

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

THE MINISTRY OF ENVIRONMENT
THE REPUBLIC OF TURKEY

**THE STUDY
ON
REGIONAL SOLID WASTE
MANAGEMENT
FOR
ADANA-MERSIN
IN
THE REPUBLIC OF TURKEY**

**FINAL REPORT
VOLUME II**

MAIN REPORT

JANUARY 2000

KOKUSAI KOGYO CO., LTD.

PREFACE

In response to a request from the Government of the Republic of Turkey, the Government of Japan decided to conduct a Master plan and feasibility Study on Regional Solid Waste Management for Adana-Mersin in the Republic of Turkey and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Susumu Shimura, Kokusai Kogyo Co., Ltd. to Turkey, four times between July 1998 to January 2000. In addition, JICA set up an advisory committee headed by Mr. Takashi Ikeguchi, Section Chief of Waste Disposal Engineering Section, Engineering of Waste Management Department, National Institute of Public Health, Ministry of Health and Welfare between July 1998 to January 2000, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of Turkey 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 Turkey for their close cooperation extended to the study.

January 2000



Kimio Fujita

President

Japan International Cooperation Agency

January 2000

Mr. Kimio Fujita
President
Japan International Co-operation Agency

Letter of Transmittal

Dear Mr. Fujita,

It is our pleasure to submit to you the report on the Study on Regional Solid Waste Management for Adana-Mersin in the Republic of Turkey.

The report consists of three components: the study on the present Solid Waste Management (SWM); the formulation of the SWM master plan until the year 2020; and the feasibility study on the priority projects drawn from the master plan.

During the study on the present SWM, six field investigations were conducted, and existing data and information of various sources were collected and examined. By doing so, the current status of SWM in Adana-Mersin was thoroughly understood, and the issues to be considered identified.

The master plan was formulated with the principal goal of "creating a closed-loop society on solid waste in Adana and Mersin Greater Municipalities by the target year 2020" through waste minimisation (the control of waste generation as much as possible), recycling (the recycling of generated waste as much as possible), and waste stabilisation (the safe disposal of wastes that cannot be recycled in an environmentally friendly manner).

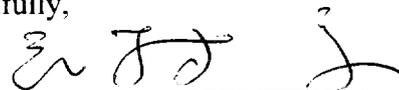
The feasibility study was carried out on five priority projects that should be implemented from 2000 to 2005: the introduction of a separate collection system; the construction of sorting and composting plants; and the construction of municipal and medical solid waste final disposal sites. From the technical, the social, the environmental, the financial, and the economical assessments of these projects, we concluded that they would be viable and sound in every aspect.

During the study we conducted two pilot projects, with the close co-operation of the Turkish counterparts, in order to identify and to overcome the difficulties that may arise in the realisation of the master plan: Experiment of Sofulu Disposal Site (a open dump site) Improvement and Experiment on Separate Collection/Compost Quality Improvement. We also held workshops on technology transfer to publicise the results of the study. These activities were reported in the local media, and attracted much attention from the general public.

We would like 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 would also like to extend our deep appreciation to the Ministry of Environment of Turkey, Adana and Mersin Greater Municipalities, the Embassy of Japan, and the JICA office in Turkey for their vital co-operation during the implementation of our study in the Republic of Turkey.

Last but not least, we hope that the output of our study presented here will contribute to the improvement of SWM and the creation of a closed loop society.

Respectfully,



Susumu Shimura

Team Leader

The Study on Regional Solid Waste Management
for Adana-Mersin in the Republic of Turkey

The Study on Regional Solid Waste Management for Adana-Mersin in the Republic of Turkey

List of Volumes

Volume I	Executive Summary
Volume II	Main Report
Volume III	Annex
Volume IV	Data Book

This is the Main Report.

In this Report, the project cost is estimated by using the price as of the end of May 1999 and the exchange rate of US\$ 1.00 = 120.0 Japanese Yen = 407,000 Turkish Lire(TL.).

Contents

Preface	
Letter of Transmittal	
List of Volumes	
Maps	
Plates	
Plate 1	: Field Investigations (1) Waste Amount and Composition Survey
Plate2	: Field Investigations (2) Survey on Medical Institutions and T&M Survey
Plate 3	: Field Investigations (3) Recycling Activities Survey
Plate 4	: Field Investigations (4) Survey for the EIA
Plate 5	: Current SWM in Adana
Plate 6	: Current SWM in Mersin
Plate 7	: Pilot Project in Adana (1)
Plate 8	: Pilot Project in Adana (2)
Plate 9	: Pilot Project in Mersin
Plate 10	: Sofulu Overall Site Development Plan
Plate 11	: Cimsa Overall Site Development Plan

Page :

PART I Current Situation of the Solid Waste Management

1 Introduction	1-1
1.1 Background.....	1-1
1.2 Scope of the Study	1-2
1.2.1 Objectives of the Study	1-2
1.2.2 Study Area	1-2
1.2.3 Solid Waste to be Covered Under the Study	1-2
1.2.4 Target Year	1-2
1.3 Policies of the Study	1-2
1.4 Work Schedule of the Study	1-5
1.5 Study Organisation and Persons Involved	1-7
1.5.1 Study Organisation.....	1-7
1.5.2 Persons Involved.....	1-7
1.6 Reports	1-9
1.7 Technology Transfer	1-9
2 Profile of the Study Area	2-1
2.1 Study Area and Target Area.....	2-1
2.1.1 Division of Municipalities	2-1
2.1.2 Study Area and Target Area.....	2-1

2.2 Adana Greater Municipality	2-1
2.2.1 Natural Conditions	2-1
2.2.2 Social Conditions	2-5
2.2.3 Population	2-11
2.2.4 City Development M/P	2-14
2.2.5 Housing Conditions and Urban Structure	2-14
2.2.6 Economic Conditions	2-18
2.3 Mersin Greater Municipality	2-25
2.3.1 Natural Conditions	2-25
2.3.2 Social Conditions	2-26
2.3.3 Population	2-32
2.3.4 City Development M/P	2-34
2.3.5 Housing Conditions and Urban Structure	2-36
2.3.6 Economic Conditions	2-38
3 Findings through Field Investigations	3-1
3.1 Waste Amount and Composition Survey (WACS)	3-1
3.1.1 Method of the Survey	3-1
3.1.2 Results of the Survey	3-2
3.2 Public Opinion Survey (POS)	3-5
3.3 Opinion Survey on Medical Institutions	3-7
3.4 Time and Motion Survey	3-7
3.5 Compost Market Survey	3-8
3.5.1 Objectives of the Survey	3-8
3.5.2 Method of the Survey	3-9
3.5.3 Results of the Survey	3-9
3.6 Survey on Recycling System	3-9
3.6.1 Objectives of the Survey	3-9
3.6.2 Method of the Survey	3-10
3.6.3 Results of the Survey	3-10
3.7 Survey on Scavengers	3-14
3.7.1 Objectives of the Survey	3-14
3.7.2 Method of the Survey	3-14
3.7.3 Scavengers in the Cities (Street Waste Pickers)	3-14
3.7.4 Scavengers at the Final Disposal Site	3-15
4 Present SWM Conditions	4-1
4.1 Present SWM Conditions	4-1
4.1.1 Present Waste Stream	4-1
4.1.2 Present SWM Conditions	4-4
4.2 Assessment of Present SWM Conditions	4-11

