

# Chapter 1

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## *Outline of the Study*

# **1 Outline of the Study**

## **1.1 Background**

The Republic of El Salvador has a population of about 5.6 million and covers an area of about 21,000km<sup>2</sup>. Civil war broke out in 1979 and lasted until 1992 when the peace treaty was established. From thereon peace measures have been smoothly implemented and the economy has been growing steadily.

The Government of the Republic of El Salvador formulated the National Economic and Social Development Plan (1994-1999) in which promoting the improvement of the living environment is stipulated. In August 1994, the government prepared the "National Environment Improvement Plan", a master plan that covers all relevant environmental issues in El Salvador and underscores the criticality of environmental problems in the San Salvador Metropolitan Area.

For solid waste management (SWM) in the San Salvador Metropolitan Area, a sort of master plan was made with the financial support of the CIDA (Canadian International Development Agency). In 1998, PAHO (Pan American Health Organization) also conducted an analysis of the sector; this however only resulted in conceptualizations and did not involve concrete planning.

Based on this master plan, MIDES, that is established by COAMSS and a subsidiary in Barbados of the Canadian company CINTEC, is currently carrying out a project, which involves the operation of a section of a new landfill and the construction of a transfer station. However, because the project does not cover waste collection and the establishment of a management and supervisory system for the landfill and the transfer station, the formulation of an SWM master plan that focuses on these aspects is necessary.

Under these circumstances, the Government of El Salvador requested the Government of Japan to carry out a study on solid waste management in the San Salvador Metropolitan Area. In response to the request, the Government of Japan sent a Preparatory Study Team in April 1999 to confirm the necessity of the study and the counterpart agency in El Salvador. In September 1999, a JICA Preliminary Study Team was dispatched and the scope of work was signed and exchanged.

JICA selected and contracted with Kokusai Kogyo Co., Ltd., a Japanese consulting firm, to carry out this study.

## **1.2 Objectives of the Study**

The study covers 14 municipalities in the San Salvador Metropolitan area, and aims to:

- Formulate a Master Plan on Regional SWM targeting the year 2010.
- Pursue technology transfer regarding SWM study and planning methods for the counterpart personnel.

## 1.3 Study Area

This Study will cover the following 14 municipalities under the jurisdiction of COAMSS:

San Salvador, Mejicanos, Ciudad Delgado, Cuscatancingo, Ayutuxtepeque, San Marcos, Nueva San Salvador, Antiguo Cuscatlan, Soyapango, Ilopango, San Martin, Apopa, Nejapa and Tonacatepeque.

## 1.4 Wastes Targeted

This Study will cover household waste, commercial waste, institutional waste, street sweeping waste and medical waste. Industrial waste will not be covered.

## 1.5 Target Year

The target year of the Master Plan is 2010.

## 1.6 Key Assumptions (Population, Economic, etc.)

The following assumption were used in this study.

### 1.6.1 Socio-economic Conditions

#### a.1 Population

Table 1-1: Population Forecast in the Study Area

Municipality	1999	2000	2005	2010
San Salvador	473,374	479,605	507,666	512,873
Mejicanos	185,204	189,392	207,153	217,248
Ciudad Delgado	149,394	153,350	170,014	180,727
Cuscatancingo	90,079	94,062	111,011	125,618
Ayutuxtepeque	28,000	29,663	36,700	43,005
San Marcos	69,660	70,610	74,864	76,106
Nueva San Salvador	138,723	144,025	171,584	197,690
Antiguo Cuscatlan	42,773	45,123	58,273	72,950
Soyapango	283,598	285,286	294,604	309,772
Ilopango	127,434	132,231	152,465	168,554
San Martin	73,000	78,761	103,952	129,365
Apopa	163,974	171,833	205,488	235,614
Nejapa	15,000	15,492	17,466	18,350
Tonacatepeque	29,000	30,265	35,503	39,509
<b>Total</b>	<b>1,869,213</b>	<b>1,919,698</b>	<b>2,146,743</b>	<b>2,327,381</b>

