

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)**

**THE MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES  
THE PLANNING OFFICE FOR SAN SALVADOR METROPOLITAN AREA  
THE REPUBLIC OF EL SALVADOR**

**THE STUDY  
ON  
REGIONAL SOLID WASTE  
MANAGEMENT  
FOR  
SAN SALVADOR METROPOLITAN AREA  
IN  
THE REPUBLIC OF EL SALVADOR**

**FINAL REPORT  
VOLUME II**

**MAIN REPORT**

**NOVEMBER 2000**

**KOKUSAI KOGYO CO., LTD.**

## PREFACE

In response to a request from the Government of the Republic of El Salvador, the Government of Japan decided to conduct a development study on Regional Solid Waste Management for San Salvador Metropolitan Area in the Republic of El Salvador and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Hiroshi Kato, KOKUSAI KOGYO CO., LTD. to El Salvador two times between December 1999 and November 2000. In addition, JICA set up an advisory committee headed by Dr. Hidetoshi Kitawaki, a professor of Toyo University between December 1999 and November 2000, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of El Salvador and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of El Salvador for their close cooperation extended to the Team.

November, 2000



---

Kunihiko Saito  
President

Japan International Cooperation Agency

November, 2000

Mr. Kunihiko Saito  
President  
Japan International Cooperation Agency

**Letter of Transmittal**

Dear Mr. Saito,

We are pleased to submit the report on the Study on Regional Solid Waste Management for San Salvador Metropolitan Area in the Republic of El Salvador.

This report consists of two main components: a study on the present situation of municipal waste management in San Salvador Metropolitan Area; and the formulation of the municipal solid waste management master plan until the year 2010.

In the study on the present situation of municipal waste management, five types of field investigations were carried out and existing data and information of various sources were collected and examined. By doing so, present situation of municipal waste management of San Salvador Metropolitan Area was assessed and the issues to be considered were identified.

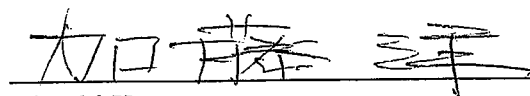
The master plan was formulated setting up its ultimate goals as promotion of public health and welfare, implementation of sustainable municipal solid waste management, and the contribution to environmental conservation. In the master plan, a planning framework with phased goals, targets, and strategies, technical system, financial system, and the organizational and institutional system were proposed. Furthermore, a regional management system that would allow all 14 municipalities of San Salvador Metropolitan Area to enjoy the merits of regional management was proposed since these municipalities have different dimensions, e.g. population, municipal budget.

During the study, three pilot projects were carried out. Two of these, the "Sanitary Education/Public Awareness Promotion Campaign" and the "Collection Service Experiment", promoted the active participation of the counterparts and residents, provoking a strong positive response.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs and the Ministry of Health and Welfare of Japan. We also wish to extend our sincere gratitude to the Government of the Republic of El Salvador, the Ministry of Environment and Natural Resources (MARN), Mayors Council for San Salvador Metropolitan Area (COAMSS), Planning Office for San Salvador Metropolitan Area (OPAMSS), the Embassy of Japan and the JICA office in the Republic of El Salvador for their cooperation during the implementation of our study in the Republic of El Salvador.

Finally, we hope that this report will help improve solid waste management and urban environment sanitation in San Salvador Metropolitan Area in El Salvador.

Respectfully,



Hiroshi Kato  
Team Leader

The Study on Regional Solid Waste Management  
for San Salvador Metropolitan Area in the Republic  
of El Salvador

The Study on Regional Solid Waste Management  
for San Salvador Metropolitan Area in the Republic of El Salvador

**List of Volumes**

Volume I	Executive Summary
Volume I(S)	Executive Summary (Spanish Version)
Volume II	Main Report
Volume II(S)	Main Report (Spanish Version)
Volume III	Annex
Volume III(S)	Annex (Spanish Version)
Volume IV	Data Book
Volume IV(S)	Data Book (Spanish Version)

***This is the Main Report.***

In this report, the project cost is estimated by using the April 2000 price and an exchange rate of 1.00 US\$ = 105.00 Japanese Yen = 8.75 Colones.

## Contents

### List of Volumes

Location Maps of the Study Area (1),(2)

#### Plates

Plate 1: Field Investigations (1) Waste Amount and Composition Survey

Plate 2: Field Investigations(2) Waste Amount and Composition Survey, Market Research on Recycling

Plate 3: Field Investigations (3) Public Opinion Survey (POS), Time and Motion Survey

Plate 4: Field Investigations (4) Medical Waste Survey

Plate 5: Field Investigations (5) Present Condition on SWM in San Salvador Metropolitan Area

Plate 6-7: Pilot Projects

Contents .....	i
List of Tables.....	vii
List of Figures .....	xiv
List of Abbreviations.....	xvi

## Contents

	Page :
<b>1 Outline of the Study</b>	<b>1-1</b>
1.1 Background.....	1-1
1.2 Objectives of the Study.....	1-1
1.3 Study Area .....	1-2
1.4 Wastes Targeted.....	1-2
1.5 Target Year .....	1-2
1.6 Key Assumptions (Population, Economic, etc.).....	1-2
1.6.1 Socio-economic Conditions .....	1-2
1.6.2 Waste Amount and Composition.....	1-3
1.6.3 Life Span of Equipment and Facilities.....	1-4
1.7 Work Schedule of the Study .....	1-4
1.8 Organization of the Study and the Assignment of the Study Team.....	1-6
1.9 Technology Transfer.....	1-7
1.10 Policies of the Study.....	1-9
<b>2 Profile of the Study Area</b>	<b>2-1</b>
2.1 Natural Condition .....	2-1
2.1.1 Location.....	2-1

