

# Chapter 5

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*Pilot Projects*

## **5 Pilot Projects**

This chapter presents objectives of pilot projects and how they were conducted in the latter half of the First Work in El Salvador. The pilot projects that were conducted are:

- Inspection of collection route improvement,
- Sanitary education and public awareness promotion campaign, and
- Collection Service Experiment.

### **5.1 Sanitary Education and Public Awareness Promotion Campaign**

#### **5.1.1 Profile of Pilot Project**

##### **a. Goals**

The pilot project of sanitary education and public awareness promotion campaign aims to:

- Raise awareness of the residents regarding SWM,
- Inform residents of the necessity of proper disposal and management of SW,
- Share the responsibilities between the municipalities and the citizens, and
- Promote public participation.

##### **b. Objectives**

In order to achieve the goals above, sanitary education and public awareness promotion campaign activities have been implemented throughout AMSS, concentrating in three municipalities: Cuscatancingo, San Marcos and San Martin (one community each in first two municipalities and one school each in all three municipalities). Profile is shown in the following table:

Table 5-1: Profile of Sanitary Education and Public Awareness Promotion Campaign Programs

Programs in the Community		
1.	Period of implementation	May-June 2000, Maria Auxiliadora (Municipality of Cuscatancingo) June 2000, 10 de Octubre (Municipality of San Marcos)
2.	Target group	Leaders and residents of the two aforementioned communities
3.	Methods and campaign tools	Meetings, workshops and clean-up activities. Educational booklet, panels, video, banners, leaflets, signboards, canvassing
4.	Organization	Municipalities of Cuscatancingo and San Marcos, Community Associations, OPAMSS, with the support of JICA Study Team
5.	Cooperation	Health Center (MSPAS) Communal Clinic (ISSS)
Programs in Schools		
1.	Period of implementation	May 2000, Liceo Cristiano (Cuscatancingo) June 2000, 10 de Octubre School (San Marcos) and Jorge Larde School (San Martin)
2.	Target group	Teachers, students and parents of the three schools.
3.	Methods and educational tools	Teacher training course and trial lessons, educational booklet and panels, practical examples, video, etc.
4.	Organization	Municipality of Cuscatancingo, Municipality of San Marcos, Municipality of San Martin, OPAMSS, with the support of JICA Study Team
5.	Cooperation	Schools of Cuscatancingo, San Marcos and San Martin
Public Awareness Promotion Campaign		
1.	Period of implementation	May-June 2000 Maria Auxiliadora (Cuscatancingo) 10 de Octubre (San Marcos) In AMSS (during or after the implementation of the campaign: any time and in any other community by the Counterpart initiative)
2.	Target group	All AMSS citizens
3.	Methods	Public participation through public logo/mascot design contest. Campaign tools: stickers, educational booklet and panels, banners, leaflets, video, broadcast canvassing, etc.
4.	Organization	OPAMSS, All municipalities in AMSS, Other relevant organizations, with the support of JICA Study Team (during pilot project implementation period)

**c. Pilot Project Areas**

The communities selected for the implementation of pilot projects were as follows:

- **Maria Auxiliadora Community:** this community comprises of approximately 750 people being located in the north of Cuscatancingo municipality. Maria Auxiliadora housing project was carried out between 1993 and 1997 by the Municipality of San Salvador to resettle 500 families that lived in high-risk areas of different communities in San Salvador municipality. This project was developed by mutual cooperation between the municipalities of San Salvador and Cuscatancingo with the support of Development and Minimum Housing

Foundation (FDVM). 140 families of low-income strata were the beneficiaries of this project and their houses were built through this project with the help of FDVM. The project was named "La Esperanza II". To resettle these families, Luxembourg and two cooperation agencies of Spain (PROSUD and MPDL) provided financial support. At present, the Municipality of Cuscatancingo is helping them in different aspects (clothes, medicine and sound recreation activities for children).

It is, therefore, a newly developed community. However, due to the lack of an appropriate collection system and the residents' habits, waste are scattered already in "quebrada" (ravine) in front of their housing complex, and sanitary problems on waste are getting bigger.

- **10 de Octubre Community:** 10 de Octubre (Phase 2) is located south of the Comalapa expressway in San Marcos. It received its name because it was established for more than 600 families of limited economic resources, which were affected by the October 10, 1986 earthquake. Support for the construction of housings, community center and services was received from government institutions and international organizations. The community has a communal organization: Communal Development Association (ADESCO 10/86) constituted by a Directive Board of eight members that represents the community neighbors.

The community has a regular waste collection service through a container system. However, due to improper use of containers and collection areas, open dumping and waste scattered on the streets and its surroundings are observed.

## 5.1.2 Methodology

### a. Applied Methodology

The pilot project of sanitary education and public awareness promotion campaign aims at raising awareness of the residents on SWM issues such as potential risks of the SW, the necessity of proper disposal and management of SW, responsibilities sharing among the municipalities, governmental institutions and residents. To achieve these goals, the methodologies applied by the Study Team consisted fundamentally of meetings and training's of the community through workshops, residents' participation in clean-up activities, teachers training course and other complementary activities by using stickers, posters, educational booklet, educational panels, video, banners and other campaign materials prepared by the Study Team.

