JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF LOCAL ADMINISTRATION
MINISTRY OF ENVIRONMENT
LATTAKIA CITY COUNCIL
HOMS CITY COUNCIL
THE SYRIAN ARAB REPUBLIC

THE STUDY ON
SOLID WASTE MANAGEMENT AT
LOCAL CITIES IN THE SYRIAN ARAB REPUBLIC

FINAL REPORT

MAIN REPORT

JANUARY 2002

YACHIYO ENGINEERING CO., LTD.

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PREFACE

In response to a request from the Government of the Syrian Arab Republic, the Government of Japan decided to conduct a Study on Solid Waste Management at Local Cities and entrusted the study to the Japan International Cooperation Agency (JICA).

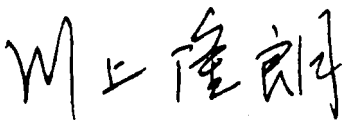
JICA selected and dispatched a study team headed by Mr. Hiroshi Abe of Yachiyo Engineering Co., Ltd. to Syria, three times between January 2001 and December 2001. In addition, JICA set up an advisory committee between January 2001 and December 2001, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of The Syrian Arab Republic and conducted field surveys in 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 the 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 Syria for their close cooperation extended to the team.

January 2002



Takao Kawakami
President
Japan International Cooperation Agency

January 2002

Mr. Takao Kawakami
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

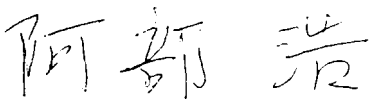
We are pleased to submit to you the final report of the Study on Solid Waste Management at Local Cities in the Syrian Arab Republic. The report includes the advise and suggestions of the authorities concerned of the Government of Japan and your Agency. Also included are comments made by the Ministry of Local Administration, Ministry of State for Environmental Affairs, Lattakia City and Homs City, the Syrian Arab Republic. This report consists of Summary Report, Main Report, Supporting Report and Data Book.

The report deals with the present conditions of solid waste management in Lattakia and three surrounding cities and presents the master plan for solid waste management with the target year of 2010, as well as the results of the feasibility study for the priority projects proposed in the master plan. In Homs city, the report presents the feasibility study for the compost plant.

In accordance with the contract with your Agency, we Yachiyo Engineering Co., Ltd. implemented this study during the period of December 15, 2000 to January 28, 2002. Based on a deep understanding of the existing conditions in Lattakia and three surrounding cities and Homs city in the Syrian Arab Republic we have prepared a plan that is feasible and can be implemented.

Finally we sincerely hope that this report will be effectively used for the realization of the master plan. We wish to express our deep gratitude to your Agency, the Ministry of Local Administration, Ministry of State for Environmental Affairs, Lattakia city, Homs city and other concerned Governmental Agencies for the close cooperation and assistance extended to us during the Study.

Very truly yours,



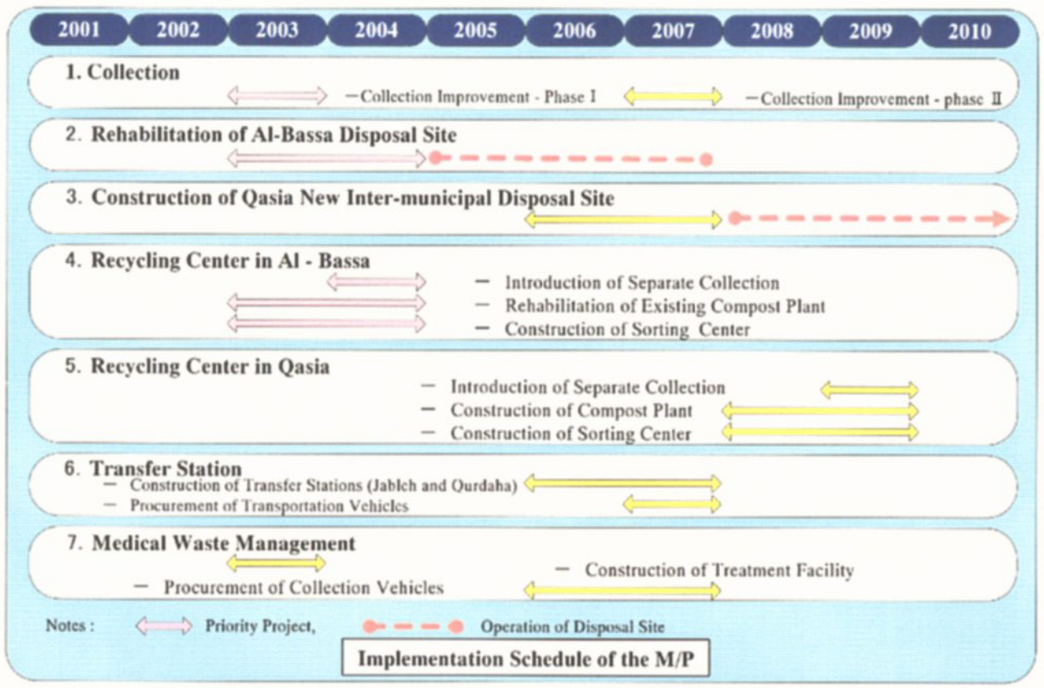
Hiroshi Abe
Team Leader
The Study on Solid Waste Management at Local Cities
in the Syrian Arab Republic

<M/P and F/S for Lattakia (Jableh, Qurdaha, Al-Haffeh) and Surrounding Three Cities>

Location of Proposed SWM Facilities for the M/P (2010)

Planning Conditions

- Target year : 2010 (M/P), 2006 (F/S)
- Population : 687,000 (2010), 602,000 (2005)
- GRDP : 26,117 million SP (2010), 23,655 million SP (2005)
- Waste Amount : 508 ton/day (2010), 499 ton/day (2006)