2.1.2	Topography .....	2-1
2.1.3	Climate .....	2-2
2.1.4	Geological Condition .....	2-2
2.2	Socioeconomic Conditions .....	2-3
2.2.1	Macro Economy of the Country .....	2-3
2.2.2	Regional Economy .....	2-6
2.2.3	Administration .....	2-9
2.2.4	Population .....	2-10
2.2.5	Industrial Structure .....	2-12
2.2.6	Education .....	2-13
2.2.7	Community Structure .....	2-13
2.2.8	Marginal Settlements .....	2-14
2.2.9	Public Health .....	2-14
2.3	Urban Structure .....	2-15
2.3.1	Origin and Evolution of the Study Area .....	2-15
2.3.2	Land Use Conditions .....	2-17
2.3.3	Population Density .....	2-19
2.3.4	Transportation .....	2-19
2.4	Financial Condition .....	2-20
2.4.1	Public Finance .....	2-20
2.4.2	Taxation System and Public Utilities Charge Collection System .....	2-21
2.5	Environmental Policy .....	2-22
2.5.1	General Review .....	2-22
2.5.2	Organizations Concerned .....	2-23
2.5.3	Environmental Policy on SWM .....	2-24
2.6	Other Infrastructure .....	2-24
2.6.1	Water Supply .....	2-24
2.6.2	Sewage and Drainage .....	2-25
2.6.3	Roads .....	2-25
2.6.4	Priority Ranking of Infrastructure Investment .....	2-26
<b>3</b>	<b>Field Survey</b> .....	<b>3-1</b>
3.1	Waste Amount and Composition Survey .....	3-1
3.1.1	Waste Amount Survey .....	3-1
3.1.2	Waste Composition Survey .....	3-3
3.2	Public Opinion Survey .....	3-6
3.2.1	Objectives .....	3-6
3.2.2	Number of Samples .....	3-6
3.2.3	Formulation of Questionnaire .....	3-8
3.2.4	Results of the Survey .....	3-9
3.2.5	Findings .....	3-9
3.3	Time and Motion Survey .....	3-9
3.3.1	Objectives .....	3-9
3.3.2	The Survey Schedule .....	3-9
3.3.3	Survey Records and Findings .....	3-11

3.4	Recycle Market Survey.....	3-11	
3.4.1	Objectives.....	3-11	
3.4.2	Methodology.....	3-12	
3.4.3	Results and Findings of Survey.....	3-13	
3.5	Medical Waste Survey.....	3-13	
3.5.1	Objectives.....	3-13	
3.5.2	Samples.....	3-13	
3.5.3	Formulation of Questionnaire.....	3-15	
3.5.4	Results and Findings of the Survey.....	3-16	
<b>4</b>	<b>Current Situation of Solid Waste Management</b>	<b>4-1</b>	
4.1	Service Projected Population.....	4-1	
4.2	History of Solid Waste Management.....	4-1	
4.3	Waste Stream.....	4-4	
4.3.1	Municipal Solid Waste.....	4-4	
4.3.2	Medical Waste.....	4-12	
4.3.3	Waste Generation Ratio and Generation Amount.....	4-13	
4.4	Technical System.....	4-16	
4.4.1	Storage and Discharge System.....	4-16	
4.4.2	Collection and Haulage System.....	4-16	
4.4.3	Processing, Treatment and Recycling System.....	4-28	
4.4.4	Street Sweeping System.....	4-31	
4.4.5	Final Disposal System.....	4-32	
4.4.6	Other SWM Activities by NGOs.....	4-38	
4.4.7	Medical Waste Management.....	4-41	
4.5	Institutional, Organizational and Financial System.....	4-42	
4.5.1	Institutional System of Solid Waste Management.....	4-42	
4.5.2	SWM Organizational System.....	4-47	
4.5.3	Financial System.....	4-57	
4.6	Sanitary Education and Public participation.....	4-70	
4.6.1	Sanitary Education System.....	4-70	
4.6.2	Public Participation System.....	4-70	
4.7	Relevant Studies.....	4-71	
4.8	MIDES Project.....	4-73	
4.8.1	Background.....	4-73	
4.8.2	“Solid Waste Management Improvement in the Metropolitan Region” Project	4-73	
4.8.3	“Solid Waste Management Improvement in the Metropolitan Region” Proposal	4-74	
4.8.4	Agreement COAMSS-CINTEC International Inc.....	4-75	
4.8.5	Incorporation of “MIDES, S.E.M. de C.V.”.....	4-76	
4.8.6	Private documents authenticated between MIDES and Municipalities....	4-77	
4.8.7	Service Rendering Contract between the Municipalities and Electricity	Distribution Companies of AMSS.....	4-78
4.8.8	Technical Cooperation by IDB.....	4-79	

4.8.9	Financing of MIDES Project.....	4-80
4.8.10	Agreement between MIDES –Municipality Nejapa .....	4-80
4.8.11	OPAMSS Technical Follow-up Commission for MIDES Project.....	4-80
4.8.12	Project of Modifying the Contract between MIDES and Municipalities..	4-80
4.8.13	Performance and Management of MIDES Project.....	4-81
4.9	Assessment of the Present Condition and Confirmation of Key Issues .....	4-82
4.9.1	Technical System .....	4-82
4.9.2	Institutional System.....	4-84
4.9.3	Organizational System .....	4-88
4.9.4	Financial System .....	4-90
4.9.5	Sanitary Education and Public Participation.....	4-95
<b>5</b>	<b>Pilot Projects</b>	<b>5-1</b>
5.1	Sanitary Education and Public Awareness Promotion Campaign .....	5-1
5.1.1	Profile of Pilot Project.....	5-1
5.1.2	Methodology .....	5-3
5.1.3	Results of the Pilot Project.....	5-5
5.2	Collection Service Experiment.....	5-5
5.2.1	Outline of the Project .....	5-5
5.2.2	Methodology .....	5-10
5.2.3	Results of the Project .....	5-11
5.3	Collection Route Improvement.....	5-12
5.3.1	Objectives.....	5-12
5.3.2	Selection of Target Route.....	5-12
5.3.3	Formulation of the Implementation Plan .....	5-13
5.3.4	Results of the Project .....	5-14
<b>6</b>	<b>Framework of Master Plan</b>	<b>6-1</b>
6.1	Goals, Targets and Strategies .....	6-1
6.1.1	Goals and Target year .....	6-1
6.1.2	Targets and Strategies .....	6-2
6.1.3	Compatibility of 3 Major Goals .....	6-6
6.1.4	Regional Issues and Municipal Issues in M/P Components .....	6-6
6.1.5	Action Plan for Regional Management System .....	6-6
6.1.6	Actions plan for Individual Management System.....	6-7
6.1.7	Action Plan for Respective Municipalities .....	6-7
6.2	Forecast of Future Waste Amount and Composition .....	6-12
6.2.1	Population Forecast.....	6-12
6.2.2	Assumption for Waste Amount and Composition Forecast.....	6-13
6.2.3	Waste Composition.....	6-14
6.2.4	Waste Amount.....	6-15
6.2.5	Medical Waste.....	6-17
6.3	Other Pre-Conditions .....	6-17
6.3.1	Financial Conditions .....	6-17
6.3.2	Condition for Cost Estimation .....	6-20
6.4	Comparative Examination of Technical Alternatives.....	6-21