The methods used in this pilot project are basically those proposed in the Progress Report (1), which are summarized in the following table:

Table 5-2: Applied Methodology

Method	Activity	Remarks	
1	Design of campaign tools	• Campaign logo (mascot)	Through public contest inviting all AMSS residents
		• Preparation of stickers, posters, educational booklet, educational panels, banners, leaflets, signboards, etc.	Planned by the Study Team with the cooperation of the Counterpart
		• Production of educational video	Planned by the Study Team
2	Activity-Based Learning	<ul style="list-style-type: none"> <li>• Writings and drawings by students</li> <li>• Exhibition of works made by students</li> </ul>	14 schools of AMSS
3	Meetings and Workshops	<ul style="list-style-type: none"> <li>• Meetings with community residents and teachers</li> <li>• Training through workshops</li> <li>• Teachers training course</li> <li>• Target group: community residents, teachers and students</li> </ul>	Counterpart/ other relevant organizations/ Study Team
4	Project with Participation Focus	<ul style="list-style-type: none"> <li>• Promotion of the campaign and distribution of stickers (joint activity by school/community/ municipality and other relevant organizations)</li> <li>• Clean-up activity (as part of the collection service experiment)</li> </ul>	Counterpart Municipality Community Schools Study Team
5	Health Care and Cultural Festival	<ul style="list-style-type: none"> <li>• Vaccination for children</li> <li>• Vaccination against rabies</li> <li>• Women's health care</li> <li>• Family planning</li> <li>• Blood pressure check</li> <li>• Dental check-up, etc</li> </ul>	By Health Units (MSPAS) and Communal Clinics (ISSS) personnels
		<ul style="list-style-type: none"> <li>• Music festival</li> <li>• Exhibition of educational panels</li> <li>• Video related to SWM, hygiene, etc.</li> </ul>	Municipalities, schools, relevant organizations, Study Team
6	Evaluation of Pilot Project	<ul style="list-style-type: none"> <li>• Site visits to pilot project areas (before and after pilot projects implementation)</li> </ul>	Counterpart Community leaders Study Team
7	Inspection of Pilot Project Areas	<ul style="list-style-type: none"> <li>• Inspection of project sites and monitoring in schools and community areas where the pilot projects have been conducted.</li> </ul>	Counterpart/ Study Team

#### b. Implementation Procedure

A public awareness promotion campaign was conducted in the whole AMSS by the Counterpart with the support of the Study Team from mid May until the end of June 2000. The campaign was intensified mainly in Maria Auxiliadora in Cuscantancingo and 10 de Octubre in San Marcos, located respectively at the north and southeast of the San Salvador City.

During the experiment, the following points were carefully observed to examine the viability of the proposed plan.

- To observe the changes of people's awareness before and after the campaign.
- To verify the convenience of the proposed campaign tools and the methodology proposed through the results of the pilot projects.

The following figure shows the implementation procedure of the pilot project. It is divided essentially into three stages: (1) planning and preparation stage, (2) implementation and verification stage, and (3) evaluation.

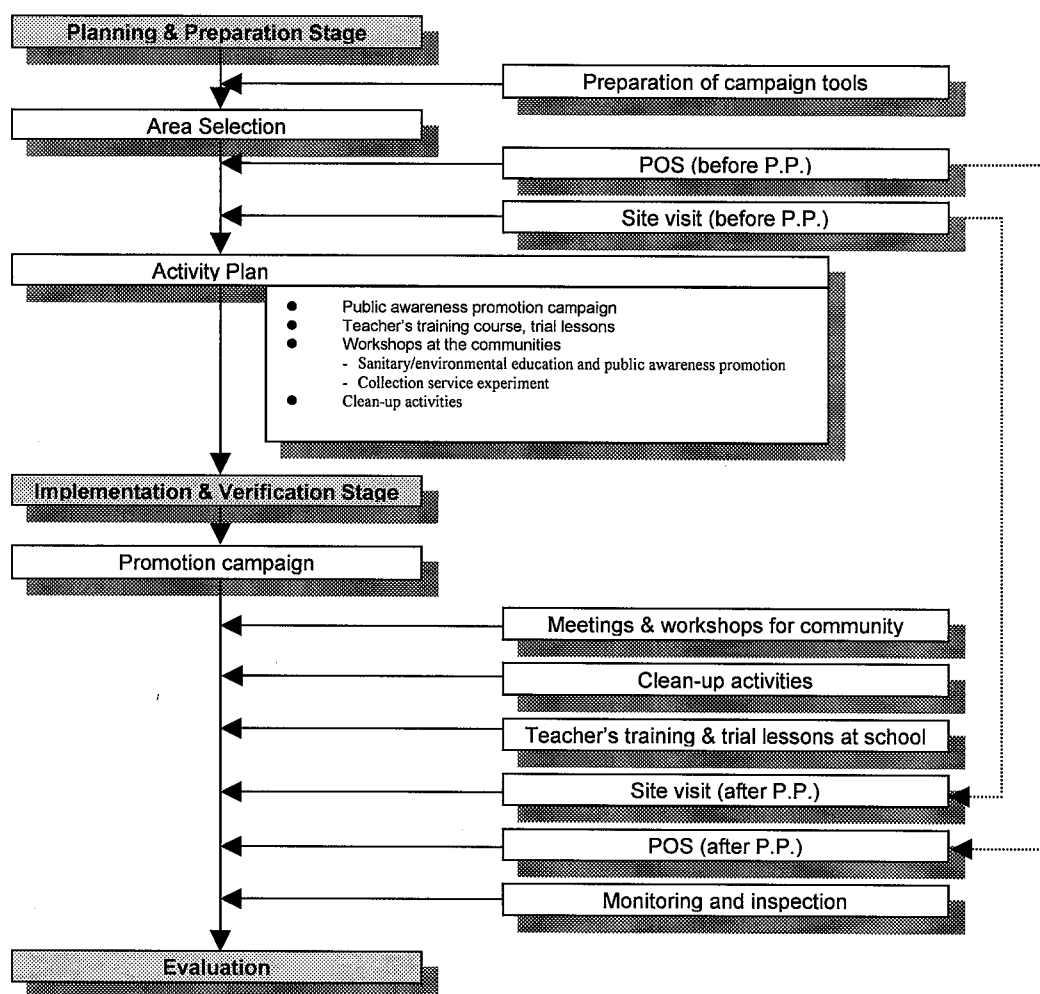


Figure 5-1: Implementation Flowchart of Pilot Project

### 5.1.3 Results of the Pilot Project

Results of the pilot project are presented in Annex H.

## 5.2 Collection Service Experiment

### 5.2.1 Outline of the Project

#### a. Objectives

Objectives of this pilot project are as follows:

- examining suitability of container collection system in areas where collection service is insufficiently or not at all provided,

- applying findings acquired through this pilot project to a M/P, and
- Technology Transfer.

