nepalese C/P *LSMC;* Mr. Pradeep Amatya Ms. Laxmi Rajbhandari Ms. Sabina Maharjan	***Received and confirmed LSMC's proposal for waste minimization activities.***	Total 600 compost bins will be provided for 3 organizations in LSMC.
October 8, 2004	LDTA	JICA Study Team Mr. Kiyoshi Shimizu Nepalese C/P *KMC;* Ms. Shriju Pradhan Ms. Sanu M. Maharjan	***Discussion of promotion for waste minimization pilot project in KMC.***	KMC (CMU) submitted proposal for waste minimization and discussed it.
October 12, 2004	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Kiyoshi Shimizu Nepalese C/P Focal person of each Municipality SWMRMC Others *WEPCO* *SOUP* *CeProIn* *MEH consultants* *(See Appendix 3.2)*	***Workshop on waste minimization pilot project. Different municipalities explain their activities for waste minimization and discussed about the specification of compost bin.*** *(See Appendix 3.2)*	Decided the shape, size and the price sharing of the composting bins municipalities and users.
November 1, 2004	CMU/KMC	JICA Study Team Mr. Kiyoshi Shimizu Nepalese C/P *KMC;* Ms. Shriju Pradhan	***Discussion of 100liter home compost bin and visited NEPATOP of compost bin factory.***	Discussed cost sharing and delivery period of the compost bin.
November 5, 2004	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Kiyoshi Shimizu Nepalese C/P Focal Point of each Municipality *SWMRMC* Others *WEPCO* *SOUP* *MEH Consultant*	***Workshop on home composting activities and confirmation of Study Tour in India.***	Confirmed final number, price, ordering procedure and delivery time of compost bin. Reported progress of survey of compost market survey.

Date	Venue	Participants	Activities	Remarks
November 16, 2004	KMC	JICA Study Team Mr. Toshiyuki Ujiie Nepalese C/P *KMC;* Mr. Indra Man Suwal Mr. Rajesh Manandhar Ms. Shriju Pradhan Ms. Sanu Maiya Maharjan	***Discussion of cost sharing of compost bins and detail activities of vermi-composting***	Confirmed cost sharing and contents of vermin-composting pilot project
November 17, 2004	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Others *SOUP*	*Discussion of the detail schedule of training and distribution*	Confirmed the schedule of the activities
November 18, 2004	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Others *WEPCO*	*Discussion of the detail schedule of training and distribution*	Confirmed the schedule of the activities
January 29, 2005	Ward 1, LSMC	JICA Study Team Mr. Toshiyuki Ujiie Ms. Sachiko Suwa Nepalese C/P *KMC;* Ms. Pradeep Amatya Others *WEPCO*	*Compost Training at Ward 1, LSMC*	
February 5, 2005	Ward 21, KMC	JICA Study Team Mr. Toshiyuki Ujiie Ms. Sachiko Suwa Nepalese C/P *KMC;* Ms. Sanu M. Maharjan Others *SOUP*, Participants 30	*Compost Training at Ward 21, KMC*	
February 6, 2005	Ward 21, KMC	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KMC;* Ms. Sanu Maiya Maharjan Others *SOUP*, Participants 30	*Compost Training at Ward 21, KMC*	
February 12, 2005	Ward 21, KMC	JICA Study Team Mr. Toshiyuki Ujiie Ms. Sachiko Suwa Nepalese C/P *KMC;* Mr. Ratna Kaji Maharjan Others *SOUP*, Participants 30	*Compost Training at Ward 21, KMC*	
February 25, 2005	Ward 5, LSMC	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *LSMC;* Ms. Sabina Maharjan Ms. Sarita Maharjan Ms. Gami S. Maharjan	*Compost Training at LSMC Ward 5 organized by LSMC*	

Date	Venue	Participants	Activities	Remarks
		Others Participants (Approx. 30)		
February 26, 2005	Ward 5, LSMC	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *LSMC;* Ms. Sabina Maharjan Ms. Sarita Maharjan Ms. Gami S. Maharjan Others Participants (Approx. 30)	*Compost Training at LSMC Ward 5 organized by LSMC*	
February 26, 2005	Ward 5, LSMC	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *LSMC;* Ms. Sabina Maharjan Ms. Sarita Maharjan Ms. Gami Shova Others Participants (Approx. 30)	*Compost Training at LSMC Ward 5 organized by LSMC*	
February 19, 2005	Ward 21, KMC	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KMC;* Ms. Sanu M. Maharjan Others *SOUP*, Participants 30	*Compost Training at Ward 21*	
March 10, 2005	LSMC CDS	JICA Study Team Mr. Toshiyuki Ujiie Ms. Sachiko Suwa Nepalese C/P *LSMC;* Mr. Komal P. Kafle Mr. Rudra Gautam Mr. Pradeep Amatya Mr. Prabin Shrestha Ms. Sabina Maharjan Ms. Sarita Maharjan Ms. Gami S. Maharjan Others *NGOs/CBOs*	*Distribution Ceremony of CKV Compost Bins*	
March 11, 2005	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Kiyoshi Shimizu Ms. Sachiko Suwa Mr. Vikram Basyal Nepalese C/P *KMC;* Ms. Shriju Pradhan *LSMC;* Mr. Pradeep Amatya Ms. Sabina Maharjan *BKM;* Mr. Moti B. Shrestha	***Confirmation of progress of Pilot Project B.2 "Promotion of Waste minimization".*** - Each C/P explained actual situation of the activities. - Then technical issues for implementation of activities were discussed.	Confirmed actual situation of the activities and schedule of the activities. JICA Study Team (Mr. Kiyoshi Shimizu) asked Nepalese C/P to visit the households, which are making compost by CKV compost bin.

Date	Venue	Participants	Activities	Remarks
		KRM; Mr. Gyan B. Maharjan Others *SOUP, WEPCO*		
March 12 and 13, 2005	Community Meeting room at Ward 21, KMC	JICA Study Team Mr. Kiyoshi Shimizu Ms. Sachiko Suwa *KMC;* Ms. Shriju Pradhan Others *SOUP;* Approx. 25 Participants	***Training on home composting by CKV compost bin.*** - Explanation of solid waste management in KMC, waste minimization and how to make compost.	At the end of the training approx. 25 compost bins have been distributed.
March 14, 2005	Ward 21, KMC and Ward 11, 12, 18, LSMC	JICA Study Team Mr. Kiyoshi Shimizu Others *SOUP;* Ms. Rejina Joshi	***Confirmation of actual situation of house composting by CKV compost bin.***	Visited 11 households. Some households have generation of small flies.
March 15, 2005	Ward 1 and 2, LSMC	JICA Study Team Mr. Kiyoshi Shimizu Others *WEPCO;* Ms.Bishnu Thakali	***Confirmation of actual situation of house composting by CKV compost bin.***	Visited 5 households. Almost of all households have generation of small flies.
March 17, 2005	Ward 5, 7, 8, LSMC	JICA Study Team Mr. Kiyoshi Shimizu Nepalese C/P *LSMC;* Ms. Sabina Maharjan	***Confirmation of actual situation of house composting by CKV compost bin.***	Visited 5 households. Almost of all households have generation of small flies.
March 21, 2005	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Mr. Kiyoshi Shimizu Ms. Sachiko Suwa Mr. Vikram Basyal Nepalese C/P *KMC;* Ms. Sanu Maiya Maharjan *LSMC;* Mr. Pradeep Amatya Ms. Sabina Maharjan *BKM;* Mr. Moti B. Shrestha *KRM;* Mr. Gyan Bazra Maharjan Others SOUP, WEPCO	***Review of activities of Pilot Project B.2 "Promotion of Waste minimization"*** - Mainly countermeasure for small flies problem of home composting has been discussed.	Nepalese C/P and related NOGs member have confirmed appropriate composting operation to solve small fries problem.
May 28, 2005	Lagaa Khala Club office Ward 21, KMC	JICA Study Team Mr. Toshiyuki Ujiie Mr. Kiyoshi Shimizu Nepalese C/P *KMC;* Ms. Shriju Pradhan Others SOUP Approx. 25 Participants	***Follow up training of home composting.*** - Participants explained their opinion on home composting and discussed them.	Shared with composting operation among participants.

Date	Venue	Participants	Activities	Remarks
June 8, 2005	KMC	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KMC;* Ms. Shriju Pradhan Ms. Sanu Maiya Maharjan Others SOUP Scrap Dealer	***Discussion about Community Recycling Center*** - Roles of each stakeholder - Future plan	
June 15, 2005	Ward 21, KMC	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *SWMRMC;* Mr. Surya Man Shakya *KMC;* Mr. Hhem Sharma Mr. Indra Man Suwal Ms. Shriju Pradhan Ms. Sanu Maiya Maharjan Others *SOUP;* Scrap Dealer	***Opening Ceremony of Community Recycling Center at Ward 21*** - Inauguration - Speech by CEO of KMC - Speech by GM of SWMRMC - Explanation of CRC by CMU	
July 6, 2005	LDTA	JICA Study Team Mr. Toshiyuki Ujiie Nepalese C/P *SWMRMC;* Mr. Ashok Shahi *KMC;* Ms. Shriju Pradhan Ms. Sanu Maiya Maharjan *LSMC;* Mr. Pradeep Amatya Ms. Sabina Maharjan *BKM;* Mr. Moti B. Shrestha *KRM;* Mr. Gyan Bazra Maharjan Others *SOUP* *WEPCO* *MEH Consultants*	***Workshop on Planning of Local-level Waste Minimization Activities (Evaluation)*** - Explanation of result of compost quality survey - Discussion on revised manual for users of compost bin - Sharing of experiences, problems and lessons learnt among Task Forces - Future schedule *(See Appendix 3.2)*	

B -2.2: Practice of Medium-scale Vermi-Composting in KMC

Date	Venue	Participants	Activities	Remarks
March 14, 2005	Teku Transfer Station, KMC	JICA Study Team Mr. Kiyoshi Shimizu Nepalese C/P *KMC;* Ms. Shriju Pradhan Others *PEMON*	***Confirmation of construction status of Vermi-composting facility.***	To be completed by 20 March 2005.
March 19, 2005	Teku Transfer Station, KMC	JICA Study Team Mr. Kiyoshi Shimizu Nepalese C/P *KMC;* Ms. Shriju Pradhan Others *PEMON*	***Final confirmation of construction status of Vermi-composting facility.***	Confirmed completion of the facility and preparation of vegetable waste.
March 21, 2005	Teku Transfer Station, KMC	JICA Study Team Mr. Toshiyuki Ujiie Mr. Kiyoshi Shimizu Nepalese C/P *MOLD;* Mr. Som Lal Subedi *SWMRMC;* Mr. Surya Man Shakya	***Inauguration for Vermi-composting facility.*** - Address of main guest. - Explanation of Vermi-composting and CKV Pilot Project B-2.2, mainly facility specification and operation. - Visit to site.	Put first earthworms in the pits. Then Vermi-composting operation has been stated.
May 24, 2005	Teku Transfer Station, KMC	JICA Study Team Mr. Kiyoshi Shimizu Nepalese C/P *KMC;* Ms. Shriju Pradhan Others *PEMON*	***Confirmation of Vermi-composting operation.***	Confirmed that harvesting Vermi-compost has been started.
May 30 and 31, 2005	CMU/KMC office, Teku, KMC	JICA Study Team Mr. Kiyoshi Shimizu Nepalese C/P *KMC;* Ms. Shriju Pradhan Others *PEMON* Approx. 25 participants	***Workshop on Vermi-composting.*** - Explanation of superiority of Vermi-compost and usage of it. - Distribution of sample pack of Vermi-compost to participants.	Participants are composed by the followings; -Gardeners of big hotels and embassies -Nurseries, and -Farmers
June 15, 2005	KMC	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KMC;* Ms. Shriju Pradhan Ms. Sanu Maiya Maharjan Mr. Indra Man Suwal Mr. Rajesh Manadhar Other staff Others *PEMON* *CEN* Approx. 25 participants	***Meeting on Marketing Strategy*** - Presentation of survey result of marketing strategy of vermi-compost (market analysis, competitive analysis, product analysis, distribution analysis, promotion analysis) - Discussion on KMC's strategy	

B-2.4: Practice of Plastic Separation in KRM

Date	Venue	Participants	Activities	Remarks
July 6, 2004	KRM	JICA Study Team Ms. Toshiko Shimada Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Meeting on with KRM*** - Discussion for the program - Objectives - Target area and target group 1) Core Area (Ward 1) 2) Rural Area (Ward 14 Chobhar) 3) Semi-Market Area (Ward 5, partly) - Work plan	KRM requested to include home composting activities.
July 14, 2004	KRM	JICA Study Team Ms. Toshiko Shimada Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Meeting on with KRM*** - Discussion for work plan - Cost estimation - Store room	KRM submitted a work plan.
July 20, 2004	KRM	JICA Study Team Ms. Toshiko Shimada Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Meeting on with KRM*** - Stakeholder and implementation structure - Roles and Responsibilities of Stakeholders	By using meta card, implementation structure including each roles and responsibilities were done to be cleared.
July 27, 2004	KRM	JICA Study Team Ms. Toshiko Shimada Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Meeting on with KRM*** - Finalization of work plan - Cost sharing	
August 5, 2004	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Meeting on with KRM*** - Discussion for whole schedule - 3days training - Preparation for materials (Brochure, Suiro, Cotton bags, Compost bin) - Store room	KRM submitted a draft of Brochure
August 12, 2004	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Meeting on with KRM*** - Discussion for 3day training	KRM submitted a draft program of 3day training
August 19, 2004	KRM	JICA Study Team; Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan	***Meeting on with KRM*** - Discussion for 3day training - Detail contents of program - Facilitator and resource person - Materials - Discussion for brochure	

Date	Venue	Participants	Activities	Remarks
		Mr. Gyan Bazra Maharjan		
September 8, 2004	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Meeting on with KRM*** - Discussion for whole schedule - Three-day training - Preparation for materials (Suiro, Cotton bags)	Cotton bag and suiro will be prepared for total 150.
September 15, 2004	KRM	JICA Study Team Ms. Toshiko Shimada Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Meeting on with KRM*** - Discussion for whole schedule - Three day training - Store room	KRM has not decided this year budget so they cannot use their budget yet.
September 22, 2004	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Gyan Bazra Maharjan Others *Resource Person;* Ms. Hari. Devi Ranjitkar Ms. Gujeshwori Shrestha	***Meeting on with Resource Person*** - Discussion for three-day training	
September 24, 2004	KRM	JICA Study Team; Ms. Sachiko Suwa Mr. Vikram Basyal Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan Others *Participants;* Youth Group from Ward 1, 5, 14 (32) *Resource Person;* Ms. Gujeshwori Shrestha	***Three- day Training for Participatory SWM Training*** ***(Plastic separation, Home composting)*** - Expectation for training - Introduction of CKV Study - Experience sharing (Group work and presentation) - Theoretical and conceptual aspect of solid waste - "Suiro" program	Mr. Gyan is facilitator of this whole training.
September 25, 2004	KRM	JICA Study Team; Mr. Toshiyuki Ujiie Mr. Kiyoshi Shimizu Ms. Sachiko Suwa Ms. Anuradha Tulachan Nepalese C/P *KRM;* Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan Others *Participants;* Youth Group from Ward 1, 5, 14 (32) *Resource Person;*	***Three- day Training for Participatory SWM Training*** ***(Plastic separation, Home composting)*** - Home Composting Training - Concept - Theoretical - Practical group exercise - Presentation and Discussion	