PART II The Solid Waste Management Master Plan

5 Planning Frameworks for a SWM Master Plan	5-1
5.1 For Adana GM	5-1
5.1.1 Siting of Future SWM Facilities	5-1
5.1.2 Forecast of Future Waste Amount and Composition.....	5-5
5.1.3 Forecast of Medical Waste Generation.....	5-8
5.1.4 Other Pre-conditions	5-8
5.2 For Mersin GM	5-10
5.2.1 Siting of Future SWM Facilities	5-10
5.2.2 Forecast of Future Waste Amount and Composition.....	5-13
5.2.3 Forecast of Medical Waste Generation.....	5-16
5.2.4 Other Pre-conditions	5-16
6 Selection of the Best Technical System Scenario	6-1
6.1 Selection of an Optimum Technical System.....	6-1
6.1.1 Selection Method	6-1
6.1.2 Preconditions for Selection of Subsystems.....	6-1
6.1.3 Identification of Potential Subsystems.....	6-2
6.2 Selection of the Best Technical System Scenario for Adana.....	6-5
6.2.1 Presentation of Technical System Scenarios	6-5
6.2.2 Conceptual Design	6-6
6.2.3 Cost Estimation.....	6-13
6.2.4 Selection of the Best Technical System Scenario.....	6-16
6.2.5 Environmental Issues for EIA of F/S Projects	6-19
6.3 Selection of the Best Technical System for Mersin.....	6-22
6.3.1 Presentation of Technical System Scenarios	6-22
6.3.2 Conceptual Design	6-23
6.3.3 Cost Estimation.....	6-30
6.3.4 Selection of the Best Technical System Scenario.....	6-33
6.3.5 Environmental Issues for EIA of F/S Projects	6-36
7 The SWM Master Plan for Adana	7-1
7.1 Outline of the Master Plan.....	7-1
7.1.1 Goals	7-1
7.1.2 Targets.....	7-2
7.1.3 Strategy	7-3
7.1.4 Future Waste Stream.....	7-7
7.2 Technical System	7-13
7.2.1 Planning Conditions.....	7-13
7.2.2 Discharge and Storage System.....	7-13
7.2.3 Collection and Haulage System	7-13
7.2.4 Public Area Cleansing System.....	7-14
7.2.5 Recycling and Intermediate Treatment System	7-14
7.2.6 Final Disposal System.....	7-15

7.2.7 Operation and Maintenance System	7-16
7.2.8 Medical SWM.....	7-17
7.3 Institutional System	7-18
7.3.1 Administration and Organisation.....	7-18
7.3.2 Legislation and Enforcement	7-19
7.3.3 Financial System.....	7-21
7.3.4 Privatisation and Contracting System.....	7-23
7.3.5 Monitoring and Information Management System	7-24
7.3.6 Human Resources Development.....	7-28
7.3.7 Public Education and Co-operation	7-30
7.3.8 Guidelines	7-32
7.3.9 Medical SWM.....	7-37
7.4 The SWM Master Plan	7-39
7.4.1 The SWM Master Plan	7-39
7.4.2 Preliminary Project Cost Estimation.....	7-41
7.4.3 Implementation Plan	7-42
7.5 Financial Analysis.....	7-45
7.5.1 Overall SWM Costs.....	7-45
7.5.2 Revenue Plan	7-46
7.5.3 FIRR and Cash Flow.....	7-47
8 The SWM Master Plan for Mersin.....	8-1
8.1 Outline of the Master Plan.....	8-1
8.1.1 Goals	8-1
8.1.2 Targets.....	8-2
8.1.3 Strategy	8-3
8.1.4 Future Waste Stream.....	8-7
8.2 Technical System.....	8-12
8.2.1 Planning Conditions.....	8-12
8.2.2 Discharge and Storage System.....	8-12
8.2.3 Collection and Haulage System	8-12
8.2.4 Public Area Cleansing System.....	8-13
8.2.5 Recycling and Intermediate Treatment System	8-14
8.2.6 Final Disposal System.....	8-14
8.2.7 Operation and Maintenance System	8-15
8.2.8 Medical SWM.....	8-16
8.3 Institutional System	8-17
8.3.1 Administration and Organisation.....	8-17
8.3.2 Legislation and Enforcement	8-18
8.3.3 Financial System.....	8-20
8.3.4 Privatisation and Contracting System.....	8-22
8.3.5 Monitoring and Information Management System	8-23
8.3.6 Human Resources Development.....	8-26
8.3.7 Public Education and Co-operation	8-28
8.3.8 Guidelines	8-30
8.3.9 Medical SWM.....	8-36

8.4 The SWM Master Plan	8-37
8.4.1 The SWM Master Plan	8-37
8.4.2 Preliminary Project Cost Estimation.....	8-40
8.4.3 Implementation Plan	8-41
8.5 Financial Analysis.....	8-44
8.5.1 Overall SWM Costs	8-44
8.5.2 Revenue Plan	8-45
8.5.3 FIRR and Cash Flow.....	8-46

PART III Feasibility Study for the Priority Projects

9 Pilot Project	9-1
9.1 Plan of Pilot Project.....	9-1
9.1.1 Objectives	9-1
9.1.2 Selection of Pilot Projects.....	9-1
9.1.3 Implementation Schedule.....	9-2
9.2 Experiment on the Improvement of the Sofulu Disposal Site in Adana GM	9-2
9.2.1 Background.....	9-2
9.2.2 Plan of the Experiment	9-3
9.2.3 Implementation of the Experiment	9-6
9.2.4 Findings	9-7
9.3 Experiment of the Separate Collection and Compost Quality Improvement in Mersin GM	9-8
9.3.1 Background.....	9-8
9.3.2 Plan of the Experiment	9-8
9.3.3 Implementation of the Experiment of the Separate Collection.....	9-9
9.3.4 Implementation of Experiment on Compost Quality Improvement	9-12
9.3.5 Compost Market Survey	9-18
9.4 Evaluation of the Pilot Project.....	9-20
9.4.1 Sofulu Disposal Site Improvement	9-20
9.4.2 Separate Collection	9-20
9.4.3 Compost Quality Improvement.....	9-21
10 Sofulu Site Development	10-1
10.1 Selection of the Priority Projects	10-1
10.1.1 Selection of the Priority Projects	10-1
10.1.2 Targets of the Priority Projects	10-1
10.2 Preliminary Design of Sofulu Site Development.....	10-2
10.2.1 Overall Site Development.....	10-2
10.2.2 Design of a Separate Collection System	10-4
10.2.3 Design of a Sorting Plant	10-5
10.2.4 Design of a Compost Plant	10-10
10.2.5 Design of a Final Disposal Site.....	10-17
10.2.6 Design of a Medical Waste Disposal Site.....	10-25