Areas, where the waste collection service is insufficiently or not at all provided, are generally inaccessible for collection vehicles. The main objective of this pilot project is to examine the suitability of the container collection system to such areas.

Findings, which are acquired through this pilot project, are to be applied to a M/P to make it practical and sustainable.

Technology will be transferred from the Study Team to the C/Ps and vice versa.

#### **b. Pilot Project Sites**

Two pilot project sites were selected, one is Maria Auxiliadora in Cuscatancingo, the other is 10 de Octubre in San Marcos. Profiles of the sites are described hereinafter.

##### **Maria Auxiliadora, Cuscatancingo**

- The number of houses covered with the container collection system was 190.
- This site is totally inaccessible for vehicles, therefore, containers need to be placed out of the site.
- Spaces at which containers can be position are only upper side of the site. The residents need to climb up for discharging waste into the containers. They used to dump waste into the river, which runs just under the site.
- The longest distance from houses to the containers is around 100m.
- The residents had never received waste collection service before.

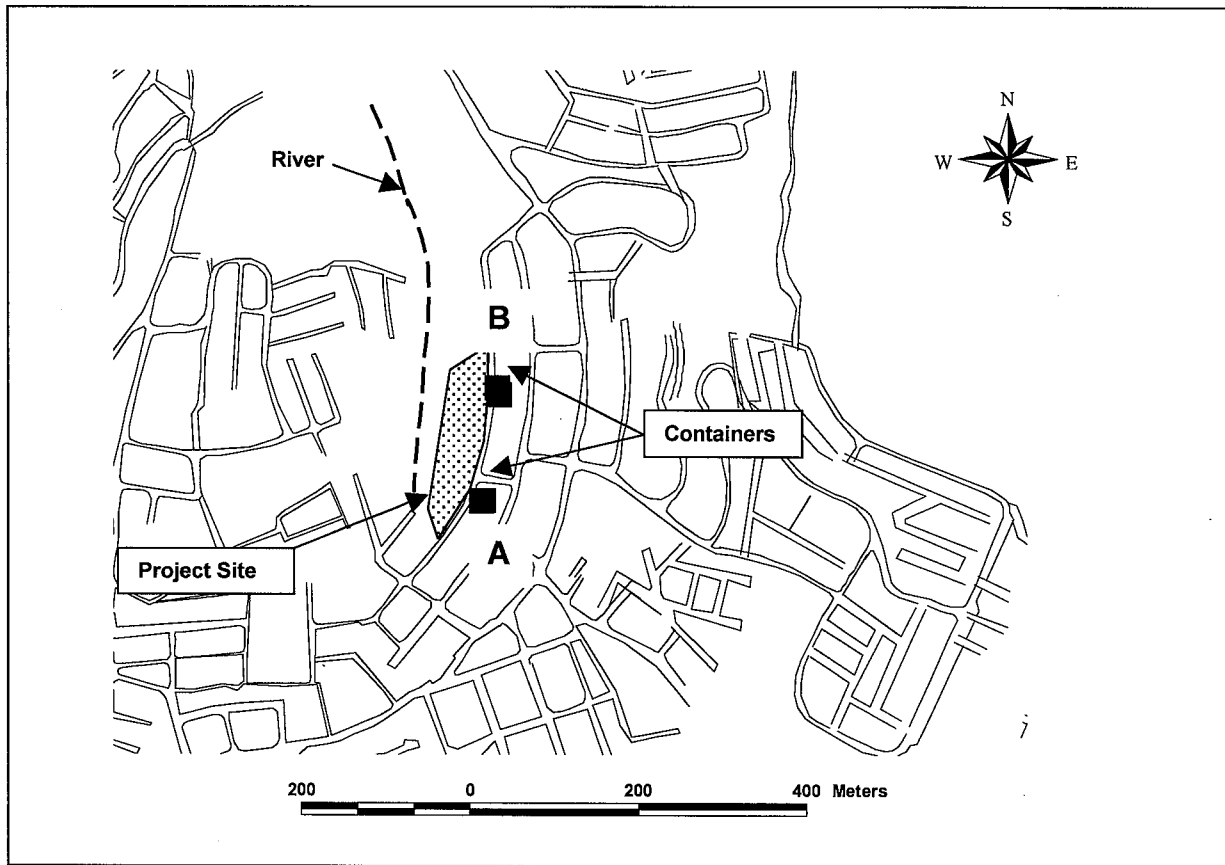


Figure 5-2: Map of Project Site (Maria Auxiliadora, Cuscatancingo)



### 10 de Octubre, San Marcos

- The number of houses covered with the container collection system was 300.
- An accessible road for collection vehicles passes through the site. There are spaces for placing containers along the road, i.e., in the site.
- The containers are placed in the central part of the site. The upper part of the site is steeper than the lower part. The residents in the upper part can come down for carrying waste to the containers.
- The longest distance from houses to containers is around 150m.
- Half of the residents have been covered with collection service since before. One container was placed, but waste was almost always spilt from and scattered around it.