Date	Venue	Participants	Activities	Remarks
		Ms. Hari Devi Ranjitkar Ms. Budha Devi Limbu		
September 26, 2004	KRM	JICA Study Team; Ms. Sachiko Suwa Ms. Anuradha Tulachan Nepalese C/P *KRM;* Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan Others Participants Youth Group from Ward 1, 5, 14 (32) *Resource Person;* Ms. Gujeshwori Shrestha	***Three- day Training for Participatory SWM Training*** ***(Plastic separation, Home composting)*** - Community mobilization and Group formation - Formation of action plan by each youth group - Feedback - Closing ceremony	
October 5, 2004	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Gyan Bazra Maharjan	***Meeting on with KRM*** - Discussion for women's training - Whole scheduling - Preparation for materials (Suiro, Cotton bags, Compost bin)	
October 6, 2004	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Gyan Bazra Maharjan	***Meeting on with KRM*** - Discussion for women's training and scheduling	Date for women's training was fixed. (October 9-14)
October 9, 2004	Ward 17, KRM (Chobhar)	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Gyan Bazra Maharjan Mr. Anuj Pradhan Mr. Sanu Babu Pariyar Others *Youth Group;* 5 members *Women;* 30 members	***Participatory SWM Training for Women (Chobar) (two-day)*** - Introduction of CKV Study - SWM in Kirtipur - Basic information of "waste", SWM, 3R - Behavior Change Communication - Suiro program	
October 10, 2004	Ward 17, KRM (Chobhar)	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Gyan Bazra Maharjan Others *Youth Group;* 5 members *Women;* 30 members	***Participatory SWM Training for Women (Chobhar) (two-day)*** - Home composting and bokashi - Group work (practice) - Distribution of Suiro and cotton bag - Commitment	At last, Suiro and cotton bag were distributed to each participant.
October 11, 2004	Ward 1, KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Gyan Bazra Maharjan Mr. Anuj Pradhan Others	***Participatory SWM Training for Women (Ward 1) (two-day)*** - Introduction of CKV Study - SWM in Kirtipur - Basic information of "waste", SWM, 3R - Behavior Change Communication	

Date	Venue	Participants	Activities	Remarks
		Youth Group; 6 members *Women;* 25 members	- Suiro program	
October 12, 2004	Ward 1, KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Gyan Bazra Maharjan Mr. Anuj Pradhan Others *Youth Group;* 6 members *Women;* 25 members	***Participatory SWM Training for Women (Ward #1) (two-day)*** - Home composting and bokashi - Group work (practice) - Distribution of Suiro and cotton bag - Commitment	At last, Suiro and cotton bag were distributed to each participant.
October 13, 2004	Ward 5, KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Gyan Bazra Maharjan Mr. Anuj Pradhan Others *Youth Group;* 7 members *Women;* 32 members	***Participatory SWM Training for Women (Ward #1) (two-day)*** - Introduction of CKV Study - SWM in Kirtipur - Basic information of "waste", SWM, 3R - Behavior Change Communication - Suiro program	
October 14, 2004	Ward 5, KRM	Nepalese C/P *KRM;* Mr. Gyan Bazra Maharjan Mr. Anuj Pradhan Others *Youth Group;* 7 members *Women;* 32 members	***Participatory SWM Training for Women (Ward #1) (two-day)*** - Home composting and bokashi - Group work (practice) - Distribution of Suiro and cotton bag - Commitment	At last, Suiro and cotton bag were distributed to each participant.
November 2, 2004	KRM	JICA Study Team Ms. Toshiko Shimada Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Gyan Bazra Maharjan	***Meeting on with KRM*** - Progress of the project - Monitoring plan	Monitoring sheet will be prepared by KRM by next meeting.
February 7, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan Mr. British Singh	***Discussion on Storehouse of Plastic***	
February 8, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan	***Discussion on Storehouse of Plastic***	

Date	Venue	Participants	Activities	Remarks
		Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan Mr. British Singh		
February 28, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Others Lucky Construction; Mr. Vikash Shrestha	***Discussion on Storehouse of Plastic***	
March 9, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan Others Youth Group Members	***Plastic Collection from each of three wards***	
March 13, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Gyan Bazra Maharjan Others Youth Group Members	***Discussion with Kabadi (Scrap Dealer)*** - Check of plastic collected - Separation of plastic - Future plan	
March 14, 2005	Ward 1 and 5, KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan Others Youth Group / Women's Group Members (Ward1,5)	***Meeting at Ward 1 and Ward 5*** - Formation of Women's Group - Discussion on roles of women' group - Future plan	
March 21, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Discussion on Next step***	
April 12, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Discussion*** - Discussion about Implementation Structure (Motivators)	
April 21, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Discussion*** - Discussion about Implementation Structure (Motivators)	
May 9, 2005	KRM	JICA Study Team Ms. Sachiko Suwa	***Discussion with Youth Groups*** - Discussion about Implementation	

Date	Venue	Participants	Activities	Remarks
		Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan Others Youth Group Members (Three Wards)	Structure (Motivators)	
May 30, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Discussion*** - Discussion about Refresher Training	
June 1, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Bal Krishna Maharjan Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Discussion*** - Discussion about Refresher Training	
June 6, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan Others Participants from each wards	***Refresher Training (1st day)*** - Sharing of experience - Roles of groups - Discussion about problems	
June 6, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan Others Participants from each wards	***Refresher Training (2nd day)*** - Methods of compost products - Site visit to Teku Compost plant - Site visit to Ward 21 (KMC) - Discussion with Youth Corner Club	
July 8, 2005	KRM	JICA Study Team Ms. Sachiko Suwa Nepalese C/P *KRM;* Mr. Anuj Pradhan Mr. Gyan Bazra Maharjan	***Discussion about motivators***	

APPENDIX 3.2

Record of Workshop/ Training under the Pilot Project B

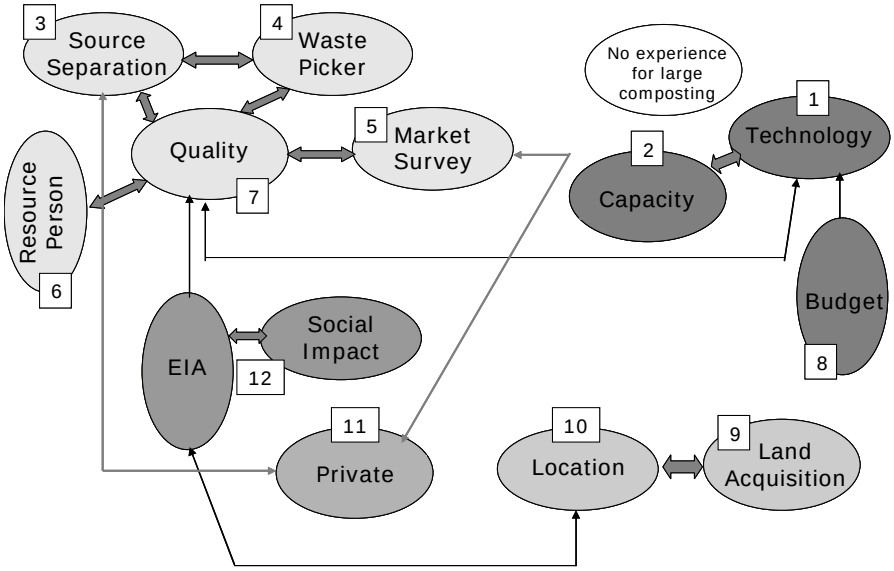
APPENDIX 3.2 RECORDS OF WORKSHOP/TRAINING UNDER THE PILOT PROJECT B

Subject:	**Kick off Meeting on Planning of Waste Minimization Facility and Practice of Community-based Waste Minimization Activities**	
Date:	July 14, 2004	
Time:	15:00 - 17:00	
Venue:	Local Development Training Academy Meeting Room	
Participants:	SWMRMC	Mr. Ashok Shahi, Civil Engineer
	KMC	Ms. Sanu Maiya Maharjan, Community Mobilization Unit
	LSMC	Mr. Pradeep Amatya, Chief, Environment Section
	BKM	Mr. Moti Bhakta Shrestha, Social Welfare Officer, Social Welfare & Sanitation Section
	JICA Study Team	Mr. Shungo Soeda

1. Agenda

1) Confirmation of Focal Points
2) Discussion on target of waste minimization
   i. Estimation of waste generation and collection quantity in the future
   ii. Necessity of waste minimization and strategy/target
3) Explanation of draft action plan of each municipality
4) Discussion of waste minimization (large-scaled composting) facility plan
   i. Activities and tentative schedule
   ii. Analysis of issues for promoting large-scaled composting
   iii. Approach for promoting large-scaled composting
   iv. Experiences in India (candidate place to be visited in September)
   v. Future works
5) Discussion of community based composting facility
   i. Activities and tentative schedule
   ii. Discussion on considerable points and approaches for promoting the community-based vermi-composting
   iii. Future works
6) Confirmation of the schedule

2. Result of KJ for Large-scale Composting (Relations of Issues and Approach)



	Issues (Name of card groups)	Approach	Main Focal Point
1	Sustainable technology is necessary for establishing large scale composting facility	Study internal and external past experience and modify them if necessary for the composting facility	SWMRMC
2	Capacity of composting facility should be studied	Capacity of the facility will be develop on the phase wise basis	SWMRMC
3	Source separation system is not practical	Separate collection to be develop	BKM
4	Mobilization of waste picker is not enough	Waste picker should be registered and trained to them	KMC
5	Demand of compost has not surveyed	Market study should be done	Study Team
6	Advisory support is essential	Technical support should be provided by expert	Study Team
7	Quality of compost is not satisfactory	Quality control should be done on routine base. Improvement of compost quality should be done	LSMC
8	Financial support for establishment of composting facility is not adequate	Discussion with concern agencies for the financial support for establishment of composting facility	SWMRMC
9	Acquisition of land for composting facility is needed	Proposed to concern organization for the acquisition of land.	SWMRMC
10	The location of the site should be far from settlement and near to the source of waste generation	Careful studied had to be carried out	KMC/ SWMRMC
11	Enrollment of private participation should be enhanced	Encourage the private sector participate to establish the composting facility on the basis of natural policies	KMC/LSMC
12	Possible environmental impacts from the composting facility may encountered	EIA studies had to be carried out and necessary mitigation measure should be applied as per EIA recommendation	SWMRMC

3. Distributed/Used Materials

Presentation Materials from the JICA Study Team

Subject:	**Workshop on Planning of Waste Minimization Facility**	
Date:	September 20, 2004	
Time:	10:00-13:30	
Venue:	Local Development Training Academy Meeting Room	
Participants:	SWMRMC	Mr. Ashok Shahi, Civil Engineer
	KMC	Mr. Rajesh Manandhar, Chief, SWM Section
	LSMC	Mr. Pradeep Amatya, Chief, Environment Section
	BKM	Mr. Moti Bhakta Shrestha, Social Welfare Officer, Social Welfare & Sanitation Section
	MTM	Mr. Surendra Shrestha, Junior Engineer, Planning and Technical Section
		Ms. Krishna Kumari Shrestha, Assistant, Community Development and Sanitation Section
	KRM	Mr. Gyan Bazra Maharjan, Assistant, SWM/Accounting,
	JICA Study Team	Mr. Toshiyuki Ujiie, Team Leader
		Mr. Shungo Soeda
		Mr. Kiyoshi Shimizu

1. Agenda

1) Outline of Pilot Project on Waste Minimization Facility Planning
2) Introduction of the Existing Technology for Large-scale Composting
3) Discussion

2. Record of Discussion

- It was suggested that the private sector was interested for 200 to 300 tons facility. We have to commercialize the composting system.
- It was suggested that as more than 50% of the waste was organic (compostable), the treatment capacity of the facility should be at least 100 tons/day.
- It was confirmed that further detail descriptions of technologies and necessary cost should be discussed to find suitable one.
- At the time of LUNA, we (SWMRMC, KMC) did not have any technical knowledge regarding large-scale composting facility.
- SWMRMC has the responsibility of land arrangement for the composting facility.
- The complain from farmer was about glasses in the compost products in the case of composting facility operation by KMC. In Bhaktapur, there is also same problem. This was because many bottles broken down while handling in the collection time.

3. Distributed/ Used Materials

Presentation Materials from the JICA Study Team

Subject:	**Workshop on Planning of Waste Minimization Facility**	
Date:	October 1, 2004	
Time:	13:30-15:00	
Venue:	Local Development Training Academy Meeting Room	
Participants:	SWMRMC	Mr. Ashok Shahi, Civil Engineer
	KMC	Mr. Sunil Man Tuladhar, Environmental Engineer
		Ms. Shriju Pradhan, Coordinator, Community Mobilization Unit
		Ms. Sanu Maiya Maharjan, Community Mobilization Unit
	LSMC	Mr. Pradeep Amatya, Chief, Environment Section
	BKM	Mr. Moti Bhakta Shrestha, Social Welfare Officer, Social Welfare & Sanitation Section
	MTM	Ms. Krishna Kumari Shrestha, Assistant, Community Development and Sanitation Section
	KRM	Mr. Gyan Bazra Maharjan, Assistant, SWM/Accounting,
		Mr. Anuj Pradhan, Assistant, Planning and Technical Section
	JICA Study Team	Mr. Toshiyuki Ujiie, Team Leader
		Mr. Kiyoshi Shimizu
	MEH Consultants	Mr. N. K. Pajdhandari, Survey Team Leader
		Mr. Murali Ranji, Senior Engineer
		Mr. Shirish Shingh, Engineer

1. Agenda

1) Introduction of several kinds of composting processes and systems
2) Method of market survey on compost product
3) Discussion

2. Record of Discussion

- In Kavre and Dhadingm, many formers are considered to be using SW-compost, but the farmers in North and South of the Valley are not productive. Therefore, the Western and Eastern parts of the Valley were selected as the target of the market survey.
- It was suggested that sets of sample pack of SW-compost should be brought when interviews are conducted so that the interviewees could clearly understand what the SW-compost is.
- Nepal Agricultural Research Center (NARC) has data of compost quality and they said that they could provide that data for the survey.
- Possible market of compost can also be considered at the nurseries and plant producers. It is considered that the nurseries can purchase even costly compost.