10.3 Operation Plan	10-30
10.3.1 Sorting Plant	10-30
10.3.2 Compost Plant.....	10-33
10.3.3 Final Disposal Site.....	10-36
10.3.4 Medical Waste Disposal Site	10-40
10.4 Cost Estimation.....	10-41
10.4.1 Separate Collection System	10-41
10.4.2 Sorting Plant	10-42
10.4.3 Compost Plant.....	10-42
10.4.4 Final Disposal Site.....	10-43
10.4.5 Medical Waste Disposal Site	10-44
10.5 Institutional Development Plan	10-45
10.5.1 Administration and Organisation.....	10-45
10.5.2 Legislation and Enforcement	10-49
10.5.3 Financial System.....	10-51
10.5.4 Privatisation and Contracting System	10-53
10.5.5 Monitoring and Information Management System	10-54
10.5.6 Human Resources Development.....	10-55
10.5.7 Public Education and Cooperation	10-56
10.6 Project Evaluation.....	10-59
10.6.1 Technical Evaluation	10-59
10.6.2 Social Evaluation	10-61
10.6.3 Environmental Evaluation	10-63
10.6.4 Financial Evaluation	10-63
10.6.5 Economic Evaluation.....	10-77
11 Cimsa Site Development.....	11-1
11.1 Selection of the Priority Projects	11-1
11.1.1 Selection of the Priority Projects	11-1
11.1.2 Targets of the Priority Projects	11-1
11.2 Preliminary Design of Cimsa Site Development.....	11-2
11.2.1 Overall Site Development Plan.....	11-2
11.2.2 Design of a Separate Collection System.....	11-4
11.2.3 Design of a Sorting Plant	11-6
11.2.4 Design of a Compost Plant	11-11
11.2.5 Design of a Final Disposal Site.....	11-19
11.2.6 Design of a Medical Waste Disposal Site.....	11-27
11.3 Operation Plan	11-34
11.3.1 Sorting Plant	11-34
11.3.2 Compost Plant.....	11-36
11.3.3 Final Disposal Site.....	11-39
11.3.4 Medical Waste Disposal Site	11-44
11.4 Cost Estimation.....	11-45
11.4.1 Separate Collection System	11-45
11.4.2 Sorting Plant	11-46
11.4.3 Compost Plant.....	11-46
11.4.4 Final Disposal Site.....	11-47

11.4.5 Medical Waste Disposal Site	11-48
11.5 Institutional Development Plan	11-49
11.5.1 Administration and Organisation.....	11-49
11.5.2 Legislation and Enforcement	11-54
11.5.3 Financial System.....	11-55
11.5.4 Privatisation and Contracting System.....	11-57
11.5.5 Monitoring and Information Management System.....	11-58
11.5.6 Human Resources Development.....	11-60
11.5.7 Public Education and Co-operation	11-60
11.6 Project Evaluation.....	11-64
11.6.1 Technical Evaluation	11-64
11.6.2 Social Evaluation	11-65
11.6.3 Environmental Evaluation	11-67
11.6.4 Financial Evaluation	11-68
11.6.5 Economic Evaluation.....	11-82
11.7 Rehabilitation of the Composting Plant Disposal Site	11-86
11.7.1 Existing Condition of Present Landfill	11-86
11.7.2 Rehabilitation Plan of Present Landfill.....	11-89
12 Alternative Study.....	12-1
12.1 Sofulu Disposal Site	12-1
12.1.1 Overall Alternative Plan	12-1
12.1.2 Design of a Final Disposal Site.....	12-3
12.1.3 Design of a Medical Disposal Site.....	12-6
12.1.4 Cost Estimation.....	12-8
12.2 Cimsa Disposal Site.....	12-9
12.2.1 Overall Alternative Plan	12-9
12.2.2 Design of a Final Disposal Site.....	12-12
12.2.3 Design of a Medical Disposal Site.....	12-14
12.2.4 Cost Estimation.....	12-18

PART IV Conclusions and Recommendations

13 Conclusions and Recommendations.....	13-1
13.1 Adana GM	13-1
13.1.1 Present Solid Waste Management Issues and Improvement Measures	13-1
13.1.2 SWM Master Plan.....	13-6
13.1.3 Feasibility Study (F/S) for Priority Projects.....	13-8
13.2 Mersin GM.....	13-11
13.2.1 Present Solid Waste Management Issues and Waste Flow.....	13-11
13.2.2 SWM Master Plan.....	13-16
13.2.3 Feasibility Study (F/S) for Priority Projects.....	13-17