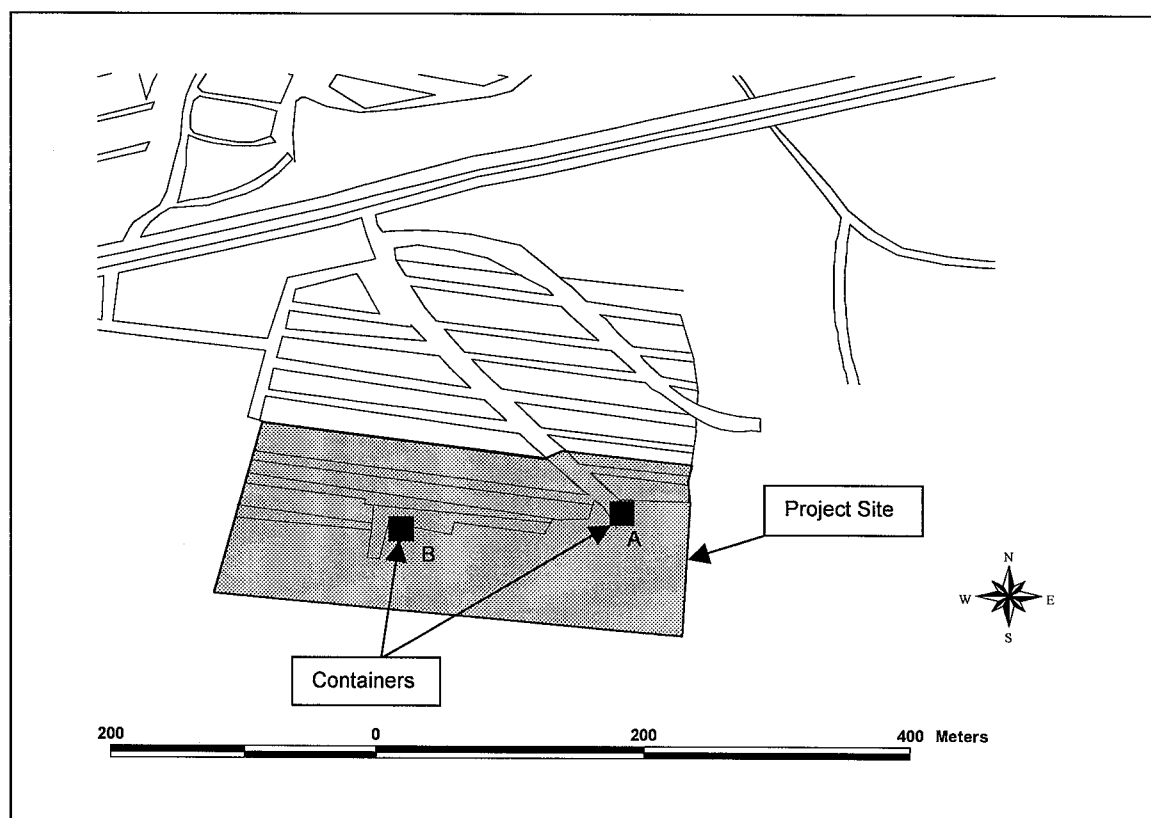


Figure 5-3: Map of Project Site (10 de Octubre, San Marcos)

**c. Schedule**

This pilot project was carried out according to the schedule below.

**Table 5-3: Schedule of Collection Service Experiment**

Date		Activities	Community	Municipality	Study Team
CT	SM				
May 8 - 13	May 5	<p><b>Explanation of discharge manner (from municipalities to community leaders)</b></p> <p>The municipalities had meetings with the community leaders to explain how to discharge waste into the containers and ask them to convey it to the residents of the project sites (communities).</p>	●	●	○
May 15 -May 26	May 8 -14	<p><b>Explanation of discharge manner (from community leaders to residents)</b></p> <p>The community leaders conveyed the manner of how to discharge waste to the residents of the communities.</p>	●	○	
May 27	May 14	<p><b>Placement of the containers</b></p> <p>JICA Study Team provided containers to the municipalities, and they placed the containers at the sites.</p>		●	●
May 29	May 15	<p><b>Commencement of collection service</b></p> <p>The residents started to dispose of waste according to the manner and the municipalities began to provide the waste collection service.</p>	●	●	
May 29 – June 18	May 15 – June 18	<p><b>Observation</b></p> <p>The municipalities observed and recorded collection amount, collection time, and waste scattering around the containers.</p>		●	
June 12 - 16	May 29 - June 2	<p><b>Questionnaire on the container collection system</b></p> <p>The municipalities' personnel interviewed the residents of the communities in order to obtain their opinion on the container collection system.</p>	○	●	

●: main  
○: support

## 5.2.2 Methodology

Methodology applied to the pilot project is as follows:

### i. Installation of Proper Number of Containers

- 2 m<sup>3</sup> capacity of containers were selected for this pilot project, which can be lifted by the 18yd<sup>3</sup> compactor truck that has a winch.
- In order to install proper number of containers, the houses to be covered with the collection service has been clearly defined. And the number of houses was counted.
- Waste generation amount was estimated on the basis of the number of houses and the results of WACS carried out in this Study.
- The number of containers to be required was estimated from the waste generation amount. This calculation is presented in Table 5-4 and Table 5-5. Consequently, 4 containers in Maria Auxiliadora, Cuscatancingo and 6 containers in 10 de Octubre, San Marcos have been placed. Each site has two places for containers, therefore, 2 containers in each place in Maria Auxiliadora and 3 containers in each place in 10 de Octubre were installed.

### ii. Encouragement of Proper Discharge

- In order to encourage proper discharge, which is:  
“to put waste into the containers not to leave it around the containers or any other places.”  
The manner was conveyed to the residents before the placement of the containers.
- Besides the principal manner, in order to avoid adverse impacts of the containers on the surroundings such as odor, an instruction that is:  
“to put waste in the morning on the days when the collection vehicle passes,”  
is also given.
- The discharge manner was basically conveyed as follows:
  - from municipal personnel to community leaders, and
  - from community leaders to residents in the sites.

### iii. Evaluation

- Evaluation of the pilot project was carried out based on the results of:
  - observation of collection amount, collection time and waste scattering around the containers, and
  - questionnaire survey conducted after the implementation of the collection service.