6.4.1	Storage and Discharge System.....	6-21
6.4.2	Collection and Transport System.....	6-22
6.4.3	Intermediate Processing System.....	6-46
6.4.4	Final Disposal System.....	6-49
6.4.5	Medical Waste Management System.....	6-61
6.5	Alternatives for Competitive Services (Participation by Private Sector).....	6-69
6.5.1	Participation by Private Sector (PPS) for Solid Waste Management.....	6-69
6.5.2	Different Forms of PPS in Solid Waste Management.....	6-71
6.5.3	Description and Analysis of the Different Forms of PPS in Solid Waste Management.....	6-72
6.5.4	Rules of Competition for the Diverse Forms of PPS.....	6-79
6.5.5	Criteria for Selection of the Most Appropriate PPS Model for Solid Waste Management in AMSS.....	6-80
6.6	Database Management.....	6-82
6.6.1	Introduction.....	6-82
6.6.2	Current Structures.....	6-82
6.6.3	Problems and Deficiency of the Current System.....	6-84
6.6.4	Proposal of the Collection System Improvement.....	6-88
<b>7</b>	<b>Particulars for Master Plan Formulation</b>	<b>7-1</b>
7.1	Policy for Selection of an Optimum System.....	7-1
7.2	Technical System.....	7-2
7.2.1	Technical Particulars to be Considered.....	7-2
7.3	Institutional and Organizational System.....	7-4
7.3.1	Institutional Particularities to be taken into Account.....	7-4
7.3.2	Selection of institutional and organizational proposals.....	7-8
7.3.3	Social Aspects.....	7-17
7.4	Financial System.....	7-18
7.4.1	Current Financial Problems to be Taken into Account.....	7-18
7.5	Regulatory Framework for Competitive Services.....	7-27
7.5.1	Introduction.....	7-27
7.5.2	General Rules of Regulation.....	7-27
7.5.3	Policies of Competition.....	7-28
7.5.4	Service Quality Parameters.....	7-29
7.5.5	Principles and Rules of Information Submission.....	7-32
7.5.6	Public Liability Insurance.....	7-32
7.5.7	Rules for Price Fixing.....	7-33
7.5.8	Rate of Capital Cost.....	7-35
7.5.9	Efficiency Parameters Recommended for PPS with Regulated Prices for the Competitiveness Analysis: Implications for an Effective Regulation.....	7-37
7.5.10	Arbitration and Decisions.....	7-40
7.5.11	Contracts, Effective Regulation and Role by Organizations.....	7-40
<b>8</b>	<b>The Master Plan</b>	<b>8-1</b>
8.1	Outline of the Master Plan.....	8-1
8.1.1	Discharge and Storage System.....	8-2

8.1.2	Collection and Haulage System .....	8-4
8.1.3	Intermediate Treatment System .....	8-4
8.1.4	Final Disposal System.....	8-6
8.1.5	Medical Waste Management.....	8-6
8.1.6	Outline of the Master Plan .....	8-7
8.1.7	Institutional and Organizational System .....	8-12
8.1.8	Institutionalization of the M/P .....	8-13
8.2	Description Master of the Master Plan .....	8-19
8.2.1	Projection until 2010.....	8-19
8.2.2	Technical System .....	8-20
8.2.3	Institutional and Organizational System .....	8-32
8.2.4	Financial System .....	8-49
8.2.5	Social Aspect (Sanitary Education and Public Participation).....	8-61
8.3	Project Cost Estimates .....	8-62
8.3.1	Basic Conditions .....	8-62
8.3.2	Cost Estimation.....	8-64
8.4	Evaluation of the Master Plan .....	8-76
8.4.1	Technical Evaluation.....	8-76
8.4.2	Financial Evaluation .....	8-79
8.4.3	Economic Evaluation .....	8-90
8.4.4	Institutional Evaluation .....	8-91
8.4.5	Social Evaluation .....	8-94
8.4.6	Environmental Evaluation.....	8-96
8.4.7	Overall Evaluation .....	8-97
8.4.8	Phased Implementation Plan.....	8-98
8.5	Alternatives of the Regional System of Municipal SWM.....	8-104
8.5.1	Present System and Proposed System.....	8-104
8.5.2	Brief Outline of Alternatives.....	8-105
8.5.3	Comparison of Alternatives .....	8-107
8.5.4	Conclusion .....	8-107
<b>9</b>	<b>Conclusions and Recommendations</b> .....	<b>9-1</b>
9.1	Conclusions .....	9-1
9.2	Recommendations .....	9-2
9.2.1	Study Continuity .....	9-2
9.2.2	Compilation and Utilization of Data.....	9-3
9.2.3	Collection Route Improvement.....	9-3
9.2.4	Transfer Stations and Trailer Transport .....	9-3
9.2.5	Administration of SWM Services.....	9-3
9.2.6	Independent Accounting .....	9-4
9.2.7	SWM Fees Collection.....	9-4

## List of Tables

	Page:
Table 1-1: Population Forecast in the Study Area .....	1-2
Table 1-2: GDP Growing Ratio in AMSS .....	1-3
Table 1-3: Forecast of GRDP in AMSS.....	1-3
Table 1-4: Waste Generation Amount in 2010 .....	1-3
Table 1-5: Forecast of Future Medical Waste Generation Amount .....	1-3
Table 1-6: Physical Composition of Household Waste .....	1-4
Table 1-7: Physical Composition of Commercial, Institutional, Market and Road Sweeping Waste.....	1-4
Table 1-8: Life Span and Salvage Value.....	1-4
Table 2-1: Area and Average Elevation of Municipalities .....	2-1
Table 2-2: Season of Year.....	2-2
Table 2-3: Climate Parameters registered in Ilopango Meteorological Station .....	2-2
Table 2-4: Trend of Industrial Structure .....	2-4
Table 2-5: Trend of Unemployment Rate .....	2-6
Table 2-6: Major Economic Indicators of El Salvador .....	2-6
Table 2-7: Economic Potential of San Salvador and La Libertad Departments .....	2-7
Table 2-8: Population Engaged in Respective Economic Activities (older than 10 years) .....	2-7
Table 2-9: Population Engaged in Respective Economic Activities .....	2-8
Table 2-10: GRDP of San Salvador Metropolitan Area in 1998 .....	2-9
Table 2-11: Population in the Country.....	2-11
Table 2-12: Estimated Population from 1950 to 1999 .....	2-11
Table 2-13: Population in the Study Area in the Past.....	2-12
Table 2-14: Industrial Structure in the Metropolitan Area.....	2-12
Table 2-15: Municipalities forming San Salvador Metropolitan Area .....	2-16
Table 2-16: Land Use Conditions in AMSS .....	2-17
Table 2-17: Population Density in AMSS in 1999 .....	2-19
Table 2-18: Annual Budget of Central Government.....	2-20
Table 2-19: Ordinary Revenue in 1999.....	2-21
Table 2-20: Annual Budget of Related Ministries .....	2-21
Table 2-21: Personal Income Tax Rates .....	2-21
Table 2-22: Electricity Bill of "CAESS" .....	2-22
Table 2-23: Water Supply per Municipalities and Houses .....	2-24
Table 2-24: Wastewater Discharge Type per House.....	2-25
Table 2-25: Programs Developed by PLAMADUR .....	2-26
Table 2-26: Best-Ranked Projects by the Entities that Participated in PLAMADUR .....	2-26
Table 3-1: Number of Sources and Samples.....	3-2
Table 3-2: Estimation of Waste Generation Ratio .....	3-2
Table 3-3: Waste Generation Ratio of Residential Waste .....	3-2
Table 3-4: Waste Generation Ratio of Commercial, Institutional, Market and Road Sweeping Wastes .....	3-3
Table 3-5: Number of Samples of Waste Composition Survey .....	3-3
Table 3-6: Bulk Density of Wastes .....	3-4
Table 3-7: Composition of Residential Waste .....	3-4
Table 3-8: Composition of Commercial, Institutional, Market and Road Sweeping Wastes.....	3-5