List of Tables

	Page :
Table 2-1: Division of Municipalities.....	2-1
Table 2-2: District Municipalities of Adana (1990)	2-5
Table 2-3: Adana Adjacent Areas (1990)	2-6
Table 2-4: Population Growth of Adana GM (excluding adjacent areas)	2-12
Table 2-5: Population Growth of Adana GM (excluding adjacent areas)	2-13
Table 2-6: Land Use Framework of Yeni Adana Project	2-17
Table 2-7: North Yuregir Housing Project	2-17
Table 2-8: Changes in the Industrial Structure in Adana Province.....	2-18
Table 2-9: Changes in Tax Revenues	2-19
Table 2-10: Income Tax Rate	2-20
Table 2-11: Water Supply Tariff in Adana	2-21
Table 2-12: Tariff on Electricity	2-21
Table 2-13: Changes in the Seyhan DM Budget (1994 - 1998).....	2-22
Table 2-14: Revenues of Seyhan DM.....	2-22
Table 2-15: Changes in the Balance of Yuregir DM (1994 - 1998)	2-23
Table 2-16: Revenues of Yuregir DM	2-23
Table 2-17: Changes in the Balance of Adana GM	2-24
Table 2-18: Revenue of Adana GM.....	2-24
Table 2-19: District Municipalities in Mersin GM (1997 Population Survey).....	2-27
Table 2-20: Population Growth in Mersin.....	2-32
Table 2-21: Population Growth of Mersin GM (excluding adjacent areas)	2-34
Table 2-22: Population Framework of Mersin Master Plan (1:25,000, 2010).....	2-35
Table 2-23: Land Use Framework of Mersin M/P (1:25,000, 2010).....	2-35
Table 2-24: Changes in the Industrial Structure of Icel Province	2-38
Table 2-25: Changes in Tax Revenues	2-39
Table 2-26: Income Tax Rate	2-39
Table 2-27: Water Supply Tariff in Mersin	2-40
Table 2-28: Tariff on Electricity	2-41
Table 2-29: Changes in the Balance of Yenisehir DM	2-41
Table 2-30: Actual Revenues of Yenisehir DM (1998).....	2-42
Table 2-31: Changes in the Balance of Toroslar DM	2-42
Table 2-32: Revenues of Toroslar DM	2-43
Table 2-33: Changes in the Balance of Akdeniz DM	2-43
Table 2-34: Revenue of Akdeniz DM.....	2-44
Table 2-35: Changes in the Balance of Mersin GM	2-44
Table 2-36: Revenues of Mersin GM	2-45
Table 3-1: Generation Source and Number of Waste Sample	3-1
Table 3-2: Household Waste Discharge Ratio in the Target Area.....	3-2
Table 3-3: Discharge Ratio of Other Types of Waste.....	3-3
Table 3-4: Waste Composition in Adana GM (1998).....	3-3
Table 3-5: Waste Composition in Mersin GM (1998).....	3-4
Table 3-6: Results of Chemical Analysis for Middle Income Household and Market Waste in Adana	3-4
Table 3-7: Results of Chemical Analysis for Middle Income Household and Market Waste in Mersin	3-5
Table 3-8: Waste Generation from Medical Institutions in Adana GM (1998).....	3-7

Table 3-9: Waste Generation from Medical Institutions in Mersin GM (1998).....	3-7
Table 3-10: Number of Samples and Method of Survey	3-10
Table 3-11: Amount of Recycled Materials by Income Level in Adana	3-11
Table 3-12: Total Recycling Amount and Breakdown by Major Waste Items in Adana ..	3-12
Table 3-13: Amount of Recycled Items by Income Level in Mersin.....	3-12
Table 3-14: Total Recycling Amount and Breakdown by Major Waste Items.....	3-13
Table 3-15: Recycling in the Target Areas (1998).....	3-14
Table 3-16: Wastes Recycled by Scavengers at Sofulu Landfill and Price	3-16
Table 3-17: Recycled Materials by Scavengers at Mersin Composting Plant	3-17
Table 3-18: Recycled Materials by Scavengers at Mersin Disposal Site.....	3-17
Table 4-1: Population by Income Level & Household Waste Discharge Ratio.....	4-1
Table 4-2: Waste Discharge Amount in Adana GM (1999)	4-1
Table 4-3: Waste Discharge Amount in Mersin GM (1998)	4-2
Table 4-4: Waste Stream Component in the Target Area.....	4-2
Table 4-5: Present SWM Conditions in the Target Areas	4-5
Table 4-6: Assessment of Present SWM Conditions in the Target Area.....	4-11
Table 5-1: Site Selection Procedures	5-1
Table 5-2: Evaluation of Candidate Final Disposal Sites for Adana GM.....	5-4
Table 5-3: Population Forecast for Adana GM (1999-2020).....	5-6
Table 5-4: Forecast on Waste Discharge Amount for Adana GM.....	5-7
Table 5-5: Forecast on Composition of MSW for Adana GM	5-7
Table 5-6: Forecast of Medical Waste Generation for Adana	5-8
Table 5-7: GNP and GDP Forecasts	5-8
Table 5-8: Adana Province GRDP Forecast	5-8
Table 5-9: Revenue Forecast (Adana)	5-9
Table 5-10: Evaluation of Candidate Final Disposal Sites for Mersin GM.....	5-12
Table 5-11: Mersin GM Population Growth Rate Forecast.....	5-14
Table 5-12: Population Forecast for Mersin GM (1998 - 2020).....	5-14
Table 5-13: Forecast on Waste Discharge Amount for Mersin GM.....	5-15
Table 5-14: Forecast on Composition of MSW for Mersin GM	5-16
Table 5-15: Forecast of Medical Waste Generation for Mersin	5-16
Table 5-16: GNP & GDP Forecasts.....	5-16
Table 5-17: Icel Province GRDP Forecast.....	5-17
Table 5-18: Revenue Forecast (Mersin).....	5-17
Table 6-1: Sites of Future SWM Facilities	6-2
Table 6-2: Potential Sub-systems for SWM in Adana and Mersin.....	6-3
Table 6-3: Optimum Technical System	6-4
Table 6-4: Targets of Each Scenario for 2020 (Adana).....	6-6
Table 6-5: Future Waste Stream for Each M/P Scenario for Adana (2020)	6-9
Table 6-6: Depreciation Period of Facility and Equipment	6-13
Table 6-7: Unit Cost	6-13
Table 6-8: Refuse Collection & Transportation and Public Area Cleansing Amount.....	6-14
Table 6-9: Recycling Intermediate Treatment Amount	6-14
Table 6-10: Landfill Disposal Amount	6-14
Table 6-11: Operational Cost of Each Scenario (Adana)	6-15
Table 6-12: Comparison of M/P Scenarios (Adana).....	6-17
Table 6-13: EIA issues to be implemented for priority projects.....	6-21
Table 6-14: Targets of Each Scenario for 2020 (Mersin)	6-23
Table 6-15: Future Waste Stream for Each M/P Scenario for Mersin.....	6-26
Table 6-16: Depreciation Period of Facility and Equipment	6-30

