Chapter 7

The Master Plan

7 The Master Plan

7.1 Outline of the Master Plan

7.1.1 Goals and Targets

a. Goals

The principal goal of the SWM master plan is:

"To establish a Sound Solid Waste Management System in order to beautify the Central District by the target year 2010".

The master plan aims to:

A. Establish a financially sustainable, accountable, and stable solid waste management system.

B. To improve the unsightly view in the city caused by waste.

C. Minimize the negative environmental impacts caused by solid waste management.

D. Provide all citizens with an acceptable level of hygiene.

The proposed measures to be taken, in order to attain the goals, are summarized below.

No.	Proposed Measures	Effect			
		A	B	C	D
1	**Improvement of the Institutional and Organizational System**				
1.1	Establishment of an autonomous institution	x			
1.2	Establishment of a self-supporting accounting system	x			
1.3	Improvement of the waste fee system	x			
1.4	Reduction of the municipality's involvement in activities	x			
2	**Improvement of Managerial Capability of the Executing Body**				
2.1	Establishment of a data control system	x			
2.2	Improvement of the cost control system	x			
2.3	Improvement of the financial planning system	x			
2.4	Scaling down the required procurement procedures	x			
2.5	Training human resources in the solid waste management sector	x	x	x	x
2.6	Introduction of private sector participation	x	x		
3	**Improvement of the Sanitary Level of the Disposal Site**				
3.1	Improvement of facilities at the disposal site			x	x
3.2	Training on proper sanitary landfilling operation			x	x
4	**Improvement in the Efficiency of the Collection and Haulage System and Expansion of Collection Service Areas**				
4.1	Improvement of the collection and haulage plan	x	x		x
4.2	Establishment of an optimal collection system for problematic areas	x	x		x
4.3	Promotion of primary collection by CBOs	x	x		x
4.4	Promotion of adequate self disposal	x	x		x
4.5	Improvement of the efficiency of the street sweeping system	x	x		x
4.6	Promotion of recycling	x	x	x	x
5	**Education**				
5.1	Raising awareness on solid waste	x	x	x	x
5.2	Hygiene education	x	x	x	x
5.3	Promotion of public cooperation	x	x	x	x

b. Targets

In order to achieve the principle goal of the master plan, the targets for the establishment of major technical system components are proposed and tabulated in Table 7-1. Figure 7-1 to Figure 7-4 illustrate the proposed master plan.

Table 7-1: Targets for Establishment of Major Technical System

		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
A. Main Targets														
Collection Rate	%	64	64	64	72	72	72	79	79	79	79	85	85	85
Recycling Rate	%	3	3	3	4	4	4	4	4	4	4	5	5	5
Street Sweeping Length	km	180	180	180	180	190	190	190	200	210	220	230	240	250
Final Disposal		Level 1	Level 2									Level 2 or 3		
B. Detailed Targets														
1. Waste Generation Amount	**t/d**	**481**	**514**	**550**	**586**	**626**	**667**	**711**	**759**	**807**	**858**	**912**	**970**	**1,031**
Residential Waste	t/d	318	342	367	392	419	447	478	510	542	576	613	651	692
Non-residential Waste	t/d	134	144	155	166	177	190	203	218	232	247	263	280	299
Street Sweeping Waste	t/d	28	28	28	28	30	30	30	32	33	35	36	38	40
2. Waste Collection Amount	**t/d**	**309**	**330**	**352**	**422**	**451**	**480**	**558**	**597**	**636**	**676**	**776**	**825**	**878**
Collection of Residential Waste	t/d	213	229	246	294	314	336	386	413	440	469	529	563	600
Collection of Non-Residential Waste	t/d	67	72	77	99	106	114	142	152	162	173	211	224	239
Collection of Street Waste	t/d	28	28	28	28	30	30	30	32	33	35	36	38	40
Direct Haulage	t/d	27	29	31	33	35	38	41	44	46	49	53	56	60
On-site Disposal	t/d	19	21	22	24	25	27	29	31	33	35	37	39	42
Recycling	t/d	0	7	8	10	10	11	19	20	21	23	24	25	27
Uncollected	t/d	126	128	137	98	104	111	65	68	72	75	23	23	24
3. Service Rate	**%**	**64**	**64**	**64**	**72**	**72**	**72**	**79**	**79**	**79**	**79**	**85**	**85**	**85**
High Income Residents	%	90	90	90	100	100	100	100	100	100	100	100	100	100
Middle Income Residents	%	70	70	70	80	80	80	90	90	90	90	93	93	93
Low Income Residents	%	50	50	50	55	55	55	60	60	60	60	70	70	70
4. Service Population														
4.1 Service Population	**t/d**	**543,270**	**565,568**	**588,781**	**685,868**	**714,392**	**744,099**	**840,339**	**876,247**	**913,681**	**952,705**	**1,060,236**	**1,104,564**	**1,150,740**
High Income Residents	t/d	152,795	154,848	156,825	176,353	178,350	180,232	181,984	183,595	185,049	186,333	187,431	188,326	189,000
Middle Income Residents	t/d	178,260	194,552	211,851	263,099	285,360	308,969	375,744	405,577	437,179	470,642	522,933	561,666	602,640
Low Income Residents	t/d	212,215	216,169	220,105	246,417	250,681	254,899	282,611	287,075	291,453	295,729	349,871	354,572	359,100
4.2 Unserviced Population	**t/d**	**305,589**	**316,754**	**328,323**	**267,389**	**276,443**	**285,796**	**230,156**	**236,448**	**242,877**	**249,446**	**189,305**	**194,235**	**199,260**
High Income Residents	t/d	16,977	17,205	17,425	0	0	0	0	0	0	0	0	0	0
Middle Income Residents	t/d	76,397	83,379	90,793	65,775	71,340	77,242	41,749	45,064	48,575	52,294	39,361	42,276	45,360
Low Income Residents	t/d	212,215	216,169	220,105	201,614	205,103	208,554	188,407	191,384	194,302	197,153	149,945	151,959	153,900
5. Final Disposal Amount	**t/d**	**353**	**358**	**382**	**454**	**485**	**517**	**601**	**643**	**684**	**728**	**831**	**884**	**942**
Municipal Waste	t/d	343	347	370	442	472	503	586	626	667	710	811	863	919
Others	t/d	10	11	12	12	13	14	15	16	17	18	20	21	22

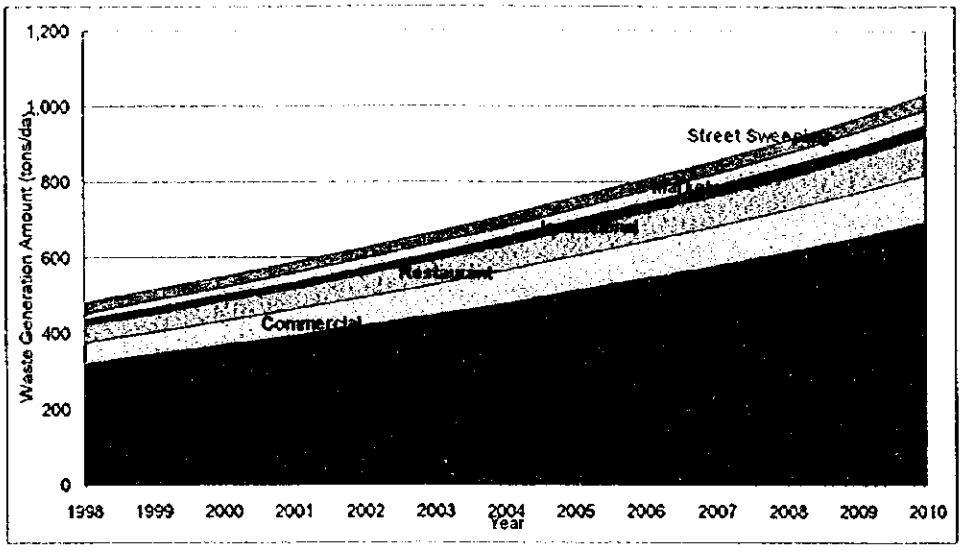


Figure 7-1: Waste Generation Amount Forecast until 2010

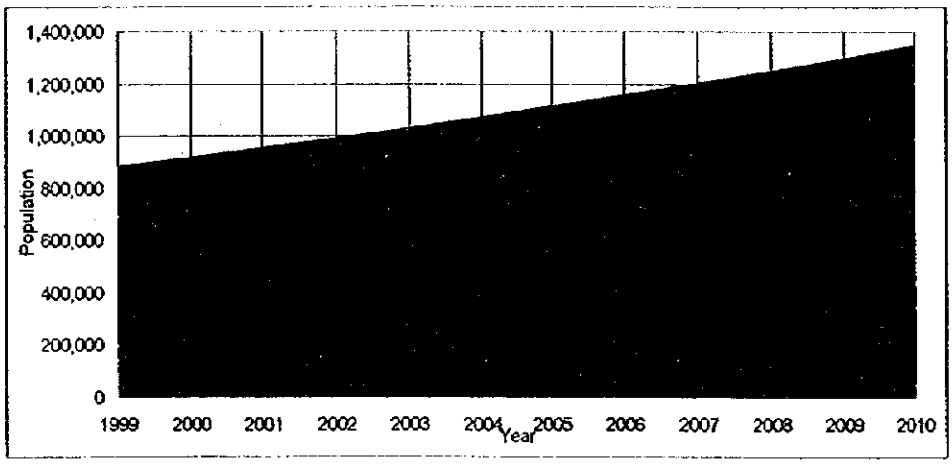


Figure 7-2: Master Plan of Service Population

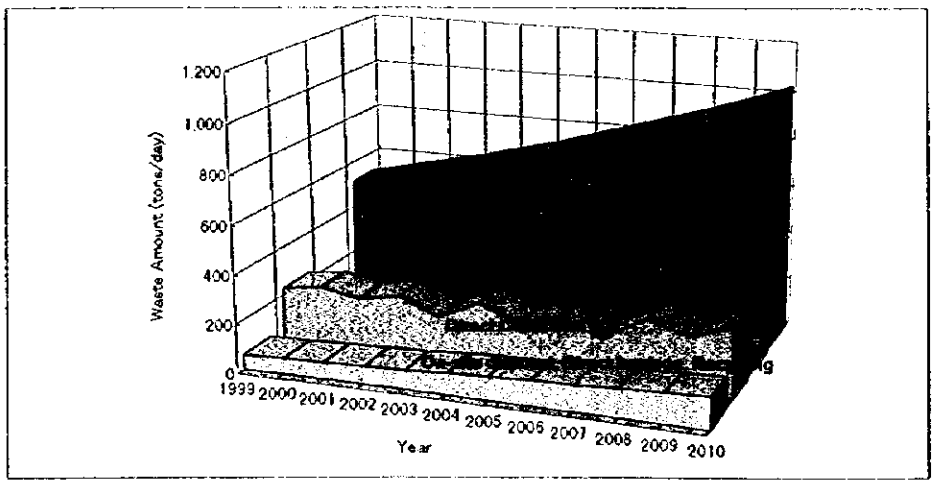
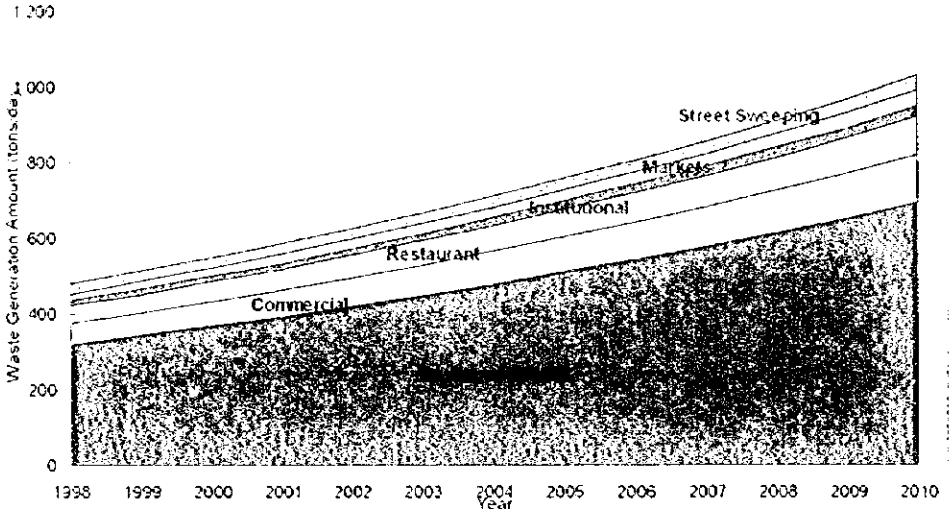


Figure 7-3: Master Plan of Waste Collection and Haulage



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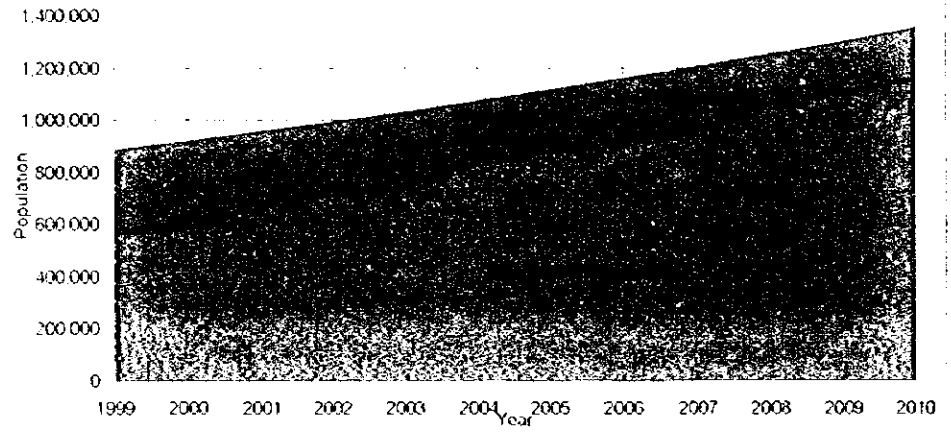