Table 3-9: Moisture Content .....	3-5
Table 3-10: Carbon and Nitrogen Content.....	3-5
Table 3-11: Distribution of Samples (Household).....	3-6
Table 3-12: Distribution of Samples (Institutions) (1).....	3-7
Table 3-13: Distribution of Samples (Institutions) (2).....	3-8
Table 3-14: Targeted Areas and Vehicles for the Time and Motion Survey .....	3-10
Table 3-15: Schedule of Time and Motion Survey .....	3-11
Table 3-16: Outline of Samples .....	3-12
Table 3-17: Hospitals and Number of Beds in AMSS.....	3-14
Table 3-18: Outline of Sample Hospitals.....	3-14
Table 4-1: Estimated Population in the Study Area in 1998 and 1999.....	4-1
Table 4-2: Collection Coverage in the Urban Area in 1992 and 1996.....	4-3
Table 4-3: Comparison of Waste Generation Ratio in Latin American Countries .....	4-5
Table 4-4: Waste Generation Ratio.....	4-6
Table 4-5: Waste Generation Amount .....	4-6
Table 4-6: Weighing Data at Mariona Final Disposal Site (1998) .....	4-8
Table 4-7: Waste Stream with Collection Routes Breakdown (After Adjustment) in 1998-9	
Table 4-8: DIGESTYC Census Data .....	4-10
Table 4-9: Ratio of On-site Disposal Method.....	4-10
Table 4-10: Waste Stream in 1998.....	4-11
Table 4-11: Waste Generation Ratio.....	4-13
Table 4-12: Number of Bed .....	4-14
Table 4-13: Waste Generation Amount .....	4-14
Table 4-14: Distribution Ratio .....	4-15
Table 4-15: Storage and Discharge System in AMSS .....	4-16
Table 4-16: Collection Method .....	4-18
Table 4-17: Present Collection Areas and Routes.....	4-19
Table 4-18: Collection Vehicles Currently Owned by Municipalities.....	4-19
Table 4-19: Types of Compactor Trucks Used in the Study Area .....	4-20
Table 4-20: Conditions of Collection Vehicles.....	4-20
Table 4-21: Working Rate of Vehicle according to Manufacture Year .....	4-20
Table 4-22: Working Rate of Vehicle according to Municipality.....	4-21
Table 4-23: Productivity of Compactor Truck.....	4-21
Table 4-24: Productivity of 11yd <sup>3</sup> Compactor Truck.....	4-21
Table 4-25: Productivity of 16yd <sup>3</sup> Compactor Truck.....	4-22
Table 4-26: Productivity of 18yd <sup>3</sup> Compactor Truck.....	4-22
Table 4-27: Loading Condition of 11 yd <sup>3</sup> Compactor Truck .....	4-23
Table 4-28: Loading Condition of 16 yd <sup>3</sup> Compactor Truck .....	4-23
Table 4-29: Loading Condition of 18 yd <sup>3</sup> Compactor Truck .....	4-23
Table 4-30: Haulage Data of MIDES from Mariona to Nejapa.....	4-24
Table 4-31: Haulage Distance.....	4-25
Table 4-32: Workshops in AMSS.....	4-26
Table 4-33: Micro-enterprises in AMSS in 1995.....	4-27
Table 4-34: Distribution of Registered Micro-enterprises in AMSS in 1999.....	4-27
Table 4-35: Current Contract Type .....	4-28
Table 4-36: Composting Plants in AMSS.....	4-29
Table 4-37: Length of Manual Street Sweeping .....	4-31
Table 4-38: Length of Street Sweeping by Mechanical Sweeper .....	4-31
Table 4-39: Road Sweepers owned by San Salvador.....	4-31

Table 4-40: Final Disposal Sites Used by the 14 Municipalities .....	4-32
Table 4-41: Landfilling Operation of Respective FDS .....	4-35
Table 4-42: Landfill Structure of Existing Disposal Sites .....	4-36
Table 4-43: Mitigation Management of Final Disposal Site.....	4-37
Table 4-44: Precautious Management of Final Disposal Site.....	4-38
Table 4-45: Landfill Active Management.....	4-38
Table 4-46: SWM Activities by NGOs.....	4-40
Table 4-47: Juridical Framework related to Solid Waste Management.....	4-43
Table 4-48: Functions to be performed by Institutions and Entities of SWM in AMSS (Year 1999) .....	4-45
Table 4-49: Institutional Coordination.....	4-46
Table 4-50: Organization chart and Municipal Ordinances in AMSS .....	4-48
Table 4-51: Hierarchy of the Cleansing Service in Municipalities of AMSS (Staff and resources), 1999 .....	4-52
Table 4-52: Planning System of the Cleansing Service .....	4-53
Table 4-53: Financial System 1999.....	4-54
Table 4-54: Cleansing Service Staff in AMSS (1999).....	4-55
Table 4-55: Participation of Enterprises and Micro-enterprises in SWM in AMSS.....	4-56
Table 4-56: Management of Pathological Hospital Wastes.....	4-57
Table 4-57: Trend of Annual Revenue and Expenditure .....	4-59
Table 4-58: Tax and Fee Collection.....	4-60
Table 4-59: Cleansing Fee .....	4-61
Table 4-60: Landfill Fee of Mejicanos Municipality .....	4-62
Table 4-61: Landfill Fee of Delgado Municipality .....	4-62
Table 4-62: Landfill Fee of Five (Ayutuxtepeque, San Marcos, Soyapango, Ilopango, Apopa) Municipalities.....	4-63
Table 4-63: Landfill Fee of Nueva San Salvador Municipality .....	4-63
Table 4-64: Collected Fee in 1999 .....	4-64
Table 4-65: Trend of Cleansing Department Annual Expenditure .....	4-65
Table 4-66: Summary of Annual Expenditure (1999 Real) .....	4-66
Table 4-67: Breakdown of Annual Expenditure .....	4-66
Table 4-68: Unit Cost of SWM.....	4-68
Table 4-69: Typical Cost of Municipal SWM .....	4-69
Table 4-70: Balance of Municipal SWM (1999) .....	4-69
Table 4-71: Relevant Studies .....	4-72
Table 4-72: Proposed Investment Costs.....	4-75
Table 4-73: Proposed Program.....	4-75
Table 4-74: Minimum Amount to be disposed of at Nejapa's Sanitary Landfill.....	4-78
Table 4-75: Performance and Management of the New Sanitary Landfill, 1999 .....	4-81
Table 4-76: Other Activities of MIDES Project, 1999 .....	4-82
Table 4-77: Organizational Systems in SWM. Confirmation of Key Issues .....	4-89
Table 4-78: Examination of Current Balance of SWM .....	4-90
Table 4-79: SWM Cost and Burden on Citizen's Income (BCI) .....	4-92
Table 4-80: Representative Costs of Municipal SWM .....	4-92
Table 4-81: Willingness to Pay for Municipal SWM Fees .....	4-93
Table 5-1: Profile of Sanitary Education and Public Awareness Promotion Campaign Programs .....	5-2
Table 5-2: Applied Methodology .....	5-4
Table 5-3: Schedule of Collection Service Experiment.....	5-9