3. Distributed/ Used Materials

1) Presentation Materials from the JICA Study Team
2) Comparison table of the proposals for the composting facility in the Kathmandu Valley (SWMRMC)

Subject:	**Workshop on Planning of Waste Minimization Facility**	
Date:	October 11, 2004	
Time:	10:00-13:30	
Venue:	Local Development Training Academy Meeting Room	
Participants:	SWMRMC	Mr. Ashok Shahi, Civil Engineer
	KMC	Mr. Sunil Man Tuladhar, Environmental Engineer
	LSMC	Mr. Pradeep Amatya, Chief, Environment Section
		Ms. Sabina Maharjan, Community Development Section
	BKM	Mr. Moti Bhakta Shrestha, Social Welfare Officer, Social Welfare & Sanitation Section
		Mr. Dinesh Rajbhandari, Sanitation Engineer, Planning and Technical Section
		Mr. Dilip Kumar Suwal, Assistant, Sanitation Sub-Section
	MTM	Mr. Surendra Shrestha, Junior Engineer, Planning and Technical Section
	KRM	Mr. Gyan Bazra Maharjan, Assistant, SWM/Accounting,
	JICA Study Team	Mr. Toshiyuki Ujiie, Team Leader
		Mr. Kiyoshi Shimizu
	MEH Consultants	Mr. N. K. Pajdhandari, Survey Team Leader
		Mr. Murali Ranji, Senior Engineer
		Mr. Shirish Shingh, Engineer

1. Agenda

1) Procedure and schedule for a large scale composting planning
2) Finalization of methodology of the compost market survey
3) Discussion

2. Record of Discussion

- The nursery and gardening people have been covered by the market survey as they are consuming the compost. As many hotels are also using compost product for greeneries, it was suggested that the survey should cover the hotels.
- It was suggested that the targets for the market survey should be not only large-scale farmers but also the middle and poor farmers.
- It was recommended that as fertilizer was needed for good quality of seeds, the question about production of the seeds was also necessary.
- It was confirmed that this survey was the first step to know the possible market of the solid waste compost and the detailed survey should be conducted as the next step if the positive responses was obtained.
- The participants were requested to share the information of the discussion with the other staff of the each municipality.

3. Distributed/ Used Materials

Presentation materials from the JICA Study Team

Subject:	**Workshop on Planning of Local-level Waste Minimization Activities**	
Date:	October 12, 2004	
Time:	13:30-16:00	
Venue:	Local Development Training Academy Meeting Room	
Participants:	SWMRMC	Mr. Ashok Shahi, Civil Engineer
	KMC	Ms. Shriju Pradhan, Coordinator, Community Mobilization Unit
		Ms. Sanu Maiya Maharjan, Community Mobilization Unit
		Mr. Rajaram Karmacharya, Community Mobilization Unit
	LSMC	Mr. Pradeep Amatya, Chief, Environment Section
	BKM	Mr. Moti Bhakta Shrestha, Social Welfare Officer, Social Welfare & Sanitation Section
	KRM	Mr. Gyan Bazra Maharjan, Assistant, SWM/Accounting,
	JICA Study Team	Mr. Toshiyuki Ujiie
		Mr. Kiyoshi Shimizu
	Ce Pro In	Ms. H. D. Ranjitkar, Chairperson
	SOUP	Ms. Bijaya Rabaidya, Program Manager
	MEH Consultants	Mr. N. K. Pajdhandari, Team Leader
		Mr. Merali Ranji, Senior Engineer

1. Agenda

1) Explanation and discussion on proposed or being implemented pilot projects (KRM, LSMC, KMC)
2) Proposed CKV compost bins
3) Discussion

2. Record of Discussion

1) Explanation and discussion on proposed or being implemented pilot projects

The concerned municipalities explained the following current and future activities regarding waste minimization.

KRM: Practice of Plastic Separation Collection

- Total 3 wards would be covered
- Total households to be involved: 150 (50 in each ward)
- Three days training was conducted and youth group was formed. 150 Suiro has distributed for plastic separation together with cloth bags to replace from plastic bags (poly bags). The total cost of Suiro is Rs.7 and user had to pay Rs.2. By the end of October, 2004 total 75 bin would be distributed.

LSMC: Practice of Promotion of Home Composting

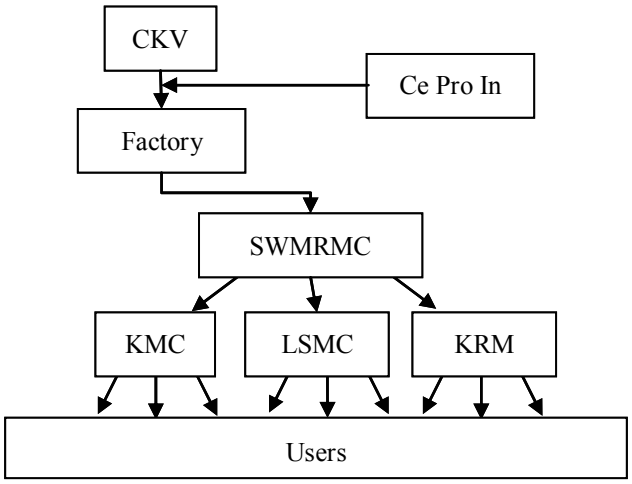
- We would try to minimize 12 tons of waste while going to Sisdol LF. In the first phase, 100 bins would be distributed. The distribution would start in the mid of November, 2004 and it would take at least one month. After the first phase, again 300 bins would be distributed. A training for users would be provided before distributing the bins.

KMC: Practice of Community based Solid Waste Minimization Activities and Vermi-Composting

- Since 1989-90 the composting program started. KMC has a composting chamber and a paper recycling machine. Generally it takes one month for composting but in winter it takes 40 days. In the household level, vermin-composting is being conducted as there is no odor from vermin-composting. Many people are earning by selling both compost and earthworms. The pilot project is needed for new technology and system.

2) Proposed home compost bins (CKV compost bins)

- The participants agreed to develop a unified type home compost bins as CKV compost bins. The agreed specifications of the CKV compost bins are as follows:
  1) Shape: Hexagonal
  2) Color: Dark green
  3) Aeration hole: The size of the holes should be half inch.
  4) Support for frame: It should be screw and 6 inches from the bottom.
  5) Lid on compost door: There should be door.
  6) Leached hole: Without hole.
  7) Logo of CKV: Front plate.
  8) Capacity of bin: 100 lits.
- The procedure of production and distribution of the CKV compost bins were confirmed by the participants as follows:



- Manuals for trainers and users would be prepared by the Focal Points together with the JICA Study Team with support from local NGOs (Ce Pro In).
- Cost of CKV home compost bin is expected to be around Rs.1,072. On the basis of this price, the cost sharing was discussed as follows:

Stake holders	KMC			LSMC			KRM		
Price sharing	KMC	User	JICA Study Team	LSMC	User	JICA Study Team	KRM	User	JICA Study Team
	Rs.321.6	Rs.250	Remaining	25%	Rs. 250	Remaining	-	Rs. 250	Remaining

3. Distributed/ Used Materials:

Presentation materials from the JICA Study Team.

Subject:	**Workshop on Pre-feasibility Study of large-scale composting facility**	
Date:	May 25, 2005	
Time:	15:00-16:30	
Venue:	Local Development Training Academy Meeting Room	
Participants:	SWMRMC	Mr. Ashok Shahi, Civil Engineer
	KMC	Mr. Rajesh Manadhar, Chief, Solid Waste Management Section
	LSMC	Mr. Pradeep Amatya, Chief, Environment Section
	BKM	Mr. Moti Bhakta Shrestha, Social Welfare Officer, Social Welfare & Sanitation Section
	KRM	Mr. Gyan Bazra Maharjan, Assistant, SWM/Accounting,
	JICA Study Team	Mr. Shungo Soeda
		Mr. Norihiko Inoue
		Mr. Kiyoshi Shimizu
		Mr. Vikram Basyal
	SILT Consultant	Mr. Deepak Bahadur Singh
		Mr. Shivani Malla
	MEH Consultant	Mr. Govinda M. Tarmrakar
		Mr. N. K. Rajdhandari

1. Agenda:

1) Discussion of methodology of the pre-feasibility examination of a large-scale composting facility
2) Result of composting data collected at BKM Composting Facility
3) Result of market survey for compost product

2. Records of Discussion:

1) Methodology of pre-feasibility examination of large-scale composting facility

- It was confirmed that waste processing facilities are necessary to establish in near city area because it can reduce the waste quantity to be transported to landfill, especially in the case of Banchare Danda.
- It was confirmed that "operation cost + transportation cost of the residues – revenue of compost sales" of the proposed waste processing facility (large-scale composting facility) should be smaller than "saved cost of secondary transportation" as validity from the viewpoint of cost.
- It was explained that questionnaire regarding planning of a large-scale composting facility would be distributed to the related staff including the Task Force members. The contents of the questionnaire include target waste, capacity of the facility, technical system, operation and sales issues.

2) Result of data collection at BKM Composting Facility

- The result of data collection survey at BKM composting facility including current operation situation, material balance and quality of produced compost was discussed.

3) Result of market survey of compost

- The result of market survey of compost product was also explained. This result would be utilized for the pre-feasibility examination.

Subject:	**Workshop on Planning of Local-level Waste Minimization Activities (Evaluation)**	
Date:	July 6, 2005	
Time:	15:00-16:30	
Venue:	Local Development Training Academy Meeting Room	
Participants:	SWMRMC	Mr. Ashok Shahi, Civil Engineer
	KMC	Ms. Shriju Pradhan, Coordinator, Community Mobilization Unit
		Ms. Sanu Maiya Maharjan, Community Mobilization Unit
	LSMC	Mr. Pradeep Amatya, Chief, Environment Section
		Ms. Sabina Maharjan, Community Development Section
	KRM	Mr. Gyan Bazra Maharjan, Assistant, SWM/Accounting,
	JICA Study Team	Mr. Toshiyuki Ujiie
		Mr. Vikram Basyal
	SOUP	Ms. Rejina Joshi
		Ms. Ratna Shova Chitrakar
	WEPCO	Ms. Bishnu Thakali
	MEH Consultant	Mr. Govinda M. Tarmrakar
		Mr. N. K. Rajdhandari

1. Agenda:

1) Explanation of result of compost quality survey
2) Discussion on revised manual for users of compost bin
3) Sharing of experiences, problems and lessons learnt among Task Forces
4) Future schedule

2. Records of Discussion:

1) Explanation of result of compost quality survey

- The result of compost quality survey including interview to 100 households and evaluation of home compost activities were explained.
- It was confirmed that almost all of surveyed compost produced in home compost bin contained good proportion of nutrients (pH - 7.7, MC-40.0%, OM-11.9%, N- 1.13%, P2O5 -0.70%, K2O-3.49%, EC-1.33 (mmhos/cm) and C:N-6.7) and found better than solid waste compost produced at Bhaktapur Composting Facility.
- The conclusions were explained as follows;
  - The households were happy for utilizing home compost bin and some household told that they don't have to go to the container to dispose the waste every morning.
  - Households had used produced compost in their gardens, some had used in field of eggplants, paddy seedbed and so on.
  - Mostly all bin users received training on home composting understood the manual "How to Use Home Compost Bin" prepared by the CKV Study Team.
  - The design of home compost bin and its structure has no such big complain but some improvements were suggested.
  - As the average generation of the waste at each household was less than 1 kg per day, size of the bin was appropriate and comfortable, but some suggested more larger bins.
  - Some households faced problems of insect and leachate, but the problems were solved by improving in waste filling technique and prevention taken against the problems.

2) Discussion on revised manual for users of compost bin

- It was explained that the manual for users ("How to use home compost bin") was revised based on the interview survey of 100 households.
- It was suggested that in order to let users understand more easily, it is better to add contents of "Question and Answer" at the last part of the manual.

3) Sharing of experience, problems and lessons learnt among Task Forces

- The following opinions were raised by the members of Task Forces
  - The pilot projects of home composting activities were succeeded because almost all household expressed that they were satisfied with the activities and continued to use home compost bins.
  - Public awareness was also improved through home composting activities and they became to consider other inorganic waste for treating.
  - Monitoring and follow up of home composting activities was important so that some problems faced could be solved easily and households feel the activities easy.
  - Because some of the users requested larger size of home compost bins, several size of compost bins have to be produced.
  - Effect of home compost had to be studied in crop growth and crop production (in main crops) as next step.

4) Future schedule

- KMC plans to expand home composting activities through distribution of home compost bins and vermi-composting kits.
- LSMC plans to distribute 1,200 sets of home compost bins as short-term activities and have already ordered the bins.
- KRM plans to expand the target area of home composting.

APPENDIX 3.3

Questionnaire Sheet for Market Survey of Compost Products

APPENDIX 3.3 QUESTIONNAIRE SHEET FOR MARKET SURVEY OF COMPOST PRODUCTS

Name of the Household Head :..... Questionnaire No.:.....
District: …… VDC/Municipality: …… Ward No.: ……
Name of Interviewer: ……. Date: …….

Q.1 Land Ownership-Agricultural Lands

Land Ownership Pattern	Code No	Cropped Area	
		Area	Parcel
Own land self cultivated	1		
Rented – In	2		
Rented- Out	3		
Total			

Q.2 Area, Production and Inputs Use by Land Type and Irrigation Status

Operational Total Area :.....

Crops	Code	Cropped Area									
		Area	Production (kg or mu)	Seed (kg)	Urea (kg)	DAP (kg)	Potash (kg)	Compost (kg)	SWP-C (kg)	B. Meal (kg)	Others (kg)
Summer Season Crops (June/July-Oct./Nov.											
Early Paddy	1										
Normal Paddy	2										
Maize	3										
Soybean	4										
Other Pulses	5										
Summer Vegetables	6										
Sugarcane	7										
Winter Season (Oct./Nov. to Mar./April)											
Wheat	21										
Maize	22										
Barley	23										
Oilseeds	24										
Lentil	25										
Pulses	26										
Potato	27										
Veg. (Cauli, cabbage etc)	28										
Veg. Bulb (Onion, Garlic)	29										
Spring Season (Mar./April to June/July)											
S. Paddy	40										
S. Maize	41										
Vegetable	42										
	43										

Q.3 Improved Seeds

Q.3.1 Did you use improved seed?

☐Yes ☐No

If yes, (tick mark √)

☐Paddy ☐Wheat ☐Maize ☐Lentil

☐Mustard ☐Potato ☐Vegetables

Q.3.2 If not, why?

☐(a) Not available ☐(b) Too expensive ☐(c) Too far

☐(d) Not needed ☐(e) No knowledge

Q.4 Chemical Fertilizer

Q.4.1 Did you use chemical Fertilizer ?

☐Yes ☐No

If yes, (tick mark √)

☐Paddy ☐Wheat ☐Maize ☐Lentil

☐Mustard ☐Potato ☐Vegetables

Q.4.2 If not, why?

☐(a) Not available ☐(b) Too expensive ☐(c) Too far

☐(d) Not needed ☐(e) No knowledge

Q.4.3 Is Chemical Fertilizer Timely Available?

☐Yes ☐No

Q.4.4 Where do you buy/get chemical fertilizer?

☐(a) At village market/cooperative ☐(b) At adjoining VDC market/cooperative

☐(c) At district head quarter AIC/cooperative ☐(d) Indian market

Q.4.5 Quality Of Fertilizer (tick mark √)

Institution	Good Quality	Poor Quality
AIC		
Private		

Q.4.6 How much Chemical Fertilizer you have used in last five years?

Fertilizer	FY1999/00 FY2056/57	FY2000/01 FY2057/58	FY2001/02 FY2058/59	FY2002/03 FY2059/60	FY2003/04 FY2060/61
Urea					
DAP					
Potash					
A. Sulphate					

Q.5 Manure/Pit Compost/Saga

Q.5.1 Did you use Manure ?