Figure 7-2 Master Plan of Service Population

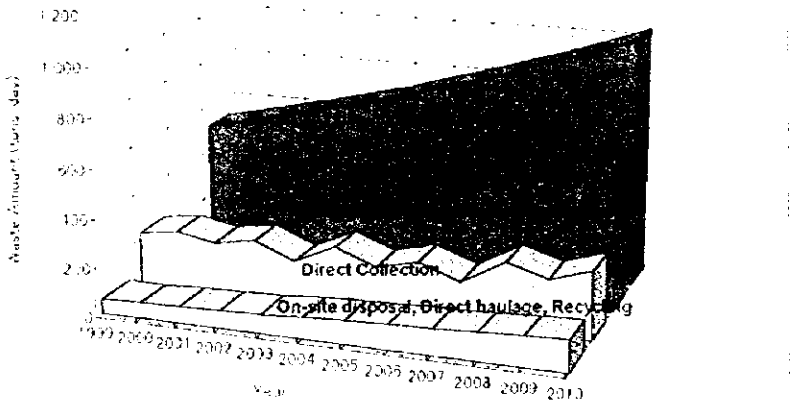

Figure 7-3: Master Plan of Waste Collection and Haulage

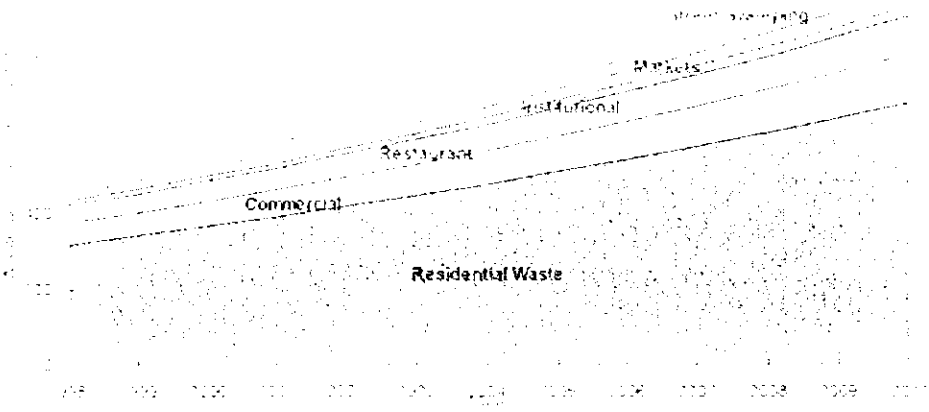

Figure 7-1 Waste Generation Amount Forecast until 2018

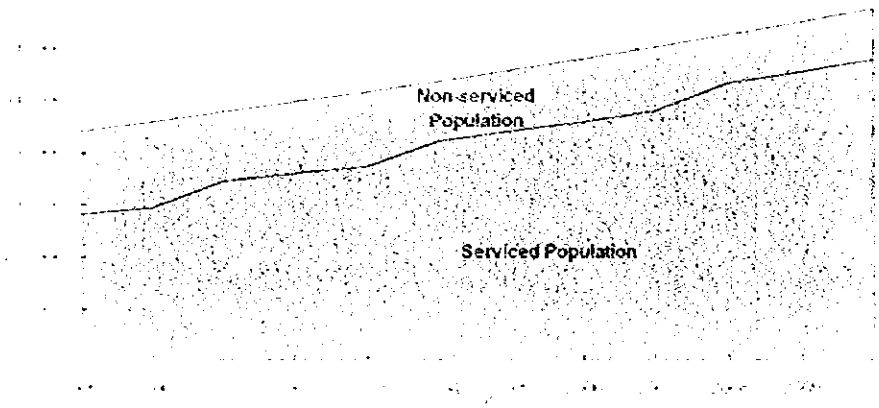

Figure 7-2 Master Plan of Service Population

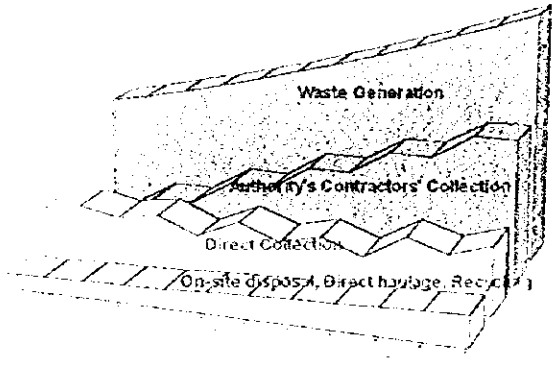

Figure 7-3 Master Plan of Waste Collection and Haulage

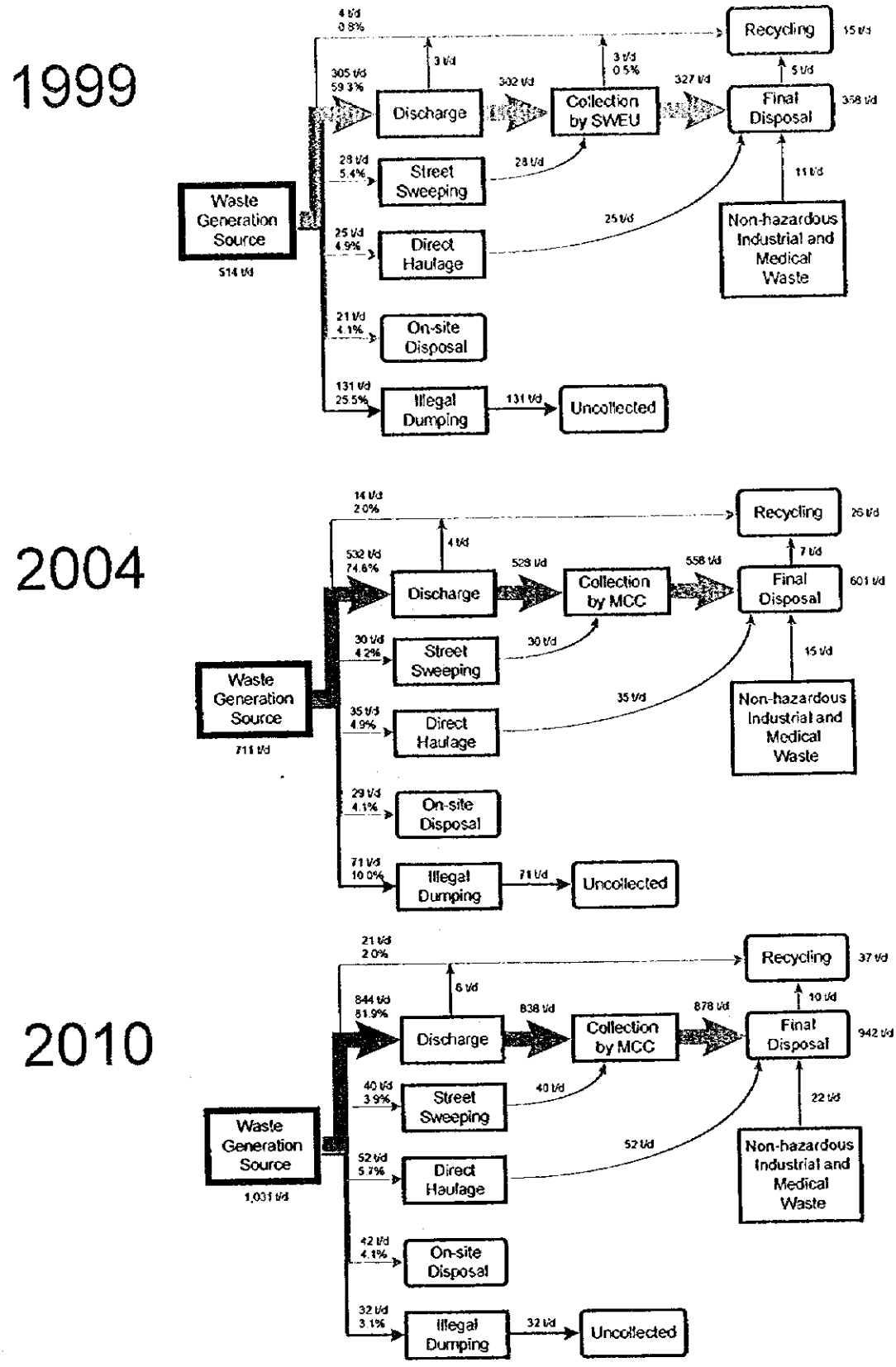

Figure 7-4: Waste Stream for the Central District

7.1.2 Master Plan Concepts

a. Institutional, Organizational, and Financial System Reform

a.1 Institutional System

1) The private sector's participation will be expanded.

2) The current cleansing status will be upgraded.

a.2 Organizational System

1) The executing agency of solid waste management will become autonomous, creating a Municipal Cleansing Corporation (MCC), to bring about more flexibility and stability.

2) A self-supporting accounting system will be established so that revenue from the waste collection fee is apportioned to only solid waste management works.

a.3 Financial System

1) The new waste fee system will be based on the most appropriate combination of the following concepts.

- Polluter-pays-principle (waste dischargers pay the SWM cost).
- Cross-subsidy mechanism (the affluent pay for the less well off).
- Minimization of the waste fee collection costs.
- Strong enforceability of the collection system.
- Different service levels in accordance with the amount of collection fee paid.

2) A disposal fee will be imposed on direct waste hauliers.

a.4 Management System

1) The AMDC's new Solid Waste Management Executing Unit (SWEU), created during the first phase of the institutional reform program, will be required to have a sound managerial capability to control the participation of the private sector. The management capability of the SWEU, especially regarding cost control, financial planning, technical planning, contracting, monitoring and supervision works, will be improved compared to the current Cleansing Department.

2) Accountability and transparency of solid waste management practices will be established in the SWEU.

a.5 Education and Raising Awareness

When raising public awareness through education and encouragement of social participation, the following should be considered.

1) Inform the citizens on:

- Environmental problems and health problems related to SWM.
- Changes in the organization structure, the responsibilities, and legal powers of the organization.

- Existing legislation; explaining penalties and punitive measures to transgressors and the enforcement procedures.
- Duties and responsibilities of the citizens, including the waste collection fee and the methods of payment.
- Procedures to submit complaints to the authorities.

2) Institutionalize the municipal program: "Mobile Municipality" as a means to promote social participation in the improvement of public health through clean-up campaigns, cultural activities, and provision of primary medical services to residents (e.g., ante- and postnatal care, immunization programs, dental check-ups, etc.).

3) Education programs for school students and local groups through effective use of existing resources.

Public education cannot proceed if the human resources responsible for SWM do not have a sufficient information base with which they can teach the general public. The master plan proposes a human resource training program, consisting of three training courses.

- Public Affairs
- Operations
- Support Services

b. Technical System

b.1 Storage and Discharge

1) The type of containers used will be regulated.

2) A separate discharge system for recyclable and non-recyclable wastes will be introduced.

b.2 Collection and Haulage

1) Areas given a priority for waste collection services are as follows.

1. City center.
2. High and middle income residential areas.
3. Low income residential areas in the city limits.
4. Low income residential areas in the outskirts of the city.

2) The compactor truck collection system will be extended.

3) In problematic areas, the dump truck sytem, the arm-roll container system, the hoist truck container systems, etc., will be appropriately adapted depending on the conditions in each area.

4) In problematic areas, primary collection will be provided by micro-enterprises or community based organizations (CBOs) and secondary collection by the AMDC. The AMDC will promote primary collection activities, however, all costs incurred for this service will be shouldered directly by the users.

b.3 Processing, Treatment and Recycling

1) No major processing or treatment plants for solid waste will be introduced.

2) Recycling activities will be promoted by the AMDC's SWEU and carried out mainly by the private sector. The SWEU will not participate in recycling activities directly.

b.4 Street Sweeping

1) All street sweeping work will be carried out manually.

2) An appropriate collection and transportation system for street waste will be introduced.

b.5 Final Disposal

1) The sanitary level of the existing disposal site will be improved to minimize the negative impacts on the environment.

2) The whole area of the existing final disposal site will be fully utilized, in order to continue its operation for as long as possible.

3) The control of scavengers will be reinforced; they will be prohibited from continuing their activities at the disposal site by 2010, without ensuing considerable social impacts.

b.6 Maintenance System

1) Only preventive and daily maintenance as well as repair services, that cannot be done at private workshops, will be conducted by the AMDC's workshop. The rest will be undertaken by the private sector.

7.2 Institutional System Master Plan

Not only in Honduras but also in most developed countries, solid waste problems are becoming more difficult and complex, onset by social changes, peoples' life styles, economic growth, population growth, among others. With these the needs of solid waste management are rapidly changing from sanitation to environmental protection, and further to natural resource conservation. The complete solution to these problems have yet to be solved. At present, the only course of action that humanity can take is to quickly grasp the existing problems, to take appropriate actions, and to prepare for further problems that may arise. The first step in conquering the unremitting problems of solid waste is, therefore, to establish a proper institutional system.

a. The Institutional System's Existing Problems

Following problems were identified in the present institutional system.

1) The institution's low hierarchy level within the municipal structure.
2) Weak organizational structure.
3) Limited capacity to make decisions.
4) Slow administrative procedures.

5) Human resources lack motivation.
6) Lack of accountability and transparency.
7) Large number of clients are not registered for payment.
8) Fee and tariffs which do not correspond to the service provided.
9) No reliable accounting records reflecting overall revenues and expenditures.
10) No reliable records of the waste collection and disposal amounts.
11) No one knows the real service costs.
12) Collection and cleansing routes that are unbalanced.
13) Deficient coverage (80 ton/day of domestic waste are not collected).
14) There is neither punctuality nor order with respect to frequencies and schedule.
15) The dumpsite deteriorates the environment and jeopardizes public health.
16) Machinery and equipment is damaged due to lack of maintenance and delays in the purchase of spare parts.
17) There are neither objectives nor goals; services are unplanned and undeveloped.
18) There is a lack of control and supervision of those working under contract.

b. Requirements for the Proposed Institutional System

1) The proposed institutional system master plan aims to overcome these problems, since most causes of these problems are attributed to the inadequate institutional system.

2) The improvement of the institutional system must precede any technical system reforms, because improved technical systems require additional costs that cannot be covered by the present revenue from the waste collection fee.

3) A general objective for each sub-institutional system is as follows.

Sub-system	Objective
Administration and organization	To establish autonomy and accountability in SWM
Finance	To increase revenue for SWM
Management	To attain the targets with minimal SWM costs

7.2.1 Administration and Organizational System

As the improvement of the institutional system is a priority issue concerning the improvement of the present SWM system, its reform shall be conducted in two stages. The first stage targets immediate improvements, and the second stage aims for full-scale improvement.

First Stage: Immediate Improvement Plan

"Establishment of a Solid Waste Management Executing Unit SWEU"

Description:

An SWEU, a temporary organization directly linked to the Mayor's office, will be established immediately (see Figure 7-5 and Figure 7-6). The SWEU will have the same functions as the present Cleansing Department, however, its hierarchy level will be raised to much a higher level than the present Cleansing Department.

This improvement aims at the following.

- Urgent improvement of the SWM system's efficiency with minimal changes in the administering of the present organizational system.
- Execution of necessary preparations for the establishment of an autonomous entity to undertake solid waste management.

Schedule: In early 1999

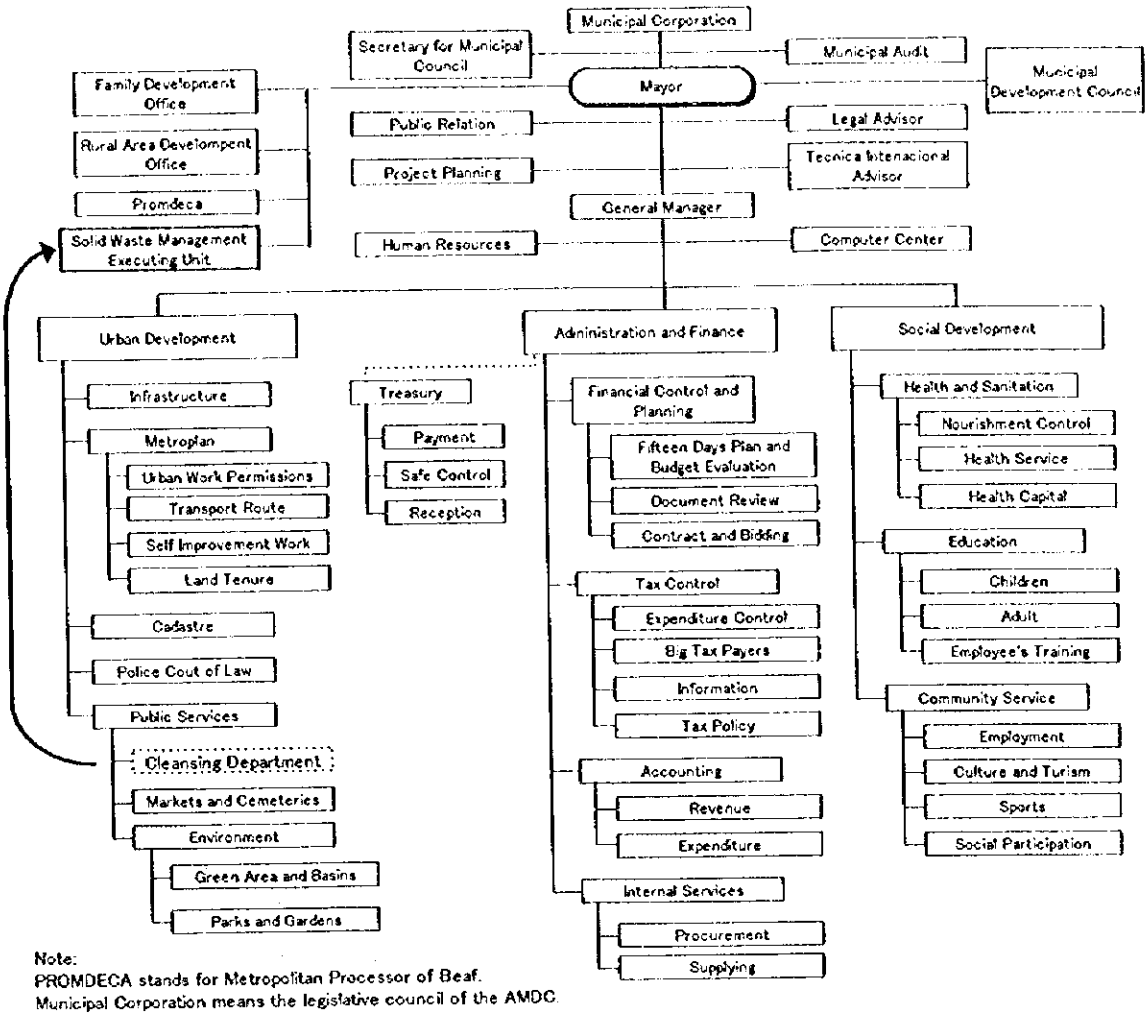

Figure 7-5: "1st Stage" Proposed Hierarchy Level of SWM Executing Unit

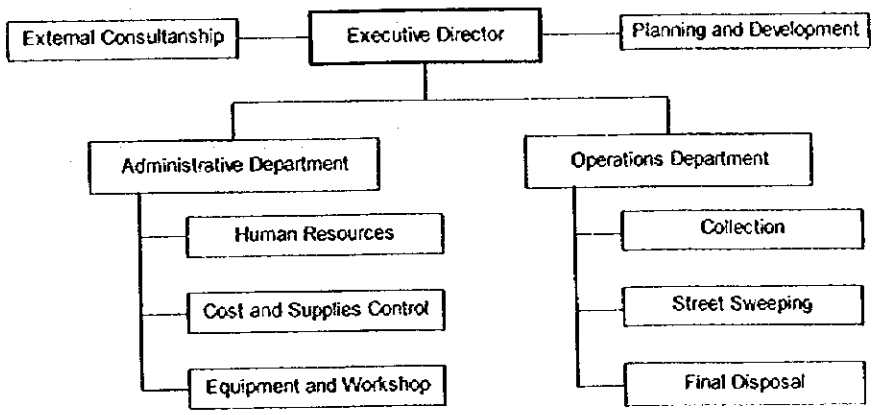

Figure 7-6: "1st Stage" Organizational Chart of SWM Executing Unit

Second Stage: Full-scale Improvement Plan

"Establishment of a Solid Waste Management Autonomous Entity, the Municipal Cleansing Corporation"

Description:

An autonomous entity – the Municipal Cleansing Corporation (MCC) – with complete administrative and financial autonomy, will be established, for the purpose of having an integral management of municipal SWM in the Central District (see Figure 7-7).

Objective:

- To halt and reverse environmental deterioration caused by the provision of waste services.
- To rehabilitate, to renew, and to expand the infrastructure.
- To guarantee service quality with appropriate controls.
- To improve and to simplify contacts with clients.
- To contribute to the recovery of the environment.

Schedule: Before 2001

Justification:

With the continuous urban expansion, the amount of SWM works is becoming more intricate and overwhelming; it has reached a point where it is both physically and financially difficult for the AMDC to effectively manage on their own. Therefore the private sector's financial and technical capabilities must to be introduced into the SWM system. In fact some services have already been contracted out to the private sector.

There are, however, some discrepancies between the private sector's objective and the government's objective in SWM. The private sector's aim in SWM is more profit oriented, whereas the municipality strives to provide citizens with sanitary conditions and achieve aesthetic conditions, environmental protection, and conservation of natural resources, etc. Therefore, the municipality must retain its function in order to control the private sector's activities properly so that the master plan targets are achieved.

On the other hand, there are many problems with a direct municipal operation (see Chapter 12 for details). Because an autonomous entity is not bound by the same administrative restrictions that are at the root of the problems faced by public waste services, financial stability for the new autonomous entity -- achieved through the billing of services -- will become a reality.

Autonomous entities are gaining popularity in other Latin American countries, as management decisions -- especially concerning personnel appointments and setting of fees -- are not swayed by political intervention.