Table 6-17: Unit Cost	6-30
Table 6-18: Refuse Collection & Transportation and Public Area Cleansing Amount.....	6-31
Table 6-19: Recycling Intermediate Treatment Amount	6-31
Table 6-20: Landfill Disposal Amount	6-31
Table 6-21: Operational Cost of Each Scenario (Mersin).....	6-32
Table 6-22: Comparison of M/P Scenarios (Mersin).....	6-34
Table 6-23: EIA issues to be Implemented for Priority Projects	6-38
Table 7-1: Targets of SWM M/P for Adana	7-2
Table 7-2: Changes of the Influential Factors in Adana GM.....	7-8
Table 7-3: Future Waste Stream (Adana GM).....	7-10
Table 7-4: Planning Conditions for SWM M/P for Adana.....	7-13
Table 7-5: Outline of Intermediate Treatment System for Adana	7-15
Table 7-6: Outline of Final Disposal System for Adana.....	7-16
Table 7-7: SWM Costs (Adana) in 1998	7-22
Table 7-8: Revenue from Waste Fee Collection (Adana).....	7-22
Table 7-9: The SWM Master Plan for Adana.....	7-39
Table 7-10: Depreciation Period of Facility and Equipment	7-42
Table 7-11: Unit Cost	7-42
Table 7-12: Refuse Collection & Transportation and Public Area Cleansing Amount.....	7-42
Table 7-13: Implementation Plan of the Master Plan for Mersin GM.....	7-43
Table 7-14: Cost Schedule of the Master Plan Projects for Mersin GM	7-44
Table 7-15: Investment Costs of Master Plan for Adana.....	7-45
Table 7-16: SWM Costs for Adana	7-45
Table 7-17: Unit Costs of Master Plan for Adana	7-46
Table 7-18: Stepwise Increase Plan of Cleansing Tax for Adana.....	7-46
Table 7-19: Changes in Residents' Share in SWM Costs for Adana	7-46
Table 7-20: General Budget and Allocation for SWM in Adana	7-47
Table 7-21: SWM Financial Source for Adana	7-47
Table 8-1: Targets of SWM M/P for Mersin	8-2
Table 8-2: Changes of the Influential Factors in Mersin GM.....	8-8
Table 8-3: Future Waste Stream (1998-2020) in Mersin GM	8-9
Table 8-4: Planning Conditions for SWM M/P for Mersin.....	8-12
Table 8-5: Outline of Intermediate Treatment System for Mersin (2001-2020).....	8-14
Table 8-6: Outline of Final Disposal System for Mersin (2001-2020).....	8-15
Table 8-7: SWM Costs in 1998 (Mersin GM).....	8-21
Table 8-8: Revenue from Waste Fee Collection (Mersin GM)	8-21
Table 8-9: The SWM Master Plan for Mersin	8-38
Table 8-10: Depreciation Period of Facility and Equipment	8-40
Table 8-11: Unit Cost	8-40
Table 8-12: Refuse Collection & Transportation and Public Area Cleansing Amount.....	8-40
Table 8-13: Implementation Plan of the Master Plan for Mersin GM.....	8-42
Table 8-14: Cost Schedule of the Master Plan Projects for Mersin GM	8-43
Table 8-15: Investment Costs of Master Plan for Mersin.....	8-44
Table 8-16: SWM Costs for Mersin	8-44
Table 8-17: Unit Costs of Master Plan for Mersin	8-45
Table 8-18: Stepwise Increase Plan of Cleansing Tax for Mersin.....	8-45
Table 8-19: Changes in Residents' Share in SWM Costs for Mersin.....	8-45
Table 8-20: General Budget and Allocation for SWM in Mersin.....	8-46
Table 8-21: SWM Financial Source for Mersin	8-46
Table 9-1: Implementation Schedule of the Pilot Project.....	9-2

Table 9-2: Work Division of the Sofulu Disposal Site Improvement	9-6
Table 9-3: Implementation Schedule of the Sofulu Improvement.....	9-7
Table 9-4: Outline of Experiment on Separate Collection & Composting Quality Improvement and Division of Work.....	9-9
Table 9-5: Implementation Schedule for Separate Collection	9-9
Table 9-6: Implementation Schedule for Compost Quality Improvement in Mersin (1999).....	9-13
Table 9-7: Composition of Compostable Waste and Non-compostable Waste (1999).....	9-15
Table 9-8: Estimate of Moisture Content of Compostable Waste on Collection Vehicle's Arrival at the Weighbridge of Disposal Site (1999).....	9-16
Table 9-9: Weight Ratio of Rejected Non-compostable Material from Compostable Waste (1999).....	9-16
Table 9-10: Physical Composition Analysis of Non-compostable Material Mixed with Compostable Waste (1999).....	9-17
Table 9-11: Moisture Content of Compostable Waste by the result of WACS in 1998....	9-17
Table 9-12: Physical Composition Analysis.....	9-22
Table 9-13: Sieve Analysis	9-23
Table 9-14: Chemical Analysis.....	9-23
Table 10-1: The Targets of the Priority Projects for Adana GM	10-1
Table 10-2: Waste Generation, Discharge and Collection Amount in Adana GM.....	10-4
Table 10-3: Productivity of Collection Vehicles	10-4
Table 10-4: Required Number of Collection Vehicle.....	10-5
Table 10-5: Required Number of Container in Adana.....	10-5
Table 10-6: Composition for Non-Compostable Wastes.....	10-6
Table 10-7: Design Parameters of Sorting Plant in Sofulu.....	10-7
Table 10-8: Composition of the Compostable Waste.....	10-11
Table 10-9: Design Parameters of Compost Plant at Sofulu	10-13
Table 10-10: Quantity and Quality of Compost Product	10-14
Table 10-11: Outline of the Sofulu Disposal Site.....	10-18
Table 10-12: Final Disposal Amount in Sofulu.....	10-19
Table 10-13: Average Precipitation and Evaporation at Adana	10-22
Table 10-14: Effluent Standards in Sofulu	10-22
Table 10-15: Results of the Calculation of Recirculation Pump and the Regulation Pond in Sofulu.....	10-24
Table 10-16: Personnel and Heavy Vehicle Plan.....	10-24
Table 10-17: Target Wastes to be Disposed at Medical Waste Disposal Site in Sofulu .	10-25
Table 10-18: Basic Concept of a Medical Waste Final Disposal Site in Sofulu	10-27
Table 10-19: Outline of the Medical Waste Final Disposal Site in Sofulu	10-28
Table 10-20: Final Disposal Amount in Sofulu.....	10-28
Table 10-21: Structure of Top Cover of Medical Disposal Site in Sofulu	10-29
Table 10-22: Design Parameters of the Sorting Plant in Sofulu.....	10-31
Table 10-23: Staffing Schedule in Sofulu.....	10-33
Table 10-24: Design Parameters of the Compost Plant.....	10-34
Table 10-25: Staff Allocation Schedule in Adana.....	10-36
Table 10-26: Outline of the Sofulu Disposal Site.....	10-37
Table 10-27: Personnel and Heavy Vehicle Plan in Sofulu.....	10-37
Table 10-28: Outline of the Medical Disposal Site in Sofulu.....	10-40
Table 10-29: Landfill Implementation of the Medical Landfill in Sofulu	10-41
Table 10-30: Procurement Schedule of Container for Separate Collection for Sofulu (2002-2005)	10-41