Table 5-4: Calculation of Required Number of Containers (Maria Auxiliadora, Cuscatancingo).....	5-11
Table 5-5: Calculation of Required Number of Containers (10 de Octubre, San Marcos).....	5-11
Table 6-1: Goals, Targets, and Strategies .....	6-5
Table 6-2: Master Plan Components.....	6-6
Table 6-3: Action Plan for Regional Management System.....	6-7
Table 6-4: Action plans of Technical Aspects .....	6-7
Table 6-5: Action Plan for Respective Municipalities.....	6-8
Table 6-6: Population Growth Rate in Rural Area.....	6-12
Table 6-7: Population Forecast in AMSS (1999 – 2010).....	6-13
Table 6-8: Composition of Residential Waste .....	6-14
Table 6-9: Composition of Commercial, Institutional, Market and Road Sweeping Wastes.....	6-14
Table 6-10: Moisture Content .....	6-15
Table 6-11: Carbon and Nitrogen Content.....	6-15
Table 6-12: Waste Generation Ratio.....	6-15
Table 6-13: Forecast Parameters in 2010.....	6-16
Table 6-14: Waste Generation Amount in 2010 .....	6-16
Table 6-15: Forecast of Future Medical Waste Generation Amount .....	6-17
Table 6-16: Forecast of Economic Growth Rate until 2004 .....	6-17
Table 6-17: GRDP in San Salvador Metropolitan Area.....	6-18
Table 6-18: GRDP in San Salvador Metropolitan Area.....	6-18
Table 6-19: Financial Scale of Municipalities .....	6-18
Table 6-20: Prediction of Average Household Income.....	6-19
Table 6-21: Current Financial System of Municipality.....	6-19
Table 6-22: Budget of OPAMSS .....	6-20
Table 6-23: Balance of OPAMSS .....	6-20
Table 6-24: Definition of Collection and Transport System.....	6-22
Table 6-25: With/Without Primary Collection .....	6-23
Table 6-26: Potential Technical Alternatives of Primary Collection.....	6-23
Table 6-27: Institutional Consideration of Primary Collection.....	6-24
Table 6-28: Communal Storage (station).....	6-24
Table 6-29: Communal Storage (container).....	6-24
Table 6-30: House to House Collection by Community-based Collection.....	6-25
Table 6-31: House to House Collection by Micro-enterprise .....	6-25
Table 6-32: With/Without Transfer Transport.....	6-27
Table 6-33: Potential Technical Alternatives of Transport.....	6-28
Table 6-34: Cost Estimates of Transport (Summary) .....	6-30
Table 6-35: Cost Estimates of Transfer Station (Summary).....	6-30
Table 6-36: Breakeven Distance/Time between Direct and Transfer Transport and its Unit Cost .....	6-31
Table 6-37: Travel Time to Nejapa Disposal Site.....	6-32
Table 6-38: Cost Reduction by Transfer Transport (Case 1; T/S 1-1, 1200t).....	6-37
Table 6-39: Cost Reduction by Transfer Transport (Case 2; T/S 2-1, 300t; T/S 2-2, 600t; T/S 2-3, 300t).....	6-38
Table 6-40: Transport Cost Reduction of Transfer Transport (Case 3; T/S 3-1, 300t; T/S 3-2 900T).....	6-38
Table 6-41: Comparison of Collection Amount by Direct or Transfer Transport .....	6-39
Table 6-42: Collection and Transport Cost Reduction by Transfer Transport (Case 1; T/S 1-1, 1200t) .....	6-40

Table 6-43: Collection and Transport Cost Reduction by Transfer Transport (Case 2; T/S 2-1, 300t; T/S 2-2 600t; T/S 2-3, 300t) .....	6-40
Table 6-44: Collection and Transport Cost Reduction by Transfer Transport (Case 3; T/S 3-1, 300t; T/S 3-2 900t).....	6-41
Table 6-45: Comparative Evaluation of Transfer Stations by Size.....	6-42
Table 6-46: Comparative Evaluation of Transfer Stations by Type .....	6-44
Table 6-47: Objectives and Methods of Intermediate Processing System .....	6-46
Table 6-48: Objectives and Activities of Selection Plant (S/P) .....	6-48
Table 6-49: Comparison of Aerobic and Anaerobic Composting for Organic Fraction of Municipal SW .....	6-49
Table 6-50: Outline of Technical Standard for MSW Landfill.....	6-50
Table 6-51: Correlation of Capacity and Unit Cost of Sanitary Landfill .....	6-53
Table 6-52: Conceptual Cost Estimation for Participation in MIDES Nejapa Landfill....	6-56
Table 6-53: Conceptual Cost Estimation for Participation in New ESPIGA Landfill.....	6-56
Table 6-54: Comparison of Alternatives for AC.....	6-56
Table 6-55: Comparison of Alternatives for CT .....	6-57
Table 6-56: Conceptual Cost Estimation for Proper Landfill in SMT and TN.....	6-58
Table 6-57: Conceptual Cost Estimation for Co-use Landfill by 2 Municipalities .....	6-59
Table 6-58: Conceptual Cost Estimation for Participation in MIDES Nejapa Landfill....	6-60
Table 6-59: Conceptual Cost Estimation for Participation in New ESPIGA Landfill.....	6-60
Table 6-60: Comparison of Alternatives for SMT .....	6-60
Table 6-61: Comparison of Alternatives for TN.....	6-61
Table 6-62: Categories of Medical Waste.....	6-62
Table 6-63: Collection Container for Medical Waste .....	6-66
Table 6-64: Options for Participation by Private Sector in Solid Waste Management....	6-72
Table 6-65: Commission of EDE for Rate Collection .....	6-82
Table 6-66: Entities in charge of DB Process .....	6-83
Table 6-67: Monthly Average Consumption per Subscriber in 1999 .....	6-86
Table 6-68: Monthly Average of Users and Number.....	6-86
Table 6-69: Comparison of Assigned Fee.....	6-87
Table 6-70: Total Amount Billed by MIDES (Final Disposal).....	6-88
Table 7-1: Institutional Approach of SWM Elements within AMSS .....	7-9
Table 7-2: Optimal Operation Methods Proposed for SWM in AMSS.....	7-13
Table 7-3: Advantages and Disadvantages of Direct and Contracted Operation of SWM.....	7-14
Table 7-4: Scheme of Supervision and Control for SWM in AMSS.....	7-16
Table 7-5: Proposals to Minimize Social Restrictions.....	7-17
Table 7-6: Billing amount by MIDES and Burden to Municipal Finance in 1999 .....	7-20
Table 7-7: Comparison of Waste Collection Costs.....	7-21
Table 7-8: Municipal Burden to Replace Vehicles in 2001 .....	7-22
Table 7-9: Municipal Burden to Replace Vehicles in 2003 .....	7-23
Table 7-10: Total Balance of SWM until 2010.....	7-23
Table 7-11: Scale of T/S and Municipalities Using T/S (Case A).....	7-24
Table 7-12: Unit Cost and Breakdown (Case A) .....	7-25
Table 7-13: Scale of T/S and Municipalities Using T/S (Case B) .....	7-25
Table 7-14: Unit cost and its Breakdown (Case B).....	7-25
Table 7-15: Improvement of Total Balance until Year 2010 by Adopting Respective Measures .....	7-26
Table 7-16: Municipal Burden Transfer to replace vehicles in 2001 and in 2003 .....	7-26
Table 7-17: General Quality Parameters for Collection and Sweeping Services.....	7-30