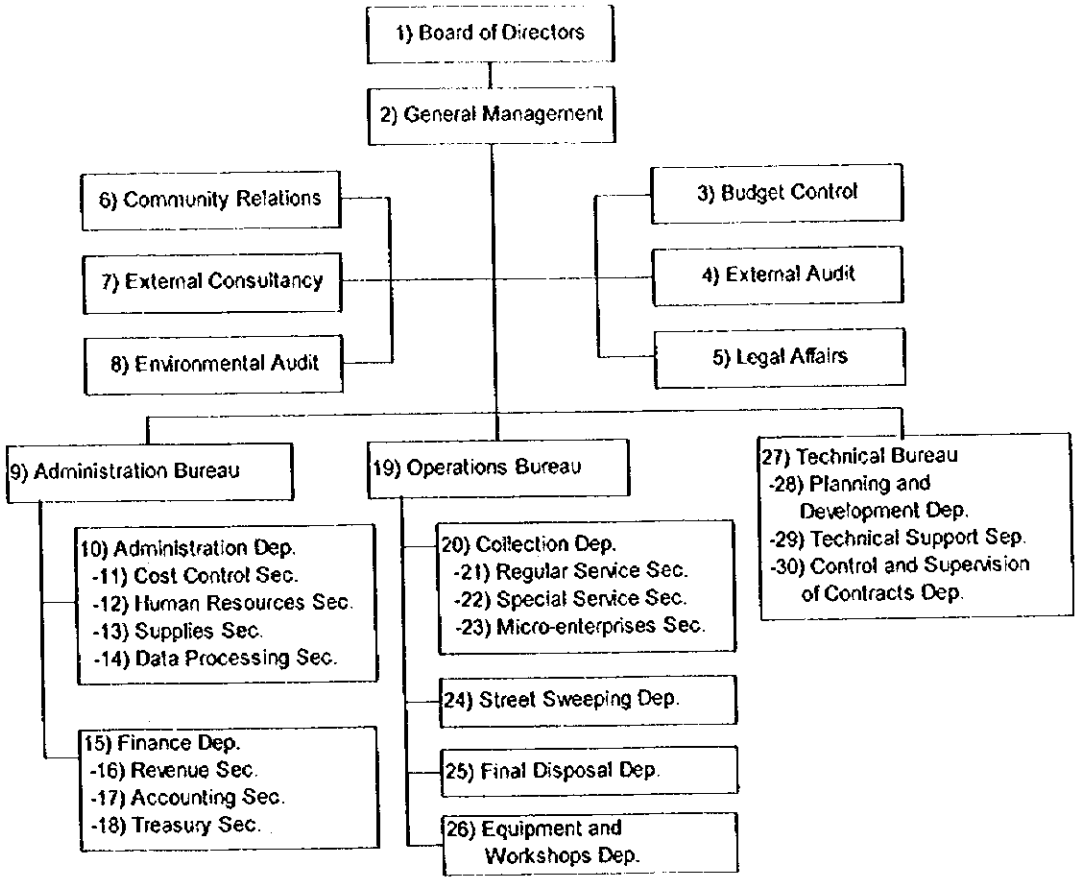

Figure 7-7: "2nd Stage" Organizational Structure of the Autonomous Municipal Cleansing Corporation

7.2.2 Financial System

a. Existing Problems

The waste collection fee is currently collected jointly with the fixed property tax. The existing problems in this system are as follows.

1) Although everybody discharges wastes, only fixed property owners are invoiced for waste collection fees. Currently, there are 126,000 fixed property owners (approximately 80% of Central District households) who are registered taxpayers. Many residents who receive waste services, therefore, are not issued invoices for waste collection fees.

2) The value of the fixed property is set for five years.

3) The collection system of the fixed property tax is ineffective because tax evaders cannot be identified. Therefore the collection rate (at approximately 50%) is very low.

4) The waste collection fee does not reflect both the service level and the waste discharge amount. It is difficult to justify the present fee system, and, as a result, citizens are dissatisfied and unwilling to paying their dues.

b. Master Plan

b.1 Introduction of a New Waste Fee Collection System for Residential Waste

"Joint Billing System with the Electricity Bill"

The master plan proposes to introduce a joint billing system where residences and businesses are issued invoices for waste collection fees with the electricity bill. This system has following advantages.

- The number of households currently invoiced is approximately 200,000 and it is equivalent to approximately 100% of the Central District's population.
- The collection rate of electricity bills is nearly 100%.
- The collection cost for waste fees will be cheap.

b.2 Concept of New Waste Tariff System

Costs	Payer	Comments
Residential waste	Residents	Cross-subsidy mechanism (the affluent pay for the less well off) is applied.
Non-residential waste	Business establishments	Covering all collection, haulage and disposal costs.
Collection and haulage of large waste amounts	Large scale dischargers	Covering all collection, haulage and disposal costs for large waste amounts.
Direct Haulage	Direct hauliers	Covering the costs of final disposal.
Street sweeping etc.	High income residents and business establishments	Included in the waste fees for high income residential areas and waste tax of non-residential waste

b.3 New Waste Collection Fee System

For an accountable SWM system, it is necessary to clearly establish fees according to service level. Accordingly, a special collection fee will be imposed on houses or businesses that demand additional services such as the door to door collection services in marginal area or the haulage of larger volumes of waste. The table below shows the different categories of waste fee payers in both the current waste fee system and the waste fee system proposed in the master plan.

Present Waste Fee System	Proposed Waste Fee System	Comments
Residential Waste	Residential Waste; classified into wastes from: • High income residents • Middle income residents • Low income residents	At present, residential waste fees are jointly billed with the property tax; in the new system, a cross-subsidy mechanism (the affluent pay for the less well off) will be applied.
Business Waste	Non-Residential Waste; classified into: • Business waste • Large dischargers • Direct hauliers	At present large dischargers and direct hauliers are not charged for waste services. Businesses waste fees are jointly billed with the business income tax.

b.4 Proposed Waste Fee Rates

Type of waste			Fee Rates 2001 - 2002	2003 - 2007	2008 - 2010
Residential waste	High income residents	(Lps/house/month)	63	70	80
	Middle income residents	(Lps/house/month)	22	33	36
	Low income residents	(Lps/house/month)	11	18	20
Non-Residential waste	Business waste (Lps/establishment/month)	Annual business income more than L.4,000,000	500		
		L.3,000,001-4,000,000	450		
		L.2,000,001-3,000,000	400		
		L.1,000,001-2,000,000	250		
		L.500,001-1,000,000	200		
		L.300,001-500,000	150		
		L.100,001-300,000	100		
		L.50,001-100,000	75		
		up to L.50,000*	50		
	Large amount discharger	(Lps/ton)	480		530
	Direct haulage discharger	(Lps/ton)	50		55

Note: The basic business waste fee rate starts at Lps50/establishment/month

7.2.3 Management System

a. Revenue Control

a.1 Required Functions

The major required functions are as follows.

- Invoice issuance
- Demanding and checking payments
- Listing habitual defaulters
- Maintaining a fee payers' database
- Analyzing the fee collection situations by zones

- Reporting the issues from the viewpoint of revenue
- Developing new sources of revenue

a.2 Information Flow of Waste Fee Collection System

Figure 7-8 shows the information flow of routine work.

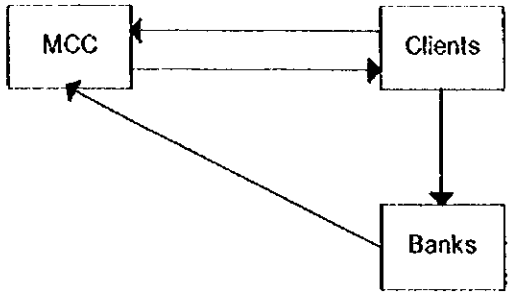

Figure 7-8: Information Flow Diagram of Waste Fee Collection

a.3 Database

A client database for residents, businesses, large scale dischargers, and direct waste hauliers will be produced.

a.4 Reporting System

A monthly report of payment and a dossier on client changes will be produced.

a.5 Fee enforcement in collaboration with the Tax Bureau

As waste fees for businesses will be charged based on the business income tax, it is essential that the Tax Bureau discloses all information to the MCC as soon as businesses declare their business income tax forms at the end of the fiscal year. In general as habitual defaulters have a tendency to evade payment of other taxes, it is advisable to monitor these cases closely and to enforce penalties in case of nonpayment.

b. Expenditure Control

b.1 Functions of expenditure control

The expenditure control system should consider the following functions.

- Initial approval for requests to acquire goods and services.
- Control the use of the budget.
- Achieve better conditions for acquisition.
- To register expenses in an organized manner so to establish an effective control on costs per activity.
- To control the quality and to certify the execution of contracted services; to authorize payments and to impose punitive measures against those who violate the law.

b.2 Information Flows

Figure 7-9, Figure 7-10 and Figure 7-11 show the proposed information flows.

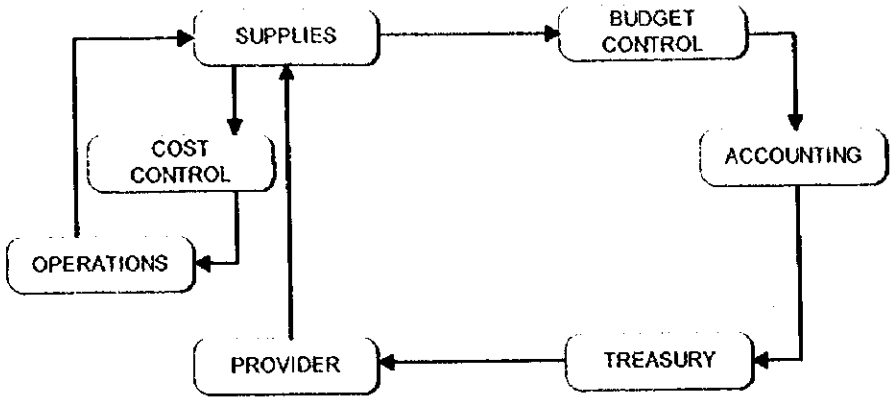

Figure 7-9: Expenditure Control System; Information Flow for Making Acquisitions

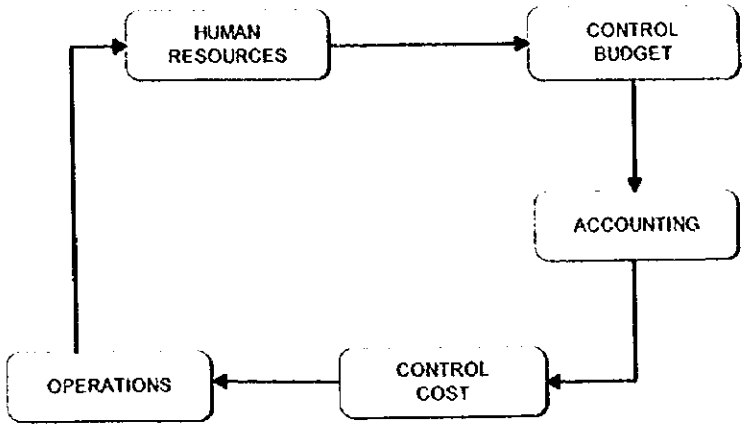

Figure 7-10: Expenditure Control System; Information Flow to Hire Personnel

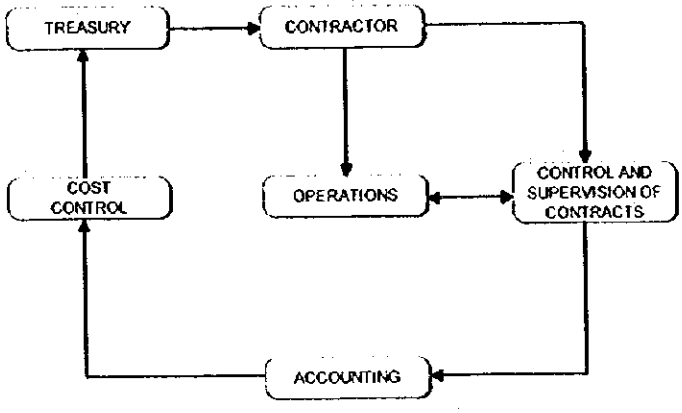

Figure 7-11: Expenditure Control System; Information Flow to Control and Supervise Contracts

c. Private Sector Participation

In order to ease the burden of SWM that is currently experienced by the AMDC and to utilize the financial, the technical and the managerial capacities of the private sector, the private sector's roles will be extended under the control of the Municipal Cleansing Corporation.

Contract	Description	Remarks
A	Collection and Haulage of Municipal Solid Waste (MSW) in the City's Urban Areas	• The contract will include collection and haulage works. • Open bidding • To be paid per ton of waste • A collection area under contract will have a waste discharge amount of apprx. 50ton/day
B	Collection and Haulage of Municipal Solid Waste in the City's Marginal Areas	• This contract is only for the secondary collection and haulage. • A contract includes all required cost for operation services under the provision of container trucks and skip containers by the MCC. • Open bidding • To be paid per ton.
C	Street Sweeping	• The contract will include street sweeping and transporting waste to stations. • Open bidding • For the city center: to be paid per sweeping area. For other areas: to be paid per km swept.
D	Sanitary Landfill	
	• Operation	• The contract will include all costs required for operation such as labor, fuel, materials, etc. However, heavy equipment owned by the MCC are provided to the contractor. • Open bidding • To be paid per ton of waste disposed
	• Rehabilitaion of the landfill site	• The contract will include all costs required such as materials, machinery work, labor, surveying, etc. • Open bidding • To be paid by a lump sum

d. Quality Control

d.1 Monitoring and Supervision

An information system, to assist in monitoring and controlling SWM works, is an important resource in order to verify and to improve SWM. Most of the services are repetitive with variations from time to time and with special services when they are requested. Planning and design for these tasks and final evaluation of services make up the quality control system (Figure 7-12).

First, guidelines and quality levels that need to be attained (parameters) will be defined; also, procedures to be followed and activities to be monitored will also be determined. This information will be provided to the general public, institution workers, and contractors.

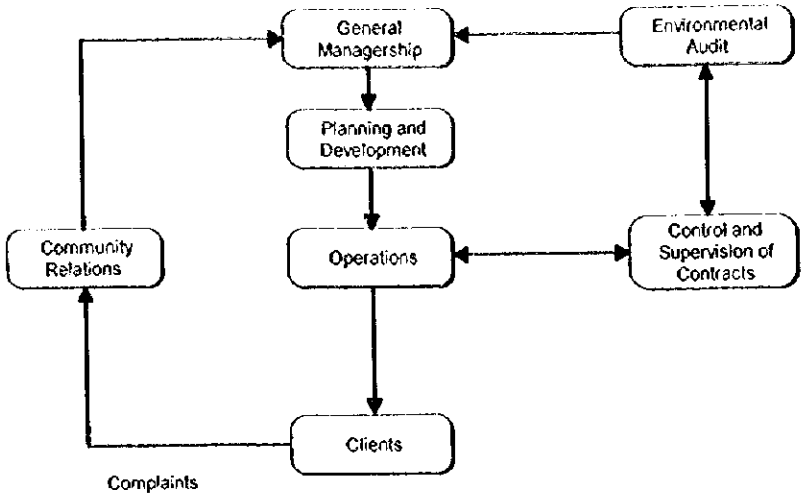

Figure 7-12: Quality Control System, Monitoring and Supervision

d.2 System Functions

- To establish physical and environmental parameters
- To instruct on monitoring procedures
- To verify the degree of satisfaction in attaining goals
- To recommend necessary adjustments

e. Human Resource Development System

The improvement of public services requires a continuous development of strength and skills for those who provide the service. This basic concept shows the objectives on training human resources. The first is to instill a sense of pride in public servants toward their work so that they develop a positive attitude and gain public trust for the institution. The second is to provide the public servants with necessary skills to improve their work and to ensure a cleaner environment that is comfortable for their citizens.

The human resources training program consists of three training courses.

- Public Affairs
- Operations
- Support Services

7.3 Technical System Master Plan

7.3.1 Design Conditions

a. Key Design Data

1) Specific weight of uncompacted waste when transported by refuse vehicles : 0.2 ton/m^3
2) ASG of waste when it is transported by compactors : 0.5 ton/m^3
3) ASG of waste when it is compacted at a disposal site : 0.8 ton/m^3
4) Average waste haulage distance : 18 km
5) Operation efficiency of refuse vehicles : 0.9
6) Operation hours of waste collection time
   From Monday to Friday : 7.5 h/day
   Saturday : 4.5 h/day
   Sunday : off

b. Economic Life

1) Communal containers : 7 years
2) Waste collection vehicles : 7 years
3) Heavy equipment : 6 years
4) Machinery : 15 years
5) Buildings and civil works : 30 years

c. Remaining Economic Life of Existing Equipment

Although their economic life have expired, the equipment that was procured in 1988 still function and is in fine working condition. It is unrealistic to propose the replacement of all these equipment at once because the present solid waste management system rely heavily on them. It was, therefore, assumed that all the existing equipment would be operational until the end of 2000, but requiring higher maintenance costs.

7.3.2 Discharge and Storage System

a. Cost Sharing

The AMDC's SWEU and, eventually, the MCC will not bear any costs related to discharge and storage except the cost of containers and for the handling of recyclable waste.

b. Discharge Method

A separate discharge system will be first introduced to the high income residential areas, where more recyclable materials are included in the generated wastes, and gradually expanded to the middle and low income residential areas.

c. Storage System

a) The type of storage system to be used will not be specified. People are free to select the type of storage system according to their preference. The use of metal drums, however, as a waste storage container, will be discouraged and eliminated in the future due to its heavy weight. The SWEU will begin to promote the use of plastic bags, plastic containers, paper bags, etc.

b) The installation of waste basket stands will be promoted in the residential areas, especially for the new residential development areas.

7.3.3 Collection and Haulage System

a. Basic Policy

1) In the long term, the private sector's involvement will be extended, but the MCC will directly operate at least 25% of the entire collection and haulage works.

2) The areas given immediate priority for waste collection services are as follows.

1. City center.
2. High and middle income residential areas.
3. Low income residential areas in the city.
4. Low income residential areas on the outskirts of the city.

3) In problematic areas the hoist truck system (with 5.5 m^3 containers) and the armroll truck system (with 10 m^3 containers) will be used. Primary collection will be provided by micro-enterprises or community based organizations, and secondary collection by the AMDC's SWEU. The SWEU will promote primary collection activities, however, all costs incurred by this service will be directly shouldered by users.

4) Where roads are narrow and busy, for example in the old city center, smaller compactor trucks (8 m^3), will be introduced in order to improve the collection efficiency and to minimize traffic disruptions caused by collection works.

5) The container system will be used only for marginal areas, where residents can supervise the containers, and for collection points for street sweeping wastes, carefully supervised by the proposed waste management authorities because its improper use would affect the entire SWM system.

b. Master Plan Program

b.1 Executing body

The executing body will be the SWM Executing Unit (SWEU) from 1999 to 2000, and after 2001 the executing authority will be the MCC.

The MCC will collect and haul waste directly and also by hired contractors.

b.2 Collection Method

Collection Frequency

- City center and high income residential areas: three times a week
- Other areas: twice a week

Working hours

From Monday to Friday: from 6:00 to 14:30
Saturday: from 6:00 to 10:30
Sunday: Off

b.3 Collection Method

The type of collection equipment and collection methods proposed for each type of area is summarized below.