Arranged by the Study Team on the basis of information from the municipalities and  
Source: Dirección General de Estadística y Censos, Ministerio de Economía, 1995, "Proyección de la Población de El Salvador," El Salvador

**b. Economic Conditions**

Table 1-2: GDP Growing Ratio in AMSS

	Unit	1999	2000	2001 to 2005	2006 to 2010
GDP growth rate	%	2.1%	3.5%	5.0%	4.0%
GRDP growth rate	%	2.6%	4.0%	5.5%	4.5%

Table 1-3: Forecast of GRDP in AMSS

	Unit	1999	2000	2005	2010
GRDP	million colon in 1998 price	42,057	43,739	57,166	71,239
GRDP/capita *	US\$	2,466	2,500	2,927	3,369

Note: \* divided by total population of 14 municipalities

**1.6.2 Waste Amount and Composition**

**a. Waste Amount**

Table 1-4: Waste Generation Amount in 2010

	Household	Restaurant	Other than restaurant	Institutional	Market	Road sweeping	Total
San Salvador	257.6	9.4	24.7	18.3	39.2	64.4	413.6
Mejicanos	101.0	4.8	10.9	8.5	2.8	5.8	133.8
Delgado	79.8	4.2	10.6	4.6	0.9	3.0	103.1
Cuscatancingo	54.6	4.1	6.0	3.0	0.0	1.8	69.5
Ayutuxtepeque	21.2	0.6	1.8	2.1	0.5	0.5	26.7
San Marcos	34.5	1.8	2.7	1.3	0.9	1.4	42.6
Nueva San Salvador	106.8	3.3	8.2	8.1	5.5	8.5	140.4
Antiguo Cuscatlan	41.2	1.1	3.6	4.6	1.2	10.2	61.9
Soyapango	136.4	11.2	13.4	8.9	6.2	2.5	178.6
Ilopango	75.4	3.9	5.9	3.4	0.9	0.3	89.8
San Martin	57.5	6.0	6.7	2.9	7.8	0.3	81.2
Apopa	100.4	9.3	8.9	3.2	11.3	1.1	134.2
Nejapa	8.9	0.7	1.3	0.4	0.2	0.1	11.6
Tonacatepeque	19.0	0.8	2.7	3.4	0.3	0.6	26.8
Total	1,094.3	61.2	107.4	72.7	77.7	100.5	1,513.8

Table 1-5: Forecast of Future Medical Waste Generation Amount

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Increase Rate	1.000	1.027	1.053	1.078	1.103	1.126	1.148	1.170	1.189	1.208	1.227	1.245
Amount (ton/day)	3.20	3.29	3.37	3.45	3.53	3.60	3.67	3.74	3.80	3.87	3.93	3.98

## b. Waste Composition

Table 1-6: Physical Composition of Household Waste

Unit: %

Composition	High income	Middle income	Low income
Combustible	95.5	94.4	93.4
Food waste	59.5	57.6	66.0
Papers	18.5	13.0	13.1
Textiles	1.2	1.1	2.5
Grass, wood, bamboo	2.7	16.8	4.0
Plastics	12.1	5.8	7.8
Rubber, leather	1.5	0.1	0.0
Incombustible	4.5	5.6	6.6
Metals	1.3	1.1	1.2
Bottles, glass	1.3	2.6	3.7
Ceramics and soil	0.2	0.7	0.6
Others	1.7	1.2	1.1
Total	100.0	100.0	100.0

Table 1-7: Physical Composition of Commercial, Institutional, Market and Road Sweeping Waste