Table 10-31: Operation & Maintenance Cost of Collection Vehicle for Sofulu (2002-2005)	10-42
Table 10-32: Investment Cost of the Sorting Plant for Sofulu (2001).....	10-42
Table 10-33: Investment Schedule of the Sorting Plant for Sofulu (2000-2005)	10-42
Table 10-34: Investment Cost of the Compost Plant for Sofulu (2001).....	10-43
Table 10-35: Investment Schedule of the Compost Plant for Sofulu (2000-2005)	10-43
Table 10-36: Investment Cost of Construction of MSW Landfill Site (Phase2) & Administration Area in Sofulu.....	10-43
Table 10-37: Investment Cost for Vehicle & Equipment of MSW Landfill Site in Sofulu.....	10-44
Table 10-38: Investment Cost of Construction of MSW Landfill Site (Phase3) in Sofulu.....	10-44
Table 10-39: Investment Schedule of MSW Landfill Site in Sofulu.....	10-44
Table 10-40: Investment Cost of Construction of the Medical Solid Waste Landfill in Sofulu.....	10-45
Table 10-41: Investment Cost for Vehicle & Equipment of the Medical Waste Landfill Site in Sofulu.....	10-45
Table 10-42: Investment Schedule for Medical Solid Waste Landfill Site in Sofulu.....	10-45
Table 10-43: Staffing of Compost and Sorting Plants in Adana	10-49
Table 10-44: Advantages and Disadvantages of Cleansing Tax System by Waste Amount and by Building Use.....	10-52
Table 10-45: Education Materials for Adana GM	10-57
Table 10-46: Ratio of Cleansing Tax to Income for Adana GM	10-62
Table 10-47: Summary of the Priority Project Environmental Evaluation for Adana GM.....	10-63
Table 10-48: Conditions for Financial Evaluation for Adana GM.....	10-64
Table 10-49: Cost Summary of Priority Projects for Adana GM	10-66
Table 10-50: Investment Costs for Financial Evaluation for Adana GM	10-66
Table 10-51: Annual SWM Costs for Financial Evaluation for Adana GM	10-67
Table 10-52: Waste Amount for Financial Evaluation for Adana GM.....	10-67
Table 10-53: Unit Costs for Financial Evaluation for Adana GM.....	10-68
Table 10-54: Revenue Plan (Cleansing Tax) for Adana GM.....	10-68
Table 10-55: Amount and Price of Recycled Materials for Adana GM	10-69
Table 10-56: Revenue Plan (Sale of Recoverables and Compost) for Adana GM (2002-2005).....	10-69
Table 10-57: Revenue Plan (Tipping Fee) for Adana GM (2002-2005)	10-70
Table 10-58: Revenue Plan (Budget Allocation) for Adana GM (2002-2005)	10-70
Table 10-59: FIRR by Case for Adana GM.....	10-70
Table 10-60: FIRR by Investment Funding for Adana GM.....	10-71
Table 10-61: Sensitivity Analysis for Case 1-C for Adana GM	10-72
Table 10-62: Financially Feasible Cases for Adana GM.....	10-72
Table 10-63: Case Studies for the Implementation Plan for Adana GM	10-74
Table 10-64: FIRR by Implementation Plan Case Studies for Adana GM.....	10-74
Table 10-65: Changes in Residents' Share for Adana GM.....	10-74
Table 10-66: Cash Flow of the Recommended Case (MB.b - FL.a)	10-76
Table 10-67: Profit and Loss Statement.....	10-76
Table 10-68: Economic Evaluation Method for Adana GM	10-77
Table 10-69: Benefits & Costs for Adana GM	10-77
Table 10-70: Benefits from Recoverables and Compost for Adana GM.....	10-78
Table 10-71: Benefits from Reduced Disposal Cost.....	10-78

Table 10-72: Benefits from Reduced Haulage Costs for Adana GM (2002-2005)	10-79
Table 10-73: Land Use Benefits for Adana GM (2002-2005).....	10-79
Table 10-74: Conversion Rates for Economic Evaluation for Adana GM.....	10-80
Table 10-75: Investment Costs for Economic Evaluation for Adana GM.....	10-80
Table 10-76: O&M Costs for Economic Evaluation for Adana GM.....	10-80
Table 11-1: The Targets of the Priority Projects for Mersin GM	11-1
Table 11-2: Waste Generation, Discharge and Collection Amount in Cimsa	11-4
Table 11-3: Productivity of Collection Vehicles in Cimsa.....	11-5
Table 11-4: Required number of collection vehicle in Cimsa	11-5
Table 11-5: Required Number of Container in Cimsa.....	11-5
Table 11-6: Composition for Non-Compostable Wastes in Cimsa	11-6
Table 11-7: Design Parameters of Sorting Plant in Cimsa	11-8
Table 11-8: Composition of the Compostable Waste.....	11-12
Table 11-9: Design Parameters of Compost Plant at Cimsa.....	11-15
Table 11-10: Quantity and Quality of Compost Product in Cimsa.....	11-15
Table 11-11: Outline of the Cimsa Disposal Site	11-20
Table 11-12: Final Disposal Amount in Cimsa	11-20
Table 11-13: Average Precipitation and Evaporation at Mersin.....	11-23
Table 11-14: Effluent Standards	11-23
Table 11-15: Each Leachate Treatment Pond Volume in Cimsa.....	11-25
Table 11-16: Results of the Calculation of Capacity of Recirculation Pump and Capacity of Regulation Pond in Cimsa	11-26
Table 11-17: Personnel and heavy vehicle plan.....	11-26
Table 11-18: Target wastes to be disposed at Medical Waste Disposal Site in Cimsa ...	11-27
Table 11-19: Basic Concept of Preliminary Design of Medical Waste Final Disposal Site in Cimsa	11-29
Table 11-20: Outline of the Medical Waste Final Disposal Site in Cimsa.....	11-30
Table 11-21: Final Disposal Amount in Cimsa (2002-2020)	11-31
Table 11-22: Structure of Top Cover of Medical Disposal Site	11-32
Table 11-23: Design Parameters of the Sorting Plant in Cimsa	11-34
Table 11-24: Staffing Schedule in Cimsa.....	11-36
Table 11-25: Design Parameters of the Compost Plant in Cimsa.....	11-37
Table 11-26: Staff Allocation Schedule in Cimsa	11-39
Table 11-27: Outline of the Cimsa Disposal Site in Cimsa.....	11-40
Table 11-28: Personnel and Heavy Vehicle Plan in Cimsa	11-41
Table 11-29: Outline of the Medical Disposal Site in Cimsa.....	11-44
Table 11-30: Landfill Implementation of the Medical Landfill in Cimsa	11-45
Table 11-31: Procurement Schedule of Container for Separate Collection (2002-2005)	11-45
Table 11-32: Operation & Maintenance Cost of Collection Vehicle (2002-2005).....	11-45
Table 11-33: Investment Cost of the Sorting Plant (2001).....	11-46
Table 11-34: Investment Schedule of the Sorting Plant (1999-2005)	11-46
Table 11-35: Investment Cost of the Compost Plant (2001)	11-47
Table 11-36: Investment Schedule of the Compost Plant (2000-2005).....	11-47
Table 11-37: Investment Cost of Construction of the MSW Landfill Site (Phase2) & Administration Area	11-47
Table 11-38: Investment Cost for Vehicle & Equipment for the MSW Landfill Site (2001).....	11-48
Table 11-39: Investment Cost of Construction of the MSW Landfill Site (2005)	11-48
Table 11-40: Investment Schedule of MSW Landfill Site (2000-2005).....	11-48