☐Yes ☐No

If yes, (tick mark √)

☐Paddy ☐Wheat ☐Maize ☐Lentil

☐Mustard ☐Potato ☐Vegetables

Q.5.2 If not, why?

☐(a) Not available ☐(b) Too expensive ☐(c) Too far

☐(d) Not needed ☐(e) No knowledge

Q.5.3 Do you prepare manure in your farm ?

☐Yes ☐No

Q. 5.4 Is manure prepared in own farm is sufficient for yourself?

☐Yes ☐No

Q.5.5 How much Tons of manure do you prepare in a year?

……MT/Kg

Q.5.6 What is your annual requirement of manure?

……MT/Kg

Q.5.7 How will be annual requirement of manure?

☐(a) Increase ☐(b) Decrease ☐(c) Will remain same

Q.5.8 Is manure available when needed?

☐Yes ☐No

Q.5.9 Where do you buy/get manure?

☐(a) House product ☐(b) At village ☐(c) At adjoining VDC village

Q.5.10 Quality of manure (tick mark √)

☐(a) Good ☐(b) Average ☐(c) Bad

Q.5.11 Livestock Inventory

Livestock and Birds	Code No.	No. of Animal	Compost Production
Cattle	1		
Buffalo	2		
Goat/Sheep	3		
Others	4		

Q.5.12 How is the Cattle Farming/Compost production rate?

Items	Increasing	Decreasing	As such
Cattle Farming			
Compost production			

Q.5.13 How much manure you have used in last five years?

Compost	FY1999/00 FY2056/57	FY2000/01 FY2057/58	FY2001/02 FY2058/59	FY2002/03 FY2059/60	FY2003/04 FY2060/61
Own					
Purchased					
Total					
Price/kg					

Q.6 Solid Waste Product –Compost (SWP-C)

Q.6.1 Do you have knowledge/idea about SWP-C?

☐Yes ☐No

Q.6.2 Did you use SWP-C ?

If yes, (tick mark √)

☐Paddy ☐Wheat ☐Maize ☐Lentil
☐Mustard ☐Potato ☐Vegetables

Q.6.3 If not, why?

☐(a) Not available ☐(b) Too expensive ☐(c) Too far
☐(d) Not needed ☐(e) No knowledge

Q.6.4 Are you interested to use SWP-C in your crops?

☐Yes ☐No

Q.6.5 How many % of manure requirement can be replaced by SWP-C?

☐Less 20% ☐20-30% ☐30-40% ☐About 50%

Q.6.6 How many % of Fertilizer requirement can be replaced by SWP-C?

☐Less 20% ☐20-30% ☐30-40% ☐About 50%

Q.6.7 Is SWP-C easily available?

☐Yes ☐No

Q.6.8 Problems faced in SWP-C use?

……

……

Q.6.9 Where do you buy/get SWP-C?

☐(a) At village market/cooperative
☐(b) At adjoining VDC market/cooperative
☐(c) At district head quarter AIC/cooperative
☐(d) SWP-C Factory/Office

Q.6.10 Quality of SWP-C (tick mark √)

☐(a) Good ☐(b) Average ☐(c) Bad

Q.6.11 Can compost bin method will be applicable to prepare compost for farm use?

☐Yes ☐No

Q.6.12 Can compost chamber (large bin) method will be applicable to prepare compost for farm use?

☐Yes ☐No

Q.6.13 Can dry toilet materials will be applicable to prepare compost for farm use?

☐Yes ☐No

Q.6.14 How much SWP-C and Others you have used in last five years?

Type	FY1999/00 FY2056/57	FY2000/01 FY2057/58	FY2001/02 FY2058/59	FY2002/03 FY2059/60	FY2003/04 FY2060/61
SWP-C					
Price/kg					
Bone-meal					
Price/kg					

Q.7 Agricultural Support Services in Compost promotion

Q.7.1 Are any Program Launched for /Manure Compost Promotion?

☐Yes ☐No

If yes what Program?

(a) ……..
(b) ……..
(c) ……..

Q.7.2 Are any Program Launched for SWP-C?

☐Yes ☐No

If yes what Program?

(a) ……..
(b) ……..
(c) ……..

Q.7.3 Have you taken any agricultural training conducted for Compost and SWP-C?

☐Yes ☐No

Q.7.4 Have you taken any Package Program Launched for Compost and SWP-C?

☐Yes ☐No

Q.7.5 Are any Association and community/group formed for Soil fertility Improvement in the Village?

☐Yes ☐No

Q.7.6 Is there system of buying agricultural inputs in group/community in the Village?

☐Yes ☐No

Q.7.7 What do you feel about the use of SWP-C?

☐(a) Use rate increasing ☐(b) Use rate decreasing ☐(c) Use rate same

Q.7.8 What do you feel about effect of the SWP-C?

☐(a) Production increase ☐(b) Production decrease ☐(c) Production same

Q.7.9 What are the importance you feel in Compost/SWP-C use?

(a) ……..
(b) ……..
(c) ……..
(d) ……..

Q.7.10 SWP-C will help to improve community sanitation?

☐Yes ☐No

Q.7.11 SWP-C will help to improve/maintain soil fertility?

☐Yes ☐No

Q.7.12 Prices of Compost/SWP-C?

Materials	Present Price/kg	Proposed Price /kg
Compost		
SWP-C		

Q.7.13 Which organization exists in you VDC?

☐(a) Credit bank ☐(b) Cooperative
☐(c) Agriculture Service Center/Agriculture Sub-center
☐(d) SWP-C sale center

Q.7.14 What do you feel about the marketing of SWP-C in future?

……
……
……
……

Q. 7.15 If you have any thing to say on Compost and SWP-C ?

……
……
……
……

APPENDIX 3.4

Result of Questionnaire for Planning of Large-Scale Composting Facility

APPENDIX 3.4 RESULT OF QUESTIONNAIRE FOR PLANNING OF LARGE-SCALE COMPOSTING FACILITY

Classification	Item	Description							
Respondent	Number of person	SWMRMC	KMC	LSMC	BKM	KRM	Local Consu	JICA	Total
		2	3	3	3	1	2	4	18
	Experience on composting	Planning	Operation	Ex. operati	Investigatic	Others			
		10	4	4	13	11			42
		56%	22%	22%	72%	61%	for persons		233%
Purpose	Priority	☐Waste minimization is given priority						13	72%
		☐Production of organic fertilizer is given priority						2	11%
		☐Same priority						3	17%
							Total	18	100%
Target (Merit)	Waste minimization (Reduction of disposal amount) *Priority 5 to 1 in descending order	( ) Transportation costs reduction						78	31%
		( ) Landfilling costs reduction						55	22%
		( ) Extension of landfill site life						63	25%
		( ) Moderating environmental impact						37	15%
		( ) Others						22	9%
							Total	255	100%
	Production of organic fertilizer *Priority 5 to 1 in descending order	( ) Saving chemical fertilizer						49	20%
		( ) Improvement of farm production						70	29%
		( ) Preserving soil condition						69	29%
		( ) Saving fertilizer cost						37	15%
		( ) Others						15	6%
							Total	240	100%
Plant capacity	Treatment Capacity	☐350 t/d						1	6%
		☐200 t/d						2	13%
		☐150 t/d						0	0%
		☐100 t/d						1	6%
		☐ 50 t/d						7	44%
		☐ 30 t/d						3	19%
		☐ 20 t/d						2	13%
							Total	16	100%
Kind of waste	Separation at source	☐Yes						11	61%
		☐No (Mixed)						6	33%
		☐Not decided						1	6%
							Total	18	100%
Process	Composting method	☐Windrow						17	85%
		☐Vermi						2	10%
		☐Mechanical						1	5%
		☐Other						0	0%
							Total	20	100%
System									
Receiving	Control of waste amount	☐Measuring by weighbridge						13	72%
		☐Number of incoming vehicles						5	28%
		☐Other						0	0%
							Total	18	100%
Sorting	Timing	☐Before composting						14	64%
		☐During composting						3	14%
		☐After composting						5	23%
		☐Other						0	0%
							Total	22	100%
	Method	☐Hand sorting						10	43%
		☐Mechanical/Screen						13	57%
		☐Mechanical/Exclusive machine						0	0%
		☐Other						0	0%
							Total	23	100%
Aeration	Method	☐Man-powered						6	32%
		☐Mechanical/Wheel Loader						13	68%
		☐Mechanical/Exclusive machine						0	0%
		☐Other						0	0%
							Total	19	100%

Classification	Item	Description		
Finishing	Screening	☐Min. required mechanical screening	13	72%
		☐With glass particle removal system	5	28%
		☐Other	0	0%
		Total	18	100%
	Material addition	☐Yes	10	59%
		☐No	7	41%
		Total	17	100%
	Sales shape	☐Bulk	12	57%
		☐Packing	9	43%
		☐Other	0	0%
		Total	21	100%
	Quality	☐Standard to be applied	13	68%
		☐No standard	6	32%
		☐Other	0	0%
		Total	19	100%
Environmental protection	Countermeasure	☐Collection of leachate	9	29%
		☐Tree planting	8	26%
		☐Buffer Zone from residential areas	12	39%
		☐Other	2	6%
		Total	31	100%
Operation	Working time	☐1shift	6	33%
		☐2shift	11	61%
		☐Other	1	6%
		Total	18	100%
	Operator	☐Municipal staff/worker	1	6%
		☐Municipal staff with private worker	8	44%
		☐Entrust to private sector	9	50%
		☐Other	0	0%
		Total	18	100%
Sales	Cost Recovery	☐Municipality's subsidy is unavoidable.	8	44%
		☐Operational cost should be covered.	7	39%
		☐Both investment and operational costs should be covered.	3	17%
		☐Other	0	0%
		Total	18	100%
	Delivery	☐On plant site	15	75%
		☐Delivered to customers	4	20%
		☐Other	1	5%
		Total	20	100%
	Management	☐Municipality (s)	5	28%
		☐ SWMRMC	0	0%
		☐Entrust to private sector	13	72%
		☐Other	0	0%
		Total	18	100%
Remarks	Suitable selling cost:	(Rs/kg)		
		☐1Rs/kg	2	17%
		☐2Rs/kg	3	25%
		☐3Rs/kg	1	8%
		☐4Rs/kg	1	8%
		☐5Rs/kg	3	25%
		☐6Rs/kg	1	8%
		☐8Rs/kg	1	8%
		Total	12	100%
	Main opinion			
	Demand	1) Production of compost should be publicized so that demand will be created.		
		2) It is necessary to obtain the support of the related agricultural agencies such as Ministry of Agriculture to support the compost demand effort		
	Suitable criteria for site selection	1)It is very important that there should be a buffer zone between the plant and the surrounding residential area and that the zone be preserved. This is very important for the site selection. The selected area should also be sufficient for future expansio		
	Others	1) As per the experience with in SARRC countries, large scale composting is not so feasible. So we have to start with smaller quantity like 30 t/d.		
		2) The education of source separation have to be provided.		

APPENDIX 3.5

Study Tour in India

APPENDIX 3.5 STUDY TOUR IN INDIA

Date: November 7 to 11, 2004

1. Aim of the Tour

To learn Indian good practices on solid waste management, specially composting activities.

2. Visited Places and People

Selected good practices regarding composting in Bangalore, Mumbai and Ahmedabad.

In Bangalore

1. Bangalore Municipality (Dept./Section in charge of solid waste management)
   Mr. V. P. Ikkeri: Deputy Commissionor of Health
   Mr. H. C. Ananthaswamy: Executive Engineer
2. Karnataka Compost Development Corporation (KCDC)
   Mr. C. Basavaiah: Managing Director
3. Terra Firma
   Mr. B. Sudarshan: Manager - Works

In Mumbai

1. Mumbai Municipality (Dept./Section in charge of solid waste management)
   Mr. R. R. Markandeya: Chief Engineer for SWM
   Ms. Seema s. Redkar: Officer on Special Duty
   Mr. Jagdish Dave: Chief Protcol & Liaison Officer
   Mr. Mahesh Narvekar: Protcol & Liaison Officer
   Mr. Sagar Nayak: Asst. Protcol & Liaison Officer
2. Dadar Pumping Station, Vermigold
   Dr. Udai & Rajani Desai: Anaesthesiologists
3. Varsova, Green Cross, Composting Site

In Ahmedabad

1. Large scale compost plant of Excel Industries Ltd.
   Mr. Pankaj Pathak: Sr. Maneger Operation
   Mr. J. D. Raval: Asst Manager Operation

3. Tour Schedule

Date	Name of Sites	Composting Technique (Type)	Feed Stock	Organizational Setup	Capacity (TPD)	Report
Nov. 7 (Sun)	Moving from Kathmandu* to Bangalore **[KTM(14:15)-DEL(15:30):9W4108, DEL(17:15)-BLR(19:50):9W811]**					
Nov.8 (Mon)	**CC to Bangalore Municipality**					
	Karnataka Compost Development Corporation (KCDC)	Windrow and Vermi (E)	Mixed waste	Contractor of municipality	150	**KMC**
	Terra firm	Windrow and Vermi-composting (D)	Market & Agro-industry waste	Company	100	**LSMC**
Nov. 9 (Tue)	Moving from Bangalore to Mumbai **[BLR(8:55)-BOM(10:30):9W412]**					
	CC to Mumbai Municipality					
	Dadar pumping station Vermigold	Windrow and Vermi (C)	Market	Company	5	**KRM**
	Vermi composting at official colony	Vermi (B)	Organic HH waste	Municipality	-	
	Municipal Transfer Station	-	-	Municipality	-	
Mr. Ashok, Mr. Shimizu						
Nov.10 (Thu)	Moving from Mumbai to Ahmedabad **[BOM(9:55)-AMD(10:55)9W480]**					
	Excel Industries Pv. Ltd.	Large	-	Company	500	**SWMRMC**
Nov.11 (Fri)	Moving from Ahmedabad to Kathmandu **[AMD(8:10)-DEL(9:35):9W702, DEL(11:30)-KTM(13:15):9W4107]**					
Other members						
Nov.10 (Thu)	Varsova ,green cross, composting site or	Vermi-composting in heaps (D)	Market waste	Company, etc.	5.0	**BKM**
Nov.11 (Thu)	Moving from Mumbai to Kathmandu **[BOM(7:00)-DEL(9:00): 9Wxxx, DEL(11:30)-KTM(13:15):9W4107]**					

Note:
A – Backyard Composting
B – Neighborhood & community based (CBO) composting
C – Composting on premises of institutions and companies
D – Middle scale composting enterprises
E – Large-scale centralized composting facilities
HH – Household
NA – Not Available

4. Participants

Organizations	Name	Title
MOLD	Mr. Som Lal Subedi	Joint Secretary
SWMRMC	Mr. Surya Man Shakya	General Manager
	Mr. Ashok Shahi	Civil Engineer
KMC	Ms. Shriju Pradhan	Coordinator, Community Mobilization Unit
	Mr. Chitra Kumar Sunuwar	Operation and Enforcement Unit
LSMC	Ms. Sabina Maharjan	Community Mobilizer, Community Development Section
	Ms. Gyami Shova Maharjan	Community Mobilizer, Community Development Section
BKM	Mr. Moti Bhakta Shrestha	Social Welfare Officer, Social Welfare & Sanitation Section
MTM	Mr. Surendra Shrestha	Junior Engineer, Planning and Technical Section
KRM	Mr. Gyan Bazra Maharjan	Assistant, SWM/Accounting
JICA Study Team	Mr. Shungo Soeda	Collection & Transport/Recycling System
	Mr. Kiyoshi Shimizu	Recycling System
	Ms. Sachiko Suwa	Coordinator/ Public Participation / Social Consideration