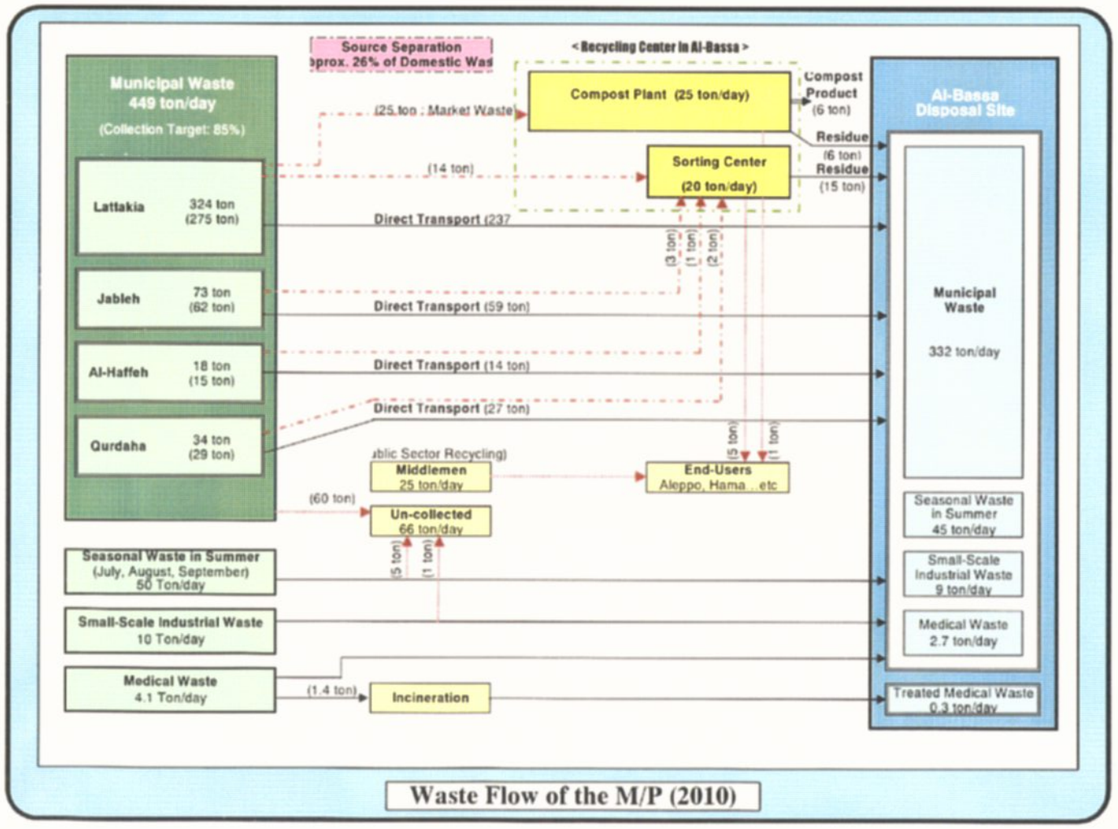
Implementation Schedule of the M/P

① Production of Better Quality Compost

②Public Awareness Campaign on Environment

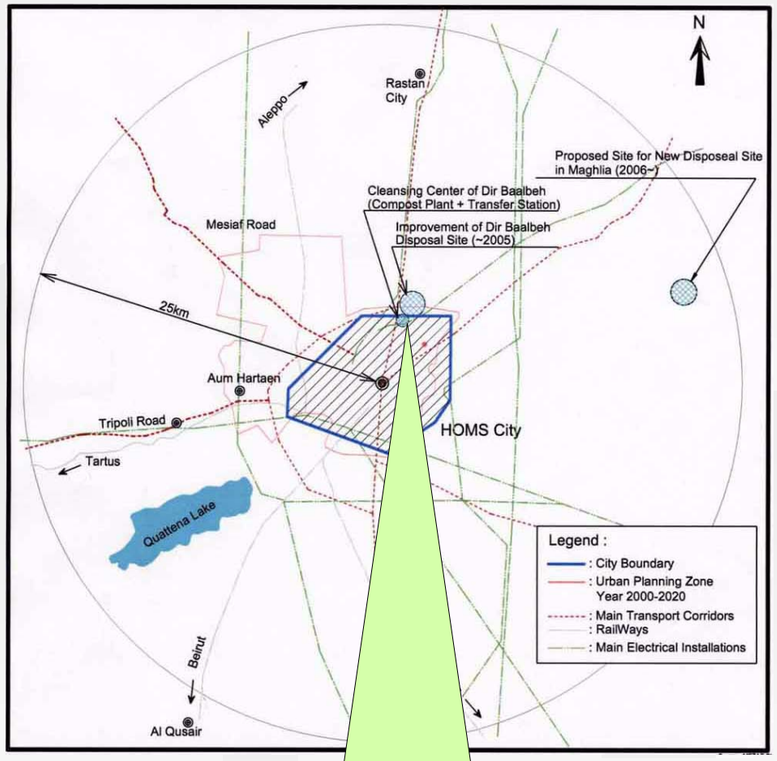
③ Improvement of Al Bassa Disposal Site

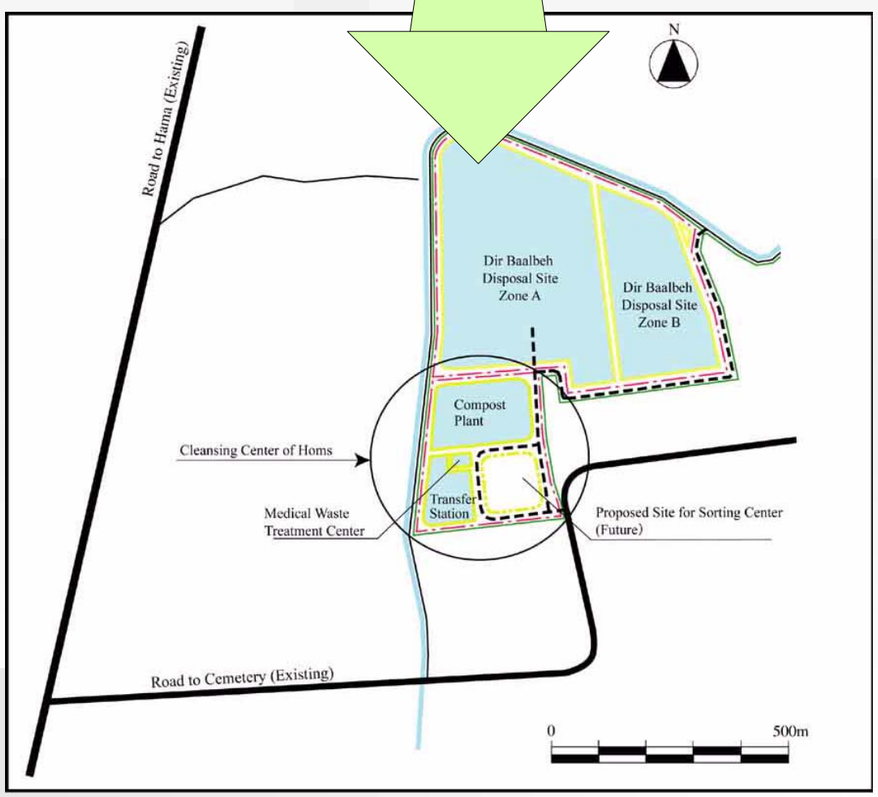
Pilot Study



Waste Flow of the M/P (2010)

<Feasibility Study (F/S) on the Compost Plant at Homs>

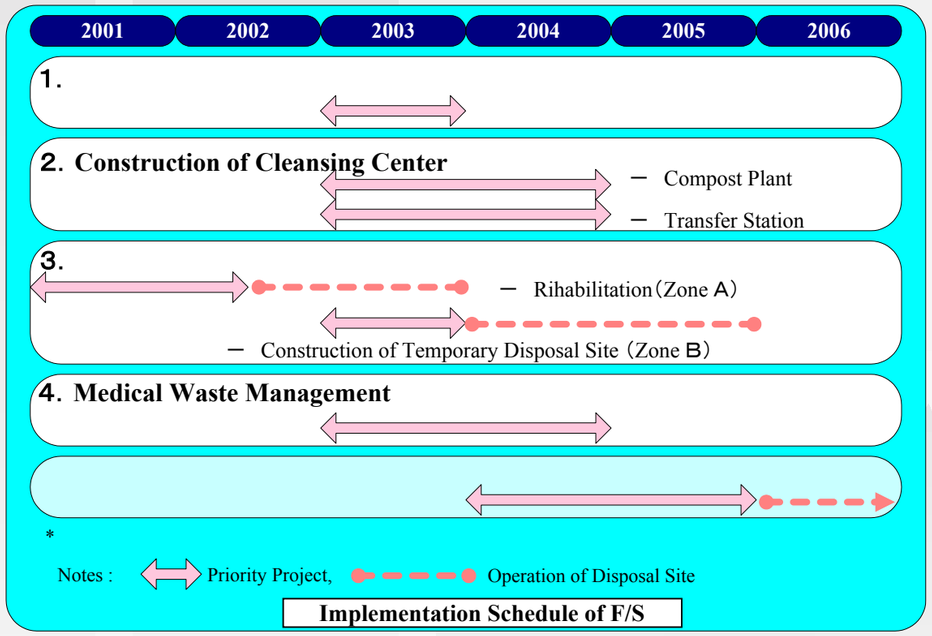




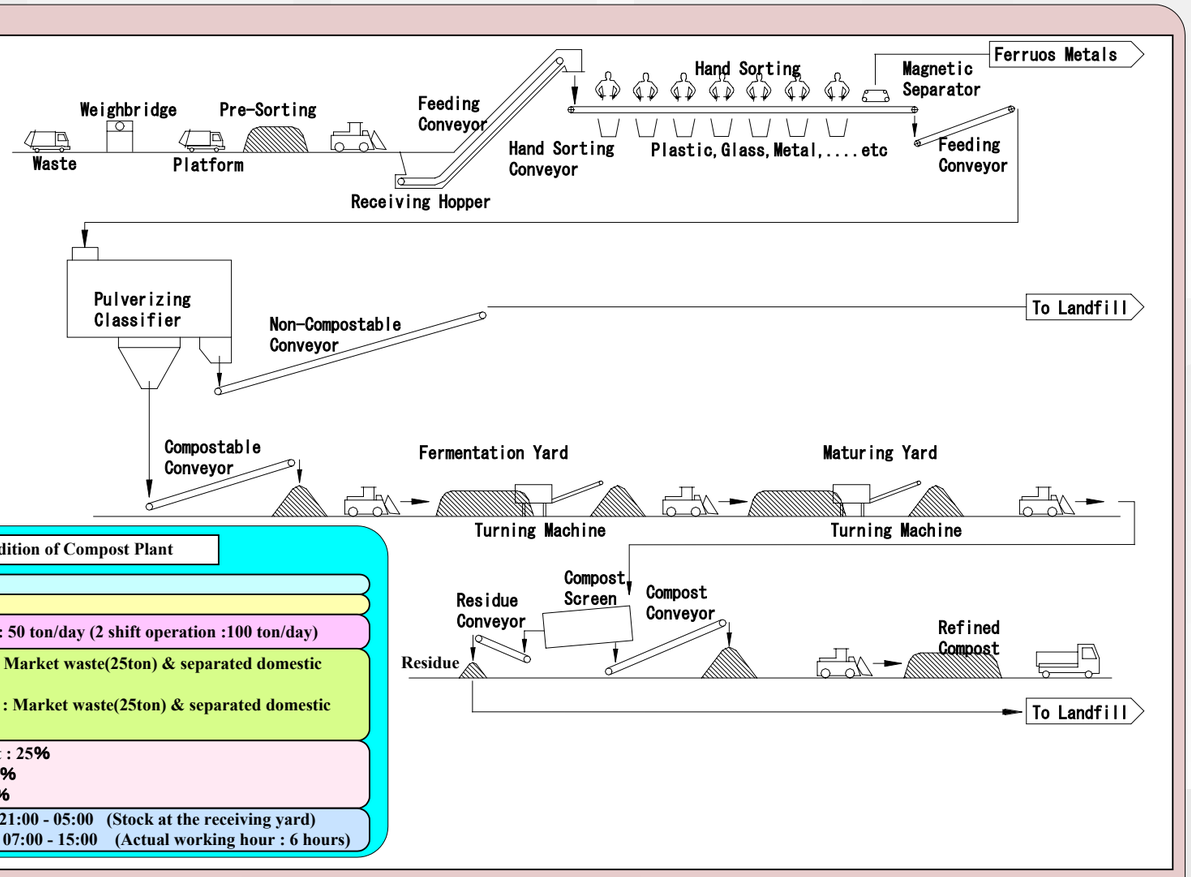
Location of Proposed SWM Facilities（2006）

Planning Conditions

Target Year	: 2006
Population	: 1,131,000 (2005)
GRDP	: 33,420 million SP (2005)
Waste Amount	: 809 ton/day (2005)



Implementation Schedule of F/S



Planning Condition of Compost Plant

Location	Dir Baalbeh
Operation Year	2005
Capacity	1 shift operation : 50 ton/day (2 shift operation :100 ton/day)
Receiving Waste	1shift operation : Market waste(25ton) & separated domestic waste(25ton) {2shift operation : Market waste(25ton) & separated domestic waste(75ton)}
Material Balance	Compost product : 25% Recyclables : 5% Residue : 25%
Operation Hour	Receiving hour : 21:00 - 05:00 (Stock at the receiving yard) Operation hour : 07:00 - 15:00 (Actual working hour : 6 hours)

System Flow of the Compost Plant

FINAL REPORT COMPOSITION

The Final Report is composed of the following reports:

1. SUMMARY REPORT
2. **MAIN REPORT**
3. SUPPORTING REPORT
4. DATA BOOK

EXECUTIVE SUMMARY

1. Background and Objectives of The Study

Lattakia City, located on the Mediterranean Coast in the western part of Syria and having a population of 375,000 in 2001, is the fourth largest city in the country. As of 2001, the city generates approximately 280 tons/day of waste and collect approximately 70% of waste. However, the collection situation in outlying areas is very poor and the city has faced a shortage and deterioration of collection vehicle. Collected waste is open dumped at Al-Bassa disposal site without soil covering. As a result, waste become scattered over a wide area and farmland is contaminated. A compost plant was constructed in Lattakia 20 years ago, however, it has closed on March, 2001 because it was only able to produce poor quality compost

The cities of Jableh, Qurdaha and Al-Haffeh are also located in Lattakia Governorate and surround Lattakia City at distances of 20-30 km. The population in these cities is 93,000, 49,000 and 24,000 respectively in 2001. These cities have also faced a shortage and deterioration of collection vehicle. The waste collection rate in Jableh is around 60% and, like in Lattakia City, collection in outlying areas is very poor and the city is confronted with absolute shortages and deterioration of collection equipment.Moreover, collected waste is open dumped at a disposal site

Homs City, located in the center of Syria having a population of 1,000,000 in 2001, is the third largest city in the country. The quantity of waste generated in Homs City is 704 tons/day as of 2000, and approximately 70% of this is collected. Here too, collection in outlying areas is not good enough and Homs City is also confronted with shortages and deterioration of collection equipment. Collected waste is disposed of at Dir Baalbeh disposal site. However, here too open dumping is carried out and the surrounding environment is adversely affected by odor and smoke from spontaneous combustion.