Table 11-41: Investment Cost of Construction of the Medical Solid Waste Landfill (2001).....	11-49
Table 11-42: Investment Cost for Vehicle & Equipment of the Medical Waste Landfill Site (2001).....	11-49
Table 11-43: Investment Schedule for the Medical Solid Waste Landfill Site (2000-2005)	11-49
Table 11-44: Staffing of Compost and Sorting Plants at Cimsa Site.....	11-53
Table 11-45: Advantages and Disadvantages of Cleansing Tax System by Waste Amount and by Building Use.....	11-56
Table 11-46: Education Materials.....	11-61
Table 11-47: Ratio of Cleansing Tax to Income.....	11-66
Table 11-48: Summary of the Priority Project Environmental Evaluation in Mersin	11-67
Table 11-49: Major Assumptions for Financial Evaluation in Mersin	11-68
Table 11-50: Cost Summary of the Priority Projects for Financial Evaluation	11-70
Table 11-51: Investment Costs for Financial Evaluation in Mersin	11-71
Table 11-52: Annual SWM Costs in Mersin	11-71
Table 11-53: Waste Amount for Financial Evaluation in Mersin.....	11-72
Table 11-54: Unit Costs for Financial Evaluation in Mersin.....	11-72
Table 11-55: Revenue Plan (Cleansing Tax) in Mersin.....	11-73
Table 11-56: Amount and Price of Recycled Materials for Mersin.....	11-73
Table 11-57: Revenue Plan (Sale of Recoverables and Compost) for Mersin	11-74
Table 11-58: Revenue Plan (Tipping Fee) for Mersin.....	11-74
Table 11-59: Revenue Plan (Budget Allocation) for Mersin.....	11-74
Table 11-60: FIRR by Revenue Case for Mersin.....	11-75
Table 11-61: FIRR by Investment Funding for Mersin	11-75
Table 11-62: Sensitivity Analysis for Case 2-C for Mersin.....	11-76
Table 11-63: Financially Feasible Cases	11-77
Table 11-64: Case Studies for the Implementation Plan	11-78
Table 11-65: FIRR by Implementation Plan Case Studies	11-78
Table 11-66: Changes in Residents' Share	11-79
Table 11-67: Cash Flow of the Recommended Case (MB.c-FI.a).....	11-81
Table 11-68: Profit and Loss Statement.....	11-81
Table 11-69: Economic Evaluation Method for Mersin.....	11-82
Table 11-70: Benefits & Costs for Mersin.....	11-82
Table 11-71: Benefits from Recoverables and Compost for Mersin	11-83
Table 11-72: Benefits from Reduced Disposal Cost.....	11-83
Table 11-73: Land Use Benefits for Mersin	11-84
Table 11-74: Conversion Rates for Economic Evaluation for Mersin	11-84
Table 11-75: Investment Costs for Economic Evaluation for Mersin	11-84
Table 11-76: O&M Costs for Economic Evaluation	11-85
Table 11-77: Construction Works in 1992 and their Present Condition.....	11-87
Table 12-1: Outline of the Sofulu Disposal Site	12-3
Table 12-2: Final Disposal Amount in Sofulu.....	12-4
Table 12-3: Outline of the Medical Disposal Site in Sofulu.....	12-6
Table 12-4: Final Disposal Amount.....	12-6
Table 12-5: Comparison of Disposal Site Construction Costs	12-8
Table 12-6: Comparison of Medical Disposal Site Construction Costs	12-9
Table 12-1: Outline of the CIMSA Disposal Site.....	12-12
Table 12-2: Final Disposal Amount in CIMSA.....	12-13
Table 12-3: Outline of the Medical Disposal Site in CIMSA.....	12-14

Table 12-4: Final Disposal Amount.....	12-15
Table 12-5: Comparison of Disposal Site.....	12-18
Table 12-6: Comparison of Medical Disposal Site Construction Costs	12-19

List of Figures

	Page :
Figure 1-1: Study Schedule.....	1-6
Figure 1-2: Study Organisational Structure	1-7
Figure 2-1: Map of Turkey.....	2-2
Figure 2-2: Map of the Study Area (Adana Province).....	2-4
Figure 2-3: Target Area (Adana Greater Municipality).....	2-9
Figure 2-4: Average Household Income in Adana	2-11
Figure 2-5: Schematic Urban Structure and Development Trend in Central Adana GM..	2-16
Figure 2-6: Share of GRDP (Adana) in the GDP.....	2-19
Figure 2-7: Map of Study Area (Icel Province)	2-25
Figure 2-8: Target Area (Mersin GM)	2-30
Figure 2-9: Average Household Income in Icel Province.....	2-32
Figure 2-10: Schematic Urban Structure and Development Trend in Mersin GM.....	2-37
Figure 2-11: Share of GRDP (Icel) in the GDP	2-38
Figure 4-1: Present Waste Stream in Adana GM (1999).....	4-3
Figure 4-2: Present Waste Stream in Mersin GM (1998).....	4-4
Figure 5-1: Location of Candidate Disposal Sites for Adana GM.....	5-3
Figure 5-2: Location of Candidate Disposal Sites for Mersin GM.....	5-11
Figure 6-1: Waste Stream Diagram for Adana in Year 2020.....	6-7
Figure 6-2: Waste Stream of M/P Scenario 1 for Adana (2020)	6-10
Figure 6-3: Waste Stream of M/P Scenario 2 for Adana (2020)	6-11
Figure 6-4: Waste Stream of M/P Scenario 3 for Adana (2020)	6-12
Figure 6-5: Waste Stream Diagram for Mersin in Year 2020.....	6-24
Figure 6-6: Waste Stream of M/P Scenario 1 for Mersin (2020).....	6-27
Figure 6-7: Waste Stream of M/P Scenario 2 for Mersin (2020).....	6-28
Figure 6-8: Waste Stream of M/P Scenario 3 for Mersin (2020).....	6-29
Figure 7-1: Waste Stream in Year 1999 and 2005 (Adana GM)	7-11
Figure 7-2: Waste Stream in Year 2012 and 2020 (Adana GM)	7-12
Figure 7-3: Cash Flow of Adana GM M/P	7-48
Figure 8-1: Waste Stream in Year 1998 and 2005 (Mersin GM)	8-10
Figure 8-2: Waste Stream in Year 2012 and 2020 (Mersin GM)	8-11
Figure 8-3: Cash Flow of Mersin GM M/P	8-46
Figure 9-1: Location, Adana City Master Plan 1996.....	9-4
Figure 9-2: Overall Plan of the Experiment on the Improvement of Sofulu Disposal Site	9-5
Figure 9-3: Cross Section of Phase 1 Landfill Operation	9-6
Figure 9-4: Guven Sitesi Housing Complex (GSHC) and Location of Containers	9-12
Figure 9-5: Material Balance of Separate Collection.....	9-18
Figure 10-1: Overall Sofulu Site Development Plan	10-3
Figure 10-2: Process Flow Diagram of the Sorting Plant in Sofulu	10-8
Figure 10-3: Material Balance of the Sorting Plant in Sofulu	10-9
Figure 10-4: Layout of the Sorting Plant	10-9
Figure 10-5: Selective Crushing Separator (SCS) in Sofulu	10-12