Nepalese counterparts: 10
Japanese experts: 3
Total participants: 13


Karnataka Compost Development Corporation (KCDC)
Nov. 8 (Mon), morning


Terra Firm
Nov. 8 (Mon), afternoon


MCGM's SWM Activities
Official Colony Composting
Collection Container
Transfer Station
Final Disposal Site


Dadar Pumping Station, Vermigold
Nov. 9 (Tue), morning


Varsova , Green Cross, Composting Site
Nov. 10 (Wed), morning


Large scale compost plant of Excel Industries Ltd.
Nov. 10 (Wed), morning

Selected Photo of Activities

- Pilot Project B –

Selected Photo of Activities - Pilot Project B -

B-1: Workshop on Waste Minimization Facility
(July, 2004)

B-1: Workshop on Waste Minimization Facility
(October, 2004)

B-1: Market Survey of Compost
(October, 2004)

B-1: Study Tour to India
(November, 2004)

B-1: Study Tour to India
(November, 2004)

B-1: Data Collection at BKM Composting Facility
(February, 2005)

B-1: Data Collection at BKM Composting Facility
(February, 2005)

B-1: Compost Quality Survey at Farming
(July, 2005)

B-2: Training on Composting at Ward 21, KMC
(February, 2005)

B-2: Training on Composting at LSMC
(February, 2005)

B-2: Training on Composting at LSMC
(February, 2005)

B-2: Compost bin Distribution
(January, 2005)

B-2: Home Composting Activity
(May, 2005)

B-2: Monitoring Activities for Home Composting
(May, 2005)

B-2: Inauguration Ceremony for Vermi-Composting
(March, 2005)

B-2: Vermi-Composting at Teku T/S
(March, 2005)

B-2: Training on Composting to Farmer
(May, 2005)

B-2: Vermi-Composting at Teku T/S
(May, 2005)

B-2: Three-day Training for Youth Group at KRM (September, 2004)

B-2: Two-day Training for Women at KRM (October, 2004)

B-2: Collected Plastic by using Suiro at KRM (March, 2005)

B-2: Plastic Collection by Youth Group from wards at KRM (March, 2005)

B-2: Refresher Training for Youth Group and Women's Group members (June, 2005)

B-2: Plastic Collection at KRM (June, 2005)

CHAPTER 4

PILOT PROJECT C

IMPROVEMENT OF FINAL DISPOSAL PLANNING AND OPERATION

CHAPTER 4 C: IMPROVEMENT OF FINAL DISPOSAL PLANNING AND OPERATION

4.1 Background and Strategy

There were no sanitary landfills presently in operation in the Kathmandu Valley. Since Gokharna Landfill was closed around five years ago all waste collected, after removal of part of the recyclable portions, was being dumped near or in the river system. Within the integrated solid waste management system it was necessary to ensure a final disposal of the solid waste that remained after efforts to reduce the waste at the source, re-use and recycle resources from the waste stream. The disposal of the waste should be implemented in a sanitary manner in order to protect the public health and mitigate impacts on the environment. In this connection, there was an urgent need to:

- develop the planning, design, construction and operation capabilities of stakeholders concerned on sanitary landfill
- educate the public on sanitary landfill
- develop the suitable landfill technical system for the Kathmandu Valley

Under this background the Pilot Project for improvement of final disposal was developed, with two components of:

1. Training for final disposal planning focusing on site selection including social and environmental impact consideration
2. Training for semi-aerobic landfill system focusing on planning, design, improvement works and operation of Sisdol short-term Landfill

The strategy adopted for the implementation of this Pilot Project component was as follows:

- Make use of previous efforts in this field both locally and abroad
- Consider short term, or urgent requirements, as well as long term needs based on the Draft Action Plans (DfA/Ps) prepared by each of the five municipalities and the Solid Waste Management and Resource Mobilization Center (SWMRMC).
- Adopt technologies that are locally sustainable, with an overview for gradual development of sanitary landfill

4.2 Basic Plan

4.2.1 Project Purpose

The Project Purpose of the Pilot Project C was identified as “Capabilities of relevant staff of five municipalities and SWMRMC regarding final disposal planning and operation are strengthened.”

4.2.2 Outputs

The designed outputs of the Pilot Project C are as follows.

Output 1	Basic knowledge for planning and final disposal is obtained
Output 2	Basic knowledge and experiences are obtained on planning, designing, improvement works and O&M of semi-aerobic landfill system

As Output 1, the training of the Nepalese counterparts responsible for landfill in the respective municipalities and SWMRMC focused on the following:

1) Adopt site selection criteria – natural, social and environmental aspects
2) Develop recommendations on EIA process
3) Identify short list for a long term landfill site to be developed to serve Kathmandu Metropolitan City (KMC), Lalitpur Sub-Metropolitan City (LSMC) and Kirtipur Municipality (KRM)

On the other hand, the training of Output 2 for semi-aerobic sanitary landfill system focused on the following;

1) Develop technical capabilities for design, construction and operation of the semi-aerobic sanitary landfill
2) Develop the environmental monitoring system associated with the sanitary landfill
3) Develop public awareness and understanding on the semi-aerobic sanitary landfill

4.2.3 Activities

Details of the activities implemented in the Pilot Project C are described in the succeeding section 4.3. A summary of the activities is shown in Table 4.2-1.

Table 4.2-1 Summary of Activities

Activities	Components of Activities
C-1 Training for Final Disposal Planning	
C-1.1 Training for site selection	• Workshops • Introduction and discussion on evaluation criteria and selection process on L/T LFs • Site visit to some candidate sites • IEE practice for L/T LFs
C-1.2 Training for environmental/social considerations on landfill site	• Workshops • Preparation for Taikabu Landfill concept design • Support for the ongoing EIA study for Taikabu Landfill site
C-2 Training/Practice of Semi-aerobic Sanitary Landfill System (Sisdol S/T LFS)	
C-2.1 Training for planning	• Site visit to Pokhara and Malaysia • Introduction and discussion on technical issues for semi-aerobic sanitary system
C-2.2 Training for designing	• Natural condition surveys and detailed design of Sisdol S/T LF
C-2.3 Training for construction supervision	• OJT through supervision of improvement works and joint site visit • Environmental monitoring (before operation)
C-2.4 Practice of O&M including environmental monitoring	• Preparation for site operation • OJT on site operation • O&M manual preparation (Supporting Report II) and regular OM review meetings (Appendix 4.2) • Environmental monitoring (after operation)

Source: JICA Study Team

4.2.4 Plan of Operation

The Plan of Operation (PO) developed for this Pilot Project is described below.

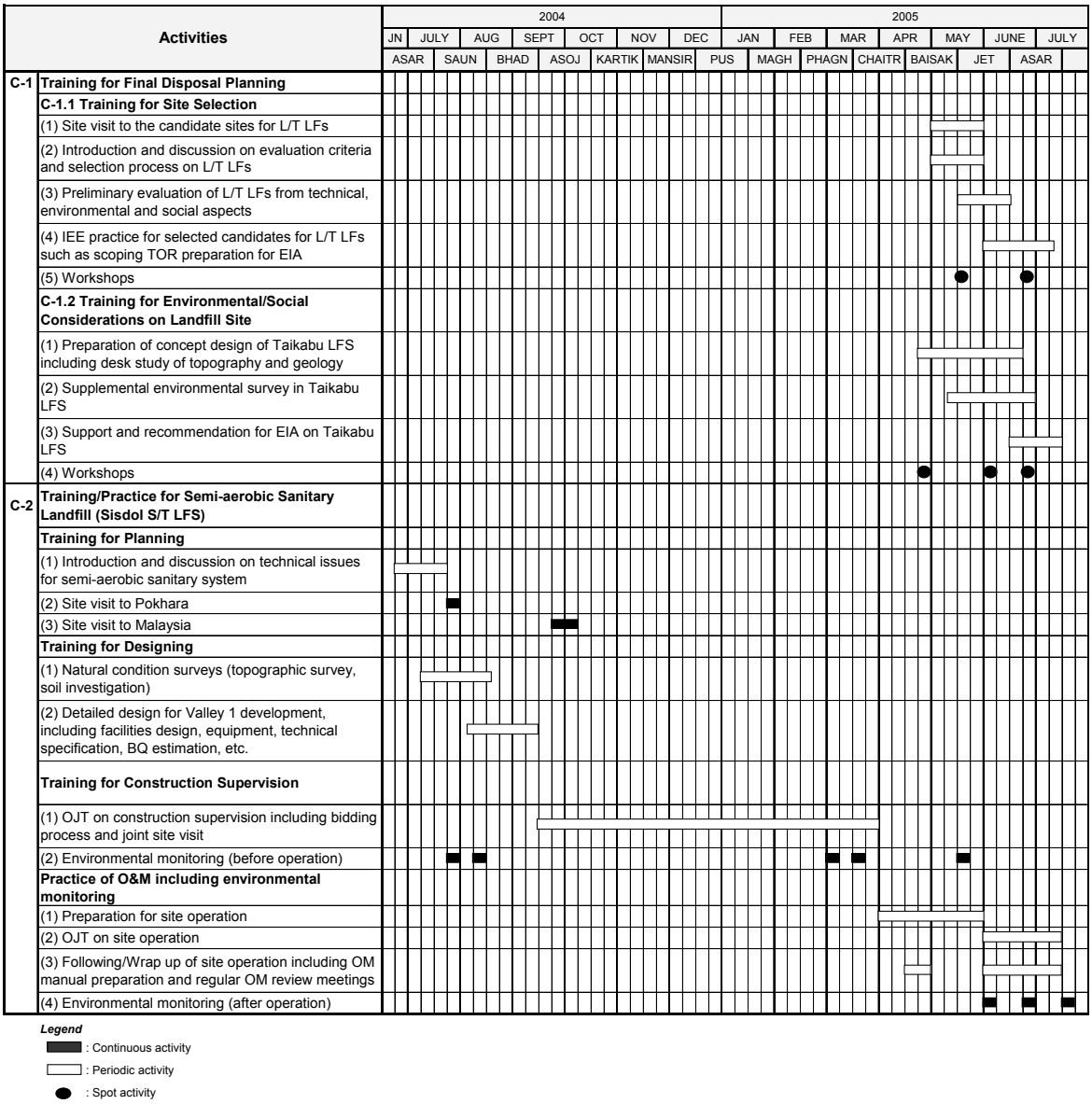


Figure 4.2-1 Plan of Operation of Pilot Project C (Actual)

Source: JICA Study Team

4.2.5 Inputs and Implementation Organization

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

Japan	Nepal
(1) Personnel • Members of the JICA Study Team - Facility Plan - Environment - Public Involvement/Social Consideration - Organizational and Institutional Strengthening/Human Resources Development • Local consultants, local contractor, local resource person (training, facilities design, improvement works, environmental monitoring) including costs (2) Study tour (3) Improvement works of Sisdol S/T-LF as Semi-aerobic system including environmental monitoring	(1) Personnel • Counterparts and other relevant staff - SWMRMC - KMC - LSMC - BKM - MTM - KRM (2) Cost - Sisdol Landfill site preparation except semi-aerobic manner - Access road improvement and maintenance (3) Equipment for Sisdol LF operation and for transportation

Table 4.2-2 shows the organizations involved in the implementation and their respective inputs.

Table 4.2-2 Inputs and Implementation Organization

Activities	Organization/ Inputs
C-1 Training for Final Disposal Planning	
C-1.1 Training for site selection	SWMRMC • Review of candidate sites studied to date • Determination of selection criteria • Site visits • Participation in workshops Five municipalities • Identification of disposal requirements • Determination of selection criteria • Site visits • Participation in workshops Department of Mines and Geology • Review of candidate sites studied to date • Site visits • Participation in workshops Academics and NGOs • Participation in workshop GEOCE • Support for IEE practice
C-1.2 Training for environmental/social considerations on landfill site	SWMRMC and BKM • Discussion on EIA guidelines under preparation by SWMRMC • Discussion on experience gained in Sisdol EIA process, operation and environmental monitoring • Participation in workshops Academics (Khwopa college) • Participation in workshops

Activities	Organization/ Inputs
	EAST Consult (P.) Ltd • Support for EIA Practice • Participation in workshops ERMC (P.) Ltd • Participation in workshops
C-2 Training/Practice of Semi-aerobic Sanitary Landfill System (Sisdol S/T-LFS)	
C-2.1 Training for planning	SWMRMC • Discussion and clarification of Sisdol LF designs previously prepared by SWMRMC • Preparation of concept design for Sisdol Semi-aerobic Landfill • Participation in Pokhara and Malaysia site visits • Preparation of reports on both visits • Participation in workshops KMC and LSMC • Identification of disposal requirements • Preparation of concept design for Sisdol Semi-aerobic Landfill • Participation in Pokhara and Malaysia site visits • Preparation of reports on both visits • Participation in workshops BKM, MTM, and KRM • Participation in Pokhara and Malaysia site visits • Preparation of reports on both visits • Participation in workshops MOPE, Academics and NGOs • Participation in workshop
C-2.2 Training for designing	SWMRMC • Discussions on detailed design with designer • Supervision of natural conditions surveys • Participation in workshops KMC and LSMC • Discussions on detailed design with designer • Participation in workshops BKM, MTM, KRM, MOPE, Academics and NGOs • Participation in workshops EAST Consult (P.) Ltd. • Implementation of natural conditions surveys • Preparation of detailed designs • Participation in workshops
C.2.3 Training for construction supervision	SWMRMC • Supervision of improvement works • Discussions on improvement works with contractor • Construction of Center's portions of the Pilot Project • Participation in workshops KMC and LSMC • OJT on improvement works • Participation in workshops BKM, MTM, KRM, MOPE, Academics and NGOs • Participation in workshops Bhairab Construction Company (Pvt.) Ltd. • Implementation of improvement works • Participation in workshops
C-2.4 (1) Practice of O&M	SWMRMC • Development of Operation Manual • Signatory of Operation Agreement

Activities	Organization/ Inputs
	• Participation in workshops • Participation in Sisdol Operation Review weekly meetings KMC and LSMC • Development of Operation Manual • Signatory of Operation Agreement • Operation of the Sisdol S/T-LF • Participation in workshops • Participation in Sisdol Operation Review weekly meetings Local Committee • Monitoring of operation of the Sisdol S/T-LF • Participation in workshops • Participation in Sisdol Operation Review weekly meetings BKM, MTM, and KRM • Participation in workshops Related agencies, Academics and NGOs • Participation in workshops
C-2.4 (2) Practice of environmental monitoring	SWMRMC • Formulation of Environmental Coordination Committee • Preparation of environmental monitoring program • Participation in workshop KMC, LSMC, KRM • Preparation for environmental monitoring implementation • Participation in workshop • Coordination with Okharpauwa Sanitary Landfill Site Main Coordination Committee (OSLSMCC) ENPHO • Support for environmental monitoring for Sisdol S/T-LF • Participation in workshop

Source: JICA Study Team

4.2.6 Preconditions and Important Assumptions

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

Preconditions	▪ Political and security conditions are not worsen. ▪ 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 C are described below.