The master plan for solid waste management in Homs City was prepared in the "Homs Solid Waste Management Study (METAP Study)". In the master plan, it is proposed that a new sanitary landfill disposal site be constructed at Maghlia, which is located some 30 km to the east of Homs City. And it is proposed to introduce recycling systems including compost plant that will also need to be implemented.

Summing up the aforementioned conditions, in order to preserve the living environment and prevent environmental pollution in these cities, it is urgently necessary to establish an appropriate solid waste treatment and management setup via the expansion of waste collection services, promotion of recycling and introduction of sanitary landfilling, etc.

Japan has so far implemented grant aid and produced good results in the area of waste treatment equipment procurement via the Project for Solid Waste Management in Damascus in 1995 and the Project for Solid Waste Management in Aleppo in 1997.

It was against this background that the Government of Syria in 1999 requested the Government of Japan for implementation of the Study. Following this, JICA dispatched the Preliminary Study Team to carry out S/W consultations in August 2000 and started the Study in January 2001.

The purpose of the Study and the Study area are as follows:

- Compiling a master plan and implementing a feasibility study for the priority projects for Lattakia City and the three surrounding cities
- Implementing a feasibility study into construction of a compost plant in Homs City.
- Technical transfer

2. Master Plan on Solid Waste Management at Lattakia, Jableh, Quedaha and Al-Haffeh Cities

2.1 BASIC POLICY OF THE MASTER PLAN

Proper solid waste collection and cleansing service shall be provided in the urban area to maintain living environment. It is also necessary to apply appropriate disposal system to avoid environmental pollution. Reuse and recycle of solid waste shall be promoted to create a society with less burden on environment. Therefore, the solid waste management master plan in Lattakia City and the three surrounding cities was compiled based on the following policy:

(1) Waste treatment services that respond to demands from society (introduction of recycling, etc.)

(2) Introduction of sanitary landfilling and inter-municipal treatment and disposal

(3) Appropriate equipment renewal

(4) Enhancement of public awareness and cooperation by citizens

(5) Establishment of a financial base founded on the beneficiaries to pay principle

2.2 PLANNING CONDITIONS

The target year of the master has set on year 2010. Major planning conditions are as follows:

- Design population 687,000 (2.69% rate of increase after 2001)
- Local gross product SP 26,117 million (2% economic growth after 2001)
- Average household income SP 138,600 (average household size 5.3 members)
- Solid waste amount 508 tons/day (187,000 tons/year)

2.3 OUTLINE OF THE SWM MASTER PLAN

In order to improve solid waste collection, collection ratio is planned to expand from 70% at present to 95% in 2010. Separate collection shall be introduced to promote recycling of waste and to produce compost and recycle reusable materials. Al Bassa disposal site shall be rehabilitated and continued to use until Qasia new disposal site will be opened as a sanitary landfill site on 2008. The master plan is outlined in Table 2.3.1.

Table 2.2.1 Outline of the SWM Master Plan

Waste collection and street sweeping	Raise the waste collection rate from the present 70% to 95% by 2010. In order to promote recycling, introduce source separate collection (organic waste and inorganic waste) in 50% of districts.	47 collection vehicles will be procured by 2005. In addition, 31 vehicles by 2010
Transport	Construct two transfer stations (Jabla 80 ton/day and Qurdaha 40 ton/day) in line with construction of new disposal sites.	Construction of transfer stations & procurement of 6 container vehicles etc.
Intermediate treatment	Construct recycling centers at Al-Bassa and Al-Qasia, and make compost from organic waste and recover reusable materials from inorganic waste. Compost plant Sorting center Al-Bassa 50 ton/day, 20 ton/day Al-Qasia 150 ton/day, 20 ton/day	Construction of recycle center at Al-Bassa and Al Qasia
Final disposal	Carry out rehabilitation of Al-Bassa disposal site and controlled landfill until 2007. Construct a final disposal site in Al-Qasia and implement sanitary landfill from 2008.	Rehabilitation of Al Bassa disposal site and procurement of heavy equipment. Construction of Qasia disposal site
Medical waste treatment	Establishment of independent collection system of infectious waste and incineration at existing facility.	Procurement of 3 special collection vehicles
Public awareness	Continuous campaign on solid waste management and environment	Continuous campaign
Organization and institutions	Implement collection and street sweeping in each city, and conduct transport, treatment and disposal under an inter-municipal organization.	Establishment of inter-municipal organization
Finance	Improve fee collection rate from 20% to 80% from household and increase charge step by step from SP 200/year to SP 1,500/year	Raise fee collection rate and cleansing charge.

2.4 IMPLEMENTATION SCHEDULE AND PROJECT COST

The investment cost will be SP 1,559 million in total and implementation schedule of the master plan are as indicated in Table 2.3.1.

Table 2.3.1 Implementation Schedule and Project Cost of SWM Master Plan

Proejct Contents	Project Cost (SP1,000)		20 01		20 02		20 03		20 04		20 05		20 06		20 07		20 08		20 09		20 10	
	2001-2006	2006-2010																				
1. Waste Collection	155,557	110,888																				
2. Recycle Center (Al-Bassa)																						
(1) Compost Plant	199,000	534,000																				
(2) Sorting Center	33,260	33,260																				
3. Transfer Station	-	95,420																				
4. Final Disposal Site Construction																						
(1) Al-Bassa Disposal Site	119,050	-																				
(2) Al-Qasia New Disposal Site	-	153,860																				
5. Medical Waste Treatment	7,200	-																				
6. Enhancement of Citizen Awareness	8,965	6,724																				
7. Engineering Service	36,612	65,391																				
Subtotal	559,644	999,543																				
Total	1,559,187																					

2.5 FINANCIAL PLAN

The investment cost to procure equipment and facilities required for solid waste management was born by the central government at present while operation and maintenance cost was covered by general budget of local government and revenue of cleansing charge. However, the local government shall be capable in future to finance investment by loan and own funds.

It will be necessary to rely on funds other than those from the municipality own budget in order to fund the investment up until 2006 because local government have no own funds at present.

Operation and maintenance cost excluding depreciation will be SP 107.6 million in 2010. From 2006 onwards, loan repayments will need to be made. The fee levels required in order to cover these costs are as indicated in Table 2.4.1. The domestic waste fee indicated here accounts for roughly 1.1% of income in 2010.

Table 2.4.1 Fee Level

(Unit: SP/hh or business entity)

	Now	2006	2010
Domestic Waste	2000/year (100/year)	500/year (200/year)	1,500/year (1,500/year)
Business Waste	250/month (100/month)	250/month (100/month)	500/month (500/month)

2.6 EVALUATION OF THE MASTER PLAN

The master plan is formulated to improve solid waste management in Lattakia and the three surrounding cities and will contribute to improve urban environment. It will be effective to promote recycling of waste to reduce environmental deterioration at surrounding area of existing disposal site. And it will be economically and financially viable as described in following:

a. This master plan aims to introduce source separate collection, construct a recycle center and introduce sanitary landfilling in order to achieve a waste collection rate of 95% and promote recycling of waste. This will make a contribution to preserving the living environment in Lattakia and the three surrounding cities and improving the environment around disposal sites.

b. Upon examining the value of quantifiable benefits of the project, i.e. 1) benefits resulting from elimination of solid waste from urban areas, 2) benefits of compost production, and 3) benefits of reusable materials recovery, the economic internal rate of return works out to be 6.7%. Also it have the effects of enhancing citizen awareness, reducing final disposal quantities and improving the environment around final disposal sites. The plan can be regarded as a viable undertaking.

c. In the financial plan of the project, it is necessary to secure funds other than those from the municipality own budget for investment up to 2006 and to raise cleansing service fees by 2010. However, fees will still account for just 1% of household income after the increases and will not represent a major burden. Moreover, if investment up until 2005 can be subsidized, it will be possible for investment from 2006 onwards to be conducted using own funds and loans, thus making it possible to achieve sustained operation of the waste management utility. Therefore, the project is viable in financial terms.

d. The compost plants and sorting centers can cover operation and maintenance costs except for personnel expenses by means of revenue from the sale of compost and reusable materials.

e. In addition to widely contributing to improvement of the living environment in urban areas, the plan will help raise citizen awareness of solid waste management through introducing separated collection at the source. Also, the introduction of sanitary landfilling, rehabilitation of existing disposal sites and construction of new disposal sites will help mitigate the environmental pollution that has been growing progressively worse at existing disposal sites. It will be important that the plan have presented a long term solution for final disposal through the development of Qasia new disposal site.

3. Feasibility Study on the Priority Project at Lattakia and the Three Surrounding Cities

3.1 PRIORITY PROJECTS

The master plan is scheduled for implementation over two phases up until 2010, and final disposal of solid waste will be continued at Al Bassa disposal site until 2007. Therefore, the priority project has selected to improve solid waste collection, to promote recycling of waste and to improve existing disposal site as shown in Table 3.1.1. Feasibility studies were carried out on these projects.

Table 3.1.1 Contents of the Priority Project

Components	Contents
Improvement of waste collection and introduction of source separate collection	Improvement of collection rate from 70% to 85 % at 2006. Introduction of separate collection and renewal of aged equipment. 47 collection vehicle will be procured.
Construction of Al-Bassa recycle center (compost plant: 25 tons/shift, sorting center: 20 tons/shift)	Construction of a compost plant (rehabilitation of existing plant) with capacity 25 ton/shift (Plant will be operated 2 shift in future). Construction of sorting center with capacity 20 ton/day.
Rehabilitation of Al-Bassa disposal site and improvement of landfill work	Rearrangement of existing waste and preparation of tentative disposal area to dispose until 2007. Procurement of heavy equipment to improve disposal operation and to conduct covering soil.
Campaigns for enhancing citizen awareness	Continuous campaign for public awareness on solid waste management and environment.
Establishment of an inter-municipal treatment division	Establishment of Department for operation of Al-bassa disposal site and recycle center.

3.2 IMPLEMENTATION SCHEDULE AND PROJECT COST OF THE PRIORITY PROJECTS

The implementation schedule and project cost of the priority works are as indicated in Table 3.2.1. Moreover, improvement of Al-Bassa disposal site will need to be continued by Lattakia and the three surrounding cities.