Figure 10-6: Process Flow Diagram of the Compost Plant in Sofulu.....	10-15
Figure 10-7: Material Balance of the Compost Plant in Sofulu.....	10-16
Figure 10-8: Layout of Proposed Compost Plant in Sofulu.....	10-17
Figure 10-9: Diagrams of the Landfill's Impermeable Strata (Bottom and Slope)	10-20
Figure 10-10: Control Facilities and Approach Road in Sofulu	10-21
Figure 10-11: Proposed Leachate Treatment Process in Sofulu	10-23
Figure 10-12: Proposed Medical Waste Disposal Site in Sofulu.....	10-26
Figure 10-13: Diagrams of the Landfill's Impermeable Strata (Slope, Top Cover and Bottom)	10-30
Figure 10-14: The condition of Proposed Landfill Site at Final Cover Stage	10-39
Figure 11-1: Overall CIMSA Site Development Plan	11-3
Figure 11-2: Process Flow Diagram of the Sorting Plant in Cimsa.....	11-9
Figure 11-3: Material Balance of the Sorting Plant in Cimsa.....	11-10
Figure 11-4 : Layout of the Sorting Plant in Cimsa.....	11-10
Figure 11-5: Selective Crushing Separator in Cimsa.....	11-13
Figure 11-6: Process Flow Diagram of the Compost Plant in Cimsa.....	11-16
Figure 11-7: Material Balance of the Compost Plant in Cimsa	11-17
Figure 11-8: Layout of Proposed Compost Plant in Cimsa	11-18
Figure 11-9: Diagrams of the Landfill's Impermeable Strata (Bottom and Slope)	11-21
Figure 11-10: Control Facilities and Approach Road in Cimsa	11-22
Figure 11-11: Proposed waste stabilisation ponds process.....	11-24
Figure 11-12: Layout of Proposed Leachate Treatment Facility in Cimsa	11-25
Figure 11-13: Proposed Medical Waste Disposal Site in Sofulu.....	11-28
Figure 11-14: Diagrams of the Landfill's Impermeable Strata (Slope, Top Cover and Bottom)	11-33
Figure 11-15: The Condition of Proposed Landfill Site at Final Cover Stage in Cimsa .	11-43
Figure 11-16: Layout of the Present Landfill.....	11-88
Figure 11-17: Overall Plan of the Rehabilitation of Present Landfill.....	11-90
Figure 12-1: Overall Alternative Plan.....	12-2
Figure 12-2: Diagrams of the Landfill's Impermeable Strata.....	12-4
Figure 12-3: Cross Section of the LPS	12-5
Figure 12-4: Typical Cross Section of Slope Without a Liner.....	12-5
Figure 12-5: Diagrams of the Landfill's Impermeable Strata.....	12-7
Figure 12-6: Typical Section of Slope with a Liner (HDPE+Mortar)	12-8
Figure 12-7: Overall Alternative Plan.....	12-11
Figure 12-8: Diagrams of the Landfill's Impermeable Strata.....	12-13
Figure 12-9: Typical Section of Slope with a Liner (HDPE+Mortar)	12-14
Figure 12-10: Diagrams of the Landfill's Impermeable Strata.....	12-17
Figure 12-11: Typical Section of Slope with a Liner (HDPE+Mortar)	12-18

List of Abbreviations

ACC	Agricultural Credit Cooperative
AGM	Adana Greater Municipality
AM	Adjacent Municipality
ASG	Apparent Specific Gravity
BoP	Bank of Provinces
CBD	Central Business District
C/P	Counterpart
DF/R	Draft Final Report
DM	District Municipality
DWAS	Disposal Waste Amount Survey
EIA	Environmental Impact Assessment
GAP	Southeastern Anatolia Project
GDP	Gross Domestic Product
GM	Greater Municipality
GNP	Gross National Product
GRDP	Gross Regional Domestic Product
GSHC	Guven Sitesi Housing Complex
F/R	Final Report
F/S	Feasibility Study
IC/R	Inception Report
IEE	Initial Environmental Examination
IT/R	Interim Report
JICA	Japan International Co-operation Agency
METAP	Middle East Technical Assistance Program
MGM	Mersin Greater Municipality
M/M	Minutes of Meeting
MoE	Ministry of Environment
MoI	Ministry of Interior
MoT	Ministry of Tourism
MoCWR	Ministry of Civil Works and Resettlement
M/P	Master Plan
MSW	Municipal Solid Waste
NEAP	National Environmental Action Plan
NGO	Non Governmental Organisation
O&M	Operation and Maintenance

POS	Public Opinion Survey
P/R	Progress Report
PSA	Province Special Administration
RDA	Regional Development Authority
RDF	Refuse Derived Fuel
SM	Single Municipality
SPO	State Planning Organisation
SDM	Seyhan District Municipality
SSI	State Statistic Institute
S/W	Scope of Work
SW	Solid Waste
SWM	Solid Waste Management
SWMS	Solid Waste Management System
WACS	Waste Amount and Composition Survey
WB	World Bank
YDM	Yenisehir District Municipality