Important Assumptions that might affect the Outputs	▪ Trained staff continue working in municipalities and SWMRMC.

Important assumptions that might affect the Project Purpose of the Pilot Project C are as follows.

Important Assumptions that might affect the Project Purpose	▪ Staff is assigned to Sisdol S/T-LF operation by KMC and LSMC . ▪ KMC and LSMC together with SWMRMC transport the collected solid waste to Sisdol S/T-LF

4.3 Results of Activities

The activities conducted until the end of June 2005 under the Pilot Project C are summarized in Appendix 4.1, while the records of workshops/trainings are summarized in Appendix 4.2.

4.3.1 C-1: Training of Final Disposal Planning

(1) Activities Implemented

The Pilot Project C-1 was composed of C-1.1: Training for site selection and C-1.2: Training for environmental/social consideration on landfill site. Table 4.3-1 shows the summary of activities implemented under the Pilot Project C-1.

Table 4.3-1 Summary of Activities of Pilot Project C-1

Activities	Nepalese C/Ps mainly involved	Remarks
C-1.1: TRAINING FOR SITE SELECTION		
Workshop (Jul. 23, 2004, May 16, Jun. 22, 2005)		
- Discussion on site selection criteria and screening for candidate sites - Discussion on environmental issues including lesson of Sisdol EIA, SWMRMC EIA guideline, environmental monitoring program, etc. - Introduction of experiences and case studies in Japan on site selection as well as environmental issues. - Joint preliminary evaluation of selected candidate sites from technical and environmental viewpoints. - Introduction of implication for developing and operating each candidate with rough cost estimation. - Discussion on the draft scoping and TOR for EIA on two of the selected candidates for long-term landfill site (L/T-LFS).	- SWMRMC, KMC, LSMC - MTM, BKM (only July 23, 2004)	Support from local consultant (GEOCE) on May 16 and June 22, 2005
Site visit to candidate site for L/T-LF		
- Joint site visit to Sisdol and Banchare Danda in Okharpauwa, Pharsidol in Bungamati, and others.	- SWMRMC, KMC, LSMC	
IEE practice for Long-term LFS		
- Practice of scoping and TOR for EIA.	- SWMRMC, KMC, LSMC	Support from GEOCE
C-1.2: TRAINING FOR ENVIRONMENTAL/SOCIAL CONSIDERATIONS ON LANDFILL SITE		
Technology transfer		
- Preparation of concept design of Taikabu LFS including desk study of topography and geology - Implementation of supplemental environmental survey in Taikabu LFS. - Support and recommendation for EIA - Technical meetings.	- SWMRMC, BKM	Support from local consultant (EAST)

Activities	Nepalese C/Ps mainly involved	Remarks
Workshop		
- Discussion on concept design of Taikabu LFS. - Discussion on EIA recommendation including technical issues and public involvement process.	- SWMRMC, BKM	Support from local consultant (EAST) Involvement of Khwopa college

Source: JICA Study Team

1) C-1.1: Training for Site Selection

Workshop 1 (July 23, 2004)

a. Discussion on site selection criteria
b. Identification of six candidate sites from over 20 sites studied in the past
c. Development of environmental monitoring system for the Sisdol Semi-aerobic Landfill Pilot Project
d. Review and comment on the Sisdol EIA from aspects of natural liner provision, leachate treatment by aeration and re-circulation, social aspects related to surrounding residents and expected leachate quality
e. Discussion on draft national EIA guidelines on solid waste management under preparation by SWMRMC
f. Introduction of EIA system in Japan including strategic environmental assessment (SEA) and the JICA Environmental Impact Assessment Guideline as reference
g. Introduction of case studies in Japan on site selection for SWM facilities of landfill and intermediate treatment from the environmental point of view.

Workshop 2 (May 16, 2005)

The first workshop was organized for the purpose of screening the optimum candidate(s) of long-term landfill site (L/T-LFS) under the Umbrella Concept of the Zone A (KMC, LSMC and KRM). The contents of the workshop are summarized below:

a. Overviews of the environmental conditions of three candidates site (Banchare Danda in Okharpauwa, Pharsidol North in Bungamati, Pharsidol South in Bungamati).
b. Sharing the preliminary technical features of each site, such as capacity, life time, rough cost estimation for development, unit cost per disposal, etc.
c. Preliminary ranking of each site based on the scoring system of LFS candidates proposed in SWMRMC EIA Guidelines
d. Sharing the expected development schedule for the L/T-LFS of the zone A, considering the life span of Sisdol short-term Landfill (S/T-LF).
e. Discussion on the estimated investment cost and disbursement schedule.
f. Discussion on the implied cost for transfer haul under each case of three candidates.

Workshop 3 (June 22, 2005)

The second workshop regarding L/T-LFS for the zone A was organized for sharing the preliminary initial environmental examination (IEE) on the two candidates of L/T-LFS of the zone A (Banchare Danda, Pharsidol North). The contents of the workshop are summarized below:

a. Review of the results of preliminary evaluation for selecting the L/T-LFSs on which IEE should proceed.
b. Explanation of legal framework and requirements to be followed in the course of IEE and further EIA study.

c. Explanation of possible environmental/social issues and impacts on which attention should be paid in the course of further EIA study, based on the result of draft scoping of two candidates.
d. Pointing out the prerequisite of public involvement for finalization of scoping process, which a developer should organize in accordance with Nepalese legislation.
e. Explanation of draft TOR for further EIA study on two candidates.
f. Discussion on the results of draft scoping and TOR, as well as the process to steer an optimum site between two candidates.

Site Visits

a. Visits to candidate sites of Pharsidol and Banchare Danda (Okharpauwa).
b. Identification of six candidate sites from over 20 sites studied in the past.

2) C-1.2: Training for Environmental/Social Considerations on Landfill Site

Training for environmental/social consideration on landfill site is mainly composed of i) preparation of a concept design of Taikabu LFS to be included in EIA, and ii) recommendation for the further EIA study of Taikabu LFS to be conducted by SWMRMC and BKM. This Pilot Project aimed at technology transfer to the Nepalese counterparts (C/Ps) for the capacity development on the EIA preparation which would be environmentally and socially acceptable. The activities of the Pilot Project can be summarized as follows:

a. Kick-off meeting on the Pilot Project for discussion on April 26, 2005, regarding the methodology and expected outcomes, work schedule, and joint site visit, with involving the Focal Points of BKM and SWMRMC as well as members of study assisting committee.
b. Secondary data/information collection on topography and soil in and around the proposed site, including analysis of the aerial photo.
c. Preparation of the concept design using the above engineering outcomes, including general layout plan, measures for environmental control, capacity calculation, rough cost estimation, etc.
d. First sharing meeting on June 10, 2005, regarding the draft concept design with involving CEO and Focal Points of BKM, Focal Point of SWMRMC, and professors of Khwopa College.
e. Preparation of EIA recommendation report on Taikabu LFS development including not only the project description (outcomes of concept design) but also implications and suggestions on conceivable impacts, basic framework for environmental management, and necessary steps or process toward the stakeholder involvement and acceptance.
f. Second sharing meeting on June 26, 2005, regarding the draft EIA recommendation report with involving the CEO and Focal Points of BKM, Focal Point of SWMRMC, and a professor of Khwopa College.

In the early of May, 2005, local people/communities around the proposed Taikabu LFS raised a voice on the opposition to the LF development, which assumed to be led by a political party. Considering such socially sensitive situation, the site investigations such as topography survey and soil investigation were cancelled. The number of locations of water quality analysis was also decreased due to non availability of boreholes to be prepared through soil investigation. However, in order to meet the objective of technical transfer on the EIA practice on Taikabu LFS, the concept design, which should be integrated into the EIA, was prepared by sorting out the secondary data on topography and soil. In addition,

the technical support of EIA recommendation for BKM covered the examination of conceivable impacts and environmental management framework, which had been supplemented to the original assistance scope.

(2) Results of the Activities

The results of the Pilot Project C-1 are summarized as follows.

1) C-1.1: Training for Site Selection

a. A workshop for introducing methodologies of landfill site selection in Japan including strategic environmental assessment (SEA) was held. It was understood that important site selection criteria were: haul distance, location restrictions, land area, site access conditions, soil and topography features, hydrology consideration, technical feasibility, and local development and requirements.

b. Through the site visits to Pharsidol candidate sites (Pharsidol North and South), it was confirmed that the sites satisfied most of the technical selection criteria. Requirements of Civil Aviation Authority of Nepal (CAAN) were cleared only for the Pharsidol North site. However some critical issues to be overcome were raised for both sites from the social and cultural viewpoints. Also there was a need to confirm the acceptance of Nepal Water Supply Corporation (NWSC), which was managing the Pharsidol well fields.

c. A checklist with a rating system introduced in the SWMRMC EIA Guidelines was employed for preliminary comparison among Banchare Danda, Pharsidol North and South. The comparison was made twice by different groups, namely i) local consultant team, and ii) TWG members of SWMRMC, KMC, LSMC, and different rankings were obtained. Ranking reversal could be considered to be born from the different perspective of engineering issues regarding the hydro-geological condition, groundwater drainage, liner system, and leachate collection system for each candidate. It could be said that somewhat unfair scoring were provided to the candidates by TWG members' comparison, for example, hydro-geological issues would be overcome in case that groundwater could be properly managed, and vice versa. On the other hand, the technical and engineering examination showed that i) Banchare Danda was recognized to be the most suggestive from the viewpoints of life time and unit rate (Rs/m^3) of development, followed by Pharsidol North, whereas ii) Pharsidol North and South were advantageous in terms of the cost of transfer haul operation.

d. Based on the discussion of workshops and ad hoc meetings, it was understood that both sites (Banchare Danda and two candidates in Pharsidol) had their own advantages and disadvantages, and some of them were antithetical between both sites. Necessity of decision making at the political level for selection of the optimum site was raised by the Nepalese side. And IEE practice for preparing a draft scoping report and TOR was conducted targeting Banchare Danda and Pharsidol North respectively.

Banchare Danda

Pharsidol North

e. The option of Banchare Danda development as long-term LF was adopted for examination under the Umbrella Concept, since a decision at the national level for its development had been already made in the middle of 1990s, which gave this site advantage such as precedent development works and social acceptance in local communities. However, the option of Pharsidol North development was not screened out.

The following technical reports/outcomes generated through the Pilot Project are compiled in the Supporting Report II.

- Practice of Evaluation of Potential Landfill Sites at Bungamati.
- Practice of Scoping and TOR for EIA on Banchare Danda Landfill Site in Okharpauwa.
- Practice of Scoping and TOR for EIA on Pharsidol North Landfill Site in Bungamati.

When the Nepalese side would go to either site of Banchare Danda or Pharsidol North for L/T-LFS development, these reports would be helpful. However, in either case the public notice and consultation will be prerequisite before finalizing the scoping reports/TORs and submitting them to Ministry of Environment, Science and Technology (MOEST) for approval, in order to meet the Nepalese legislative requirements on EIA procedure.

2) C-1.2: Training for Environmental/Social Considerations on Landfill Site

a. In response to officially organizing the Taikabu Landfill Site Study Assisting Committee on March 13, 2005, the kickoff meeting was held on April 26, 2005, for discussion on the plan of operation and schedule as well as the site arrangement for the field investigation. Focal Points of the Pilot Project C of SWMRMC and BKM, members of the committee, a local consultant and the JICA Study Team participated in the meeting. However, site investigations such as topography survey and soil investigation were cancelled, due to the opposition by local communities against Taikabu LF development which assumed to be led by a political party.

b. Concept design for Taikabu LFS was examined by using the existing engineering data such as topographic maps and aerial photos. Being similar to the design policy of Sisdol S/T LFS in Okharpauwa, level three was applied in the design as the technical requirement for LF development. However, regarding the liner system, a geo-membrane with engineered clay liner was planned to be equipped considering the expected life time of the LFS (more than 30 years), despite the increment of the initial cost for development. In a detailed design stage in future, the further study will be needed in order to examine the suitable liner system including clarification of the necessity of geo-membrane, based on the results of geological survey and soil investigation at the proposed site.

c. Meetings for technical discussion on the concept design were held with focal points regarding the required facilities, landfill type and scale, layout plan, capacity, environmental countermeasures, rough cost estimation, and so on. Table 4.3-2 and Figure 4.3-1 show the major project description and general layout plan for Taikabu LFS derived from the concept design.

Table 4.3-2 Major Description of Concept Design of Taikabu LF

Total area:	29.9 ha
Landfill area:	10.2 ha
Area for facility/equipment:	4.6 ha
Buffer zone:	15.1 ha
Capacity for landfilling	Approx. 2.06 million m^3
Expected life time:	32 years
Service coverage:	BKM, MTM, and surrounding VDCs
Major facilities	- Waste dam height of 4 m - Clay liner or geomembrane - Leachate collection and recirculation system - Experimental biological treatment plant - Sorting facility for recyclable materials, composting plant, site office

Source: JICA Study Team

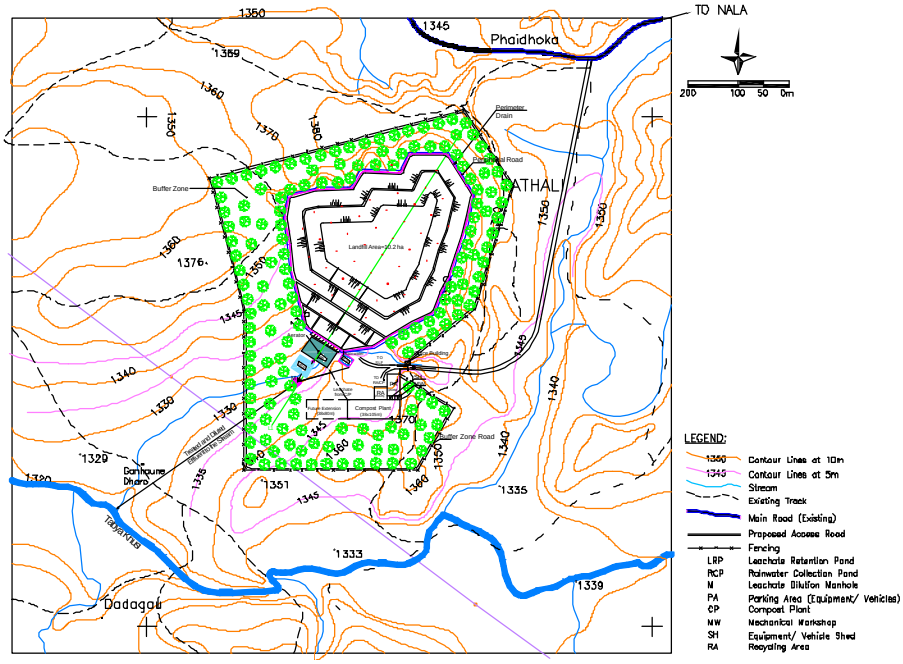


Figure 4.3-1 General Layout Plan of Taikabu LFS

Source: JICA Study Team

d. Water quality in and around the LFS was analyzed twice as a supplementary environmental survey in order to understand the current conditions. Integrating the analytical results, the EIA recommendations were prepared including the overview of environmental baseline, conceivable impact identification, and basic framework for environmental management. Suggestions were also pointed out from the viewpoints of i) successful involvement of stakeholders and ii) fulfillment of various requirements such legislation and guidelines as EPA/EPR of Nepal, Land Act, Land Acquisition Act and Rules, and JICA Guidelines.

e. EIA recommendation prepared for Taikabu LFS development under the Pilot Project will be integrated into the official EIA study by BKM receiving the support from local consultant hired by BKM. BKM and SWMRMC are also now aware through the EIA recommendation of i) the procedure for land acquisition and compensation in compliance with Nepalese legislation, and ii) importance and steps to have a stakeholder involvement and consensus for the Taikabu LFS development.

f. MOLD and BKM received the approval from MOEST on the scoping document and TOR for EIA on Taikabu LF development on May 25, 2005. BKM was preparing the official EIA study in line with the approval, and it was recommendable that BKM integrated the EIA recommendations produced into the official EIA report. In addition, stakeholder consultation with the local communities to have a good understanding mutually on LFS was suggested for BKM and SWMRMC, considering i) sufficient sharing of information among stakeholders, ii) step-by-step process without rushing, and iii) experiences and lessons learned from the LF development in Sisdol S/T LF.