Table 7-18: Technical Quality Parameters for Collection and Sweeping Services .....	7-31
Table 7-19: Technical Quality Parameters for Collection Services Only .....	7-31
Table 7-20: Technical Quality Parameters Specific for Sweeping .....	7-32
Table 7-21: Average Cost Structure of Efficient SWM (Collection and Final Disposal) in Latin America.....	7-34
Table 7-22: Current Deficiencies in the System of the San Salvador Municipality, Some Parameters of an Efficient Model Enterprise for the Tariff Calculation and Regulation .....	7-38
Table 8-1: Collection Service Coverage Ratio.....	8-3
Table 8-2: Target of Separate Collection Ratio .....	8-3
Table 8-3: Regional Management System .....	8-7
Table 8-4: Action plans of Technical Aspects .....	8-8
Table 8-5: Action Plan for Respective Municipalities (1) .....	8-8
Table 8-6: Action Plan for Respective Municipalities (2) .....	8-9
Table 8-7: Action Plan for Respective Municipalities (3) .....	8-10
Table 8-8: Action Plan for Respective Municipalities (4) .....	8-11
Table 8-9: Institutionalization of the M/P for SWM in AMSS.....	8-13
Table 8-10: Summary of the Institutional Considerations Proposed in the M/P .....	8-16
Table 8-11: Institutional Arrangement to Minimize Social Restrictions .....	8-17
Table 8-12: Strengthening of SWM Organizational Systems in Each of the 13 municipalities (*) .....	8-18
Table 8-13: Population forecast in AMSS (1999 – 2010) .....	8-19
Table 8-14: Waste Generation Amount in 2010 .....	8-20
Table 8-15: Forecast of Future Medical Waste Generation Amount .....	8-20
Table 8-16: Major Users of Transfer Stations.....	8-22
Table 8-17: Breakdown of MIDES Project.....	8-24
Table 8-18: Outline of Tonacatepeque Landfill Site.....	8-25
Table 8-19: Tipping Fee of Tonacatepeque S/L.....	8-25
Table 8-20: Collection and Transport Cost.....	8-25
Table 8-21: Comparison of Collection/Haulage and Landfill Cost .....	8-26
Table 8-22: Proposal of Hazardous Medical SWM .....	8-31
Table 8-23: Recommendation for the Execution of the PPS Contracts.....	8-33
Table 8-24: Monitoring Performance.....	8-35
Table 8-25: Required Personnel for the Execution Unit.....	8-40
Table 8-26: Personnel Table .....	8-42
Table 8-27: Total Expenditure Comparison of With/Without M/P .....	8-49
Table 8-28: Summary of Expenditure of Regional Management System.....	8-50
Table 8-29: Condition for Projects' Cost Estimation.....	8-51
Table 8-30: Results of Projects' Cost Estimation .....	8-52
Table 8-31: Regional Projects Unit Rate to be Internalized for Respective Municipal Expenditures.....	8-55
Table 8-32: Summary of Expenditure of Individual Management System.....	8-56
Table 8-33: Income Improvement of Total Balance until year 2010 by Adopting Respective Measures .....	8-58
Table 8-34: Minimum Increase of Fee and its Burden on Citizen's Income .....	8-59
Table 8-35: Revenue Plan .....	8-60
Table 8-36: Financial Status in 2010 .....	8-61
Table 8-37: Program of Sanitary Education and Public Participation (Draft) .....	8-62
Table 8-38: Unit Costs .....	8-63



Table 8-39: Outline of Transfer Station Facilities .....	8-65
Table 8-40: Outline of Facility.....	8-65
Table 8-41: Outline of Tonacatepeque Landfill Site.....	8-66
Table 8-42: Overall Cost.....	8-67
Table 8-43: Cost of Container Collection System .....	8-70
Table 8-44: Number of Collection Vehicle.....	8-72
Table 8-45: Collection Cost .....	8-74
Table 8-46: Road Sweeping Cost (Manual Sweeping).....	8-75
Table 8-47: Road Sweeping Cost (Mechanical Sweeping, San Salvador only) .....	8-76
Table 8-48: Conditions of Respective Financing Alternatives .....	8-79
Table 8-49: Unit Costs based on the Respective Financing Conditions .....	8-79
Table 8-50: Financial Evaluation Method for MP .....	8-80
Table 8-51: Revenue and Expenditure for Financial Evaluation of Regional Management System.....	8-81
Table 8-52: Revenue Plan for Financial Evaluation of Regional Management System .....	8-82
Table 8-53: Estimate Condition .....	8-82
Table 8-54: Expenditure for Cases of “With M/P” and “Without M/P” .....	8-83
Table 8-55: Costs for Utilizing Regional Projects for Respective Municipalities.....	8-84
Table 8-56: Comparison of Total Balance until 2010.....	8-85
Table 8-57: Comparison of Total Balance until 2010 in San Martin and Tonacatepeque for the Cases of “With M/P” and “To Participate MIDES S/L” .....	8-85
Table 8-58: Total Balance Improvement by Adopting Measures-1 (joint-billing with electricity and fee collection rate increase) .....	8-86
Table 8-59: Total Balance Improvement by Adopting Measures-2 (specific duty on large dischargers ) .....	8-87
Table 8-60: Price Increase Rate and Total Balance until Year 2010 .....	8-88
Table 8-61: Representative Costs of Municipal SWM in Middle Income Countries and Percentage on Citizen’s Income.....	8-88
Table 8-62: Total Balance in Cases of Other Financing Conditions.....	8-89
Table 8-63: Share of SWM Burden to Municipal Budget in Cases of Other Financing Conditions .....	8-90
Table 8-64: Institutional Evaluation of M/P in line with Objectives and Components ....	8-92
Table 8-65: Summary of Social Evaluation of the M/P .....	8-96
Table 8-66: Phased Implementation Plan for Regional System.....	8-99
Table 8-67: Implementation Plan for Individual System (1) .....	8-100
Table 8-68: Implementation Plan for Individual System (2) .....	8-101
Table 8-69: Implementation Plan for Individual System (3) .....	8-102
Table 8-70: Implementation Plan for Individual System (4) .....	8-103
Table 8-71: Comparison of Alternatives.....	8-107