Table 3.2.1 Implementation Schedule of Priority Works in Lattakia and Three Surrounding Cities

	Proejct Contents	Project Cost (SP1,000)	20 01				20 02				20 03				20 04				20 05				20 06			
1	Improvement of Waste Collection, Introduction of Source Separation	155,557									■	■	■	■												
2	Construction of Recycling Center																									
	(1) Compost Plant	199,000									■	■	■	■	■	■	■	■								
	(2) Sorting Center	33,260									■	■	■	■	■	■	■	■								
3	Rehabilitaiton of Al-Bassa Disposal Site																									
	(1) Zone I & II	730	■	■	■	■	■	■	■	■	■	■	■	■												
	(2) Zone III	88,480									■	■	■	■	■	■	■	■								
	(3) Disposal Site Equipment	29,840									■	■	■	■	■	■	■	■								
4	Enhancement of Citizen Awareness	8,965					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
5	Engineering Services	36,108					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Total	551,940																								

3.3 FINANCIAL PLAN

Investment cost based of the priority projects is SP 551.9 million. The financial source of this investment are note yet decided. Since the municipalities do not possess the financial resources to pay for such investment, funds other than those from the municipality budget will be relied on to provide funds.

The operation and maintenance cost of solid waste management in 2006 will be SP 100 million and it is almost same with present expenditure. However, to create own fund for future renewal of equipment, it will be necessary to raise cleansing fees of SP 500/year from households in Lattakia and SP 200/year from households in the three surrounding cities and the fee collection rate to at least 80%. In addition, it will be necessary for each city to outlay costs equivalent at present.

3.4 ASSESSMENT OF PRIORITY PROJECTS

The priority project is formulated to improve solid waste collection, to promote recycling and improve the existing disposal site and it will contribute to improve urban environment in Lattakia and the three surrounding cities. And it will be economically and financially viable as described in following:

a. This priority project aims to introduce source separate collection, construct a recycle center and carry out rehabilitation of Al-Bassa disposal site in order to achieve a waste collection rate of 85% and promote recycling of waste. This will make a contribution to preserving the living environment in Lattakia and the three surrounding cities and improving the environment around disposal sites.

b. Upon examining the value of quantifiable benefits of this project, the economic internal rate of return works out to be 9.2%. Also, it havs effects on enlightening of citizen awareness, reduction of final disposal quantities and improvement of the environment around final disposal sites, etc. Moreover, since improvement of the environment in Al-Bassa will contribute the tourism development here, the priority project can be regarded as a viable undertaking.

c. In the financial plan of the project, it is necessary to secure funds other than those from the municipality own budget for the priority projects. Moreover, it is necessary to raise domestic cleansing service fees to SP 500/year in Lattakia and SP 200/year in the three surrounding cities. Also, as is indicated in the master plan, it will be necessary to raise fees further by revising the appropriate law by 2010. However, fees will still account for just 1% of household income after the increases and will not represent a major burden. Moreover, if investment up until 2005 can be subsidized, it will be possible for investment from 2006 onwards to be conducted using own funds and loans, thus making it possible to achieve sustained operation of the waste management utility.

d. The compost plants and sorting centers can cover operation and maintenance costs except for personnel expenses by means of revenue from the sale of compost and reusable materials.

e. In addition to widely contributing to improvement of the living environment in urban areas, the project will help raise citizen awareness of solid waste management through introducing separated collection at the source. Also, the ,

rehabilitation of existing disposal sites will help mitigate the environmental pollution that has been growing progressively worse at existing disposal sites.

4. Feasibility Study for Compost Plant Construction in Homs City

4.1 Basic Policy and Planning Conditions of Compost Plant Construction

The solid waste management in Homs City is confronted with the issues of deterioration of collection equipment and environmental pollution around the existing disposal site. The master plan of solid waste management in Homs City was compiled in the "Homs Solid Waste Management Study (METAP study) and comprises construction of a new disposal site at Maghlia and introduction of a recycle system including a compost plant. This feasibility study has conducted in line with the master plan policy. Planning conditions of the Project conditions are as indicated below.

- Project target year 2006
- Design population 1,614,654 (3% rate of population increase)
- Local gross product SP 36,898 million (2% economic growth after 2001)
- Average household income SP 106,000 (average household size 5.3 members)
- Design waste quantity 809 tons/day (Target collection ratio : 85%)
- Compost plant site Land adjoining the existing disposal site

4.2 Contents of the Compost Plant Construction Works

Land adjoining the existing disposal site has been selected as the compost plant site. Since it will also be necessary to construct a transfer station on this land, the facility shall be constructed as Homs City Cleansing Center. The components of the project is described in Table 4.2.1.

Table 4.2.1 Components and Contents of Homs Compost Plant Project

Component	Content
Improvement of waste collection and introduction of source separate collection	Improvement of collection rate from 70% to 85 % at 2006. Introduction of separate collection and renewal of aged equipment. 59 collection vehicles will be procured.
Construciton of Homs cleansing center Compost plant Transfer station	Construction of the compost plant with capacity 50 ton/shift (Plant will be operated 2 shift in future) and the transfer station with capacity 810 ton/day. (Transportation from the transfer station to the new disposal site will be contract-out)
Rehabilitation of existing disposal site	Rearrangement of existing waste and preparation of tentative disposal area to dispose until 2007. Procurement of heavy equipment to improve disposal operation and to conduct covering soil.
Medical waste management	Establishment of independent collection system and treatment for infectious waste. 3 special collection vehicles and a autoclave will be procured.
Enhancement of citizen awareness	Continuous campaign for public awareness on solid waste management and environment.

4.3 IMPLEMENTATION SCHEDULE OF COMPOST PLANT CONSTRUCTION

The project will start in 2002 with facilities construction and equipment procurement taking place in 2003 and 2004. The implementation schedule is as indicated in Table 4.3.1

Table 4.3.1 Implementation Schedule of Homs City Compost Plant Construction

	Proejct Contents	Project Cost (SP1,000)	20 01				20 02				20 03				20 04				20 05				20 06			
1	Improvement of Waste Collection, Introduction of Source Separation	201,996																								
2	Construction of Cleansing Center																									
	(1) Compost Plant	350,000																								
	(2) Transfer Station	64,604																								
3	Rehabilitaiton of Existing Disposal Site																									
	(1) Rehabilitation	30,817																								
	(2) Improvement of Disposal	45,960																								
4	Medical Waste Treatment	22,280																								
5	Enhancement of Citizen Awareness	9,341																								
6	Engineering Services	50,750																								
	Total	775,748																								

4.4 FINANCIAL PLAN

Investment cost based of the project is SP 775.7 million. The financial source of this investment is note yet decided. Since the Homs municipalities do not possess the financial resources to pay for such investment, funds other than those from the municipality budget will be relied on to provide funds.

The operation and maintenance cost of solid waste management in 2006 will be SP 142 million and it is 10 % more compare with present expenditure. However, to create own fund for future renewal of equipment, it will be necessary to raise cleansing fees of SP 500/year from households and the fee collection rate to at least 80%. In addition, it will be necessary for to outlay costs equivalent at present.

4.5 EVALUATION OF THE PROJECTS

The project has covered an improvement of solid waste collection, promotion of recycling and improvement of the existing disposal site and it will contribute to improve urban environment in Homs. And it will be economically and financially viable as described in following:

a. This project intends to construct compost plant together with rehabilitation of the existing disposal site and improvement of waste collection in order to acheive collection rate of 85% and promote recycling of waste. This will make a contribution to preserving the living environment in Homs City and improving the environment around disposal sites.

b. Upon examining the value of quantifiable benefits of this project, the economic internal rate of return works out to be 11.7%. Moreover, since other effects can be considered such as enlightening of citizen awareness, reduction of final disposal quantities and improvement of the environment around final disposal sites, the project can be regarded as a viable undertaking.

c. In the financial plan of the project, it is necessary to secure funds other than those from the municipality own budget for the priority works. Moreover, it is necessary to raise domestic cleansing service fees to SP 500/year. Also, it will be necessary to raise fees further by revising the appropriate law by 2010. However, fees will still account for just 1% of household income after the increases and will not represent a major burden. Moreover, if investment up until 2005 can be subsidized, it will be possible for investment from 2006 onwards to be conducted using own funds and loans, thus making it possible to achieve sustained operation of the waste management utility.

d. The compost plants can cover operation and maintenance costs except for personnel expenses by means of revenue from the sale of compost and reusable materials.

e. In addition to widely contributing to improvement of the living environment in urban areas, the project will help raise citizen awareness of solid waste management through introducing separated collection at the source Also, rehabilitation of existing disposal sites and implementation of earth covering will help mitigate the environmental pollution that has been growing progressively worse at the existing disposal site.

ABBREVIATION

CDEARE	The Center for Environmental Development for Arab States and Europe
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
FAO	Food and Agricultural Organization of the United Nations
F/S	Feasibility Study
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
GTZ	Deutsche Gesellschaft fur Techniche Zusammenarbeit
JICA	Japan International Cooperation Agency
METAP	Mediterranean Environmental Technical Assistance Programme
MOAAR	Ministry of Agriculture and Agrarian Reform
MOC	Ministry of Culture
MOE	Ministry of Education
MOH	Ministry of Health
MOI	Ministry of Information
MOLA	Ministry of Local Administration
MSEA	Ministry of State for Environmental Affaires
MSW	Municipal Solid Waste
O/M	Operation and Maintenance
PHC	Primary Health Care
PPP	Polluter Pays Principle
SCE	Supreme Council for Environment
SP	Syrian Pound
SPC	State Planning Commission
S/W	Scope of Works
SWM	Solid Waste Management
The Study	The Study on Solid Waste Management at Local Cities in the Syrian Arab Republic
UNDP	United Nation Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

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INTRODUCTION

Lattakia City, located on the Mediterranean Cost in the western part of Syria and having a population of 375,000, is the fourth largest city in the country. As of 2001, the city generates approximately 280 tons/day of waste and the municipal government carries out collection, transport, treatment and disposal of waste in accordance with the Local Autonomy Law.

Waste collection and transport is largely carried out by compactors, and the collection rate is approximately 70%. Street sweeping is adequately carried out in central urban areas, however, the collection situation in outlying areas is very poor and it is clear that maintenance of the present collection setup will become difficult in the near future as a result of equipment shortages and advancing deterioration.

Collected waste is transported to Al-Bassa disposal site for final disposal. Al-Bassa disposal site, which has served as a disposal site for many years, is located approximately 12 km southeast of the city center on the coast and covers an area of 100 ha. However, waste disposal here only consists of open dumping with no earth covering. As a result, not only does waste become scattered over a wide area and harm tourism resources, but nearby farmland is contaminated.