Area	Collection Equipment	Collection Method
Standard residential areas and commercial areas	15m^3 Compactor truck	Curb collection
Busy commercial areas	8m^3 Compactor truck	Curb collection
Marginal areas	5 to 10 m^3 Container truck	Point collection
Street waste	5 to 10 m^3 Container truck	Point collection

b.4 Waste Collection Amount

The waste amount proposed to be collected by the SWEU (from 1999) and by the MCC (starting 2001) is summarized below.

unit: ton/day

Items	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Residential												
High	87	91	105	110	114	119	123	127	132	136	140	144
Middle	69	78	100	111	124	155	173	191	211	240	264	290
Low	73	77	89	93	98	112	117	122	127	153	159	165
Sub-total	229	246	294	314	336	386	413	440	469	529	563	600
Non-Residential (1)												
Commercial	31	33	43	46	49	61	65	69	74	90	96	102
Restaurant	24	26	34	36	38	48	51	55	58	71	76	81
Institutional	7	8	10	10	11	14	15	16	17	21	22	23
Markets	10	11	14	15	16	20	21	22	24	29	31	33
Sub-total	72	77	99	106	114	142	152	162	173	211	224	239
Non-Residential (2)												
Street Sweeping	28	28	28	30	30	30	32	33	35	36	38	40
Grand Total	330	352	422	451	480	558	597	636	676	776	825	878

b.5 Waste Amounts Collected by the Authority Responsible for SWM and its Contractors

The waste amounts to be collected by both the waste authority (i.e., either the SWEU or the MCC) directly and its contractors are shown below.

unit: tons/day

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Direct operation	230	252	222	251	180	258	197	236	176	276	225	278
MCC's contractor	100	100	200	200	300	300	400	400	500	500	600	600
total	330	352	422	451	480	558	597	636	676	776	825	878

b.6 Resources Required for the Authority Responsible for SWM

The resources required for executing the collection work, to be undertaken directly by one of the proposed waste authorities, are shown below.

unit: nos.

Equipment	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
15m^3 compactor	11	11	10	10	10	10	10	10	10	10	10	10
13m^3 compactor	9	9										
8m^3 compactor	0	0	3	3	3	3	3	3	3	3	3	3
12m^3 dump truck	10	10	5	5	5	5	5	5	5	5	5	5
5.5m^3 hoist truck	1	1	9	9	9	9	9	9	9	9	9	9
10m^3 armroll truck	1	1	9	9	9	9	9	9	9	9	9	9
5.5m^3 containers	11	11	90	90	90	90	90	90	90	90	90	90
10m^3 containers	13	13	90	90	90	90	90	90	90	90	90	90
Leased 6m^3 dump truck	0	3	0	0	0	3	0	0	0	7	0	7
Collection Capacity (t/d)	308	324	315	315	315	332	315	315	315	354	315	354

b.7 Procurement Schedule for the Authority Responsible for SWM

The procurement schedule for equipment to carry out the collection work, to be directly conducted by one of the proposed waste authorities, is shown in the table below.

unit: nos.

Equipment	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
15m^3 compactor		10							10			
8m^3 compactor		3							3			
12m^3 dump truck		5							5			
5.5m^3 hoist truck		9							9			
10m^3 armroll truck		9							9			
5.5m^3 container		90							90			
10m^3 container		90							90			

7.3.4 Processing, Treatment and Recycling System

a. Basic Concept

a.1 Major processing or treatment plants

Neither major processing nor treatment plants for municipal solid waste, to be operated by the AMDC's SWM Executing Unit, will be introduced provided that acquisition of a landfill site and its operation do not impose too much effort on the entire AMDC; this is due to the following reasons.

a) The current technological phase has not reached a sufficient level to operate and maintain an incineration plant.

b) For waste composting, gaining public cooperation for segregation of organic waste at generation sources is unlikely, and in addition the demand for compost is deemed to be too little.

a.2 Recycling

The AMDC's SWM Executing Unit will promote recycling activities by encouraging the participation of the private sector and avoid direct involvement in the execution of recycling activities. The percentage of recyclable materials in the waste and the

market for recycled products are still limited in the Central District. The purposes of recycling in the Central District will be as follows.

a) To gradually divert the present predominantly informal recycling channel to a more formal avenue in order to eliminate the current problems associated with the informal recycling activities. For example, at present, the presence of scavengers at the disposal site disturbs waste covering operations and informal waste picking by collection workers reduces collection efficiency significantly.

b) To raise public awareness on waste and the importance of environmental preservation through the promotion of recycling activities.

c) To change the present solid waste management system to a more environmentally sustainable system.

b. Master Plan Program

Program	Description
Communal recycling container method, Phase 1	In 2004, the proposed waste authority will place 100 recycling bins at 50 locations often frequented by many people, such as supermarkets, parks, squares, bus stations, etc. It will encourage people to sort and carry recyclable waste to these containers. This measure targets the high income and some middle income households. The recyclable wastes deposited in the containers will be collected by private contractors. The selection of a private contractor will be conducted through a tender process. At the tender the contractor will bid for an operator's license and will be requested by the MCC to offer their most competitive price. The contractor will conduct the collection and haulage work, which will be financed by the revenue generated from the sale of recyclable materials.
Communal recycling container method, Phase 2	In 2008, as the second phase of the communal recycling container method, the MCC will place 200 recycling bins at 100 schools. The MCC will encourage citizens to sort and carry recyclable waste to containers. This measure targets some middle income and low income households. The recyclable wastes disposed in the containers will be collected by private contractors.
Establishing the sorting company	In 2007, the MCC, private companies, and a Scavenger Association will establish a sorting company and set up a sorting yard equipped with manual tools beside the new disposal site. This sorting company will start the operation of a plant by employing scavengers in 2008.
MCC begins separate collection	In 2008, the MCC will introduce separate collection. Citizens will be requested to discharge recyclable waste separately and the MCC will collect and haul them to the sorting yard operated by the sorting company.
To prohibit scavenging work in the new disposal site	In 2008, when the MCC begins landfill operations in the new disposal site, it will prohibit the entry of unauthorized persons to the disposal site.

7.3.5 Street Sweeping System

a. Basic Concept

The present street sweeping work, mainly conducted manually, is deemed to be an appropriate method until 2010 due to cheap labor costs and inferior road conditions that would hamper mechanical street sweeping equipment. Therefore, this system basically would be maintained until 2010.

However, the following points will be focused upon in order to improve the work efficiency.

a) Economic use of micro-enterprises.

b) Prevention of littering in the city.

c) Improve the haulage work of the collected waste.

d) Improve the supervision system of laborers.

b. Master Plan Program

b.1 Economic utilization of micro-enterprises

A street sweeping area for contracting out will be appropriate for a gang consisting of seven sweepers as is the case now.

b.2 Appropriate distribution of collection stations for street sweeping waste

More litter boxes will be installed to reduce the work load for street sweepers and preventing waste from scattering.

b.3 Appropriate allocation of collection stations for street sweeping waste

In order to shorten the haulage distance of the collected waste, communal containers to be used as collection points, which will be placed in close proximity. The haulage distance will be controlled to under one km.

b.4 To use a new type of cart to carry litter collected

A new type of cart with a larger haulage capacity will be introduced to improve the efficiency of the haulage work.

b.5 To acquire small site offices in proper locations for street sweeping work

The AMDC's SWM Executing Unit will set up site offices with storage space in accordance with the increase in street sweeping area. The site office will function as a store house to stow carts, tools, etc., and to enable a foreman to supervise street sweepers.

c. Sweeping Frequency

Road Classification	Frequency of Sweeping
Commercial roads and market zones	2 or 4 times per day
Main roads in the Central Zone	2 times per day
Suburban commercial streets	1 time per day
Secondary streets	3 times/week
Residential Streets	Once per week
Main roads (boulevards)	Once per week

d. Sweeping Length

unit: km

Items	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sweeping Length	180	180	180	190	190	190	200	210	220	230	240	250

e. Required Resources

Items	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Micro-enterprises	36	36	36	38	38	38	40	42	44	46	48	50
Labor												
Foreman	9	9	9	10	10	10	11	11	12	12	13	13
Sweeper	95	95	95	100	100	100	106	111	116	121	127	132
Equipment												
Hand cart	19	19	19	20	20	20	21	22	23	24	25	26
Shovel	38	38	38	40	40	40	42	44	46	49	51	53
Brooms	95	95	95	100	100	100	106	111	116	121	127	132
Push broom	28	28	28	30	30	30	32	33	35	36	38	40
Dustpan	19	19	19	20	20	20	21	22	23	24	25	26
4t truck			2	2	2	2	2	2	2	2	3	3
Small site office	23	23	23	24	24	24	25	27	28	29	30	32

7.3.6 Final Disposal System

a. Basic Concept

a.1 Existing Final Disposal Site

1) The sanitary level of the existing disposal site will be improved to minimize the negative impact on the environment.

2) The whole area of the existing final disposal site will be fully utilized, in order to continue its operation for as long as possible.

3) The problem of scavengers will be eliminated through the introduction of a participatory approach.

a.2 New Final Disposal Site

1) Before the completion of the existing disposal site, which will probably be around 2007, a new final disposal site will be constructed at the most appropriate location selected.

2) The new final disposal site will have proper environmental control facilities to regulate emissions to the surrounding environment within an acceptable level.

b. Master Plan Program

b.1 Required Capacity of Final Disposal Site

Year	Waste Received	Cumulated Waste Amount	Compacted Waste (D=0.8)	Cumulated Compacted Waste	Cover Soil (15%)	Cumulated Cover Soil	Required Capacity
	tons/year	tons	m3	m3	m3	m3	m3
1998	128,958	128,958	161,198	161,198	24,180	24,180	185,377
1999	130,554	259,512	163,192	324,390	24,479	48,658	373,048
2000	139,434	398,946	174,293	498,683	26,144	74,802	573,485
2001	165,714	564,661	207,143	705,826	31,071	105,874	811,700
2002	177,079	741,740	221,349	927,175	33,202	139,076	1,066,251
2003	188,595	930,335	235,744	1,162,919	35,362	174,438	1,337,357
2004	219,330	1,149,665	274,162	1,437,081	41,124	215,562	1,652,643
2005	234,544	1,384,208	293,179	1,730,260	43,977	259,539	1,989,799
2006	249,659	1,633,867	312,074	2,042,334	46,811	306,350	2,348,684
2007	265,721	1,899,588	332,151	2,374,485	49,823	356,173	2,730,658
2008	303,225	2,202,813	379,031	2,753,517	56,855	413,027	3,166,544
2009	322,593	2,525,407	403,242	3,156,758	60,486	473,514	3,630,272
2010	343,665	2,869,071	429,581	3,586,339	64,437	537,951	4,124,290

b.2 Existing Disposal Site

In 1999, the following facilities will be constructed in order to improve the existing disposal site: weighbridge; leachate circulation system; gas vents; fence; site office; green buffer zone; garage; etc.

b.3 New Disposal Site

In 2006, the new disposal site will be constructed. The new disposal site will be carefully selected from the area shown in Figure 7-13, and will include the following facilities: enclosing structure; drainage system; access road; buffer zone; litter control facilities; site office; weighbridge; garage for heavy equipment; monitoring facilities; landfill equipment, etc.

b.4 Planned Resources

Resources	Unit	1,999	2,000	2,001	2,002	2,003	2,004	2,005	2,006	2,007	2,008	2,009	2,010
Disposal Site													
Existing	nos.	1	1	1	1	1	1	1					
New	nos.								1	1	1	1	1
Equipment													
Bulldozer, 210Hp	units	3	3	3	3	4	4	4	4	5	5	6	6
Wheel loader, 150Hp	units	1	1	1	1	1	1	1	1	1	1	1	1
Dump truck, 6m3	units	3	3	3	3	3	4	4	4	4	5	5	5
Water tanker	units	0	1	1	1	1	1	1	1	1	1	1	1
Pickup	units	0	1	1	1	1	1	1	1	1	1	1	1
Labor													
Manager	persons	1	1	1	1	1	1	1	1	1	1	1	1
Assistant Manager	persons	1	1	2	2	2	2	2	2	2	2	2	2
Operator	persons	7	9	9	9	10	11	11	11	12	13	14	14
Weighbridge operator	persons	2	2	2	2	2	2	2	2	2	2	2	2
Worker	persons	10	10	10	12	12	12	12	15	15	15	18	18
Security guards	persons	3	3	3	3	3	3	3	3	3	3	3	3
Rental													
Motor grader	hours/y	300	300	300	300	300	300	300	300	300	300	300	300

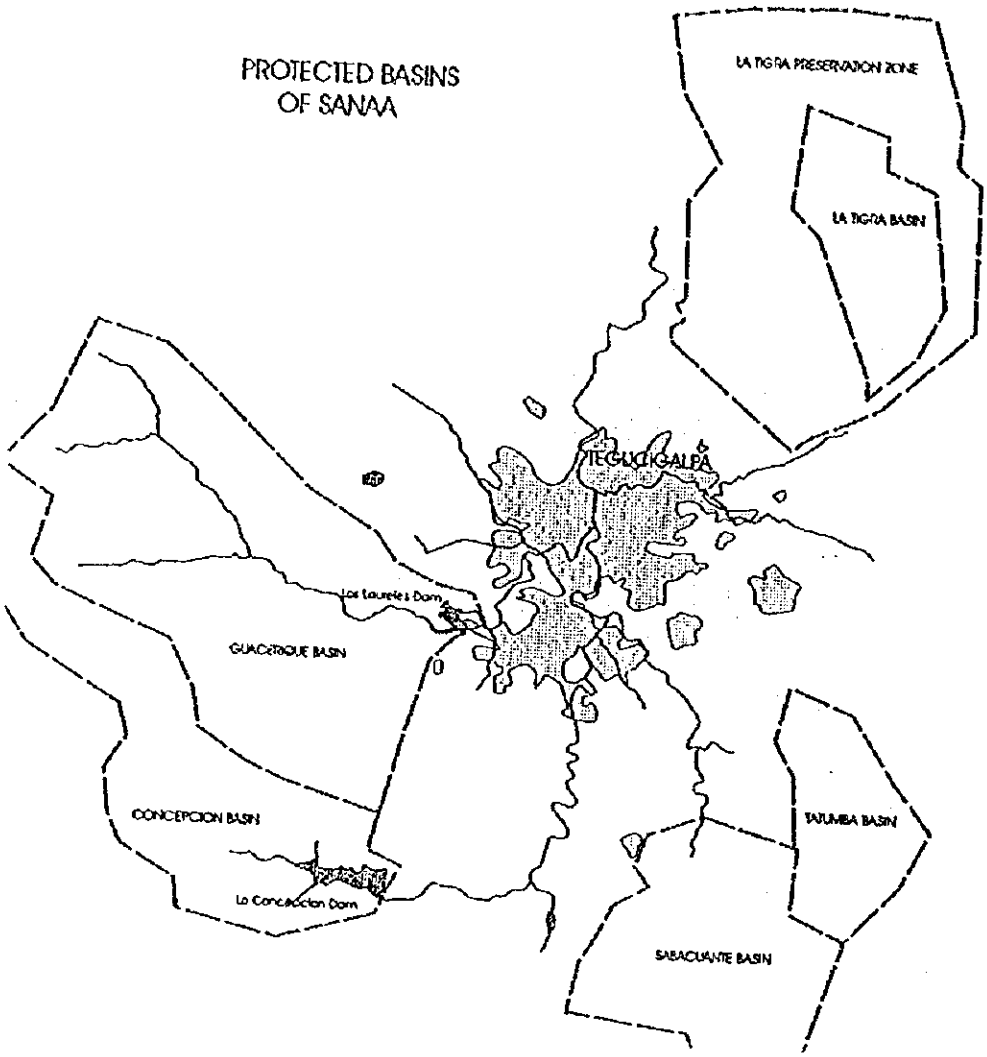

Figure 7-13: Protected Areas for Water Source

b.5 Procurement Schedule

Unit: nos

Items	1,999	2,000	2,001	2,002	2,003	2,004	2,005	2,006	2,007	2,008	2,009	2,010
Bulldozer, 210Hp		3		1			1	3		1	1	
Wheel loader, 150Hp		1							1			
Dump truck, 10tons		3			1			3	1			1
Water tanker		1							1			
Pickup		1							1			

7.3.7 Operation and Maintenance Plan

a. Basic Concept

The number of people who are involved in SWM works is currently more than 500 and it is expected to reach 1,000 people by the year 2010. SWM works change on a day to day basis; to maintain the efficiency of operations, making a prompt decision and taking swift action are essential. Employing a large number of people is risky and is also difficult to maintain the level of management required, so it is recommended that the private sector participates in SWM works in order to reduce the burden and work load on the authority responsible for SWM.

b. Master Plan Program

Item	Program
Maintenance of Equipment	At present, the workshop owned by the AMDC only provide preventive maintenance service for equipment. The M/P proposes major repairs be conducted at private garages. The reason for this is as follows. • It takes time for the AMDC's workshop to purchase spare parts. So spare parts only used frequently will be purchased and kept in storage. • Complex repair works will be consigned to the private sector although the cost is higher than if directly conducted at the AMDC's workshop because private garages are able to purchase spare parts much more readily.
Operation of Collection Vehicles	To limit the burden and workload, currently experienced by the Cleansing Department, various measures of private sector participation will be encouraged. The proposed measures are as follows. • As for dump trucks, the municipal waste authority will only own 10 dump trucks. The rest will be hired from the private sector because the dump truck is a commonly used equipment. The contract would include drivers, collection workers, fuel, and maintenance. • As for other collection vehicles, the municipal waste authority will contract a limited amount of operation work to the private sector. The private collection company will be entrusted a small percentage of collection vehicles owned by the municipal waste authority. Through the gradual expansion of this system, the authority responsible for SWM can nurture the potential of the private section, in preparation for the future hand-over of all collection work.
Street Sweeping	Street sweeping workers will be employed in a contract base because, at present, it is very difficult for the AMDC to manage many street sweepers. The AMDC SWM Executing Unit's task and, eventually, the MCC's task is mainly to supervise contracted sweepers.
Recycling	The AMDC SWM Executing Unit's main task in recycling will be to educate people and to promote recycling. By 2001, the MCC will be responsible for these tasks. The private sector will be in charge of the actual recycling work. Concrete plans for action are as follows. • The collection of the deposited reusables from recycling points will be contracted out to the private sector. • A recycling company, that will have a manual sorting plant operated by former scavengers will be jointly established by the MCC and the private sector.

7.3.8 Hygiene Education Plan

a. Basic Concept

Hygiene education is an important component of any integrated SWM program. It is a well known fact that the constant presence of waste confined in a densely populated area, with poor hygiene practices and improper handling of solid waste, has lead to serious health repercussions. A classic example of this is the bubonic plague epidemic, spread by rats and other vectors, that wiped out over thirty percent of western Europe's population in the middle ages. Therefore, the public must be informed of the various physical hazards and diseases brought about by close contact with waste and inappropriate handling procedures.