Unit: %

Composition	Commercial		Institutional	Market	Road sweeping
	restaurant	Other			
Combustible	95.1	97.5	89.3	96.8	88.3
Food waste	62.2	6.4	19.0	78.1	2.6
Papers	22.1	63.1	35.0	9.5	6.4
Textiles	0.0	5.2	1.1	0.3	0.4
Grass, wood, bamboo	0.3	11.8	12.3	1.4	75.3
Plastics	10.2	10.6	20.5	7.2	3.6
Rubber, leather	0.3	0.4	1.4	0.3	0.0
Incombustible	4.9	2.5	10.7	3.2	11.7
Metals	0.7	1.3	0.5	0.4	0.1
Bottles, glass	2.4	0.3	4.6	0.8	0.3
Ceramics and soil	0.0	0.0	1.6	0.7	9.8
Others	1.8	0.9	4.0	1.3	1.5
Total	100.0	100.0	100.0	100.0	100.0

### 1.6.3 Life Span of Equipment and Facilities

Table 1-8: Life Span and Salvage Value

	Service life (year)	Salvage value (%)
Truck & heavy equipment	7	0
Transfer station	20	0
MRF	15	0
Medical waste incinerator	15	10

## 1.7 Work Schedule of the Study

The schedule of the study work is shown in Figure 1-1.