The following technical outcome generated through the Pilot Project is compiled in the Supporting Report II. The main bodies of the following reports were also prepared and available.

- Practice of EIA at Taikabu Landfill Site

In addition to the abovementioned outcome, BKM is trying to obtain the good understandings and acceptance from the local people/communities in/around Taikabu LFS, after BKM encountered the local opposition against the development. As the first step, BKM requested Khwopa College to organize a technical seminar for the purpose of information dissemination on SWM issues in BKM. The college held the seminar "Approaches in SWM in Urban Area" on June 18, 2005 with inviting professors and students of the college, environmental scientists, SWMRMC, Okharpauwa Sanitary Landfill Site Main Coordination Committee (OSLSMCC), etc. Current situation on SWM in BKM was presented in the seminar by the municipality staff. Also the experiences and good practices of Sisdol S/T-LF development and operation were shared among the participants through the presentation from local consultants and OSLSMCC, including some suggestions for Taikabu LFS development in semi-aerobic sanitary manner with receiving the good understandings and acceptance of local communities.

The seminar was thought to be successful from the viewpoint of technical information sharing on sanitary LF development, involving academic standing people in the local society. And BKM plans i) provision of budgetary support for local development to the local VDCs where the LFS is located, ii) involvement of the students of Khwopa or other colleges into the EIA study, and iii) issuance of a kind of public notice to provide an opportunity of raising concerns for stakeholders.

With step-by-step approach, it is hoped that BKM will gradually expand i) the opportunities of information sharing and discussion / consultation, and ii) the stakeholders to be involved in the Taikabu project planning.

4.3.2 C-2: Training/Practice of Semi- aerobic Landfill System (Sisdol S/T-LFS)

(1) Activities Implemented

The training sessions and practice for semi-aerobic landfill system were implemented at Sisdol S/T-LF through the improvement works of Valley 1 of the site. Four steps for the

Pilot Project C-2 were arranged namely planning, design, improvement works and operation with environmental monitoring. Table 4.3-3 shows the summary of activities implemented under C-2.

Table 4.3-3 Summary of Activities of Pilot Project (C-2)

Activities	Nepalese C/Ps mainly involved	Remarks
PLANNING OF SISDOL S/T-LF		
Workshop (July 23, 2004)		
- Discussion on different system and necessary facilities/functions for semi-aerobic sanitary landfill. - Introduction of experiences on landfill development in Japan, US and EU. - Discussion on the concept of Sisdol S/T-LF development with environmental monitoring.	- SWMRMC, KMC, LSMC, BKM, MTM	
Site Visit		
- Study tour to Pokhara municipality to inspect the sanitary landfill constructed there and to have an opinion exchange with the municipality's officials. - Study tour to Malaysia to attend the workshop on semi-aerobic landfill and seminar on safe closure of landfill.	- SWMRMC, KMC, LSMC, BKM, MTM, KRM	
DESIGNING OF SISDOL S/T-LF		
Workshop (September 13, 2004)		
- Discussion on design of the Valley 1 development in Sisdol S/T-LF. - Discussion on facilities and equipment to be procured and installed in the Valley 1.	- SWMRMC, KMC, LSMC	Support from local consultant (EAST)
Technology transfer		
- Implementation of natural condition surveys (topography survey, soil investigation) - Detailed design for the Valley 1 development including technical specifications and estimation of bill of quantities.	- SWMRMC, KMC, LSMC	Support from local consultant (EAST)
CONSTRUCTION SUPERVISION OF SISDOL S/T-LF		
- OJT for Nepalese C/Ps on supervision of improvement works. - Technical transfer for environmental monitoring (before operation). - Joint site visit.	- SWMRMC, KMC, LSMC	Support from local consultant and NGO (EAST, ENPHO) Support from local contractor (Bhairab)
OPERATION AND MANAGEMENT INCLUDING ENVIRONMENTAL MONITORING		
Workshop (Jan. 19, 2005, Feb. 27, 2005, Jun. 12, 2005)		
- Introduction of major facilities, equipment, and their functions. - Discussion on preparation of site operation (manpower requirement, heavy equipment arrangement, etc.) - Discussion on operation manual. - Follow-up and wrap-up discussion for site operation including the preparation for expected full-scale operation from October, 2005.	- SWMRMC, KMC, LSMC	Involvement of OSLSMCC

Activities	Nepalese C/Ps mainly involved	Remarks
Technology transfer		
- OJT on site operation including approach road preparation, waste-unloading manner, spraying, soil covering, leachate pond operation, waste-in-coming recording, etc.. - Instruction on operating the related equipment such as weighbridge, aerator, etc. - Sisdol Operation Review weekly meetings - Technical transfer on environmental monitoring.	- SWMRMC, KMC, LSMC	Support from local consultant and NGO (EAST, ENPHO) Involvement of OSLSMCC

Source: JICA Study Team

Workshop 1 (July 23, 2004) (Refer to Appendix 4.2)

1) The landfill facility necessity, functions and levels were discussed.
2) The different landfill systems of aerobic, anaerobic, semi-aerobic and bioreactor systems were discussed.
3) Landfill development in Japan, the US and EU were shared.
4) The semi-aerobic system for landfill was introduced.
5) The concept for Sisdol Semi-aerobic Landfill Pilot Project was discussed.
6) Establishment of an Environmental Monitoring Committee for Sisdol Semi- aerobic Landfill Pilot Project was proposed.

Detailed Design

7) The natural conditions surveys – soil investigation and topography surveys.
8) Detailed design for Valley 1 including technical specifications and bill of quantities estimation.

Workshop 2 (September 13, 2004) (Refer to Appendix 4.2)

9) Discussion on the design of Sisdol S/T-LFS (Valley 1).

Site Visits (Refer to Appendix 4.3)

10) Study tour to Pokhara municipality in order to inspect the sanitary landfill constructed there, visit to the existing dump site and discussions with the officials and stakeholders in the municipality.
11) Study tour to Malaysia with three main objectives: participation in the second seminar on safe closure of landfills held in Kuala Lumpur by the Malaysian Ministry of Housing and Local Government and JICA, attending the workshop on semi-aerobic landfill organized by JICA, and visit to SWM facilities in Malaysia.

Improvement Works

12) Commencement of improvement works on October 1, 2004 at Sisdol S/T-LFS. Completion of civil works and equipment installation respectively in March 2005 and in April 2005.

Workshop 3 (December 2, 2004)

13) This workshop was held at Sisdol S/T-LF to observe the progress of the improvement works.

Operation

14) The Operation Manual was prepared based on discussions held with the counterparts

15) Operation of Sisdol S/T-LF commenced on June 5, 2005. Since then weekly meetings were held with KMC, LSMC, SWMRMC and OSLSMCC to discuss the operation progress.

Environmental Monitoring at Sisdol (Refer to Supporting Report II)

16) Sampling and analysis of river water, groundwater to prepare the baseline data for the environmental monitoring before operating the Sisdol S/T-LF.
17) Sampling and analysis of river water, groundwater and leachate to confirm the impact on the water quality of the surrounding hydrosphere after operating the Sisdol S/T-LF.

(2) Results of the Activities

The achievements and products of the above activities are briefly described as follows:

1) A site visit to Pokhara LF was helpful in understanding the importance of planning and gradual implementation of landfill. The Pokhara Landfill just recently commenced operation, the delay being due to lack of heavy equipment and operation budget. Furthermore the landfill construction was substantially delayed because of opposition of the surrounding community.
2) A site visit to Malaysia provided an opportunity to interact with participants from Malaysia and other countries at the seminar and workshop. Application of the semi-aerobic landfill system in both Japan and Malaysia was extensively discussed. Furthermore the participants visited the landfill and transfer station facilities serving Kuala Lumpur. In addition the participants had the opportunity to learn the experience of the Malaysian side in introducing privatization to the solid waste sector.
3) The semi-aerobic landfill system was adopted for the Sisdol S/T-LF Valley 1 as a Pilot Project because of its apparent suitability to the Nepal conditions. On this basis, the JICA Study Team and Focal Points jointly conducted the natural conditions survey and the detailed design while receiving support from the local consultant. The major facilities and equipment provided in the detailed design are shown in Table 4.3-4.

Table 4.3-4 Major Facilities/Equipment of the Valley 1 of Sisdol S/T-LF

Demarcation	Major facilities and equipment designed
Pilot project activities	- Landfill area development including excavation, liner basement, clay liner installation, internal service road, etc. - Leachate collection pipe network and re-circulation system including retention pond, aerator, pumping, etc. - Landfill gas vents. - Weigh bridge installation.
Works by SWMRMC	- Heightening of west waste dam. - Utility works including site office, heavy equipment parking, gate, fence, power supply, etc.

Source: JICA Study Team

4) The Sisdol S/T-LF Valley 1 was designed as Level Three which meant that an extensive composite liner system (synthetic liner plus engineered clay liner) and leachate treatment system were not included. The soil survey results showed that natural clay was available along the north portion of the site with low permeability. In order to abide by the EIA requirement to introduce a liner, clay soil was imported to the site and laid on top of the natural clay to a compacted depth of 50cm. Furthermore in order to improve the drainage of the leachate into the leachate collection pipes, a drainage carpet of gravel (30 to 50mm) was installed. Above the

compacted clay liner and underlying the drainage carpet, a jute mat was installed. The purpose of this mat was to provide some protection to the clay liner and assist in improving the flow of water into the leachate pipes because of the high permeability. In case of a large area and need to reduce the costs, this jute may be considered as optional. It should be noted that in case of laying a full geo-membrane liner along the site, some sand layer should be included between the liner and the drainage carpet to prevent the damage to the membrane by the gravel forming the carpet. In the case of Sisdol LF, considering the short life span of the site and soil conditions, this liner system was adopted. More details on the liner system are explained in Supporting Report II (Detailed Design and As-built Drawings for Improvement Work at Sisdol Short-term Landfill).

5) The natural conditions surveys were implemented with minor modifications in the soil surveys to deepen the investigation there.

6) The detailed design of Sisdol S/T-LF was completed as per the concept discussed at the workshops. The result of detailed design is shown in Supporting Report II, and the facilities provided in the detailed design for Sisdol Semi-aerobic Landfill are as described in the box.

(1) Construction of an access road with a length of about 200 m and width 5 m, to lead into the active waste disposal area and for locating the weighbridge

(2) Development of the landfill area in the western north-south valley where the waste will be disposed through excavation to secure waste disposal capacity, preparation of liner basement, procurement and installation of clay liner and improvement of the waste storage dam

(3) Installation of leachate collection pipe network comprising perforated RC pipes as main line and branch lines including construction of manholes and laying of HDPE sheet underneath the main line to collect the leachate and drain to the leachate pond and introduce air into the land filled waste

(4) Installation of perforated PVC vents as landfill gas vents to passively collect and release the generated landfill gas

(5) Procurement and installation of aerator system in the leachate retention pond

(6) Construction of leachate retention pond to accommodate about one week capacity of leachate by excavation, laying of HDPE sheet as liner, and improvement of existing adjacent manhole

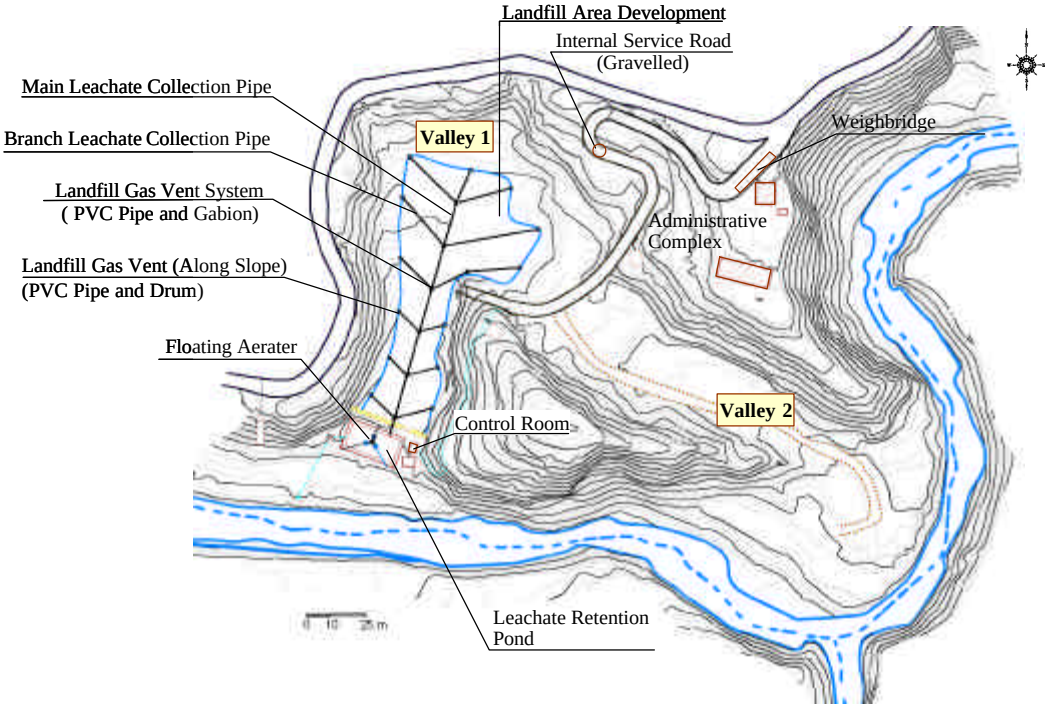
(7) Installation of leachate re-circulation system to re-circulate the collected leachate from the pond back into the waste disposal area composed of hose pipes, procurement and installation of re-circulation pump and sprinkler system

(8) Procurement and installation of weighbridge along the newly constructed access road, including foundation construction

(9) Construction of control room adjacent to the retention pond to install the aerator and pump switch boards

(10) Outstanding works for the sanitary landfill as the administrative and storage buildings, perimeter cut-off drain, utilities supply (electricity, telephone, water), fencing installation and approach road preparation and repairs

7) Improvement works of the Valley 1 started from October 1, 2004. Civil works were completed and handed over to SWMRMC on March 17, 2005, whereas equipment procured and installed were handed over on June 9, 2005. The As-build drawings of the construction works are shown in Supporting Report II, and the layout of the improved Valley 1 as semi-aerobic landfill is shown in Figure 4.3-2.