Another reason why hygiene education is important, is the necessity to introduce the public to the idea that it is the responsibility of each individual to engage in activities that would not only improve their overall health, but also in effect lead to the management of the waste produced. An informed public is more likely to take the initiative to begin waste minimization, community-based recycling programs, alter consumption patterns, and eventually pass on their knowledge and experiences to the future generation. In a sense, provision of hygiene education for the public would pave the way for achieving the ultimate goal of this study: the evolution of an integrated SWM system.

b. Master Plan Guideline

Hygiene education is not an absolute: it is highly dependent on various intrinsic features of a given society, and therefore must be planned and implemented accordingly. The following are rough guidelines for a hygiene education plan, bearing in mind that specifics and details of a long-term education program will be devised and undertaken by the counterparts and academics of Honduras.

1) Importance of aesthetic and environmental issues

Raise public awareness on urban environmental issues and the benefits that result from a cleaner environment. The need to conserve non-renewable natural resources should also be emphasized.

2) Importance of proper waste handling practices

Use of appropriate containers and storage methods for waste prior to collection. The public should be informed of the physical dangers associated with inconsiderate littering and poor waste storage and set-out habits, e.g., injuries sustained by collection workers and children who come into contact with haphazardly discharged waste. The need to remove waste from human contact as soon as possible should also be emphasized.

3) Hazardous features and diseases associated with solid waste

Chronic and acute illnesses resulting from exposure to toxic substances in municipal waste, e.g. household bleaching agents, batteries, heavy metals, etc. Communicable diseases carried by vectors and pathogenic microorganisms that have an affinity for accumulated waste.

4) Responsibilities of individuals, various groups and authorities regarding solid waste management

Need for public cooperation and coordination with the authorities that manage waste collection, haulage, treatment and disposal. The public should be given information on waste minimization and importance of recycling.

5) How the public can make a change. What they could do to assist SWM in the future

Public right as voters to have a say in how SWM is conducted by the authorities. As consumers, they have the power to change consumption patterns, as well as the quality of manufactured goods and packaging, through selective purchasing e.g. refraining from buying virgin materials, non-biodegradable plastics. Conversely, the use of goods made from recycled materials, etc., should be encouraged. As producers of waste, the different methods of waste minimization, recycling and conscientious discharge manners can be discussed.

6) Promotion of public interest in the future of SWM in the Central District

The authorities can encourage public motivation to participate and devise a SWM system, unique to the local culture and common practices.

7) Institutional, administrative and legislative changes

National and regional laws and legislation in place, that help maintain urban sanitation and mitigate environmental pollution, should be made know to the general public. Also for future reference, the public should be encouraged to contribute any ideas that could be used to enforce and enact new regulations for environmental protection.

7.4 Preliminary Project Cost Estimation

7.4.1 Basic Prices

a. Exchange Rates

The prices and foreign exchange rates are based on exchange rates in March 1998.

US$ 1.00 = Lps. 13.4892 = JPY 143.85

b. Sales Tax

The sale tax rate as of August 1998 is 12%.

c. Main Equipment Price

Equipment	Prices 1000 Lps/unit
15m^3 compactor	938
8m^3 compactor	619
12m^3 dump truck	619
5.5m^3 hoist truck	619
5.5m^3 hoist truck	731
10m^3 armroll truck	788
5.5m^3 container	15
8m^3 container	27
10m^3 container	35
Bulldozer 210 Hp	2,961
Wheel Loader	891
Dump truck	578
Backhoe 0.7m^3	1,875
Water Tanker	422
Pickup	234
Mobile Workshop	1,889
1 m^3 Container for recycling	5
0.5 m^3 Container for recycling	3
4 ton truck	328
Manual Cart	1.5

d. Labor Costs

Item	Basic (Lps/m)	Basic (Lps/y)	Bonus (Lps/y)	Total (Lps/y)	Pension 11% (Lps/y)	Social security 7% (Lps/y)	Total (Lps/y)
General Manager	40,000	480,000	80,000	560,000	61600	39,200	660,800
Engineer (1st class)	15,000	180,000	30,000	210,000	23100	14,700	247,800
Engineer (2nd class)	12,000	144,000	24,000	168,000	18480	11,760	198,240
Engineer (3rd class)	8,000	96,000	16,000	112,000	12320	7,840	132,160
Supervisor	7,000	84,000	14,000	98,000	10780	6,860	115,640
Foreman	2,000	24,000	4,000	28,000	3080	1,960	33,040
Driver	2,000	24,000	4,000	28,000	3080	1,960	33,040
Mechanic	2,000	24,000	4,000	28,000	3080	1,960	33,040
Collection worker	2,000	24,000	4,000	28,000	3080	1,960	33,040
Street sweeper	1,500	18,000	3,000	21,000	2310	1,470	24,780
Clerk	2,000	24,000	4,000	28,000	3080	1,960	33,040

7.4.2 Cost Estimation

a. Collection and Haulage System

a.1 Investment

Table 7-2 shows the investment schedule for collection vehicles, that was estimated based on the procurement schedule.

Table 7-2: Investment Schedule for Collection Vehicles

unit: 10^3 Lps

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Book Balue
Investment													
15m³ compactor	0	10,503	0	0	0	0	0	0	10,503	0	0	0	6,001
8m³ compactor	0	2,080	0	0	0	0	0	0	2,080	0	0	0	1,188
12m³ dump truck	0	3,466	0	0	0	0	0	0	3,466	0	0	0	1,980
8m³ hoist truck	0	6,239	0	0	0	0	0	0	6,239	0	0	0	3,565
10m³ armroll truck	0	7,940	0	0	0	0	0	0	7,940	0	0	0	4,537
5.5m³ container	0	1,512	0	0	0	0	0	0	1,512	0	0	0	864
10m³ container	0	3,528	0	0	0	0	0	0	3,528	0	0	0	2,016
Total	0	35,266	0	0	0	0	0	0	35,266	0	0	0	20,152
O & M Cost													
15m³ compactor	4,345	4,345	3,950	3,950	3,950	3,950	3,950	3,950	3,950	3,950	3,950	3,950	-
13m³ compactor	4,230	4,230	0	0	0	0	0	0	0	0	0	0	-
8m³ compactor	0	0	885	885	885	885	885	885	885	885	885	885	-
12m³ dump truck	1,074	1,074	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	-
6m³ dump truck	0	0	0	0	0	0	0	0	0	0	0	0	-
5.5m³ hoist truck	226	226	2,034	2,034	2,034	2,034	2,034	2,034	2,034	2,034	2,034	2,034	-
10m³ armroll truck	253	253	2,277	2,277	2,277	2,277	2,277	2,277	2,277	2,277	2,277	2,277	-
5.5m³ container	9	9	76	76	76	76	76	76	76	76	76	76	-
10m³ container	25	25	176	176	176	176	176	176	176	176	176	176	-
Rental truck	0	1,404	0	0	0	1,404	0	0	0	3,276	0	3,276	-
Total	10,163	11,567	11,188	11,188	11,188	12,592	11,188	11,188	11,188	14,464	11,188	14,464	-
Contracting out Cost	10,950	10,950	21,900	21,900	32,850	32,850	43,800	43,800	54,750	54,750	65,700	65,700	-
Grand Total	10,950	57,783	33,088	33,088	44,038	45,442	54,988	54,988	101,204	69,214	76,888	80,164	20,152

Table 7-3 shows the annual operation and maintenance costs as well as the total unit cost of all vehicles to be used.

Table 7-3: O & M Costs of Collection Each Type of Vehicles

Category	Items	Unit	15m³ Compactor	8m³ Compactor	12m³ Tipper Truck	5.5m³ Hoist Truck	10m³ Armroll Truck	13m³ Compactor
Labor	Driver	10^3 Lps/year	33,040	33,040	33,040	33,040	33,040	33,040
	Collector	10^3 Lps/year	132,160	99,120	165,200	33,040	33,040	132,160
Material	Diesel	10^3 Lps/year	102,062	77,426	71,987	71,987	77,426	102,062
	Lubrication Oil	10^3 Lps/year	15,309	11,614	10,798	10,798	11,614	15,309
	Spare parts	10^3 Lps/year	75,018	49,512	49,512	49,512	63,015	75,018
Repair		10^3 Lps/year	37,509	24,756	24,756	24,756	31,508	112,527
Total		10^3 Lps/year	395,098	295,468	358,293	226,133	252,643	470,117
Waste amount collected		ton/year	3,499	2,799	1,866	1,503	2,732	3,033
O & M cost per ton		Lps/ton	113	105	192	150	93	155

b. Street Sweeping System

Table 7-4 shows the investment schedule and the operation and maintenance costs for street sweeping per annum, that was estimated based on the master plan.

The salvaged value of equipment were not taken into account because all the equipment are inexpensive and their lifespans are relatively short. Only the costs of street sweeping and primary collection work are included, as the costs of secondary collection and haulage are part of the collection and haulage system.

Table 7-4: Investment Schedule and Operation and Maintenance Cost per annum for Street Sweeping

unit: 10^3 Lps

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Investment												
4ton truck	0	656	0	0	0	0	0	0	656	328	0	0
O&M												
Foreman	314	314	314	331	331	331	349	366	384	401	418	436
Sweeper	2,354	2,354	2,354	2,484	2,484	2,484	2,615	2,746	2,877	3,007	3,138	3,269
Hand cart	28	28	28	30	30	30	32	33	35	36	38	40
Shovel	2	2	2	2	2	2	2	2	2	2	2	2
Brooms	2	2	2	2	2	2	3	3	3	3	3	3
Push broom	1	1	1	2	2	2	2	2	2	2	2	2
Dustpan	2	2	2	2	2	2	2	2	2	2	3	3
4t truck	0	0	476	503	503	503	529	555	582	608	635	661
Site Office	137	137	137	145	145	145	152	160	167	175	183	190
Sub-total	2,840	2,840	3,316	3,500	3,500	3,500	3,685	3,869	4,053	4,237	4,422	4,606
Contracting out	6,730	6,730	6,730	7,104	7,104	7,104	7,478	7,852	8,226	8,599	8,973	9,347
Total	9,570	10,226	10,046	10,604	10,604	10,604	11,162	11,721	12,935	13,165	13,395	13,953

c. Recycling System

Table 7-5 shows the investment schedule for the recycling system.

Table 7-5: Investment Schedule for the Recycling System

unit: 10^3 Lps

Items	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Book Value
Investment													
2m^3 Container	0	0	0	0	525	0	0	0	0	525	0	0	-
1m^3 Container	0	0	0	0	0	0	0	0	630	0	0	0	-
Start up capital for the sorting company	0	0	0	0	0	0	0	0	1,000	0	0	0	-
4 ton truck	0	0	0	0	735	0	0	0	735	0	0	0	420
Sub-total	0	0	0	0	1,260	0	0	0	2,365	525	0	0	-
O&M													
4 ton truck	0	0	0	0	0	502	502	502	502	1,004	1,004	1,004	-
Sub-total	0	0	0	0	0	502	502	502	502	1,004	1,004	1,004	-
Total	0	0	0	0	1,260	502	502	502	2,867	1,529	1,004	1,004	420

d. Final Disposal System

Table 7-6 shows the investment schedule for the final disposal system until 2010. The book values of the equipment and the disposal site, until the end of 2010, were estimated.

Table 7-6: Investment Schedule for the Final Disposal System

unit: 10^3 Lps

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Book Value
Investment													
Disposal Site													
Facility Construction	6,332	0	0	0	0	0	0	2,227	0	0	0	0	0
Equipment													
Bulldozer, 210Hp	0	8,884	0	2,961	0	0	2,961	8,884	0	2,961	2,961	0	9,307
Wheel loader, 150Hp	0	891	0	0	0	0	0	0	891	0	0	0	509
Dump truck, 10tons	0	1,733	0	0	578	0	0	1,733	578	0	0	578	1,073
Water tanker	0	422	0	0	0	0	0	0	422	0	0	0	241
Pickup	0	234	0	0	0	0	0	0	234	0	0	0	134
Total	6,332	12,164	0	2,961	578	0	2,961	12,844	2,125	2,961	2,961	578	11,264
O & M													
Labor													
Manager	132	132	132	132	132	132	132	132	132	132	132	132	0
Assistant Manager	116	116	231	231	231	231	231	231	231	231	231	231	0
Operator	231	297	297	297	330	363	363	363	396	430	463	463	0
Weighbridge operator	66	66	66	66	66	66	66	66	66	66	66	66	0
Worker	330	330	330	396	396	396	396	496	496	496	595	595	0
Security guards	99	99	99	99	99	99	99	99	99	99	99	99	0
Material													
Diesel	1,017	1,055	1,055	1,055	1,297	1,346	1,346	1,346	1,588	1,636	1,878	1,878	0
Lubricant Oil	152	158	158	158	195	202	202	202	238	245	282	282	0
Spare parts	460	487	487	487	605	628	628	628	747	770	888	888	0
Repairs	921	973	973	973	1,210	1,256	1,256	1,256	1,493	1,539	1,776	1,776	
Contracting out	0	1,128	1,158	808	1,403	2,458	1,620	0	1,387	1,628	1,442	1,827	
Miscellaneous	454	477	489	495	586	607	607	617	707	728	829	829	0
Rental	120	120	120	120	120	120	120	120	120	120	120	120	0
Total	4,099	5,439	5,597	5,319	6,672	7,906	7,067	5,556	7,701	8,120	8,801	9,186	
G-total	10,431	17,604	5,597	8,281	7,250	7,906	10,028	18,400	9,825	11,082	11,762	9,764	11,264

e. Indirect Expenses

Indirect expenses consist of the following components.

- Cost of managing, administering, planning, and supervision (including salary, materials, utilities).
- Cost for mechanics and general expenses required to operate the workshop.

The indirect expenses were assumed to occupy a given proportion of the whole operation and maintenance cost. The adopted rates are as follows.

- From 1999 to 2000: 15%
- From 2001 to 2010: 18%

7.4.3 SWM Project Cost and Implementation Program

Table 7-7: Summary of the Costs Involved in SWM Works

unit: 10^6 Lps.

	Activities	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	**Administration**												
1.1	Institutional, Organizational and Financial Reform												
	Institutional reform												
	To improve the financial system												
	Organizational reform												
	Improvement of managerial capability												
1.2	Hygiene Education												
	To operate the mobile municipality campaign												
	To conduct hygiene education at school												
	To start education on recycling												
1.3	General administrative work												
Cost	Investment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Operation and Maintenance Cost	2.6	3.0	3.6	3.6	3.8	4.4	4.0	3.8	4.2	5.0	4.6	5.3
	Total Cost	2.6	3.0	3.6	3.6	3.8	4.4	4.0	3.8	4.2	5.0	4.6	5.3
2	**Collection and Haulage System**												
	Detailed design on collection vehicles (1st phase)												
	Arrangement of financial source (1st phase)												
	Procurement of collection vehicles (1st phase)												
	Operation of vehicles procured at the 1st phase												
	Detailed design on collection vehicles (2nd phase)												
	Arrangement of financial source (2nd phase)												
	Procurement of collection vehicles (2nd phase)												
	Operation of vehicles procured at the 2nd phase												
Cost	Investment	0.0	35.3	0.0	0.0	0.0	0.0	0.0	0.0	35.3	0.0	0.0	0.0
	Operation and Maintenance Cost	10.2	11.6	11.2	11.2	11.2	12.6	11.2	11.2	11.2	14.5	11.2	14.5
	Contracting Out	11.0	11.0	21.9	21.9	32.9	32.9	43.8	43.8	54.8	54.8	65.7	65.7
	Total Cost	10.2	46.8	11.2	11.2	11.2	12.6	11.2	11.2	46.5	14.5	11.2	14.5
3	**Recycling System**												
	Preparation for recycling point collection (1st phase)												
	Recycling point collection (1st phase) start												
	Preparation for recycling point collection (2nd phase)												
	Recycling point collection (2nd phase) start												
	Establishment of a recycling company by AMDC and private sector												
	Construction of a sorting plant												
	Separate collection by AMDC start												
	Recycling company start operation												
Cost	Investment	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	2.4	0.5	0.0	0.0
	Operation and Maintenance Cost	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	1.0	1.0	1.0
	Total Cost	0.0	0.0	0.0	0.0	1.3	0.5	0.5	0.5	2.9	1.5	1.0	1.0
4	**Street Sweeping System**												
	To increase litter boxes along the streets												
	To increase the number of collection points												
	To introduce a new type of carts for carrying litters collected												
	To set up site offices												
	To operate it in the new method												
Cost	Investment	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.3	0.0	0.0
	Operation and Maintenance Cost	2.8	2.8	3.3	3.5	3.5	3.5	3.7	3.9	4.1	4.2	4.4	4.6
	Contracting Out	6.7	6.7	6.7	7.1	7.1	7.1	7.5	7.9	8.2	8.6	9.0	9.3
	Total Cost	9.6	10.2	10.0	10.6	10.6	10.6	11.2	11.7	12.9	13.2	13.4	14.0
5	**Final Disposal System**												
	Improvement of the existing disposal site												
	Establishment of the new disposal site committee												
	Siting a new disposal site												
	To conduct EIA and obtain an approval from Ministry of Environment												
	Preliminary design of a new disposal site												
	To get acceptance from neighborhood												
	Arrangement of financial source												
	Detailed design												
	Construction												
	Operation												
Cost	Investment	6.3	12.2	0.0	3.0	0.6	0.0	3.0	12.8	2.1	3.0	3.0	0.6
	Operation and Maintenance Cost	4.1	5.4	5.6	5.3	6.7	7.9	7.1	5.6	7.7	8.1	8.8	9.2
	Total Cost	10.4	17.6	5.6	8.3	7.2	7.9	10.0	18.4	9.8	11.1	11.8	9.8
Cost	Investment	6.3	48.1	0.0	3.0	1.8	0.0	3.0	12.8	40.4	3.8	3.0	0.6
	Operation and Maintenance Cost	19.7	22.8	23.7	23.6	25.2	28.9	26.5	24.9	27.7	32.8	30.0	34.5
	Contracting Out	17.7	17.7	28.6	29.0	40.0	40.0	51.3	51.7	63.0	63.3	74.7	75.0
	Total Cost	43.7	88.6	52.3	55.6	67.0	68.9	80.7	89.4	131.1	100.0	107.6	110.2

7.5 Cost Analysis

Table 7-8 shows the estimated unit SWM costs in the master plan. The costs until 2000 exclude depreciation, while the costs between 2001 and 2010 are all inclusive.