## List of Figures

	Page:
Figure 1-1: Study Schedule .....	1-5
Figure 1-2: Study Organizational Structure .....	1-6
Figure 1-3: Study Area.....	1-8
Figure 2-1: Economic Growth Rate (GDP) .....	2-3
Figure 2-2: Annual Inflation Rate .....	2-5
Figure 2-3: External Sector .....	2-5
Figure 2-4: Zoning Map in AMSS .....	2-18
Figure 3-1: Distribution of Samples in the Study Area.....	3-7
Figure 4-1: Concept of Present Waste Stream .....	4-5
Figure 4-2: Overall Waste Stream in 1998 .....	4-12
Figure 4-3: Concept of Present Medical Waste Stream .....	4-13
Figure 4-4: Present Medical Waste Stream.....	4-15
Figure 4-5: Collection and Haulage System in AMSS .....	4-17
Figure 4-6: Locations of Existing Final Disposal Sites .....	4-34
Figure 4-7: Regulatory and Operative Institutional Framework of SWM in AMSS .....	4-44
Figure 4-8: Organizational Structure of Soyapango Municipality .....	4-49
Figure 4-9: Organizational Structure of Ayutuxtepeque Municipality .....	4-50
Figure 4-10: Organizational Structure of Cleansing Department in San Salvador Municipality .....	4-51
Figure 4-11: Relation among BCI, ATP and WTP .....	4-94
Figure 5-1: Implementation Flowchart of Pilot Project .....	5-5
Figure 5-2: Map of Project Site (Maria Auxiliadora, Cuscatancingo).....	5-7
Figure 5-3: Map of Project Site (10 de Octubre, San Marcos) .....	5-8
Figure 5-4: Implementation Plan of Collection Route Improvement .....	5-14
Figure 6-1: Flow of Examination on Transport Method.....	6-29
Figure 6-2: Break-even Distance/Time between Direct and Transfer Transport and its Unit Cost .....	6-31
Figure 6-3: Travel Time to Nejapa Disposal Site (round trip).....	6-32
Figure 6-4: Waste Amount and Weighted Center of Municipalities.....	6-34
Figure 6-5: Transfer Station and its Covering Area (Case 1) .....	6-35
Figure 6-6: Transfer Station and its Covering Area (Case 2) .....	6-36
Figure 6-7: Transfer Station and its Covering Area (Case 3) .....	6-36
Figure 6-8: Correlation of Capacity and Unit Cost of Sanitary Landfill.....	6-53
Figure 6-9: Representative Cost of Collection and Transport (18yd <sup>3</sup> Compactor).....	6-54
Figure 6-10: Estimated Concept of Co-use Landfill by 2 Municipalities .....	6-59
Figure 6-11: Data Flow of Current Fee Collection System.....	6-84
Figure 6-12: Proposed Data Flow .....	6-89
Figure 6-13: Databases under the Municipality's Control .....	6-90
Figure 6-14: Database for Collection Control.....	6-91
Figure 7-1: Transformation Process ( <i>terciarizacion</i> ) of the Municipality of San Salvador and Creation of a San Salvador Municipal Public Company of Urban Cleansing (EMAUSS) .....	7-8
Figure 8-1: Present Municipal SWM System .....	8-1
Figure 8-2: Proposed MSWM System .....	8-2
Figure 8-3: Location of Transfer Station.....	8-4

Figure 8-4: Regional Municipal Solid Waste Management in AMSS.....	8-14
Figure 8-5: Metropolitan Hazardous Medical SWM System in AMSS .....	8-15
Figure 8-6: Waste Stream in 2003 .....	8-27
Figure 8-7: Waste Stream in 2006 .....	8-27
Figure 8-8: Waste Stream in 2010 .....	8-28
Figure 8-9: Functional Structure of SWM Execution Unit of OPAMSS .....	8-37
Figure 8-10: Proposed Administrative Structure for the Municipal Company .....	8-41
Figure 8-11: Information Flow Diagram of Waste Fee Collection .....	8-43
Figure 8-12: Expenditure Control System; Information Flow for Making Acquisitions..	8-44
Figure 8-13: Expenditure Control System; Information Flow to Hire Personnel .....	8-44
Figure 8-14: Expenditure Control System; Information Flow to Control and Supervise Contracts .....	8-44
Figure 8-15: Quality Control, Monitoring and Supervision System .....	8-47
Figure 8-16: Location of Tonacatepeque Landfill Site .....	8-66
Figure 8-17: Present System .....	8-104
Figure 8-18: Proposed System .....	8-104
Figure 8-19: Alternative 1 .....	8-105
Figure 8-20: Alternative 2 .....	8-105
Figure 8-21: Alternative 3 .....	8-106
Figure 8-22: Alternative 3 .....	8-106