A compost plant was constructed in Lattakia 20 years ago, however, this has hardly been operating at all in recent years and is only able to produce poor quality compost. Accordingly, only a small portion of the produced compost can be sold and the plant was closed down in March 2001.

The cities of Jableh, Qurdaha and Al-Haffeh are also located in Lattakia Governorate and surround Lattakia City at distances of 20-30 km. The population in these cities is 93,000, 49,000 and 24,000 respectively. The waste collection rate in Jableh is around 60% and, like in Lattakia City, collection in outlying areas is very poor and the city is confronted with absolute shortages and deterioration of collection equipment. Moreover, collected waste is open dumped at a disposal site on the coast and this situation leads to contamination of the surrounding environment. Qurdaha has more or less sufficient collection equipment and transports collected waste to Al-Bassa disposal site for final disposal. In Al-Haffeh, waste collection is carried out using two tractors. Since this is a small city, the waste collection rate is high, however, collected waste is open dumped at an old stone quarry site located nearby. Quantities of waste are small, but pollution of the surrounding environment is again a problem.

Homs City, located in the center of Syria, is the third largest city in the country. Expansion of the municipal area is scheduled to take place in the near future, and when this happens the population of Homs will reach 1,000,000. The municipal government carries out collection, transport, treatment and disposal of waste in accordance with the Local Autonomy Law. The quantity of waste generated in Homs City (including the expanded municipal area) is 704 tons/day as of 2000, and approximately 70% of this is collected mainly in compactors. Here too, collection in outlying areas is not good enough. As is the case in Lattakia City, Homs City is also confronted with shortages and deterioration of collection equipment, and drastic countermeasures are required in order to improve the collection situation.

Collected waste is disposed of at Dir Baalbeh disposal site. This disposal site, located in the northern part of the city, has an area of approximately 30 ha and has been utilized for a long time. However, here too open dumping is carried out and the surrounding environment is adversely affected by odor and smoke from spontaneous combustion. As a result, there is a constant stream of complaints and calls for the immediate relocation of the disposal site.

The master plan for solid waste management in Homs City was formulated in the METAP-ETIB Study and finally compiled into the amended interim report that was presented in January 2001. In the Master Plan, it is proposed that a new sanitary landfill disposal site be constructed at Maghlia, which is located some 30 km to the east of Homs City. Moreover, the Master Plan also proposes introduction of composting and recycling, and measures to this end will also need to be implemented. However, since it will be necessary to continue using the existing disposal site at Dir Baalbeh until the new site is ready, disposal work will need to undergo immediate improvement by implementing earth covering, etc. in order to prevent further environmental pollution.

Summing up the aforementioned conditions, in order to preserve the living environment and prevent environmental pollution in these cities, it is urgently necessary to establish an appropriate solid waste treatment and management setup via the expansion of waste collection services, promotion of recycling and introduction of sanitary landfilling, etc.

Japan has so far implemented grant aid and produced good results in the area of waste treatment equipment procurement via the Project for Solid Waste Management in Damascus in 1995 and the Project for Solid Waste Management in Aleppo in 1997.

It was against this background that the Government of Syria in 1999 requested the Government of Japan for implementation of the Study, with the aims of compiling a master plan and implementing a feasibility study for the priority projects for Lattakia City and the three surrounding cities and implementing a feasibility study into construction of a compost plant in Homs City. Following this, JICA dispatched the Preliminary Study Team to carry out S/W consultations in August 2000 and started work on the study proper in January 2001. This is the summary of the Final Report of the Study.

PART I

MASTER PLAN ON SOLID WASTE MANAGEMENT AT LATTAKIA, JABLEH, QURDAHA AND AL-HAFFEH CITIES

PART I MASTER PLAN ON SOLID WASTE MANAGEMENT AT LATTAKIA, JABLEH, QURDAHA AND AL-HAFFEH CITIES

CHAPTER 1 PRESENT CONDITIONS

1.1 OUTLINE OF THE SYRIAN ARAB REPUBLIC

1.1.1 Location

The Syrian Arab Republic is located between latitudes 32 degree N and 37 degree N in the northern part of the Arabian Peninsula. It lies on the eastern coast of the Mediterranean Sea, bounded by Turkey to the north, Iraq to the East, Palestine and Jordan to the south and by Lebanon and the Mediterranean Sea to the west. The total land area of the country is 185,180 km^2.

The Study Area is located on the northwest coast of the Mediterranean Sea in the Lattakia Governorate shown in Figure 1.1.1. The Study Area composed of four municipalities called Lattakia, Jableh, Al-Haffeh and Qurdaha.

1.1.2 History

The modern state of Syria was established only in 1946. However archaeologists have unearthed evidence of habitation dating back to 5000 B.C. Furthermore many archaeologists consider Damascus to be the world's oldest continuously inhabited city.

The Egyptians, Babylonians, Hittites, Chaldeans and Persians have successively ruled ancient Syria. It became part of the Greek empire in 333 B.C. and a province of the Roman empire from 64 B.C. to 400 A.D. Remains of the famous Roman roads are still visible in Syria, attesting to the country's importance as a transport hub for the empire. Syria then fell under the Byzantine Empire until the 7th century when it became part of the Arab and Islamic nation.

From the 16th century Syria fell under the rule of the Ottoman Empire. At that time Syria was part of the Sham region, which roughly covered the present countries of Syria, Lebanon and parts of Palestine and Jordan. With the defeat of the Ottoman Empire in the First World War, the Sham region was divided up and Syria became a protectorate under French rule.

The country gained independence in 1946 becoming a republic. Syria has and continues to play a leading role in Arab and regional politics.

1.1.3 Administration

Syria is a republic with the President at the head of the executive branch. The president is elected for a seven years period and the president in turn appoints the -ministers and governors. There are a number of political parties, and the President heads the Arab Ba'ath Socialist Party. The Government is composed of several parties under a coalition government.

The People's Council forms the legislative branch of the country and comprises 195 members elected for five-year terms.

The country is divided into 14 administrative regions or "governorates". The President appoints a Governor to each region for an indefinite period. Each Governor in turn heads a regional administration. Smaller administrative units exist within the governorates. These include cities, villages, towns, hamlets, counties, "Nahia" and "Mantika". The largest administrative unit after the governorate is the Mantika and in total there are 60 Mantikas.

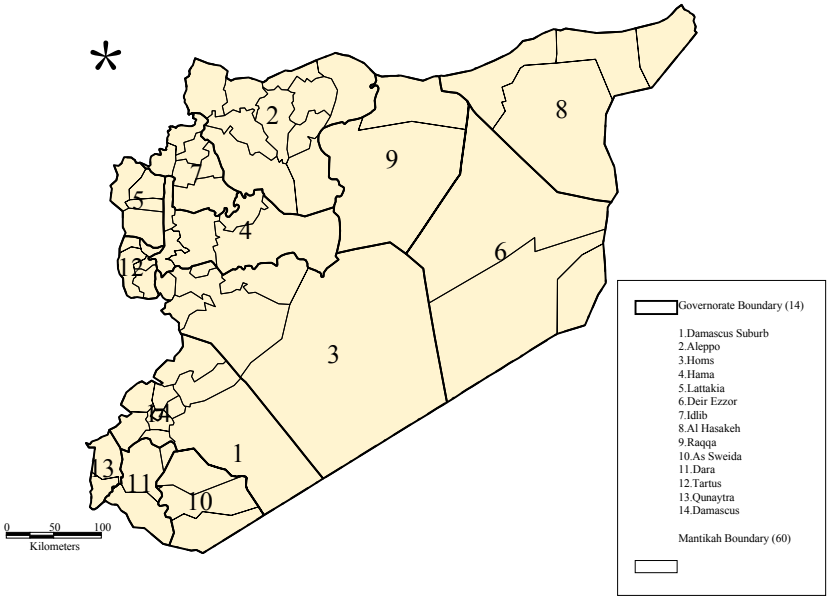


Figure 1.1.1 Administrative Map of Syria

1.1.4 Natural Conditions

(1) Geographic Features

The land area of Syria is broken into:

Arable lands 32%; Steppe and pasture (subject to sufficient rainfall) 44%, forests 4% and non-arable lands 20%. Protection of the limited areas of arable and forest lands is of concern.

The General Organization for Remote Sensing, GORS, has divided Syria into seven geographical regions listed below:

Table 1.1.1 Geographic Regions

Region/Characteristics
1. Coastal Region This region is a narrow strip of land (25-35 km wide) between the Mediterranean coast and the adjoining uplands. With reasonable rainfall, it is extensively cultivated, and given a relatively mild summer climate is popular as a resort area.
2. Coastal mountain The coastal mountains extend along the coast from north to south, about 25-35 kilometers inland. Extensive cultivation is possible in the south part of the region relying on fresh water springs. The scenery especially in the north is breathtaking.
3. Upland region Bounded to the east by rocky mountains and to the west by the coastal range, this region includes the fertile valley of the Orontes River including the plains of Homs, Hama and Aleppo. The Al-Ghab region supports extensive agricultural activity.
4. Middle and East Syrian Desert Steppe This region covers about 60% of Syria. Nomads, Bedouins and shepherds inhabit oases and meager water points. The region also includes large phosphate mines
5. Southeast sand area This region is cut by valleys and extensive areas of moving sand to the west of the Euphrates valley. Rainfall is only 150 to 200 mm per year
6. Euphrates Valley The Euphrates flows diagonally from the north west border with Turkey to the south east border with Iraq crossing the desert. The valley of the river provides fertile agricultural land.
7. Syrian-Jordanian border Volcanic summits, slag cones and craters with intermittent, extensive lava fields provide excellent soil conditions for the cultivation of cereals.

Source: GORS, 1996, Syria Space Image Atlas

(2) Climate

The Mediterranean climate generally prevails in Syria: a rainy winter and a dry, hot summer separated by two short transitional seasons. The coastal region of the country has heavy winter rains. In summer these regions have moderate temperatures and high relative humidity. The interior has a rainy winter season and a hot and dry summer. The mountainous areas above 1000 meters have wet winters and may receive over 1000 mm of precipitation, sometimes as snow. Summers here are cooler. Finally the desert region has a little rain in winter and a hot and dry summer.

Following figure shows monthly average precipitation and temperature in Lattakia. It is typical Mediterranean climate that is rainy winter and hot and dry summer. The annual total precipitation and the annual average temperature are approximately 900 mm and 19.5 degree Celsius respectively.