Table 5-4: Calculation of Required Number of Containers (Maria Auxiliadora, Cuscatancingo)

<p><b>Estimation of waste generation amount</b></p> <p>a) The target population: about 1,000 persons The target site has 190 houses, 190 houses x 5 persons/house = 950 persons (it is assumed that a family has five persons).</p> <p>b) Waste generation ratio: 0.475 kg/person/day 0.475kg/person/day is the result of the WACS</p> <p>c) Waste generation amount (ton/day): <math>0.475 \times 950 / 1,000 = 0.45</math> ton/day</p> <p>d) Bulk density of household waste: <math>0.2 \text{ ton/m}^3</math> <math>0.2 \text{ ton/m}^3</math> is the result of the WACS</p> <p>e) Waste generation amount: <math>0.45 / 0.2 = 2.25 \text{ m}^3/\text{day}</math></p> <p>f) Collection waste amount per collection time: <math>2.25 \times 3 \text{ days} = 6.75 \text{ m}^3</math> When collection frequency is 3 times a week, the longest duration where the collection vehicle does not come is for 3 days.</p> <p>g) Volume of container: <math>2 \text{ m}^3</math></p> <p>h) Required number of containers: <math>6.75 / 2 = 3.375</math> <b>4 containers</b> are required.</p>
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Table 5-5: Calculation of Required Number of Containers (10 de Octubre, San Marcos)

<p><b>1. Estimation of waste generated from the area</b></p> <p>a) The target population: about 1,500 person The target area has 300 houses, 300 houses x 5 persons/house = 1,500 persons (it is assumed that a family has five persons).</p> <p>b) Waste generation ratio: 0.475 kg/person/day 0.475kg/person/day is the result of the WACS</p> <p>c) Waste generation amount (ton/day): <math>0.475 \times 1,500 / 1,000 = 0.71</math> ton/day</p> <p>d) Bulk density of household waste: <math>0.2 \text{ ton/m}^3</math> <math>0.2 \text{ ton/m}^3</math> is the result of the WACS</p> <p>e) Waste generation amount: <math>0.71 / 0.2 = 3.55 \text{ m}^3/\text{day}</math></p> <p>f) Collection waste amount per collection time: <math>3.55 \times 3 \text{ days} = 10.65 \text{ m}^3</math> When collection frequency is 3 times a week, the longest duration where the collection vehicle does not come is for 3 days.</p> <p>g) Volume of container: <math>2 \text{ m}^3</math></p> <p>h) Required number of containers: <math>10.65 / 2 = 5.325</math> <b>6 containers</b> are required.</p>
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### 5.2.3 Results of the Project

Results of the project are presented in Annex I.

## **5.3 Collection Route Improvement**

### **5.3.1 Objectives**

The objectives of this pilot project were as follows:

- Technology transfer,
- The creation of a manual that shows how to improve the collection route, and
- Data gathering to apply them to the M/P.

Since the main objective was technology transfer and the adapting of a methodology, it was imperative to explain some concepts that the users of such methodology had to know, given the heterogeneity of the group. Such elements were measure conversions and this objective was achieved through expositions, tutorship and field practices.

Technology transfer was conducted throughout the project between the counterpart and the Study Team through joint work. In total 12 meetings of 3 hours each were held, using half of this time to review the progress and clarifications; the second half was devoted to teach step by step the use of the formularies to gather the information. Likewise, 28 tutorships of 2 hours each were given, and at least 14 field visits were conducted.

This technology transfer came from the Study Team to the counterpart and vice versa, since the experiences and knowledge that the counterpart members acquired through daily work were crucial to the collection route improvement.

On the other hand, with the information and experience obtained through the pilot project a Collection Route Improvement Manual was formulated, which will systematize the methodology applied throughout the project in order to provide a tool for the users to apply such methodology by themselves.

Also, the efficiency and effectiveness of the collection route improvement through the data obtained during the pilot project were assessed.

### **5.3.2 Selection of Target Route**

14 collection routes were selected for this pilot project. The requirements for a target route to be accepted were the following:

- The municipalities should appoint a person for this pilot project who knew the waste collection and haulage tasks from his corresponding municipality.
- The proposal of 2 routes per municipality.
- Besides, it was preferable to have the data on the collection amount from a weighbridge, in order to evaluate the pilot project.

As previously mentioned, the Study Team requested the counterpart members that each municipality presented two collection routes for this pilot project. The location of the municipality, i.e., the target routes being evenly distributed over the Study Area, was to be taken into account.

The participating municipalities, counterpart members and routes were as follows:

Municipality	Representative	Route
San Salvador (SS)	Manuel de Jesús Olivares Geronimo Macario Pérez	Participation without routes
Mejicanos (MJ)	José Gonzalo Castillo	12 and 13
Ciudad Delgado (CD)	Luis Alonso Ramírez	01 and 02
Cuscatancingo (CT)	Mario Edgardo Aguilar José Manuel Ramírez	Participation without routes
San Marcos (SM)	Mauricio Antonio Balcaceres	07 and 08
Nueva San Salvador (ST)	Miguel Ángel Gutiérrez Víctor Manuel Mejía	02 and 04
Soyapango (Sy)	Héctor Nahun Martines Jorge Schafik Handal Vega	05 and 11
Ilopango (IL)	Francisco Cruz Sorto	Participation without routes
San Martín (SMT)	Pedro Arnulfo Casco David Fernando Cruz	03 and 05
Apopa (AP)	Luis Alberto Romero	04 and 05
Nejapa (NJ)	Eduardo Alfredo Cruz	Participation without routes

11 municipalities participated, which sent 16 participants and a total of 14 routes were analyzed.

### 5.3.3 Formulation of the Implementation Plan

The plan was developed during the period from March 4<sup>th</sup> and June 15<sup>th</sup> 2000.

On March 4<sup>th</sup>, the representatives from the 14 municipalities of AMSS were explained what the pilot project was about and the requirements to participate directly in the plan. They were also explained that 14 routes would be analyzed, which would be used to jointly develop the route improvement methodology.

It was then asked that each municipality proposed two routes that they were more interested in to improve them.

Finally, seven municipalities responded to the request. The pilot project began on April 26<sup>th</sup> with the presentation of the program of activities to be executed. Programming was as follows:

### Timetable of the Pilot Project

Step	Activities	Week					
		1	2	3	4	5	6
1	Presentation of the plan	■					
1	Observation of the current route	■	■	■			
1	Information survey from the collection area		■	■	■		
	Time and Motion before changing collection route			■	■		
2	Analysis of the current situation			■	■		
2	Application of indicators and formulation of proposal				■	■	
3	Implementation of proposal					■	■
	Time and Motion after changing collection route					■	■
4	Analysis and evaluation					■	■

Figure 5-4 explains the scheme on how was this pilot project conducted.