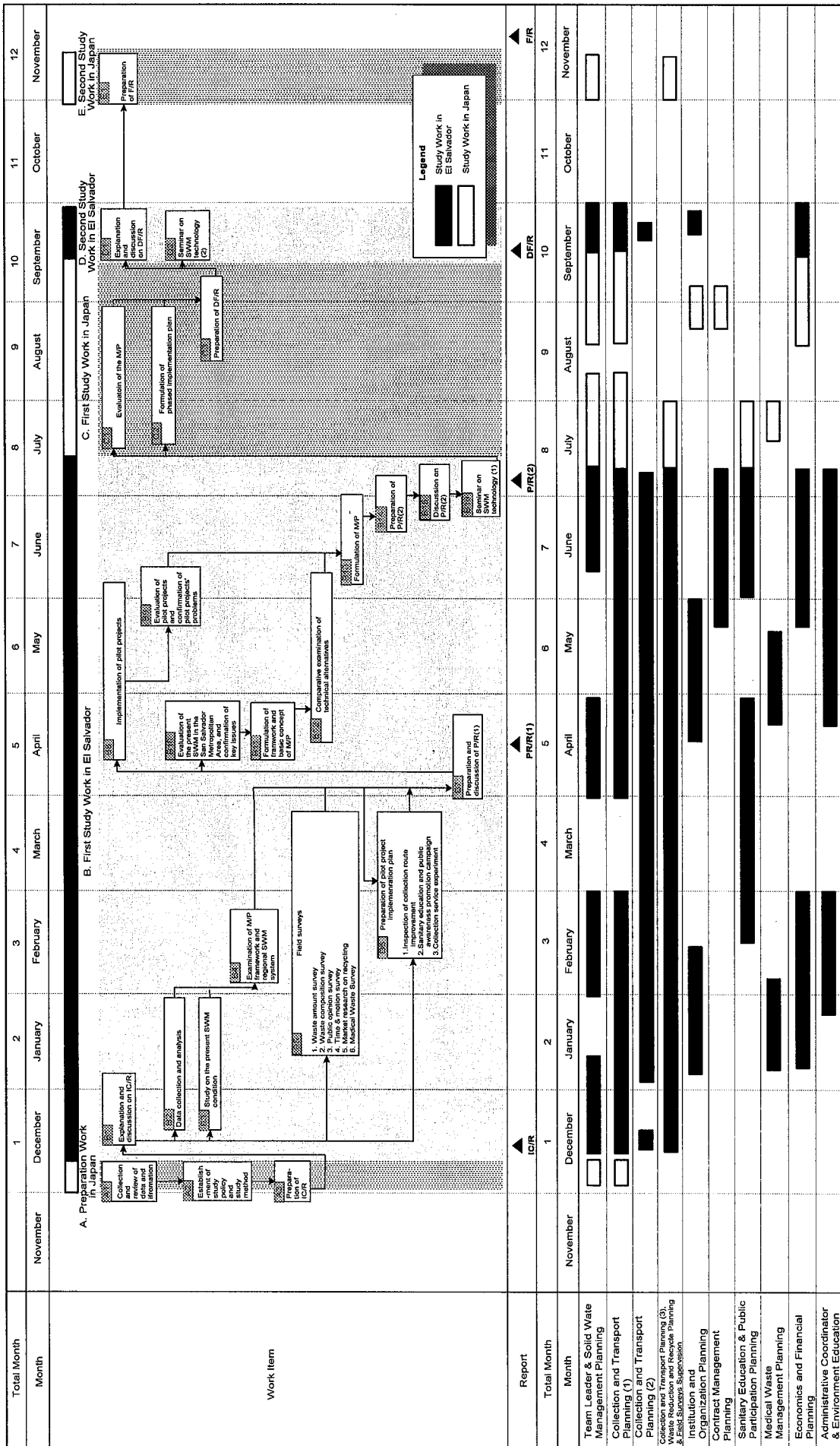


Figure 1-1: Study Schedule

## 1.8 Organization of the Study and the Assignment of the Study Team

### a. Organizational Structure of the Study

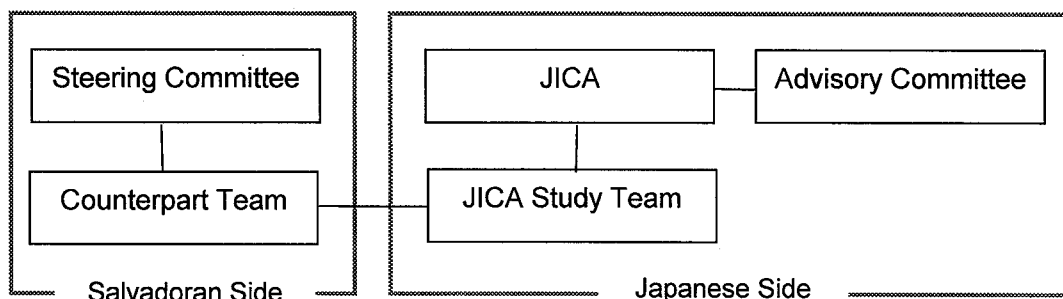


Figure 1-2: Study Organizational Structure

### b. Members of the Study Team

Assignment	Expert	Nationality
Team Leader & Solid Waste Management Planning	Hiroshi KATO	Japanese
Collection and Transport Planning (1)	Tadaya YAMAMOTO	Japanese
Collection and Transport Planning (2)	Carlos Melendez	Salvadoran
Collection and Transport Planning (3), Waste Reduction and Recycle Planning & Field Surveys Supervision	Ikuo MORI	Japanese
Institution and Organization Planning	Guido ACURIO	Peruvian
Contract Management Planning	Victor OJEDA	Costa Rican
Sanitary Education & Public Participation Planning	Masaharu KINA	Japanese
Medical Waste Management Planning	Tamotsu SUZUKI	Japanese
Economics and Financial Planning	Kozo BABA	Japanese
Administrative Coordinator & Environment Education	Ayako IDO	Japanese

### c. Members of the JICA Advisory Committee

Assignment	Expert
Chairman & Solid Waste Management Planning	Hidetoshi KITAWAKI Professor, Faculty of Regional Development Studies, Toyo University

## **1.9 Technology Transfer**

During the study, the study team endeavored to transfer technology to the Salvadoran counterpart through the following:

- On the job training (through the whole period of the study)
- Meetings on technology (about every two weeks)
- Explanation of reports (IC/R, P/R(1), P/R(2) and DF/R)
- Seminars on SWM technology (P/R(2) and DF/R)