Table 7-8: Estimated Unit SWM Costs

unit: Lps/ton

Item	1997*	1999 to 2000 average*	2001 to 2007 average	2008 to 2010 average
Collection & Haulage	83.6	175.4	263.1	266.7
Street Sweeping	N.A.	920.2	974.2	975.0
Final Disposal	5.5	37.9	45.2	37.5
Recycling	0	0	261.7	290.2
Others	N.A.	N.A.	N.A.	N.A.
Total SWM Works	130.2	290.8	361.5	349.7

Note:
*: This excludes depreciation.

The average unit cost of the collection and haulage works between 1999 and 2010 is broken down as follows.

Direct operation costs: Lps. 202.8 per ton

Contracting out price: Lps. 300.0 per ton

The costs for the proposed waste authorities to directly operate collection and haulage works (Lps. 202.8 per ton) exclude the administration cost and the financial cost, while the contracting out price includes both these costs and profit.

Part 3

Feasibility Study for the Priority Projects

Chapter 8

Outline of Priority Projects

8 Perfil de los Proyectos Prioritarios

8.1 Alcance de los Proyectos Prioritarios para el Estudio de Factibilidad

El plan maestro para el MRS cubre todos los proyectos propuestos que serán ejecutados desde 1999 hasta el año 2010, mientras que los proyectos prioritarios cubren solamente los proyectos que se realizarán desde 1999 hasta el año 2002.

En el estudio de factibilidad de los proyectos prioritarios se evalúa si los proyectos en los que se invertirá entre 1999 y el año 2001 serán factibles o no. El período de evaluación de los proyectos prioritarios para el estudio de factibilidad se extenderá hasta el año 2010. Por lo tanto, en el estudio de factibilidad serán incluidos los siguientes costos de inversiones, operación y mantenimiento:

Inversiones :

- Las inversiones para el equipo y los proyectos de construcción de instalaciones a ser realizados entre 1999 y el año 2002.
- Inversiones para el reemplazo de equipos hasta el año 2010.

Costos de operación y mantenimiento:

- La cantidad requerida para operar todo el equipo e instalaciones propiedad de la EML desde el 2003 hasta el 2010.

La Figura 8-1 muestra la imagen de los costos requeridos para los proyectos prioritarios que deben considerarse para el estudio de factibilidad.

Las zonas coloreadas muestran los costos globales de proyecto del plan maestro. La zona en rojo muestra las inversiones y la zona en azul indica los costos de operación y mantenimiento. Las zonas encerradas con líneas punteadas muestran las cantidades tomadas en consideración para el estudio de factibilidad.

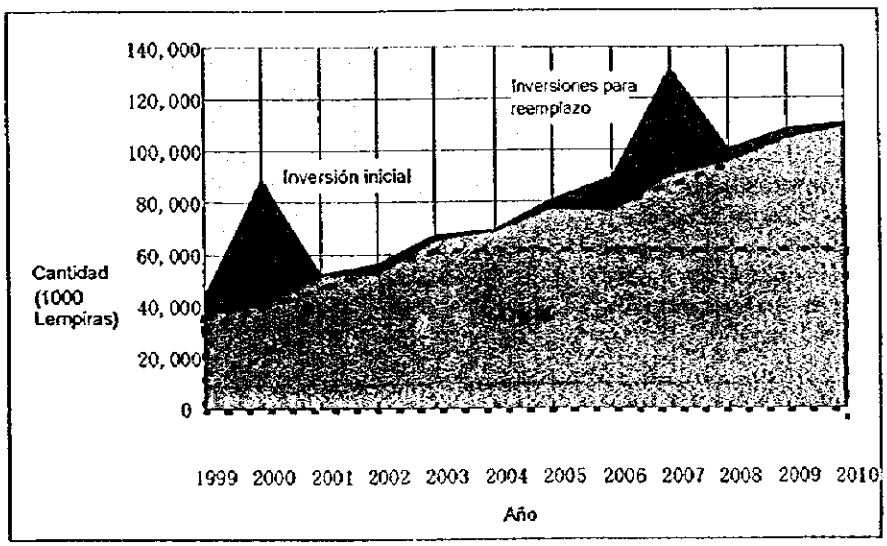

Figura 8-1: Imagen de los Proyectos Prioritarios dentro del Costo del Proyecto

8 Perfil de los Proyectos Prioritarios

8.1 Alcance de los Proyectos Prioritarios para el Estudio de Factibilidad

El plan maestro para el MRS cubre todos los proyectos propuestos que serán ejecutados desde 1999 hasta el año 2010, mientras que los proyectos prioritarios cubren solamente los proyectos que se realizarán desde 1999 hasta el año 2002.

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Inversiones :

- Las inversiones para el equipo y los proyectos de construcción de instalaciones a ser realizados entre 1999 y el año 2002.
- Inversiones para el reemplazo de equipos hasta el año 2010.

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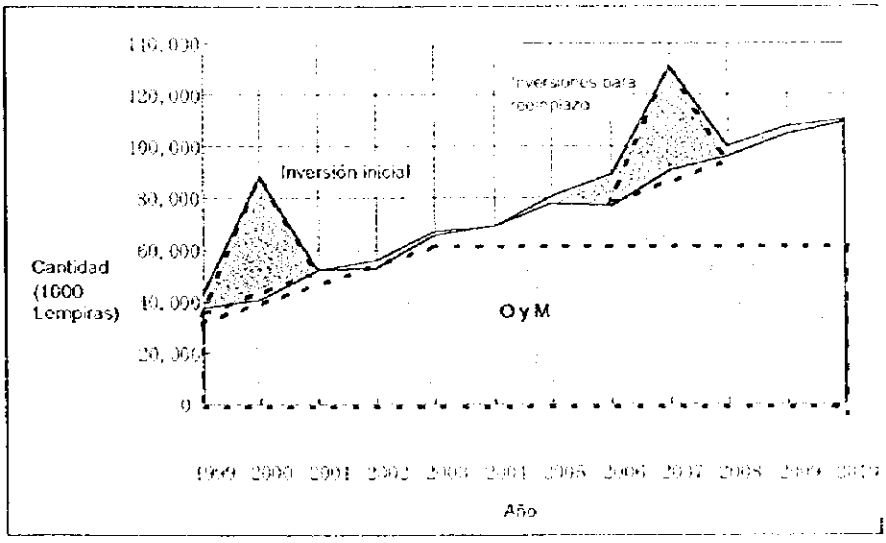

Figura 8-1: Imagen de los Proyectos Prioritarios dentro del Costo del Proyecto

8.2 Metas de los Proyectos Prioritarios

Los proyectos prioritarios consisten en:

a) Mejoramiento del sistema institucional.

b) Diseño preliminar para el mejoramiento y desarrollo integral del sitio de disposición existente.

c) Mejoramiento del sistema de recolección y transporte.

La Cuadro 8-1 muestra las metas de los proyectos prioritarios.

Cuadro 8-1: Metas de los Proyectos Prioritarios

		1998	1999	2000	2001	2002	2003
A. Metas Principales							
Tasa de recolección	%	64	64	64	72	72	72
Tasa de reciclaje	%	3	3	3	4	4	4
Longitud de barrido de calles	km	180	180	180	180	190	190
Disposición final		Nivel 1			Nivel 2		
B. Metas Detalladas							
1. Cantidad de Residuo Generada		**481**	**514**	**550**	**586**	**626**	**667**
Residuo domiciliario	t/d	318	342	367	392	419	447
Residuo no domiciliario	t/d	134	144	155	166	177	190
Residuo del barrido de calles	t/d	28	28	28	28	30	30
2. Cantidad de Recolección	**t/d**	**309**	**330**	**352**	**422**	**451**	**480**
Recolección de residuo domiciliario	t/d	213	229	246	294	314	336
Recolección de residuo no domiciliario	t/d	67	72	77	99	106	114
Recolección de barrido de calles	t/d	28	28	28	28	30	30
Transporte directo	t/d	27	29	31	33	35	38
Disposición in-situ	t/d	19	21	22	24	25	27
Reciclaje	t/d	0	7	8	10	10	11
No recolectado	t/d	-126	-128	-137	-98	-104	-111
3. Tasa de Servicio	**%**	**64**	**64**	**64**	**72**	**72**	**72**
Residentes de ingresos altos	%	90	90	90	100	100	100
Residentes de ingresos medios	%	70	70	70	80	80	80
Residentes de ingresos bajos	%	50	50	50	55	55	55
4. Población Servida							
4.1 Población Servida	**t/d**	**543,270**	**565,568**	**588,781**	**685,868**	**714,392**	**744,099**
Residentes de ingresos altos	t/d	152,795	154,848	156,825	176,353	178,350	180,232
Residentes de ingresos medios	t/d	178,260	194,552	211,851	263,099	285,360	308,969
Residentes de ingresos bajos	t/d	212,215	216,169	220,105	246,417	250,681	254,899
4.2 Población No Servida	**t/d**	**305,589**	**316,754**	**328,323**	**267,389**	**276,443**	**285,796**
Residentes de ingresos altos	t/d	16,977	17,205	17,425	0	0	0
Residentes de ingresos medios	t/d	76,397	83,379	90,793	65,775	71,340	77,242
Residentes de ingresos bajos	t/d	212,215	216,169	220,105	201,614	205,103	208,554
5. Cantidad de Disposición Final	**t/d**	**353**	**358**	**382**	**454**	**485**	**517**
Residuo municipal	t/d	343	347	370	442	472	503
Otros	t/d	10	11	12	12	13	14

Chapter 9

Evaluation
on the Proposed System
in the Master Plan
by Pilot Projects

9 Evaluation on the Proposed System in the Master Plan by Pilot Projects

9.1 Introduction

9.1.1 Objectives of Pilot Projects

During the study work in Honduras, the pilot projects were conducted:

1) to verify the feasibility of the technical system proposed in the M/P;
2) to introduce and to demonstrate SWM techniques; and
3) to collect necessary data and information for the feasibility study.

9.1.2 Proposal of Pilot Projects

As the result of the assessment on the current situation of the SWM in the Central District, the following five points were identified as the most important issues in the current SWM system.

1) To establish a financially sustainable and accountable solid waste management system.
2) To enhance the sanitary level of the existing final disposal site and to prepare an overall development plan.
3) To enhance the managerial capability of the Cleansing Section.
4) To plan appropriate collection, haulage and street sweeping systems and to establish an appropriate collection system for problematic areas.
5) To raise awareness among the AMDC's staff and citizens on solid waste management.

The master plan was drafted to propose the solutions for the above stated problems. The following pilot projects were proposed and conducted to examine some of solutions proposed in the draft master plan.

1) Campaign for Raising Awareness on Solid Waste Issues
2) Experiment on the Implementation of the Best Collection System for Marginal Areas
3) Experiment on the Improvement of Existing Final Disposal
4) Improvement of the Managerial Capability of the Cleansing Section

9.1.3 Selection of the Pilot Project Sites

In view of the current urban sanitary problems, such as illegal waste dumping in slopes, vacant lands, brooks, rivers, streams, etc., in the marginal areas located around the capital, public awareness should be heightened to gain cooperation in the improvement of SWM through of a public campaign.

Low income rural migrants live in marginal areas, e.g., steep slopes and hillsides, that are not served by the regular collection services due to poor access roads and unfavorable topography.

Periodic clean-up operations are carried out in some areas under the "mobile municipality" program by AMDC. These operations are carried out in some *colonias*, but even though they fulfill an important function, they are far from being the real solution. Within this periodic clean-up operation program, the residents either stored their wastes for several days before the clean-operations, burnt them, or dumped them illegally in the city, thereby air, soil, and river pollution, and deteriorating aesthetic conditions as well as sanitary conditions favorable for pathogens and vectors to proliferate. Being a big social for the whole city, the urgent need to adopt countermeasures to improve the sanitary conditions of the community was recognized.

Accordingly, the "Campaign for Raising Awareness on Solid Waste Issues" and the "Experiment on the Implementation of the Best Collection System for Marginal Areas" were proposed and carried out to improve the aesthetic and sanitary environment, with due consideration of the technical aspects of SWM, as well as social and cultural aspects. These activities will serve to confirm the feasibility of the plans of this study and help anticipate any problems that may arise. Since the pilot projects determine the success of the project, the active participation of concerned institutions and people is a necessary.

The pilot projects covered the whole capital city, focusing on the *colonias* of San Martín, Ayestas and Tres de Mayo, which are under Sector 7 of the Central District. The present population and number of households in these *colonias* are shown in Table 9-1.

Table 9-1: Present Population and Number of Households in the Pilot Project Areas

Colonias	San Martin	Ayestas	Tres de Mayo	Total
Total Population	1,677	8,319	13,437	23,433
Number of Housing	250	1,300	2,200	3,750

9.2 Campaign for Raising Awareness on Solid Waste Issues

9.2.1 Preparation Works for the Campaign

The following preparation works were executed in June 1998 in preparation for the campaign.

- Explanation of the purpose and detailed plan of the pilot projects to relevant organizations.
- Explanation of the purpose and detailed plan of the pilot projects and the collection system in marginal areas to community leaders and residents.
- Encouragement of the residents to participate in the clean-up operations through the help of community leaders and health center volunteers.
- Implementation of educational workshops and cooperation campaign.
- Hold a public logotype contest to select a campaign logo.

9.2.2 Relevant Organizations for the Campaign

In order to guarantee the smooth conduct and success of the project campaign, a series of meetings and discussions were carried out with the relevant organizations shown below:

- Social Development Manager's Office of AMDC
- Environmental Department of AMDC
- Health Center of Tres de Mayo (Ministry of Health)
- Educational institutions of the pilot project areas (Ministry of Education)
- Community groups, etc.

9.2.3 Design of Logotype, Poster and Banner

Public cooperation is fundamentals to the accomplishment of the goals related to solid waste problems in the marginal and urban areas of Tegucigalpa's Central District. Therefore, for the implementation of the campaign, AMDC carried out a logotype making contest with the support of the study team. The contest was open to all Central District residents. The selected logo was used in posters, stickers, T-shirts, cups, refuse bags, banners, leaflets and other publicity campaign tools. The contest was the first step towards encouraging public participation and improving public consciousness, as well as being, during the Study, the first public contribution to the improvement of the city's environment.

The logotype submission date was set for the middle of June 1998. The selection criteria were originality, neatness, creativity, design colors and identification with the capital city and campaign objectives. Among the logos submitted (54 participants), the most descriptive designs were chosen and prizes were awarded to the first, second and third places.

The first prize was awarded to the caricature of a sympathetic small container, which symbolize the street container installed by AMDC in many areas of the city, with the following slogan:

"CAPITAL LIMPIA, CAPITALINO CONTENTO"

("CLEAN CAPITAL, HAPPY CITIZEN")

Based on the logotype a poster and publicity banner bearing the campaign message *"Let's make our Capital the most clean and beautiful city"*, was designed by the counterpart and the study team to promote the "Campaign for Raising Awareness on Solid Waste Issues".

The winning logotype and those that come second and third places, and the poster and banner are as shown in Figure 9-1, Figure 9-2 and Figure 9-3.

First Place

Second Place

Third Place

Figure 9-1 : Winning Logotypes

Poster and Banner

Figure 9-2: Campaign Poster

Figure 9-3: Campaign Banner

9.2.4 Execution of the Campaign

a. Implementation of the Campaign

The campaign project was implemented by the counterpart with the support of the study team in the whole city from the beginning of July until early August 1998. The campaign especially focused on the marginal areas of San Martín, Ayestas and Tres de Mayo, colonias located at the northwest of Tegucigalpa City.

During the experiment, the following activities were carried out to examine the feasibility of the proposed plan.

- Observe the changes in degree of public awareness before and after the campaign.
- Check the suitability of the proposed campaign tools and the proposed master plan projects through the results of the pilot projects.

b. Implementation Schedule

The pilot projects areas are as shown in Figure 9-4. The pilot project implementation schedule is as shown in Figure 9-5.