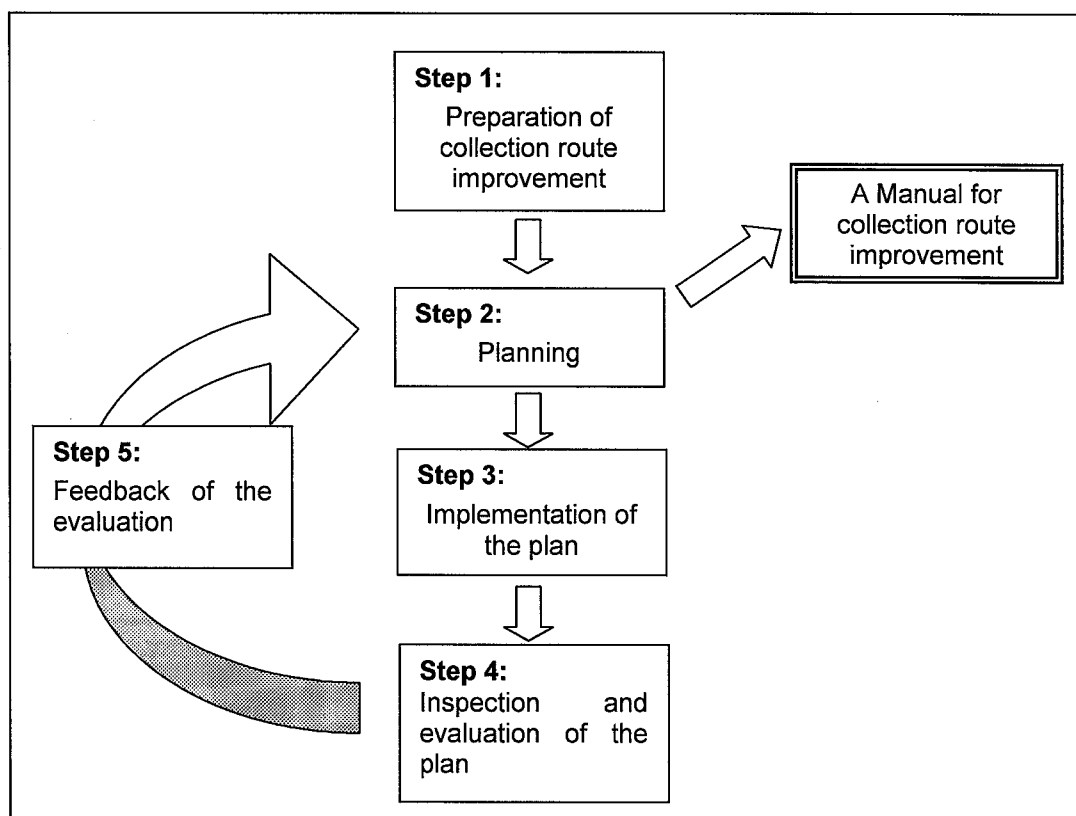


Figure 5-4: Implementation Plan of Collection Route Improvement

#### 5.3.4 Results of the Project

Results of the project are presented in Annex J.

# Chapter 6

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## *Framework of Master Plan*



## 6 Framework of Master Plan

### 6.1 Goals, Targets and Strategies

#### 6.1.1 Goals and Target year

##### a. Goals

**The principal goal of the Master Plan is to establish a sound Solid Waste Management System by the target year 2010 in AMSS,** where the major population and economic activities of the country are centered.

*The Master Plan aims to:*

- ◆ **promote the citizens' well-being and public health;**
- ◆ **implement sustainable SWM; and**
- ◆ **contribute to environmental conservation.**

The goals in practice of the Master Plan are as follows:

1. The improvement of public health and the reduction of health hazards in and around the AMSS will be a primary task of the SWM, in order to promote the citizens' well-being.
2. As sustainable SWM services is required as the duty and mandate of the municipalities, the COAMSS/OPAMSS and municipalities should expedite:
  - cost-effective SWM from technical improvement;
  - cost-effective SWM from institutional/organizational improvement; and
  - auto-sustainable SWM from adequate financial planning and management.
3. As the environmental conservation through SWM is today's requirement, the COAMSS/OPAMSS and municipalities should expedite the following:
  - SW treatment and disposal facilities should be operated not to pollute the environment;
  - public should be encouraged to be more environmentally aware of waste minimization; and
  - environmental conservation through "reduction", "re-use" and "recycling" of waste should be promoted.

##### b. Target Year

In accordance with the "scope of work" of the Study, the target year for the master plan is set up as follows

**Master Plan:           Year 2010**

## 6.1.2 Targets and Strategies

In line with respective goals mentioned above, targets should be set up for clarifying area to which efforts should be made, and strategies should be further outlined for specifying the ways in which actions are to be focused.

### a. Targets for “well-being”

In order to achieve the goal of “well-being” through SWM, the following targets can be raised.

- Improvement of public health and reduction of health hazard by SWM.

Meanwhile,

- welfare of those whose work and life are related with SWM activities should not be forgotten; and
- medical waste should be appropriately treated and disposed in order to safeguard the public.

#### a.1 Strategies for Public health Improvement

In order to achieve the target of “public health improvement”, the primary strategies are:

- to raise the collection service coverage ratio; and
- waste collection and transport method should be improved (e.g., collection point management, incorporation of primary collection by micro-enterprises etc.) to reduce the health hazard and nuisance to public.
- citizens should be reminded that appropriate SW handling by citizens themselves will improve their health as a consequence.

#### a.2 Strategies for Welfare of Stakeholders in SWM Activities

With regard to SWM, stakeholders are diverse such as marginal/vulnerable waste-pickers, municipal workers, micro-enterprises, NGOs, lucrative private companies, municipalities of course, etc. The primary strategies in this context could be as follows:

- Marginal stakeholders (i.e., waste-pickers in disposal sites) are trying to survive their lives by picking recyclable materials at unsanitary waste disposal sites where great health hazards and accident risks exist. It is necessary for such waste-pickers to find job opportunity that they can work sanitarily; and
- It is necessary to promote all stakeholders to provide competitive services.