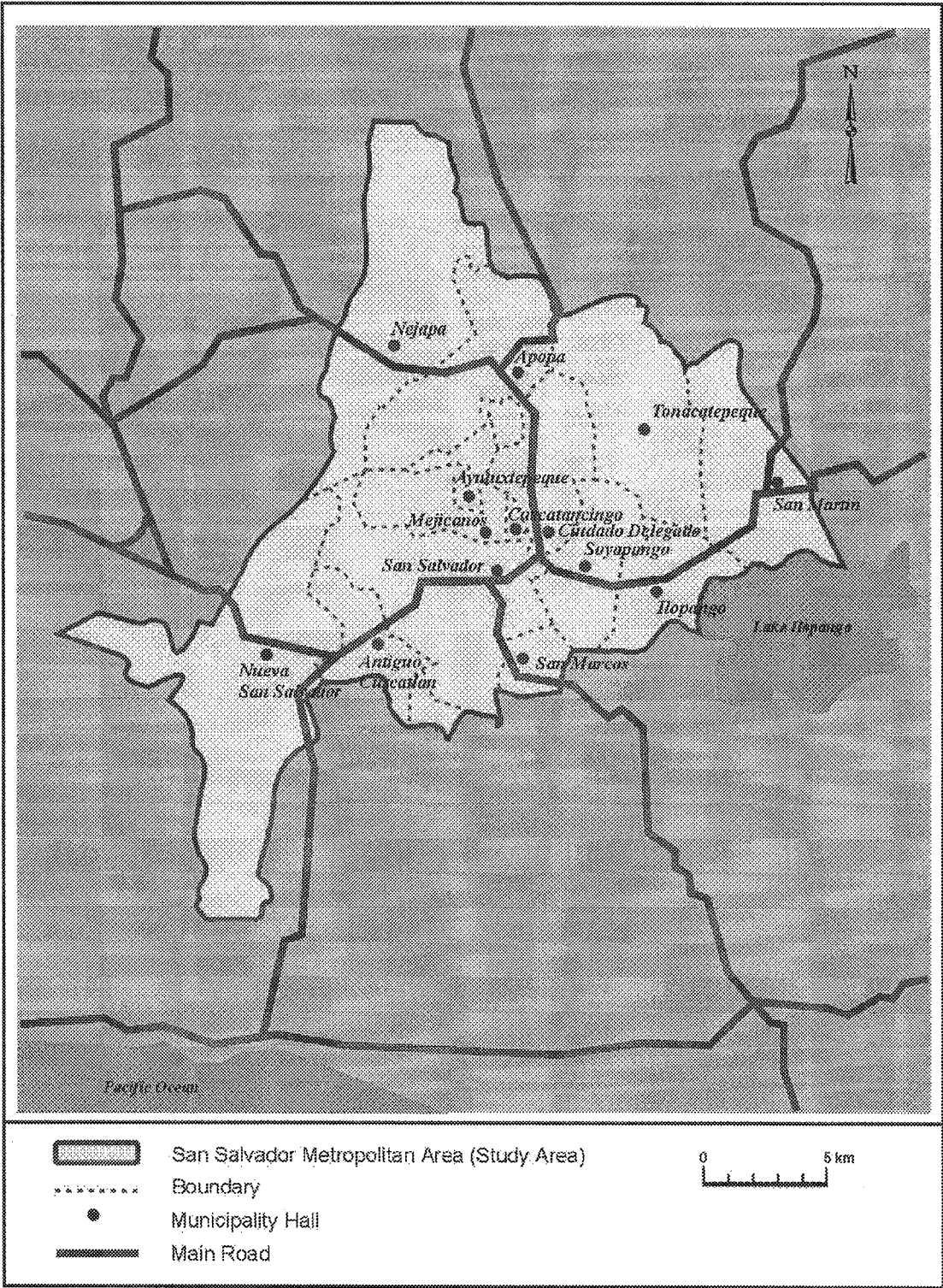


Figure 1-3: Study Area

## **1.10 Policies of the Study**

### **a. Characteristics of an SWM Study**

The prominent characteristics of an SWM study are as follows:

- The study focuses on the improvement of the existing SWM system in the Study Area.
- SWM has a direct impact on the daily lives of the residents. It is, therefore, of extreme importance to take into account the opinions and needs of the residents, and not only the intentions of administrators, local authorities, or the Cleansing Bureau, to establish an effective SWM.
- An SWM Plan cannot be realized without taking into consideration the natural, social (e.g., historical and cultural background, traditions and current lifestyle) and economic conditions of the Study Area.
- It is difficult to use a standardized method for SWM planning, as intrinsic factors, i.e., natural, social and economic conditions, that significantly affect current conditions vary by Study Area. Hence, the implementation of pilot project(s), e.g., collection and public awareness promotion experiments, would be extremely important and vital in this regard.
- It is very important to make an effort to reach a consensus on issues regarding the execution of the study, as well as to formulate a plan that would bode well with the people and groups concerned, in view of the fact that the views and values of people vary by country.

### **b. Policies of the Study**

Based on the understanding of the characteristics of SWM studies and the present SWM conditions in the San Salvador Metropolitan Area, this Study will be implemented based on the following basic policies.

- Formulation of a feasible plan
- Establishment of a sustainable SWM system
- Development and application of appropriate technology
- Encouragement of resident participation
- Establishment of Consensus
- Joint Study

#### **b.1 Formulation of a Feasible Plan**

An SWM plan that involves the contracting out of services, etc., would require a certain level of technical, administrative and operational proficiency from OPAMSS, COAMSS, the municipalities, and their cleansing sections. However, it would not be feasible to demand extremely high qualifications, as capabilities can be improved gradually through technology transfer and personnel training programs. On the other hand, if a plan proposes an extremely complex system in seeking social impartiality and fairness in full length, the plan is never implemented. Accordingly, the formulation of a feasible plan is a basic policy to contend with.

## **b.2 Establishment of a Sustainable SWM System**

The factor that significantly sets solid waste projects apart from other infrastructure projects (e.g., road and dam construction) is the small capital but high operation and maintenance costs required. In order to guide a SWM plan for success, the operation and maintenance plan is far more important than the facility and equipment procurement plan. The formulation of a sustainable operation and maintenance plan is, therefore, of importance to this study.

Securing a financial source is indispensable for the sustainability of a plan. However, drastically reconstructing the current financial system is not an easy task. Therefore, this will be covered in both long and short term plans; the latter focusing on the improvement of the present system and the former proposing improvement measures to cope with significant problems that may arise in the future.

## **b.3 Development and Application of Appropriate Technology**

As stated in *b.2*, the operation and maintenance plan is an integral part of the SWM plan. It is necessary that OPAMSS and each municipality carry out O&M using whatever resources they possess (technology, financial, human resources). Therefore, the basic policy of the technical plan will be to use technology currently available in El Salvador and the introduction of new technology suited to local conditions.

## **b.4 Encouragement of Resident Participation**

Changes in the SWM system directly affect the residents, who are the producers of waste. Separate collection, recycling, and self disposal cannot be carried out without the consent and cooperation of the residents. Accordingly, resident participation will be encouraged from the planning phase and the opinions of the residents will be fully reflected in the plan.

## **b.5 Establishment of Consensus**

Various authorities and groups participate in SWM. A plan which is made by only one group will not be realized. The 14 municipalities, OPAMSS (COAMSS) and MIDES participate in the SWM activities in the San Salvador Metropolitan Area, and each plays an important role. In order to make a feasible master plan, the Study Team recognizes that establishing consensus within all groups is important. This M/P, therefore, basically aims to establish good communication between all relevant organizations and the community, bearing in mind the importance of gaining consensus to successfully implement the plan. For this, it is crucial that the Salvadoran side iron out the authorities and groups concerned.

## **b.6 Joint Study**

This policy aims to effectively conduct the study in conformity with the policies stated in sections *b.1* to *b.5*. Where the SWM project places an importance on the operation as well as on the construction of facilities, whether or not a plan formulated through this study to be implemented will largely depend on the willingness and devotion of the counterpart. Bearing this in mind, it is made a basic policy to study jointly with the Salvadoran side.