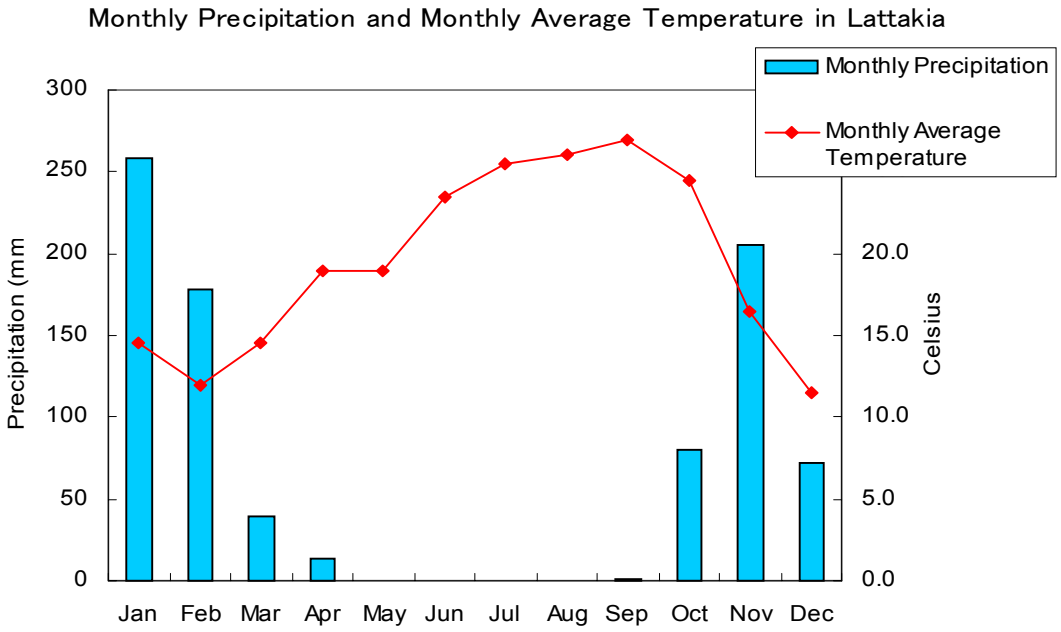


Figure 1.1.2 Monthly Average Precipitation and Temperature in Lattakia

(3) Topographical Features

The *coastal region* may be divided into two sections; the western part from the coast inland dominated by coastal valleys, and an eastern section dominated by mountains of heights ranging from 200-300 m. The *mountain region* comprises the easterly Mountain Range which stretches east of Lebanon and along its border with Syria. The highest peak is Al Skeikh Mt. (2,814 m above sea level). The *southeastern region* comprises mild hills with average heights of 650-850 m in predominantly flat plains. Ground levels fall below sea level in Wadi Yarmouk (-156 m)

The *steppes region* covers a third of Syria and stretches from the country's southern borders to the Northern Palmyra mountain range. The *Aleppo valleys region* stretches from the Orontes river in the west to the Euphrates valley in the east and from the Turkish border in the north to the Northern Palmyra mountain range in the south. The region is characterized by hilly terrain with average heights of 350-450 metres.

Finally the *Euphrates Valley and Jazira region* is located in the country's northeastern corner. The terrain in this region is almost flat with an elevation of about 350 metres.

(4) Geological and Soil Conditions

The Statistical Abstract Book has classified the soil conditions in Syria into six main groups as presented in the Soil Map. Agricultural activity is concentrated in regions with *alluvial* soil, mainly along the Euphrates River, and with *cinnamonic* soil in the country's southwest corner and in the region between Homs and Aleppo to the northern border with Turkey. Pasture lands and seasonal agriculture is found in regions with *grumusol* soils to the west and east of the cinnamonic soils region and extending eastwards to Palmyra. Remaining regions of the country are classified as *desert* and *gypsiferous* soils, which do not support agriculture. Pockets of *groundwater soils* are

scattered over the country north of Lattakia, north east of Damascus, near Aleppo and at Hasake.

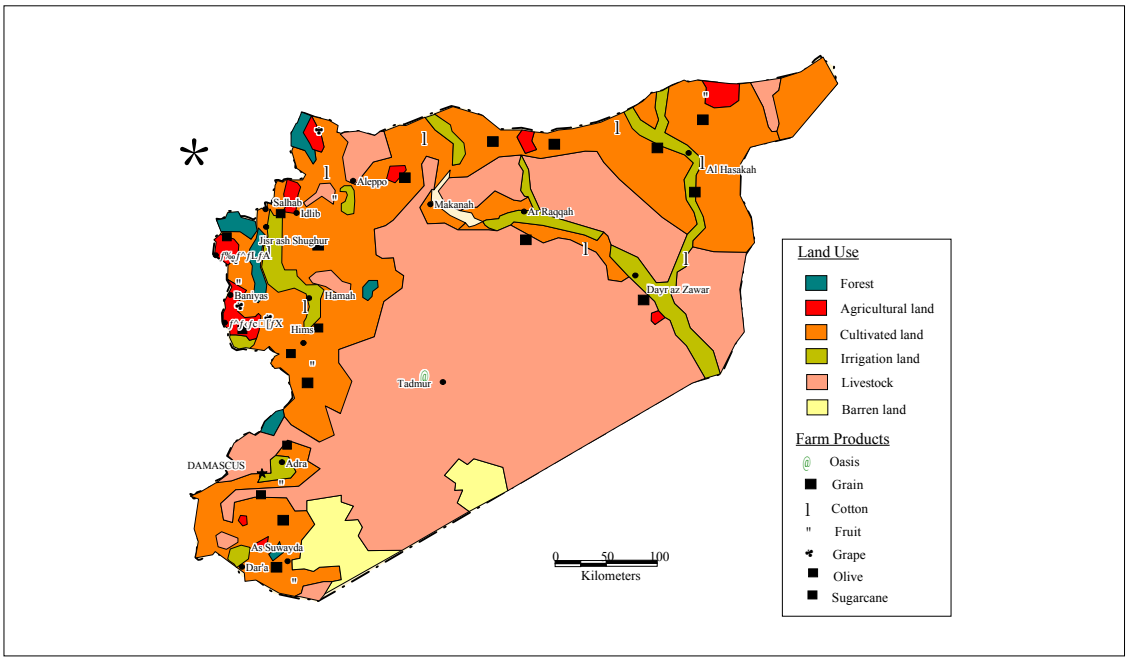


Figure 1.1.3 Agricultural Land Use

1.1.5 Population

The population of Syria is predominantly young due to a high birth rate and temporary or permanent emigration by population of working age. As a result of the high birthrate the population aged under 15, is continuing to expand rapidly, while emigration is leading to some decrease in the population over 15.

The fertility rate in rural areas remains significantly higher than in urban areas leading to the familiar problems of lack of employment opportunities in rural areas and rural migration to cities found in most developing countries.

The following population statistics are taken from the Statistical Abstract.

Table 1.1.2 Population of Syria by Age and Sex

Cohort		Population 1999 ('000)			Population 1994 census ('000)			Change (%) in size of cohort over 5 years	
From (years)	To (years)	Female	Male	Total	Female	Male	Total	Female	Male
0	0	225	242	467	191	206	397	17.8	17.5
1	4	939	994	1933	803	850	1653	12.9	10.9
5	9	1209	1272	2481	1033	1087	2120	20.5	19.7
10	14	1136	1200	2336	975	1030	2005	10.0	10.4
15	19	917	952	1869	785	814	1599	-5.9	-7.6
20	24	727	739	1466	622	632	1254	-7.4	-9.2
25	29	607	618	1225	518	527	1045	-2.4	-2.2
30	34	495	504	999	420	427	847	-4.4	-4.4
35	39	372	385	757	320	332	652	-11.4	-9.8
40	44	297	315	612	256	271	527	-7.2	-5.1
45	49	219	232	451	190	202	392	-14.4	-14.4

Cohort		Population 1999 ('000)			Population 1994 census ('000)			Change (%) in size of cohort over 5 years	
From (years)	To (years)	Female	Male	Total	Female	Male	Total	Female	Male
50	54	203	200	403	171	170	341	6.8	-1.0
55	59	149	157	306	129	135	264	-12.9	-7.6
60	64	154	168	322	133	144	277	19.4	24.4
65	-	221	262	483	187	222	409	18.2	18.0
Total		7870	8240	16110	6733	7049	13782	16.9	16.9

Source: Statistical Abstract, 1999

Table 1.1.3 Fertility Rates 1993

Cohort		Fertility Rate (births per 1000 females)			Number of births		
From	To	Urban	Rural	(Weighted) average	Urban	Rural	Total
15		71	52	63	33,595	24,605	58,200
20		157	177	172	58,896	66,398	125,294
25		186	246	223	58,257	77,050	135,307
30		145	228	192	37,036	58,236	95,271
35		105	183	149	20,155	35,127	55,282
40		44	100	74	6,743	15,325	22,068
45		7	26	17	791	2,938	3,729
Total					215,473	279,679	495,151

Source: Statistical Abstract, 1999

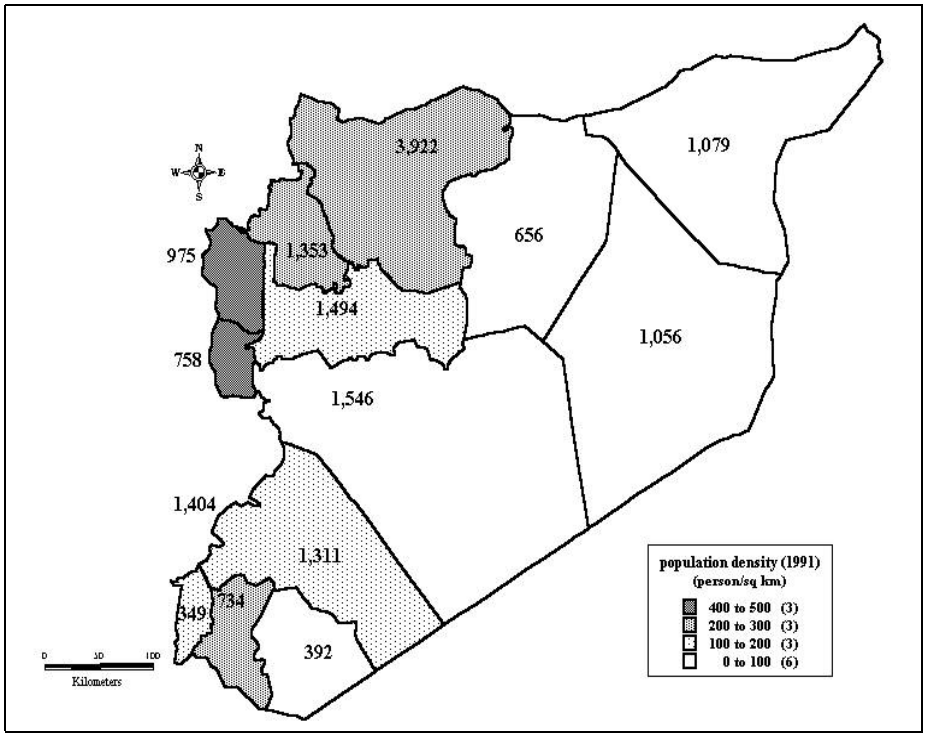


Figure 1.1.4 Population Distribution by Region

1.1.6 Economic structure

(1) The National Economy

1) Changes in the Economy

Recent economic history of Syria can be divided into two periods. During the first period from 1977 to 1987 the economy was predominantly socialist, with private sector participation restricted to handicrafts, food processing and agriculture. During this period close economic links were maintained with the Soviet Union, the Eastern Bloc and neighboring Arab countries.