It should be the responsibility of the whole society to consider the welfare of marginal/vulnerable stakeholders.

On the other hand, in order to achieve the target of “welfare of stakeholders”, the stakeholders should be oriented and motivated to improve their work output in order for them in return to enjoy the benefit of improved works.

All stakeholders should be encouraged and motivated to provide competitive services in gaining the remunerative return. It is necessary for all stakeholders to remind that whenever they provide competitive works or services they will be gaining their interests.

In other words, it should be acknowledged by all stakeholders that interests shall not be vested with any party who loose willingness to improve its competitive services.

### **a.3 Strategies for Medical Waste Management**

In order to achieve the target of “appropriate medical waste management”, the primary strategies are:

- Deployment of appropriate intra-hospital management of medical waste; and
- Execution and supervision of reliable treatment/disposal of medical waste that are separately collected.

### **b. Targets for “sustainability in SWM”**

In order to achieve the goal of “sustainability” in SWM, the following should be targeted for raising the cost-effectiveness of SWM activities.

- Improving technical performance (achievement) for higher efficiency and effectiveness, etc.
- Improvement of institutional and organizational management.
- Improvement of financial stability in SWM services through e.g., improved fee collection, appropriate investment planning, effectual cost accounting, etc.

### **b.1 Strategies of Technical Improvement for Cost-effective SWM**

In order to achieve the target of “technical improvement for cost-effective SWM”, the primary strategies are:

- municipalities should become capable of examining plural technical alternatives with cost-consciousness and be flexible and proficient in converting the present technical system to another if it turns out more beneficial and is selected.
- regional technical system in SWM should be expedited to improve cost-efficiency; and
- technical improvement of SWM offices in 14 municipalities by OPAMSS’s support.

### **b.2 Strategies of Institutional/organizational Improvement for Cost-effective SWM**

In order to achieve the target of “institutional/organizational improvement for cost-effective SWM”, the primary strategies are:

- to strengthen institutions and to improve organizations in order to be more aware of cost-conscious;
- to implement cost-effective administration on regional issues in SWM by initiatives of COAMSS/OPAMSS; and

- to collaborate with education sectors to promote citizens to have a sense of public duty on “not to throw away refuse”, which in return will reduce municipal cost burden on street sweeping, although it will take a longer time for all citizens to share the sense and to practice it.

### **b.3 Strategies of Financial Planning and Arrangement for Auto-sustainable SWM**

In order to achieve the target of “appropriate financial planning and arrangement for auto-sustainable SWM”, the primary strategies are:

- efficient fee collection should be expedited to secure the income for SWM services;
- clear cost accounting on SWM should be established by respective municipalities in order to systematically monitor the expenditure of SWM services and be utilized in its management; and
- appropriate investment planning should be expedited.

### **c. Targets for “Environmental Conservation” through SWM**

In order to achieve the goal of “environmental conservation” in SWM, there are two major category of SWM contribution.

- Prevention of pollution related with SWM activities: and
- Natural resource conservation through SWM

#### **c.1 Strategies of “environmental protection” through SWM**

In order to achieve the target of “pollution prevention”, the primary strategies are:

- SW treatment and final disposal facilities are operated not to pollute the environment.

#### **c.2 Strategies of “resource conservation” through SWM**

In order to achieve the target of “resource conservation”, the primary strategies are:

- public should be encouraged to be more environmentally aware of waste minimization; and
- environmental conservation through “reduction”, “re-use” and “recycling” of waste should be promoted.

It should also be highlighted that collaboration with education sectors is indispensable for these strategies of public involvement.

Scheme of relations among goals, targets and strategies are illustrated in Table 6-1.

Table 6-1: Goals, Targets, and Strategies

M/P aims	Target	Strategies	Specific action
Promote the citizens' well-being	Improvement of public health and reduction of health hazard	To raise collection service coverage ratio	<ul style="list-style-type: none"> <li>Improvement of collection efficiency</li> <li>Service expansion to non-served areas</li> </ul>
		Improvement of collection and transport method, to reduce health hazard and public nuisance	<ul style="list-style-type: none"> <li>Collection vehicle management system</li> <li>Collection point (e.g., 2m<sup>3</sup> container) management system</li> <li>Primary collection management system (e.g., micro-enterprises control system)</li> </ul>
		To promote appropriate SW handling by citizens	<ul style="list-style-type: none"> <li>public education program</li> </ul>
	Welfare of those who are related with SWM activities	marginal stakeholders (i.e., disposal site waste-pickers) to find sanitary job opportunity	<ul style="list-style-type: none"> <li>promote to change from downstream "waste-picking" to upstream "recyclable recovery"</li> <li>other job opportunities</li> </ul>
		provision of competitive services by stakeholders	<ul style="list-style-type: none"> <li>create mechanism to promote stakeholders to provide competitive services</li> </ul>
	Appropriate medical waste management	Appropriate intra-hospital management of medical waste	Reliable treatment/disposal
Reliable treatment/disposal			<ul style="list-style-type: none"> <li>To execute and supervise reliable treatment/disposal</li> </ul>
Sustainable SWM	Improvement of technical performance	<ul style="list-style-type: none"> <li>To be capable of examining technical alternatives and of converting the present to another if it turns out more beneficial and is selected</li> <li>Regional approach in SWM</li> <li>Technical support by OPAMSS</li> </ul>	<ul style="list-style-type: none"> <li>Collection rout improvement</li> <li>Improvement of transportation system</li> <li>Improvement of collection vehicle management system</li> </ul>
		Institutional/organizational improvement	<ul style="list-style-type: none"> <li>Establishment of regional approach in SWM</li> <li>Strengthening of each municipal SWM</li> <li>Strengthening of national approach in medical SWM</li> <li>Plans for competitive services (e.g., appropriate contract management)</li> </ul>
	Financial planning and arrangement for auto-sustainable SWM		To secure sufficient and stable income for the SWM services
		To establish clear cost accounting and utilize in its management	<ul style="list-style-type: none"> <li>Establishment of clear cost accounting</li> <li>training</li> </ul>
Contribute to environmental conservation	Environment protection	Improvement of landfill level	<ul style="list-style-type: none"> <li>Establish cleansing fund</li> <li>sanitary landfill</li> </ul>
	Resources conservation	Promotion of recycle and recovery	<ul style="list-style-type: none"> <li>Source separation and separate collection</li> <li>Collaboration with education sectors</li> </ul>

### 6.1.3 Compatibility of 3 Major Goals

It is important to sustain compatibility among three (3) goals.