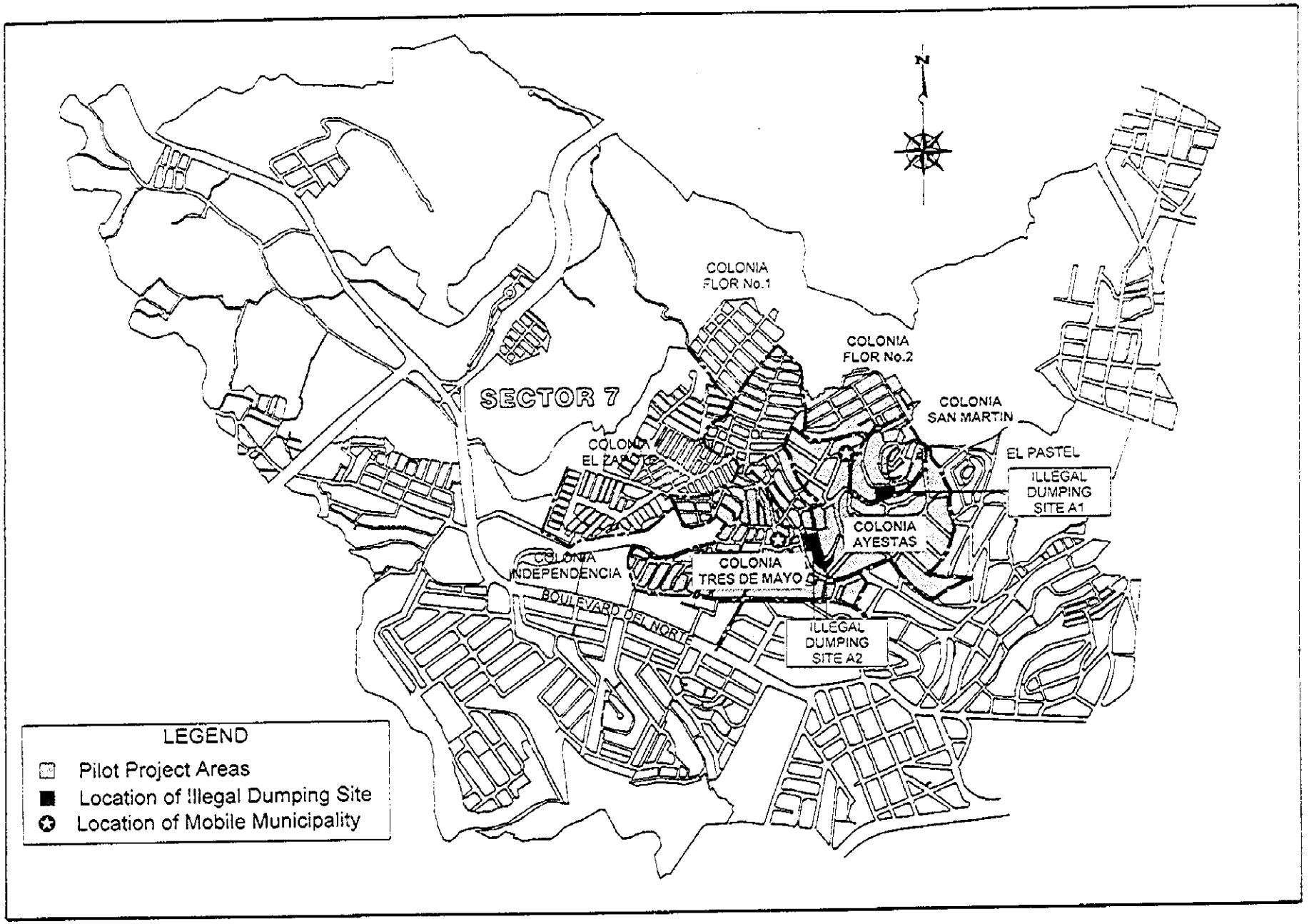

Figure 9-4: Location of Pilot Project Areas

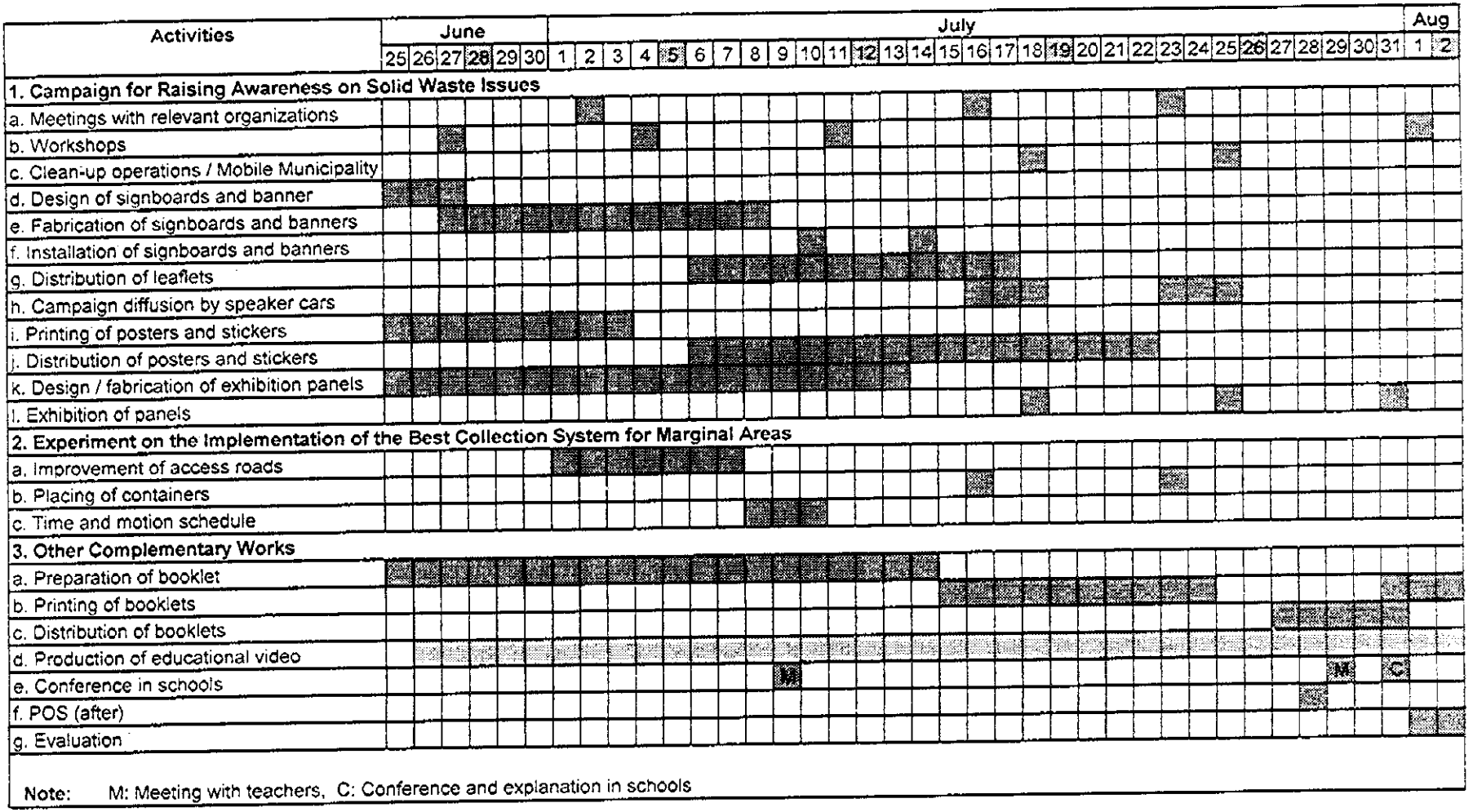

Figure 9-5: Pilot Projects Implementation Schedule

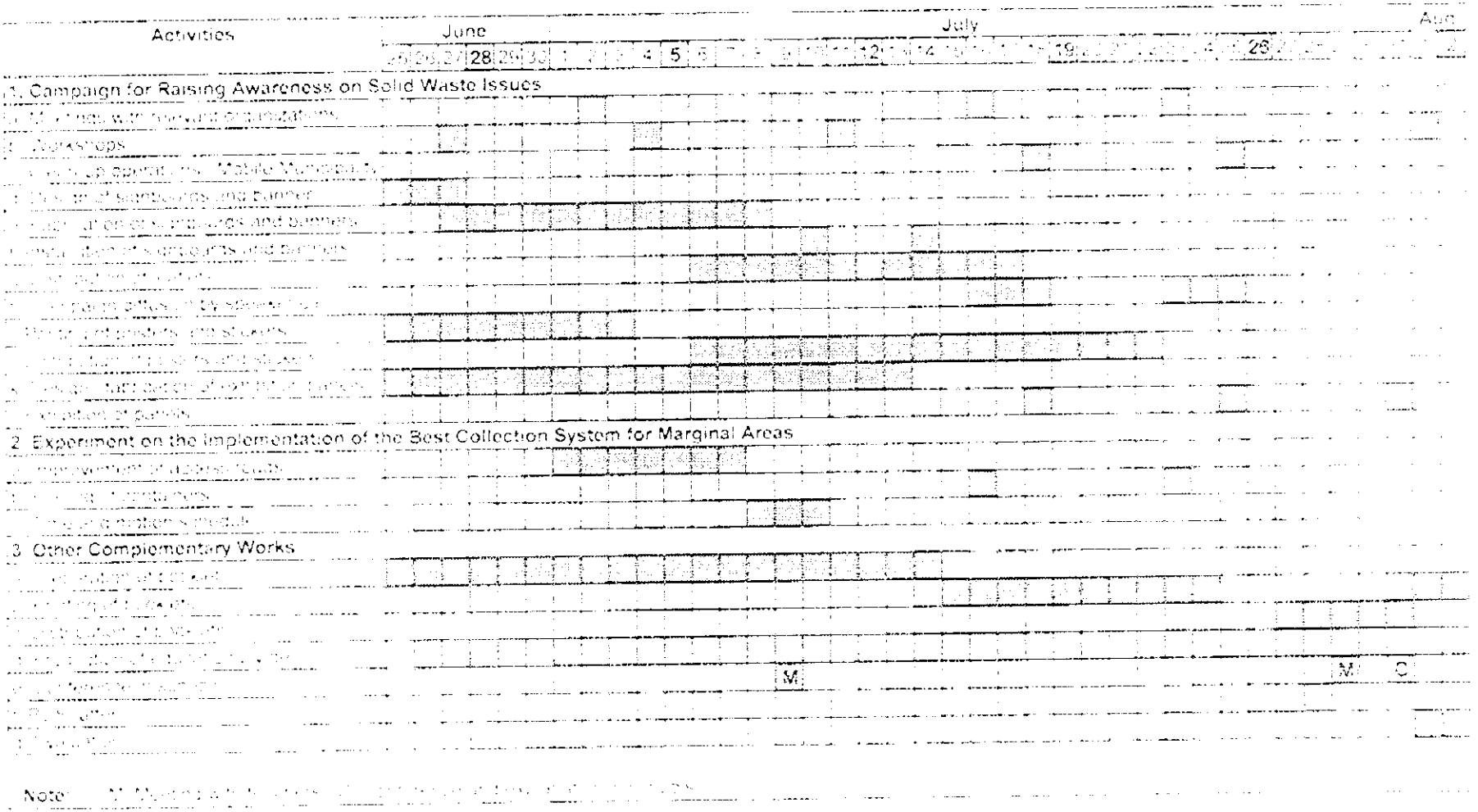

Figure 5 Pilot Projects Implementation Schedule

9.2.5 Campaign Methods

a. General

The public campaign consists of attempts to improve individual, group and community behavior with regard to solid waste disposal through meetings, lectures and publications, in order to prevent diseases, and protect and improve public health. To achieve these objectives various campaign tools were used.

b. Campaign Tools

Table 9-2 tabulates the campaign tools used in the "Campaign for Raising Awareness on Solid Waste Issues" to promote public awareness and cooperation:

Table 9-2: Campaign Tools

Campaign Tools	Purpose
Signboards	12 message and indication signboards were installed in the marginal areas and final disposal site to encourage public cooperation.
Posters	3000 posters were distributed among institutions, commercial establishments, schools, community leaders and residents, to promote the campaign.
Stickers	As the stickers are very effective means of promoting the campaign because their handiness facilitates distribution to a large segment of the population. Accordingly, 15,000 stickers were distributed to institutions, commercial establishments, cars, buses, taxis, etc.
Banners	30 banners carrying the slogan below were installed all over the city: "Let's make our Capital the most clean and beautiful city" "Clean Capital, Happy Citizen"
Leaflets	4,000 leaflets were distributed within the marginal areas (2,000) and other urban areas (2,000) to promote public cooperation in clean-up operation.
Exhibition panels	10 educational panels on SW issues were prepared by the study team for use in seminars, education workshops, "mobile municipality" and other cultural events, to enhance public awareness and encourage public cooperation.
Booklets	Complementary tool for use in education programs for schoolchildren and in community lectures.
TV, video deck & video camera	A TV, video deck and video camera were provided to AMDC for the production of educational videos related to SW issues and other sanitary and environmental issues. A video was produced by the counterpart during the implementation of the campaign.
Overhead projector and screen	An overhead projector and screen were provided for use in meetings, seminars, conferences and educational workshops on SWM, sanitation and environmental issues.
A small generator, loud speakers & microphone	A generator, four large speakers, and a microphone were provided for the "mobile municipality".
Whiteboard	Whiteboard for meetings, conferences and workshops and other multiple purposes was provided.
Large tents	2 large tents for use in the outdoor free health care activity of the "mobile municipality" program, including the education of the public on hygiene and sanitary issues, were provided.
T-shirts and caps	700 T-shirts and 500 caps were distributed among the pilot project community residents, schoolchildren and participants in the clean-up operations activities.

Message signboards were installed at 6 places in the marginal areas and indication signboards at 8 places in the final disposal site. Also, 30 banners bearing the campaign message were placed at different areas in the city to promote the campaign as shown in Figure 9-6.

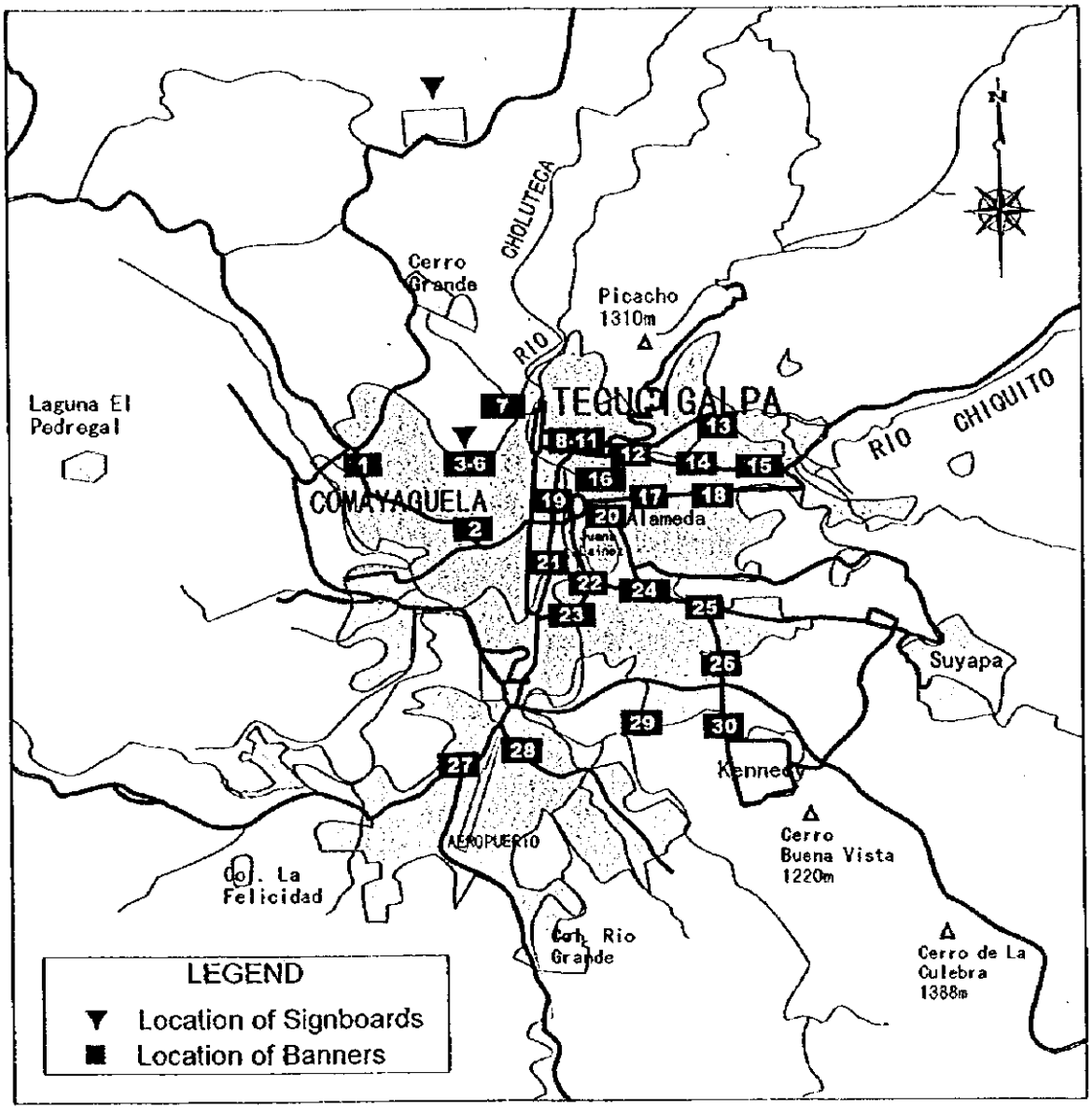

Figure 9-6: Placement of Signboards and Banners

As previously mentioned, the purpose of the public education campaign is to enhance public awareness and promote public cooperation. Under this premise, and because of the importance of the active participation of the whole population and the relevant organizations involved, the team requested AMDC to plan and implement the campaign. The counterpart proposed the following methods and campaign tools, which were implemented with the team's support:

- Mass media: advertisements, press releases, TV and radio broadcasting, newspaper publications, targeting the general public or large segments of the population.
- Music festival and/or sport events through the "mobile municipality": festivals are likely to encourage the public to participate, attend and promote campaign activities. Therefore, AMDC through the "mobile municipality" program, carried out musical and sports events with the participation of the project area residents, including children.
- Distribution of refuse plastic bags bearing the campaign logo: 5,000 refuse bags bearing the logo "Clean Capital, Happy Citizen" were distributed to the public.
- Handicrafts bearing the campaign logo: piggy banks, pots, vases, penholders, etc.: various handicraft items were produced by the counterpart to promote the campaign.

AMDC implemented all the proposed methods in cooperation with relevant institutions, e.g., the Health Center of Tres de Mayo, several schools in Tres de Mayo, Ayestas, San Martín and Comayagüela, and the residents of the three *colonias* involved.

9.2.6 Community Training

a. General

The direct supervision of the training programs for the citizens or community programs is considered an effective means of relaying information to the population. This training was the most important public education method held in the selected areas of San Martín, Ayestas, and Tres de Mayo.

The training methods used were the following:

- House visits
- Workshops
- Tour of pilot project areas by the community leaders of beneficiary areas and institutional officials.

These training activities were conducted within a month by the counterpart and the team, and were reinforced through additional publicity by means of posters, stickers, distribution of T-shirts, caps, canvassing, leaflets, etc.

Table 9-3: Community Meetings and Workshops Conducted

Activity	Place	Participants	Responsible Organization
House Visits	*Colonias* of San Martin, Ayestas and Tres de Mayo	Family members	SDD of AMDC Health Center of Tres de Mayo
Workshops	Tres de Mayo, Ayestas and San Martin	Community leaders, volunteers from the health center, residents	SDD of AMDC ED of AMDC JICA study team

b. Meetings and Workshops

1) Meeting with the Community

The main goal of the meetings held on June 20 (20 persons) and June 27 (25 persons) with the community leaders, health center volunteers and residents of San Martín, Ayestas and Tres de Mayo, was to explain the objectives of the pilot projects and gain the support and cooperation of the people. The meetings were held in the Health Center of Tres de Mayo.

Residents of the pilot project areas showed a lot of interest and were grateful that their area was selected for the pilot project. All attendees indicated the willingness to cooperate with the implementation of the "Campaign for Raising Awareness on Solid Waste Issues" and the "Experiment on the Implementation of the Best Collection System for Marginal Areas".

According to the comments of the community, the residents should be educated on relevant issues first before any collection experiment is to be implemented. This comment is presumably attributed to the inadequate SWM and is also considered important in view of the raucous attitude of the waste collectors who, instead of collecting waste, end up littering the streets.

2) Workshop before Implementation of the Pilot Projects

Prior to the implementation of the pilot projects, two education workshops were carried out in the Tres de Mayo Health Center and the church in San Martin (July 4th and 11th, 1998, respectively) with about 30 community leaders and residents of the three *colonias* involved.

3) Workshop after Implementation of the Pilot Projects

This workshop was held in the Jorge Fidel Duron School in Ayestas after the implementation of pilot projects. The workshops was attended by the community leaders, health center volunteers and residents of the three *colonias* involved.

All the participants were grateful for the implementation of the pilot project in their *colonias*. The majority of the attendees has participated in the campaign and agreed to cooperate in the sustainability of the collection experiment implemented in their *colonias* and in keeping the area of the containers clean.