## List of Abbreviations

<b>AECI</b>	Spanish International Cooperation Agency
<b>AIDIS</b>	Inter-American Sanitary Engineering and Environmental Association
<b>AMSS</b>	San Salvador Metropolitan Area
<b>ANDA</b>	National Aqueduct and Sewerage Administration
<b>ATP</b>	Availability to pay
<b>AU</b>	Urbanized/urbanizable Area
<b>B/D</b>	Basic Design
<b>BCI</b>	Burden on citizens' income
<b>BCR</b>	Central Reserve Bank
<b>BHN</b>	Basic Human Needs
<b>BOD</b>	Biological demand of oxygen
<b>BOOT</b>	Build Own Operate and Transfer
<b>BOT</b>	Build Operate and Transfer
<b>BYRP</b>	Bond Yield Risk Premium Approach
<b>C/P</b>	Counterpart
<b>C/P</b>	Compost Plant
<b>CAESS</b>	Electric Lighting Company of San Salvador
<b>CAPM</b>	Capital Asset Pricing Model
<b>CD</b>	Controlled Dumping
<b>CDA</b>	Department Council of Mayors
<b>CEPRHI</b>	Executive Committee for the Protection of Hydraulic Resources
<b>CESTA</b>	Appropriate Technology Center
<b>CIDA</b>	Canadian International Development Agency
<b>COAMSS</b>	Mayors Council for San Salvador Metropolitan Area
<b>COD</b>	Chemical oxygen demand
<b>COMURES</b>	Association of Municipalities in the Republic of El Salvador
<b>CPI</b>	Consumer Price Index
<b>CRC</b>	Zone Coverage
<b>CS</b>	Cleansing service
<b>CTR</b>	Cost per ton collected
<b>CTT</b>	Cost per ton transported
<b>D/D</b>	Detailed Design
<b>D/S</b>	Disposal Site
<b>DA</b>	Agricultural Development Zone
<b>DB</b>	Data Base
<b>DELSUR</b>	Electricity Distribution Company of the South
<b>DIGESTYC</b>	General Directorate of Statistics and Census
<b>DR</b>	Restricted Development Zone
<b>DTE</b>	Ecologically-sustainable Tourism Development Zone
<b>DUA</b>	Directorate of Urbanism and Architecture
<b>ECC</b>	Efficiency on Use of Truck Capacity
<b>EDE</b>	Electricity Distribution Companies
<b>EIA</b>	Environment Impact Assessment
<b>EMAUSS</b>	San Salvador Municipal Public Company of Urban Cleansing
<b>ERZ</b>	Route Efficiency Use in Zone
<b>FDS</b>	Final Disposal Site
<b>FIRR</b>	Financial Internal Rate of Return
<b>FISDL</b>	Social Investment Fund for Local Development

<b>FMLN</b>	Farabundo Marti National Liberation Party
<b>FODES</b>	Economic and Social Development Fund
<b>FS</b>	Feasibility Study
<b>FUSADES</b>	Salvadoran Fund for Development
<b>FUSAL</b>	Salvadoran Fund for Health and Development
<b>GC</b>	Gathering Center
<b>GCK</b>	Fuel Expense per Kilometer
<b>GDP</b>	Gross Domestic Product
<b>GRDP</b>	Gross Regional Domestic Product
<b>GTZ</b>	German Technical Cooperation
<b>GVW</b>	Gross Vehicle Weight
<b>HDPE</b>	High Density Polyethylene
<b>HHI</b>	Herfindahl-Hirschman Index
<b>ICI</b>	Institutions, Commercials and Industries
<b>IDB</b>	Inter-American Development Bank
<b>IRDB</b>	International Reconstruction and Development Bank
<b>ISDEM</b>	Salvadoran Institute for Municipal Development
<b>ISSS</b>	Salvadoran Institute of Social Security
<b>IUDOP</b>	University Institution of Public Opinion
<b>JBIC</b>	Japan Bank for International Cooperation
<b>JICA</b>	Japan International Cooperation Agency
<b>KXG</b>	Kilometer per Fuel Gallon
<b>M/P</b>	Master Plan
<b>MARN</b>	Ministry of Environment and Natural Resources
<b>MIDES</b>	Integral Solid Waste Management (company)
<b>MINED</b>	Ministry of Education
<b>MOH</b>	Ministry of Finance
<b>MP</b>	Maximum Protection Zone
<b>MRF</b>	Material Recovery Facility
<b>MSPAS</b>	Ministry of Public Health and Social Assistance
<b>MSW</b>	Municipal Solid Waste
<b>MUS</b>	Minimum Urban Salary
<b>MWI</b>	Medical Waste Incineration
<b>MWS</b>	Medical Waste Survey
<b>NGOs</b>	Non-Governmental Organizations
<b>O&amp;M</b>	Operation and Maintenance
<b>O/D</b>	Open Dumping
<b>OPAMSS</b>	Planning Office For San Salvador Metropolitan Area
<b>PAHO</b>	Pan-American Health Organization
<b>PET</b>	Polyethylene Terephthalate
<b>PLAMADUR</b>	Urban Development Master Plan
<b>PNC</b>	Civil National Police
<b>POS</b>	Public opinion survey
<b>PROCOMES</b>	Association of Communal Projects of El Salvador
<b>PSP, PPS</b>	Private Sector Participation
<b>RCXE</b>	Collection per Employee
<b>RCXEH</b>	Collection Efficiency per Employee
<b>RCXK</b>	Waste Production per Kilometer
<b>REDES</b>	Salvadoran Foundation for Reconstruction and Development
<b>S/L</b>	Sanitary landfill
<b>S/P</b>	Selection Plant

<b>SACDEL</b>	Consulting and Training System for Local Development
<b>SAE</b>	Environment Service Specialists
<b>SEMA</b>	Executive Secretariat for Environment
<b>SIGET</b>	Superintendent's Office of Electricity and Telecommunications
<b>SINAMA</b>	National Environment Arrangement System
<b>SW</b>	Solid wastes
<b>SWEU</b>	Solid Waste Management Executing Unit
<b>SWM</b>	Solid Waste Management
<b>SW-SRE</b>	Solid Waste Service-Rendering Enterprises
<b>T&amp;M</b>	Time and Motion
<b>T/S</b>	Transfer Station
<b>TDS</b>	Total Dissolved Solids
<b>UCA</b>	José Simeón Cañas Central American University
<b>UE-OPAMSS</b>	Execution Unit of SWM of OPAMSS
<b>UNES</b>	Salvadoran Ecological Unity
<b>USAID</b>	United States Agency for International Development
<b>UTLA</b>	Latin-American Technology University
<b>VAT</b>	Value Added Tax
<b>VRC</b>	On-route Velocity
<b>VT</b>	Haulage Velocity
<b>WACS</b>	Waste Amount and Composition Survey
<b>WHO</b>	World Health Organization
<b>WTP</b>	Willingness to pay
<b>ZP</b>	Protection Zone

### **Abbreviations for the 14 Municipalities**

<b>SS</b>	San Salvador
<b>MJ</b>	Mejicanos
<b>CD</b>	Delgado
<b>CT</b>	Cuscatancingo
<b>AY</b>	Ayutuxtepeque
<b>SM</b>	San Marcos
<b>ST</b>	Nueva San Salvador
<b>AC</b>	Antiguo Cuscatlan
<b>SY</b>	Soyapango
<b>IL</b>	Ilopango
<b>SMT</b>	San Martin
<b>AP</b>	Apopa
<b>NJ</b>	Nejapa
<b>TN</b>	Tonacatepeque