For example if a municipality that does not yet achieve 100% service coverage places its major emphasis on the goal of “environmental conservation” and spends considerable resources of municipal budget in activities of such as separate collection and recycling, which might possibly turn out low-efficiency collection and very costly activities. Then in the consequence, ordinary cleansing services might be deteriorated and the service coverage will be lowered since the resources for this principal service is already limited and/or further reduced. As a result, more waste will be left uncollected in streets and controversially create health hazard and jeopardize the public health that is an important another goal.

### 6.1.4 Regional Issues and Municipal Issues in M/P Components

Regional issues and municipal issues are categorized in the M/P scheme as shown in Table 6-2.

Table 6-2: Master Plan Components

	Regional management system (for COAMSS/OPAMSS)	Individual management system (for Municipalities)
Collection and transportation	Transfer station Transport system	Discharge/ storage system Collection system
Intermediate treatment	Material recovery facility	Separate collection
Final disposal	Technical and institutional management system	Landfill level (i.e., open dumping, controlled dumping, sanitary landfill)
Medical waste management	National/regional management by MSPAS	Coordination with MSPAS

### 6.1.5 Action Plan for Regional Management System

Actions plan for regional management system of principal technical components in the M/P scheme are shown in Table 6-3.

Table 6-3: Action Plan for Regional Management System

		Phase I			Phase II			Phase III			
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Transfer system	TS 1	FS, EIA	B/D, D/D	Con.	OP	OP	OP	OP	OP	OP	OP
	TS 2	FS	EIA, B/D	D/D, Con.	Con.	OP	OP	OP	OP	OP	OP
Intermediate treatment	MRF					FS, EIA	B/D, D/D	Con.	OP	OP	OP
	Incineration									Begin examine	
Landfill	MIDES Nejapa	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
	New Tonacatepeque	FS, EIA	B/D, D/D	Con.	Con.	OP	OP	OP	OP	OP	OP
	New Espiga	Con.	Con.	OP	OP	OP	OP	OP	OP	OP	OP
Medical waste treatment	MIDES/Nejapa	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
	New facility	FS, EIA	B/D, D/D	Con.	OP	OP	OP	OP	OP	OP	OP

Notes:

FS: feasibility study, B/D: basic design, EIA : environmental impact assessment,  
D/D : detailed design, Con.: construction, OP: operation

### 6.1.6 Actions plan for Individual Management System

Actions plan of principal technical components in the M/P scheme are shown in Table 6-4.

Table 6-4: Action plans of Technical Aspects

	Step I	Step II	Step III
Discharge/Storage	Improvement of hygienic condition of discharge station (2m <sup>3</sup> container yard)	Implementation of pilot project for separate collection	Implementation of separate collection
Collection	<ul style="list-style-type: none"> <li>Improvement of service coverage</li> </ul>	<ul style="list-style-type: none"> <li>Improvement of service coverage</li> <li>Renewal of collection vehicle</li> </ul>	<ul style="list-style-type: none"> <li>Improvement of service coverage after renewal of collection vehicle</li> </ul>
Haulage	Direct transport		Transfer transport
Final disposal	Open dumping	Controlled dumping	Sanitary landfill

### 6.1.7 Action Plan for Respective Municipalities

Actions to achieve the above goals targets and strategies should be, in practice, introduced step-wise manner toward the target year 2010. Hence, years till the target year 2010 are divided into three phases for the reference as shown in the table below.

Meanwhile, situations and conditions intrinsic to each municipality are diversely different. For example, in what year to enter to the Step II or Step III from present Step I should be different municipality by municipality. It is recommended that each municipality should consider time program (e.g., in what year to enter to the Step II or Step III) by examining their own intrinsic situation and conditions.

Table 6-5 below shows time program proposed by the Team which should always be subject to further examination by respective municipality.

Table 6-5: Action Plan for Respective Municipalities

			Phase I			Phase II			Phase III			
		Step	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SS	Discharge /Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										
MJ	Discharge /Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										
CD	Discharge /Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										



			Phase I			Phase II			Phase III				
		Step	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
CT	Discharge /Storage	III											
		II											
		I											
	Collection	III											
		II											
		I											
	Haulage	III											
		II											
		I											
	Final disposal	III											
		II											
		I											
AY	Discharge /Storage	III											
		II											
		I											
	Collection	III											
		II											
		I											
	Haulage	III											
		II											
		I											
	Final disposal	III											
		II											
		I											
SM	Discharge /Storage	III											
		II											
		I											
	Collection	III											
		II											
		I											
	Haulage	III											
		II											
		I											
	Final disposal	III											
		II											
		I											
ST	Discharge /Storage	III											
		II											
		I											
	Collection	III											
		II											
		I											
	Haulage	III											
		II											
		I											
	Final disposal	III											
		II											
		I											

			Phase I			Phase II			Phase III			
		Step	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
AC	Discharge /Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										
SY	Discharge /Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										
IL	Discharge /Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										
SMT	Discharge /Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										

			Phase I			Phase II			Phase III			
		Step	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
AP	Discharge /Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										
NJ	Discharge /Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										
TN	Discharge /Storage	III										
		II										
		I										
	Collection	III										
		II										
		I										
	Haulage	III										
		II										
		I										
	Final disposal	III										
		II										
		I										