The second period starting in 1988 began as the former Soviet Union, then Syria's main trading partner, weakened and soon after collapsed. With the outbreak of the Gulf War, Syria joined the alliance led by Saudi Arabia and the West to liberate Kuwait, leading to increased contact with the West. Thereafter peace negotiations with Israel took centre-stage and the threat of war diminished. In this changing environment, the West, including Japan, took a more active role in international co-operation with Syria.

During this second period Syria has undertaken some economic reforms to shift its economic management system towards market-based principles. This has led to increased economic growth, and an increase in private sector participation in the economy. The adoption of Investment Law No 10 in 1991 is often seen as the most significant change and led within twelve months to a rapid increase in private investment, so that by 1992 private investment was more than twice public investment. The new investment was concentrated in the transport sector, with investments in this sector accounting for over half all-new investment in the first year after the introduction of this law. Since then the statistics suggest that the private sector has harbored some uncertainties over the longer term economic program, and private investment again dropped below public investment in 1997 and 1998.

Some further changes now appear to be underway and are discussed in section 2.5 following. Up to this point however the economic management system remains a hybrid of market forces and command principles inherited from the earlier Soviet model. Key economic parameters such as interest rates and credit allocation are still set by Government rather than by markets, and the public sector still dominates the financial system.

Table 1.1.4 Annual Economic Growth rates for the two periods (%)

Item	First period *	Second period *	**	**	**
	1977-87	1988-98	1997	1998	1999
GDP	3.4	5.3	2.5	7.6	-1.8
GDP per capita	-0.3	2.0	-0.2	4.8	-4.4
Exports of goods and services	2.7	8.7	(a)	(a)	(a)

Source: * World Bank 1998, and ** Statistical Abstract, 2000

(a) Major differences between numbers sourced from W.B and Statistical Abstract, thought to result from differences in treatment of exchange rate.

2) Economic Structure

Since the 1960's the Syrian economy has diversified though the structure has remained fairly constant with primary, secondary and service sectors representing around 30%, 20% and 50% of the economy respectively. The increase in the size of the primary sector since 1977 is notable. It is not clear whether this is due to statistical distortions in earlier years due to price controls for agricultural products (some are still subject to price controls), rapid growth of agriculture once prices were liberalized or to the weakening of the emphasis on heavy industry that had formerly been a feature of the earlier Soviet based planning system.

Table 1.1.5 Economic structure - Relative size of sectors (% of GDP)

Item	1977	1987	1997	1998
A – Economic activity				
Agriculture	18.5	25.4	27.8	29.2
Industry	24.4	19.4	17.9	17.3
Manufacturing	-	-	6.2	6.0
Services	57.0	55.2	54.3	53.5
B – Consumption shares				
Private consumption	67.4	77.1	58.2	59.3
Gen. Govt. consumption	19.6	18.0	16.7	16.6
C – Imports of goods and services	40.7	28.9	31.4	29.0

Source: World Bank, 1998

Agriculture remains the largest single sector of the economy and the largest single employer, even though less than a third of the country is cultivated because of aridity and poor soils. Market reforms introduced to date have been particularly beneficial to the agricultural sector which has grown faster than the other sectors of the economy.

The relatively low intensity of agriculture in Syria requires only modest capital investment and has allowed the private sector to access sufficient capital to lead the expansion of this sector. Rapid expansion of private agriculture as price controls were relaxed mirrors the experience of many other transition economies. The main cash crop is cotton.

Most Syrian industry remains agrarian based – food processing and textiles, or related to petroleum processing, though the Government's industrialization policy during the years of Soviet influence stressed the importance of iron and steel and other heavy industries. The oil exploration program led to the discovery of a major oil field in the Deirr Az Zour region in the mid 1980's. Although Syria is not a major petroleum producer by Middle Eastern standards, petroleum presently accounts for some 40% of total exports, and has led to the development of petrochemical industries in the vicinity of the main refineries. The following table gives a further breakdown of economic activity and employment by sector.

Table 1.1.6 GDP and Employment by Sector

Sector	GDP (million SP)	Workers (persons)	GDP/worker '000 SP/worker
Agriculture	219,170	875,609	250
Mining	114,212	512,551	223
Construction	28,383	516,111	55
Wholesale & retail trade	136,411	537,467	254
Transportation	81,289	213,563	381
Finance and Insurance	28,379	53,391	532
Social Services	14,048	523,230	27
Government Services	55,004	327,463	168

Source: Labour survey, 1998

3) External Trade Accounts

After many years of running a massive trade deficit, Syria brought its trade accounts roughly into balance in 1996 and has maintained a reasonable balance since. The following table shows the recent structure of trade. Note that exports continue to be dominated by petroleum products. Table 1.1.10 in section 1.1.6 (3) shows trends in total trade over the past decade.

Table 1.1.7 Structure of Trade in US Dollars (million)

Item	1977	1987	1997	1998
Total Exports (fob)	1,070	1,340	4,057	3,089
Petroleum & Pet. Products	621	703	2,509	1,628
Agricultural products	--	--	989	766
Manufactures	--	--	442	396
Total Imports (cif)	2,402	2,470	3,603	3,257
Food	--	--	674	492
Fuel and energy	422	492	115	81
Capital goods	--	--	821	824
Export price index (1995 = 100)	8	22	76	n.a.
Import price index (1995 = 100)	5	22	68	n.a.

Source: World Bank, 1998

Note: These figures differ significantly to those in the Statistical Abstract, it seems due to differences in treatments of exchange rates

(2) Regional Activity

1) Regional Characteristics

The minerals and agricultural resources of Syria and depicted in the following figure. With the exception of the Euphrates valley, which is extensively irrigated, most agriculture relies on natural rainfall, and so production is dependent on seasonal conditions.

Availability of water remains a major factor in economic development. The cost of distributing water from catchment areas to areas of potential demand is a major constraint on economic development patterns. Rapid population growth in existing population centres is also creating additional water pollution problems placing further pressure on existing water supply systems.

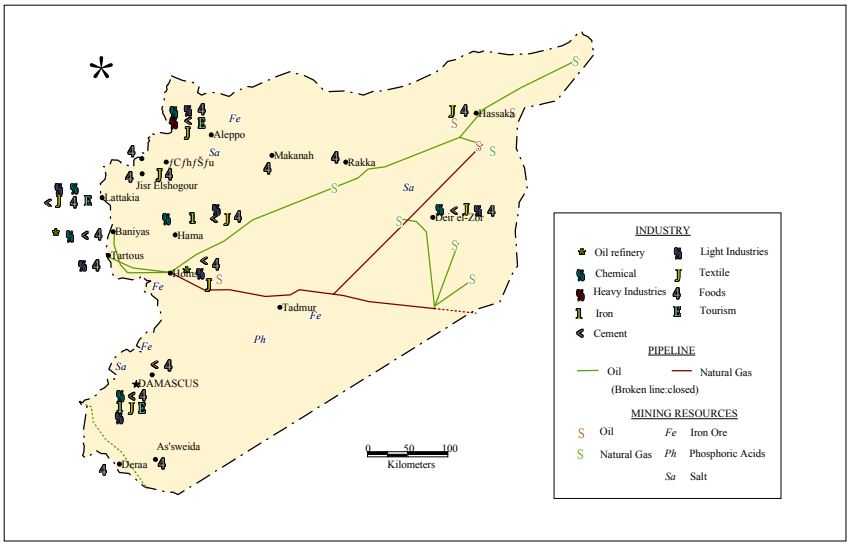


Figure 1.1.5 Location of Key Industries

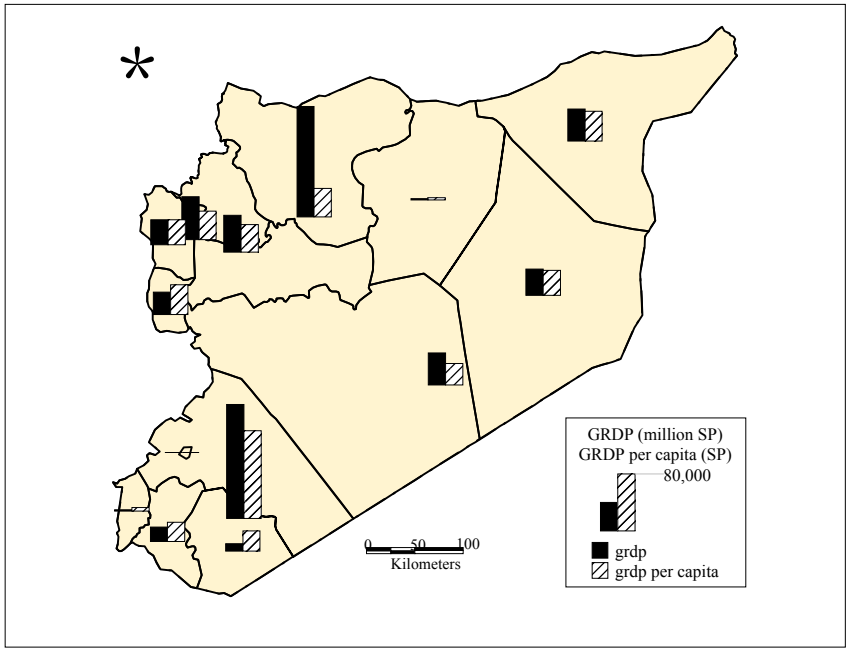


Figure 1.1.6 Gross Regional Domestic Products (GRDP)