9.2.7 Clean-up Operation and "Mobile Municipality"

a. Objectives of the Experiment

The experiment aims to demonstrate the impact of improved sanitary, environmental and esthetic conditions by eliminating illegal dumpsites located at the steep areas along the boundary of San Martín / Ayestas (A1) and Tres de Mayo / Ayestas (A2). The experiment also intends to achieve this aim by executing a clean-up operation in the public areas of the three *colonias* in conjunction with the "mobile municipality" program. Another objective of the experiment is to obtain basic data for the design of the feasibility study.

The experiment will further the understanding of the marginal area residents regarding the significance of sanitation issues, enhance public awareness, and encourage public cooperation in SWM improvement. Moreover, it will help change the residents waste management habits for the better, promote cooperation for the conduct of proper SWM, and consequently realize the campaign slogan.

b. Clean-up Operation

The experiment was carried out on the 18th and 25th of July 1998, in steep areas A1 and A2 (along the boundaries of San Martin/Ayestas and Tres de Mayo/Ayestas, respectively), and streets of these *colonias*, where the neighborhood is large. Being the largest receiver of waste amount, the selection of these steep areas was based on the extent of damage to the surrounding environment.

More than one thousand people participated and cooperated in the clean-up operation activities. The experiments were carried out with the participation of counterparts from AMDC, volunteers from Health Center of Tres de Mayo, students from several schools, community residents and volunteers.

Upon consideration of the campaign objectives, the main emphasis of the clean-up operation was to gain the interest and active participation of the citizens. Many residents, teachers, students, health center volunteers and municipal workers participated enthusiastically, and the majority of the residents of San Martin and Ayestas (North), particularly women and children, were the most cooperative. The positive response from the residents and youth during these activities helped affirm how effective the clean-up operation organized and implemented by the counterpart, with the team's support, was in enhancing public awareness and encouraging public cooperation.

The campaign activities consisted of the following:

- Community meetings before the implementation of clean-up operation days to explain how the community can participate and cooperate.
- Canvassing before and during the clean-up operation day to request cooperation in cleansing activities held by promoters of the Social Development Manager's Office (AMDC) and volunteers of the Tres de Mayo Health Center (SS).
- Resident participation (main steep area A1: approximately 130 persons; city area: about 300 residents and 120 students from several schools; and main steep

area A2: approximately 80 persons; city area: about 500 residents and 100 students from several schools).

- Use of 8 dump trucks, a wheel loader, excavator and tools, e.g. shovels, hackles, picks, brooms, refuse bags, *machetes*, gloves, etc.

In the first clean-up operations held in July 18, the activities were conducted late and slow due to the delay of the municipal personnel in bringing the cleansing tools. However, due to the initiative and hard work of the residents the operation was about 100% satisfactory, and the objectives of the campaign were successfully attained.

On the other hand, on the second clean-up operation in July 25 (in Tres de Mayo/Ayestas West), the residents and students were not as enthusiastic as they were in San Martín and Ayestas North. It seems that the people were more interested in the "mobile fair" activities or would be motivated to cooperate in the activities if they were to receive material incentives (T-shirts or caps), rather than participate because they were a part of the community. However, the leadership and initiative demonstrated by municipal supervisors and workers -taking advantage of past campaign experiences- more than compensated for the lack of enthusiasm on the part of the residents.

c. "Mobile Municipality"

The "mobile municipality" is a program carried out by the Social Development Manager's Office. At present, it is successfully executed with the support of the Ministry of Health, as a tool to establish rapport between municipal authorities and the population of the Central District.

The areas considered to have basic needs that are not met were given priority for the implementation of the mobile municipality program.

This program covers the cultural, educational, recreational, sports, health and environmental aspects, to encourage the population to adopt good habits and healthy lifestyles. This aspect covered by the program are further categorized below:

- Health: ("health fair")
- Education: (educational conferences, hair cutting, promotion of traditional children's games, i.e., kite flying, spinning of tops, etc.)
- Culture: recreational and cultural activities, i.e., dances, musical events, after the clean-up operations
- Community participation: house to house visits and community meetings
- Sports: tournament and games, i.e., jumping rope, marble games, etc.
- Communication: educational message encouraging the residents to change their waste disposal manners
- Cleansing Department of Urban Development: clean-up operations.

The other aims of the "mobile municipality" program are to:

(1) generate good habits among adults and children, contributing to AMDC concept of "Healthy Capital" through education programs, (2) implement necessary activities for a

healthy environment, and (3) reinforce cultural bonds of the capital city and increase national values and identity.

During the implementation of the clean-up operations under this program, the residents were observed to be very diligent in keeping their homes and surrounding clean. These operations were carried out successfully in the pilot project areas, but although they fulfill important functions, they are far from being the real solution to waste problems prevailing in other marginal areas around the capital city.

Therefore, considering the importance of these issues and to reinforce the "mobile municipality" program, the Social Development Manager's Office requested the JICA study team to provide equipment and other items for the implementation of educational programs in the community. The objectives of these educational programs were: (1) to promote public awareness and introduce public cooperation as a mean of keeping the city clean and healthy, and thus, (2) to improve SWM in the Central District.

The equipment and other items provided by JICA to implement the educational programs were shown in Table 9-4.

Table 9-4: Equipment for the "Mobile Municipality" Program

Equipment	Qty.	Purpose
Generator	1	To generate electricity and feed power to speakers to be used in the "mobile municipality" program.
Speakers	4	For use in cultural and social activities held outdoors.
Microphone	1	
Exhibition panels	10	Educational and informative panels on problems caused by waste, waste generation, waste collection, destination of waste, waste collection and disposal service expenses, and possible solutions.
OH Projector	1	OHP & screen to be used in seminars, meetings, workshops and conferences, etc.
Screen	1	
TV and video deck	1	To show educational videos on sanitary and environmental subjects.
Video camera	1	To film and produce educational videos on sanitary and environmental subjects.
Large tent (3.00 m x 6.00 m)	2	An open tent to attend to the needs of the community and a fully closed tent for health care services for women and others.

The above equipment were used for the implementation of the pilot projects in activities such as the opening ceremony of the campaign, conferences in schools, meetings and workshops in pilot project areas, and especially in the two "mobile municipality" and clean-up operation activities carried out in the marginal areas of San Martín, Ayestas and Tres de Mayo.

d. Results of the Clean-up Operations and Mobile Municipality Program

Table 9-5 shows the results of the clean-up operations and the mobile municipality executed on July 18th and 25th in the pilot project areas.

Table 9-5: Results of the Clean-up Operations and the Mobile Municipality Program

Activity	San Martin / Ayestas (North Sector)		Tres de Mayo / Ayestas (West Sector)	
	Result	○ Positive ● Negative	Result	○ Positive ● Negative
General Organization	Fair	●Lack of coordination between municipal departments	Good	○Well organized and coordinated activities between municipal departments and the Tres de Mayo Health Center
Organization for Clean-up Operation	Fair	●Delay in providing cleansing tools and personnel	Good	○Well coordinated activities by the Cleansing Section ●Inefficient transportation schedule and lack of fuel
Organization for Mobile Municipality Program	Good	○Good	Very Good	○Very good ○Good performance of children in the cultural activities
Diffusion and Promotion	Good	○Very Good ●Diffusion outside of the clean-up operation areas	Good	○Achievement of the objectives ●Large concentration of social promoters in the "Mobile Municipality" event
Community Participation in the Illegal Dumpsites A1 and A2	Excellent	○Clean-up operation initiated by the community residents ○Aproximately 130 participants	Good	○Participants of residents from San Martin and Ayestas (North sector) ○Clean-up operation started by municipality ○Approx. 80 participants ●Belated resident cooperation for the clean- operation
Community Participation in the Streets of the *Colonias*	Very Good	○General motivation to clean streets and homes ○Aproximately 300 participants	Good	○Degree of motivation same as in the preceding clean-up operations ○Approx. 500 participants ●There was no high cleansing motivation around the main "mobile municipality" attracted by fair events.
Student Participation	Good	○The participation of students was very positive in encouraging resident cooperation in the clean-up operation ○Participants: 120 students from primary, junior and senior high schools	Very Good	○The participation of students helped encourage residents to cooperate in the clean-up operation ○Good organization and supervision of the students. (100 students from the primary, junior and senior high schools)
Use of Containers	Very Good	○San Martin: 80% ○Ayestas: 62% ○**Total : 71%**	Good Total: 62%	○ Tres de Mayo: 45% ○ Ayestas: 62% **Total : 54%**
Residents satisfied with the Containers	Very Good	○San Martin: 97% ○Ayestas: 82%	Good	○ Tres de Mayo: 85% ○ Ayestas: 82%

Summary : The results of the clean-up operation activities were more satisfactory in the A1 illegal dumpsite in San Martin/Ayestas (North) than in Tres de Mayo / Ayestas (West).

A1 San Martin / Ayestas (North)

1) Factors which contributed to the clean-up operation

- ○ Initiative of the residents
- ○ Topographic accessibility
- ○ Separate activity and distance from the "mobile Municipality" area

2) Negative aspects

- ● Delay in providing cleansing tools and personnel by the Cleansing Section
- ● Lack of coordination between municipal departments and other relevant organizations

A2 Tres de Mayo / Ayestas (West)

1) Factors which contributed to the clean-up operation

- ○ Good coordination between relevant organizations
- ○ Good cooperation from residents of Ayestas and San Martin
- ○ Good performance of students in the clean-up operations
- ○ Good organization of the mobile fair

2) Negative aspects

- Late participation of the residents to start the clean-up operation activities
- Sloped topography, making manual cleansing activities difficult to execute
- Little participation from residents of *colonia* Tres de Mayo.

Conclusion: The "Campaign for Raising Awareness on Solid Waste Issues" had very positive results because the main objectives, which are shown below, were obtained:

To enhance public awareness on adequate SWM and introduce public cooperation as a means of keeping the city clean and healthy and to improve the aesthetic environment as well as sanitary conditions of the "colonias".

Table 9-6 shows the number of participants in the clean-up operations.

Table 9-6: Number of Participants in the Clean-up Operations

Area	Participants				Resident Cooperation	Work Performance	Clean-up Condition
	Residents	Students	Municip. Workers	Total			
Steep Area A1	115	-	15	130	Excellent	Very good	95%
Steep Area A2	60	-	20	80	Good	Good	80%
Whole city (C1)	300	120	20	440	Good	Good	70%
Whole city (C2)	500	100	10	610	Good	Good	80%
Total (Approx.)	975	220	65	1,260			

Note : Steep Area A1 : Located between San Martin and Ayestas (North)
Steep Area A2 : Located between Tres de Mayo and Ayestas (West)
Whole City (C1) : *Colonias* San Martin and Ayestas (North)
Whole City (C2) : *Colonias* Tres de Mayo and Ayestas (West)

9.2.8 Public Education Campaign

a. General

Generally public education methods are divided into campaigns targeting the general or large segments of the population, as well as the limited and confined target groups. The first method mainly utilizes the mass media, while the second concentrates on reaching specific groups through designed campaigns, events and lectures.

Techniques to reach limited target groups are endless, therefore, they were divided between area groups, i.e. community centers, neighborhood association, sports clubs, etc., and social groups, i.e., schools, women associations, church organizations, etc., determined by factors such as age, gender and religion.

In targeting area groups, the goal is to focus on issues that directly affect the residents, thus appealing to the sense of community and brotherhood, creating a sense of awareness that would help the residents influence and control changes in improper community habits. The problem with this method is finding a proper way to transmit the idea, due to different educational background and interests. The obvious advantage in dealing with social groups, on the other hand, is that the target is a narrow and specific audience.

For the public education campaign, many techniques has been utilized as much as possible to evaluate their effectiveness. But keeping in mind that the campaign is a pilot project, the selection of the education methods were based on their effectiveness in reaching determined target groups and areas rather than in changing general customs and behaviors, to facilitate proper evaluation.

For the improvement of marginal areas, therefore, the education experiment concentrated on holding meetings with the communities and lectures at educational workshops.

b. Educational Workshop

The general objectives of the educational workshops are to instruct and promote basic information on sanitary problems caused by waste to the population and to develop attitudes and practices that would contribute to proper SWM.

The specific objectives of the above workshops are set as follows:

- To explain the magnitude and urgency of the SWM improvement in marginal areas, by providing the basic means to adequately manage solid waste.
- Stress the benefits of an adequate SWM improvement and the harm that improper SWM may incur on public health, welfare and the environment in relation to the daily life of the general population.
- Point out that only through the active participation of the whole population can the problems related with SW in the community be solved.
- Underline the costs involved in SWM as a public service, and that improper waste management habits, i.e., illegal dumping, increase SWM costs, reduce SWM efficiency, etc. Also, explain the financial problems faced by the Municipality in expanding waste collection services.
- Promote adequate waste disposal habits and public participation in matters related to SWM improvement, particularly in activities that help keep communities clean and underscore the proper maintenance and use of containers.
- To conduct regular training programs for the beneficiary population in adequate solid waste disposal methods through the workshops and community meetings.

Keeping in mind the above specific objectives, community meetings and workshops were carried by the counterpart and the team.

c. Implementation of Workshops

Several workshops and community meetings were held in June and July 1998, every Saturday, targeting community leaders, volunteers and community groups of the pilot project areas for the conduct of public education programs.

The workshop was carried out in cooperation with relevant organizations, i.e., Social Development Manager's Office and Department of Environment (AMDC) and Health Center of Tres de Mayo (Ministry of Health).

The workshop mainly covered the following items:

- Introduction of problems caused by solid waste.
- Teaching appropriate solid waste disposal measures.
- Use and maintenance of waste container.
- Prevention of diseases brought about by improper waste management.
- Participation of women in sanitary education, family planning and disease prevention activities.

The increase in the percentage of community leaders who received guidance in sanitary education and the proper discharge of waste during the workshop is mainly attributed to meetings held to explain the pilot projects. These meetings heightened public awareness of the importance of maintaining a clean living environment.

d. Education Program on solid Waste Issues

The counterpart prepared an educational booklet and a video, with the support of the study team, as one of the means to gain the objectives of the "Study on Solid Waste Management of the Urban Area of Tegucigalpa's Central District". Also, the study team prepared 10 (ten) exhibition panels on solid waste issues for use in lectures during workshops and school conferences, as well as for the "mobile municipality" program.

Public awareness and cooperation are essential and indispensable to the improvement of sanitary conditions. Furthermore, if one of the project components requires community participation, linking the project with public education programs might be a major key to ensure success.

Bearing this in mind, the public education program to be incorporated in the pilot projects was prepared as outlined below. The counterpart and the team decided to conduct public sanitary education programs for the community leaders, residents and students in public schools through meetings and workshops.

The first public education conference in Rafael Pineda Ponce School located in Tres de Mayo was held on July 31st and was attended by 100 of the best students from three schools located in the pilot project areas.

The public education conference was held, showing the present situation on solid waste issues through the presentation of a video, discussion of the educational booklet, explanation on solid waste problems and possible solutions, citizen participation and cooperation.

The execution of the experiment at primary school lecture on solid waste issues motivated pupils on the environmental problems. The majority of pupils listened to the lectures and made discussions and questions full of interest. This experiment made not only the pupils but also to understand how dirty their towns were at present and how important appropriate discharge manner of solid waste was. Their motivation will be expanded to consider how they should go about making their towns clean and beautiful through the continuos sanitary education programs.

The positive response of the youth during the lecture helped affirm that the education conference held by the Counterpart and the Team was very effective in enhancing public awareness and encouraging public cooperation.

Table 9-7: Participant Students

School Name & Location	No. of Attendees	Total Number of Students	Education Level
Rafael Pineda Ponce Institute Tres de Mayo	60	1,500	Primary, junior and senior high school students
Monseñor Luis Alfonso Santos Institute, Tres de Mayo	30	320	Primary students
Jorge Fidel Durón School, Ayestas	20	213	Primary students

The conference on solid waste issues was held according to Table 9-8.

Table 9-8: SW Education Program

Time	Subject	Resource Person / Speaker
9.00 – 9.15	Introduction	Rafael Pineda Ponce Institute representative
9.15 – 9.30	Presentation of a video on solid waste issues	Mr. Masaharu Kina JICA study team member
9.30 – 9.50	Discussion of educational booklet : "Let's learn about Garbage with Florita and Panchito"	Miss Graciela Castellanos Counterpart (AMDC)
9.50 – 10.05	Break	
10.05 – 10.35	Present situation, problems and solutions related to SW in the Central District (exhibition panels on SW issues)	Mr. Masaharu Kina JICA study team member
10.35 – 10.50	Resident participation and cooperation	Mr. Jorge Rodriguez JICA study team member
10.50 – 11.00	Closing speech by school principals	Principals of the three schools involved

1) Educational Booklet on Solid Waste Issues

The counterpart prepared an educational booklet, which is an integral part of the "Campaign for Raising Awareness on Solid Waste Issues", with the support of the study team. The educational booklet was titled *"Let's learn about Garbage with Florita and Panchito"* and designed with schoolchildren in mind.

This educational booklet may be considered a part of the education program as it introduces preventive rather than corrective sanitary and environmental education measures to schoolchildren and the community residents. The design of the booklet was made taking the following factors into consideration:

- Small, brief and simple to avoid initial rejection by the public.
- Colorful and made with quality materials to encourage the people to read it.
- Layout with little text and many caricature illustrations to attract the attention of children and avoid boredom.
- Impersonal text, with a vocabulary not restricted to any particular age, gender, income, social, religious or interest group.
- Text and illustration showing present situation (harmful consequences) of the marginal areas surrounding the capital city and adequate measures to avoid such consequences (including the benefits that the adequate measures may incur).

The content of the educational booklet *"Let's learn about Garbage with Florita and Panchito"* was also identified with the campaign message for purposes of reinforcement and consistency.

2) Educational Panels

The study team designed ten educational panels (0.90m x 1.50m) related to solid waste issues, targeting the general population of the Central District, with colorful presentations, texts and illustrations showing harmful consequences and their adequate countermeasures.

These educational panels were prepared for use in seminars, education workshops, school lectures, "mobile municipality" program and other cultural events, to enhance public awareness and encourage public cooperation.

3) Educational Video

For the target area groups (institutional organizations, community organizations, schools, etc.), an educational video was prepared by the counterpart with the help of the team. The video focused on waste problems and their effects on the residents. It was produced in a manner that would appeal to the sense of community and brotherhood, and enhance public awareness by transmitting and promoting basic information on waste problems to the population, in order to develop attitudes and practices helpful to SWM improvement.