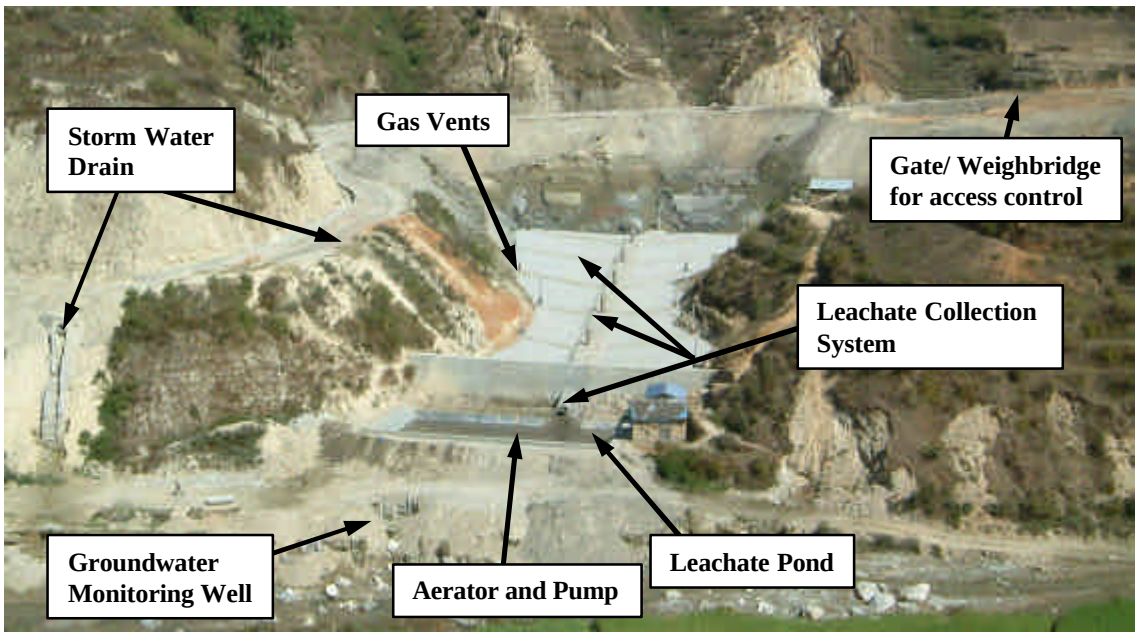


Figure 4.3-2 Layout of Improved Valley 1 of Sisdol S/T-LF

Source: JICA Study Team

8) The supervision of improvement works was organized throughout the construction period and involved work approvals, supervision of scheduling, materials and workmanship, meetings with contractor and counterparts, and overall quality control. Weekly reports on the improvement works progress were prepared and submitted.

9) Prior to commencement of operation, a local committee, OSLSMCC, was formed and legally registered as a body to coordinate the LF operation with SWMRMC, KMC, and

LSMC. Agreement for operation among them was made on May 15, 2005, and opening ceremony of Sisdol S/T-LF was held on June 5, 2005 (Environmental Day).

10) Procurement of 21 secondary transportation vehicles was settled by using the Japanese financial aid of non-project grant type. Since Sisdol S/T-LF commenced its operation in June 5, 2005, before delivery of new secondary transportation vehicles, KMC and LSMC had been transporting some of the collected waste from the morning collecting shift, about 30 to 50 tons per day, to Sisdol S/T-LF by using the existing equipment and a few rental trucks. For the appropriate operation of the LF, a Operation Manual of Sisdol S/T-LF was prepared. Full-scale operation was planned to be commenced from October, 2005.

11) Environmental monitoring especially for water quality was conducted as one of the Pilot Project C-2 activities. Water quality of the adjacent rivers and groundwater quality of bore holes were analyzed twice or three times before operation (July, 2004 and March, 2005). Whereas water quality of the rivers, groundwater and leachate were analyzed three times after operation (June and July, 2005). The analytical results are compiled in Supporting Report II with the map of sampling locations, and major findings can be summarized as follows. Table 4.3-5 shows the results of water quality analysis of the major parameters as the latest after-operation monitoring (July, 21, 2005).

- There could not be found any evident changes of water quality in rivers and boreholes between before-operation and after-operation monitoring, meaning rare implication of the pollution or negative influence to the surrounding water bodies due to the leachate generated from the landfill area. Although there could be occasionally found the peculiar data, they were not considered to be related to the landfilling activities. Because such data were obtained simultaneously, not only at the borehole No.1 (immediate downstream of the leachate retention pond) and the downstream of Kolpu Khola, but also at the other boreholes and upstream of Kolpu Khola, where the impacts on water quality due to landfilling were by no means brought about. Based on the results of monitoring conducted so far, therefore, leachate control system of Sisdol S/T-LF can be said to be well functioning, and the water quality around the site is being prevented from the unacceptable pollution.
- The leachate quality in the leachate retention pond showed the less polluted status than that from the leachate outlet pipe especially on organic pollutants and nitrogen compounds, except the 1st monitoring on June 9, 2005 when the aeration device was not workable. This implied that the aeration in the pond was contributing to the improvement of leachate as planned.
- The heavy metals such as lead and chromium were detected through the leachate quality analysis, and it implied that the waste being disposed of at the site might include undesirable composition. In line with urgently confirming the composition of waste being transported and disposed of, it is recommendable to i) secure and maintain the re-circulation system except an emergency case, in order not to flow leachate out to the surrounding water bodies, and ii) inspect regularly the water sealing condition of the pond with providing repair as required in order avoid the leachate leaking from the pond.

Table 4.3-5 Monitoring Results of Major Parameters (Latest After-Operation Monitoring, July 21, 2005)

Unit: mg/l

Location	BOD	COD	Oxidizability ($KMnO_4$)	Total Nitrogen	Hexavalent Chromium	Lead
Leachate (pipe)	27000	44500	32000	185.5	0.040	0.550
Leachate (pond)	13800	25500	16000	133.4	0.040	0.570
Borehole No.1*1	25	70	40	3.1	ND	ND
Kolpu Khola river*2	16	39	36	3.1	ND	0.12*3

Source: JICA Study Team (Samples were measured and analyzed by ENPHO.)
ND: Not Detected
*1: Borehole No.1 is located at the immediate downstream of the leachate retention pond.
*2: The data of the Kolpu Khola river in the table was obtained from the sampling point at the immediate downstream of the leachate retention pond.
*3: The numerical data was not considered as the leachate leaking from the pond, since lead was simultaneously detected from the upstream and tributary of Kolpu Khola.

Because of i) short interval for after-operation monitoring from operation commencement, and ii) partial operation of the site, analytical results of leachate was not considered to show the tendency reflecting the landfill operation in long run. Therefore, it is necessary that the Nepalese side continue the environmental monitoring especially during the full-scale operation stage. Although the Environmental Coordination Committee is under formulation, a sharing meeting on the results of environmental monitoring was held, inviting the focal points from SWMRMC, KMC, and LSMC as well as the key members of OSLSMCC and a local consultant.

12) The Operation Manual was drafted in May 2005 prior to the commencement of the operation, and finalized as compiled in Supporting Report II. Weekly review meetings were held to discuss the operation activities, manpower and equipments, and issues and resolutions adopted. Appendix 4.2 shows the minutes of the first three weekly meetings.

13) The Environmental Coordination Committee was being established for the Sisdol Semi-aerobic Landfill Pilot Project.

14) The detailed design including supplementary surveys of the natural condition for developing Valley 2 of Sisdol S/T-LF is on going under the SWMRMC initiative, based on the experiences and technical knowledge obtained through the Pilot Project C-2. It is recommendable for Nepalese side to concentrate the preparation works for the Valley 2 aiming at commencing the service before exhaustion of the Valley 1 capacity.

4.4 Evaluation of Pilot Project C

4.4.1 Achievement Level

The achievement levels of project purposes and outputs of the Pilot Project C were discussed based on the OVIs as shown in Table 4.4-1. On the whole, most of the OVIs have been achieved during the past one year pilot project implementation period.

Table 4.4-1 Achievement Level of the Pilot Project C

Project Purpose /Outputs	OVIs	Achievement Level
Project Purpose ▪ 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 landfill activities (soil covering, leachate control, environmental monitoring) are implemented at the Sisdol Valley 1.	▪ By the end of June 2005, sanitary landfill activities (soil covering, leachate control, environmental monitoring) had been implemented at the Sisdol Valley 1.
Outputs 1 Basic knowledge for planning of final disposal is obtained.	1-1 By the end of the Pilot Project, the candidates for long-term landfill site are selected. 1-2 By the end of the Pilot Project, environmental considerations for landfill sites is compiled.	1-1 By the end of the Pilot Project, the candidates for long-term landfill site had been selected. 1-2 By the end of the Pilot Project, environmental considerations for landfill sites had been compiled.
2 Basic knowledge and experience are obtained on planning, designing, construction and O&M of semi-aerobic sanitary landfill systems.	2-1 By the end August 2004, a sanitary landfill site with a semi aerobic system is designed at the Sisdol Valley 1. 2-2 By the end of the Pilot Project, a sanitary landfill site with a semi aerobic system is developed at the Sisdol Valley I site.	2-1 By the end September 2004, sanitary landfill site with semi aerobic system is designed at the Sisdol Valley 1 2-2 By the end of the Pilot Project, a sanitary landfill site with a semi aerobic system had been developed at the Sisdol Valley I site.

Source: JICA Study Team

4.4.2 Evaluation

Relevance: At the beginning of the Study, Nepalese C/Ps were facing the difficulty of non-availability of proper disposal site(s) after closure of Gokarna Landfill. The necessity of new landfill site(s) for the five municipalities was definitely recognized by the Nepalese C/Ps, and Sisdol preparation was then under way. However, their basic knowledge and technical experience for developing a sanitary landfill were not sufficient. It can be said that Pilot Project C has met the essential needs of the Nepalese side. In addition, since a technology of semi-aerobic sanitary landfill has been experienced a lot in developing countries as well as Japan, application of this technology can be justifiable. Besides, Japanese experience has been introduced and utilized from technical and procedural viewpoints for evaluation and selection of candidate sites for landfill.

Effectiveness: The project purpose of Pilot Project C was to strengthen the capabilities for planning and operation of final disposal through C-1 and C-2 components. Although the optimum site for KMC, LSMC, and KRM was not derived as an output in the course of Pilot Project C-1, it can be said that basic knowledge and technical skills for selection and planning of final disposal were built up to some extent in the process of a series of workshops and intensive discussions between the JICA Study Team and Focal Points, study tours abroad, joint site visits and so on. In addition, EIA practice on Taikabu LF in Pilot Project C-1 enhanced the motivation to develop these, especially for BKM. The Focal Points and T/F members of BKM can be considered to have obviously strengthened their capability through the preliminary design work as well as preparation for the EIA. BKM

staff have a clearer technical perspective as a roadmap to develop Taikabu LF than they had before Pilot Project C-1 commencement.

Through Pilot Project C-2, Valley 1 of Sisdol S/T-LF is being operated by the Nepalese C/P initiative. Although the full-scale operation of the site has not yet started, basic knowledge and technical experience have obviously been obtained through planning, design, construction and O&M for a semi-aerobic landfill system in Sisdol. Besides, the experience of Sisdol development has been well expanded and utilized in the case of Taikabu development.

Efficiency: The outputs of Pilot Project C were expected at the initial stage to be those of i) L/T-LFS selection as C-1, ii) environmental considerations compilation on Taikabu LFS including conceptual design as C-1, and iii) design and development of a semi-aerobic sanitary landfill at Sisdol Valley 1 as C-2. Regarding L/T-LFS selection, the two candidate sites were selected for a final decision. The outputs regarding Taikabu LFS and Sisdol Valley 1 were obtained as definitely planned. It can be said that the activities to produce the above outputs were sufficient, and that inputs for performing activities were provided properly in terms of input amount and timing.

Impact: The overall goal of Pilot Project C was that the solid waste disposal ratio to sanitary landfill site(s) would be increased from the current level of 0%. As of the end of Phase 3, Sisdol S/T-LF was providing its service as a sanitary landfill to KMC, LSMC and KRM, although the waste amount being transported to the site was relatively small (20-30 ton/day) at this moment. However, all of the collected waste in KMC, LSMC and KRM is to be transported to Sisdol S/T-LFS after the arrival of the means of transportation. On the other hand, although the final disposal system was still uncontrolled dumping in BKM and MTM, the ratio of sanitary landfilling is expected to be increased toward 2015 under the condition of Taikabu LFS development. Based on these understandings, the overall goal of Pilot Project C is considered to have been achieved.

Sustainability: The ownership of Pilot Project C is gradually being created among the Nepalese C/Ps, especially in the Environmental Department of KMC (Sisdol S/T-LF) and the Sanitation and Environment Department of BKM (Taikabu LFS development). On the other hand, budgetary arrangement of the Nepalese side for continuing Pilot Project C is still on going, and the application of technical knowledge obtained through Pilot Project C is in its initial stage. Although successive technical support and follow up will be needed for LFS planning as well as operation of a semi-aerobic sanitary landfill, the outputs and activities of Pilot Project C have had an impact on the SWM-sector planning in Nepal. Besides, the security and political condition in and around Sisdol, which could become uncontrollable, may negatively affect the continuance of Sisdol operation.

4.5 Lesson Learnt from Pilot Project C

For the EIA practice at Taikabu LFS by BKM, there were some oppositions occurred from the local people living in and around the target site. On the other hand at the Sisdol S/T-LF, a local committee named "Okharpauwa Sanitary Landfill Site Main Coordination Committee

(OSLSMCC)" was established and legally registered. The purpose of this committee is to coordinate to manage Sisdol S/T-LF appropriately among SWMRMC, KMC, LSMC and local communities. Since the commencement of landfill operation at Sisdol, the operation review meeting was held once a week continuously to discuss any issues caused by the operation among those concerned organizations. This approach can be said one of the good lessons learnt from the Pilot Project C.

In the technical aspect, though only one and half months have passed since the commencement of Sisdol S/T-LF operation, it was observed that the sanitary landfill operation work has been carried out well, especially littering of dumped waste and generation of odor have been controlled. However, continuous supply of cover soil became one of the issues to be solved because KMC was using the same volume of cover soil as the disposed waste at the moment. This situation was caused by the difficulty of landfill operation in the rainy season. Both waste transportation truck and soil transportation truck can not enter into the dumping area due to the muddy condition and have to dump them on the edge of the dumping area. A bulldozer had to move them from that edge to the latest dumping spot and, at that time, bulldozer could not help mixing the soil and waste. Therefore, it was learned that more detail operation manual should be prepared based on the actual field condition so that daily cover soiling can be done appropriately in both rainy and dry seasons.

Continuous environmental monitoring is needed to be implemented although the current leachate quality was much better than that from ordinary waste disposal site. This was because of smaller amount of discharged waste and larger rainfalls in a rainy season in these a few months of operation at Sisdol.