Table 1.1.8 Regional Characteristics

REGION/CHARACTERISTICS
Damascus • The country's capital city and often referred to as the oldest city in the world • Strong attraction for rural migrants • Sprawl of informal housing • Encroachment on green areas • Water supply problem with water rationing in some parts of the city • Highest population growth rates and high population densities • Industries creating pollution • Historic city of significant cultural importance
Aleppo • Syria's second most important governorate after Damascus city • Largest industrial centre in the country • Water supply problems • High population density in built up areas pose severe demands on existing infrastructure • Aleppo rural areas suffering from poor transport infrastructure • Historic city of significant cultural importance
Homs • Serious urban sprawl • Centre for oil refining and petrochemical industries • Pollution in the city very severe • A large governorate containing the historic city of Palmyra and phosphate rich area south of Palmyra
Hama • Urban infrastructure relatively better than other Syrian cities due to major rebuilding program in the early 1980's • Some encroachment on green areas has started recently • Many historic sites
Lattakia • The major seaport for Syria • Port was rehabilitated in the late 1970's with Soviet aid • Large industrial area concentrated south of the city • Some pollution problems from the industrial activities • Coastal resort city (northern part of the city) • High population densities compared to other Syrian cities: may have contributed to the lower than average population growth during 1981 to 1994
Idlib • Used to be part of Aleppo governorate and continues to retain that character • Rural character • Agricultural activity in this governorate has suffered as citizens have migrated to the urban centres of Aleppo and Hama
Tartous • Second seaport of Syria (after Lattakia • Development characteristics similar to Lattakia
North-Eastern Governorates: Al-Rakka, Deir Az Zour, Al-Hasakah • Rapid population growth since the 1980's with increased oil production and land reclamation • Rapid population growth has strained transport infrastructure • Rich in raw materials but lacks processing facilities except for limited facilities at Deir Az Zour • Raw products transported to Homs, Hama and Aleppo
Southern Governorates: As Sweida, Dar'a and Quneitra • Development and population growth in this area lags behind the rest of the country because of continuous problems with Israel • Quneitra only recently restored to Syrian control (ten years ago) after being under Israeli occupation for 15 years. At present a military area with access subject to permission. However citizens who resided there before 1967 have been allowed to return • Area has more agricultural than industrial potential

2) Regional Population and Production

Regional populations and Regional production is summarized in the following table.

Table 1.1.9 Regional Population and Production

Governorate	Population	Workforce	GRDP 1998 (million SP)
Damascus city	1,404,000	414,030	160,801
Damascus rural	1,311,000	512,842	
Aleppo	3,922,000	770,205	154,557
Homs	1,546,000	245,952	45,188
Hama	1,494,000	289,306	59,916
Lattakia	975,000	188,334	34,203
Deir Az Zour	1,056,000	184,229	37,180
Idlib	1,353,000	252,866	51,171
Al-Hasakeh	1,079,000	239,928	45,589
Al-Rakka	635,000	126,939	24,670
As Sweida	392,000	57,150	10,793
Dar'a	734,000	108,428	19,253
Tartous	758,000	160,344	31,689
Quneitra	349,000	8,831	1,886
TOTAL	17,008,000	3,559,384	676,896

Source: Statistical Abstract, 1999 and estimates by JICA study team

(3) Summary Economic Statistics

Table 1.1.10 Summary of Economic Data

Statistic	Units	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
GDP (market prices)	Const.'95 SP *10^6	389,469	420,242	476,850	501,546	539,929	570,975	612,896	628,148	675,888	663,688
	Current SP *10^6	268,328	311,564	371,630	413,755	506,101	570,975	690,857	745,569	790,444	821,327
GDP deflator	Deflator	1.4515	1.3488	1.2831	1.2122	1.0668	1.0000	0.8872	0.8425	0.8510	0.8081
Consumption – total	Const.'95 SP *10^6	386,208	396,028	446,509	450,970	426,431	454,852	471,474	469,108	495,082	481,627
Govt	Const.'95 SP *10^6	66,320	76,518	74,258	74,255	74,285	76,709	76,899	77,854	79,397	82,203
Private	Const.'95 SP *10^6	319,888	319,510	372,251	376,715	352,146	378,143	394,575	391,254	415,685	399,424
Capital Formation - total	Const.'95 SP *10^6	92,434	95,836	127,039	128,856	155,530	155,504	155,045	147,256	152,001	148,548
Public	Const.'95 SP *10^6	39,389	40,666	41,428	45,623	65,929	68,084	73,914	85,413	89,234	87,092
Private	Const.'95 SP *10^6	53,045	55,170	85,611	83,233	89,601	87,420	81,131	61,843	62,767	61,456
Trade in Goods & services											
Imports	Const.'95 SP *10^6	193,899	193,926	219,071	213,904	215,907	216,610	208,253	207,928	194,883	208,347
Exports	Const.'95 SP *10^6	104,726	122,304	122,373	134,624	173,875	177,229	194,630	219,13	223,688	241,860
Population (mid-year)	*10^3	12,116	12,529	12,958	13,393	13,782	14,285	14,670	15,066	15,473	15,891
Govt. employees	*10^3	662	681	701	687	729	737	761	788	804	834
Budget Structure											
Revenue Total	Current SP *10^6	71,014	87,207	88,848	106,579	125,393	156,913	180,494	203,036	217,909	217,909
Taxes	Current SP *10^6	27,720	29,408	29,489	40,455	48,903	57,371	69,296	75,516	82,686	82,686
Service charges	Current SP *10^6	3,454	4,856	5,658	6,643	7,186	12,743	18,574	20,054	19,409	19,409
Other non-tax	Current SP *10^6	39,840	52,943	53,701	59,481	69,304	86,799	92,624	107,466	115,814	115,814
Expenditure Total	Current SP *10^6	61,875	84,691	93,042	123,018	144,162	162,040	188,050	211,125	237,300	255,300
Current	Current SP *10^6	24,300	27,177	36,250	61,750	67,964	74,099	91,473	108,700	119,600	133,500
Capital	Current SP *10^6	37,575	57,514	56,792	61,268	76,198	87,941	96,577	102,425	117,700	121,800

Source: Statistical Abstract 1990 - 2000

1.1.7 Development Plan

For the past few decades Syria has been a mixed economy, with the public sector following the command economy concept formerly promoted by the Soviet Union. This pattern continued after the collapse of the Soviet Union, though some shifts towards a market economy have taken place as outlined above. In 1999, the last year for which official statistics are available, the public sector was still responsible for slightly over half of all capital expenditure. Private capital expenditure was concentrated in the residential buildings and transport equipment sectors, so the state continued to dominate investment in other sectors. Syria has not undergone as massive a change in economic management systems as its former mentor and has managed to maintain a modest rate of economic growth slightly ahead of population growth.

Further changes are taking place. In particular since 1999 there appears to be further consolidation of the exchange rate. One World Bank report dated 1998[1] indicates that the official exchange rate had already changed from 11.2 to 23 SP per US Dollar in 1996, though the Official Syrian Statistical Abstract indicates that the Official rate remained at 11.2 SP per US Dollar up to 1999. (The current commercial rate quoted by the Syrian Commercial Bank is about 46 SP per US dollar.) There appears to be further changes underway to rationalize the overvalued official exchange rate regime. Financial markets however remain tightly controlled with interest rates and allocation of finance largely under the control of the Government rather than the market. The currency remains non-convertible. Our preliminary understanding is that the Government has found it necessary to exercise some fiscal austerity during this period of ongoing change. It appears that this may have resulted inter alia in at least a temporary reduction in special grants from the national level to the municipal level (third tier) of government.

We are however awaiting further data and meetings at the national level to fully understand the extent and implications of planning changes that are currently occurring in Syria, and in particular the implications of such changes for financing municipal undertakings.

(1) Central-Local Financial Relations

Currently local (municipal) Government is responsible for various local functions and is also responsible for collecting various local taxes and service charges. Traditionally it has received some additional funding from both the middle (governorate) level and central (national) level of Government to balance its accounts. There appears to have been significant discretion in the level of this assistance. There are some formal revenue sharing arrangements which specify the proportion of certain taxes (collected by the Governorate or Central levels of Government) that should be transferred to the municipal level. However the emphasis appears to have been on balancing revenues and expenditures in toto, rather than making each level of Government responsible for generating revenues that matched its expenditures.

There is a significant chance that this emphasis will change. Even if there is no specific policy change requiring lower levels of Government to balance their revenues

[1] State of the Environment, ERM Consultants, London April 1998 (World Bank/UNDP)

and expenditures, budgetary pressures on higher levels of Government may well cause them to curtail the payment of special purpose grants to lower levels of Government. The net effect is likely to be the same: municipal Governments will have to balance their expenditures against the revenues that they collect directly or are guaranteed under revenue sharing arrangements.

Municipal and Governorate level officials do not feel competent to comment on these issues and we await meetings at the national level to clarify these matters.

(2) Development in Lattakia

Lattakia is the largest seaport in Syria, with most of the sea trade in and out of the country passing through its port. It is also a major tourist area.

There appears to have been some relaxation in policies controlling foreign trade. The effects of these have not yet appeared in the published national accounts, but are evident in the appearance of many new cars and other goods on the streets. An increase in trade will be a major boost for the economy of Lattakia.

There is also a very obvious building boom underway in Lattakia, mainly for the construction of residential and tourist accommodation. Again this has yet to appear in national economic accounts but is likely to provide a major boost to regional economic activity. Construction is following traditional designs so that most demand for materials and services are being met by local suppliers. This is undoubtedly generating many flow-on effects in the local economy.

(3) Land Use Planning and Land Use Plans in the Study Area

Land use administration and planning are based on master plans for cities. Municipalities in Syria have formulated and updated their Land Use Plans every twenty years. The Plans are formulated for twenty years period in accordance with planning criteria set at central government Entire municipalities of the Study Area are currently being preparation of updating existing the Plans as summarized below:

Table 1.1.11 Summary of Present and Proposed Land Use Plans

Municipalities	Present Plan		Proposed Plan		Remarks
	Population/ Planning Area	Target/Formu-lated Year	Population/ Planning Area	Target/Formu-lated Year	
Lattakia	372,472 pop / 2,300 ha	Year 2005 / Year 1978	500,000 / 4,760 ha	Year 2020 / 2001	Expansion of tourist areas along the north-south coast areas with tourist facilities
Jableh	52,000 pop / 320 ha.	Year 2000 /	70,000 / 600ha	Year 2020 / 2001	Approval of the unity with Homimien and Bsisien villages is in process since 1991, albeit waste collection targeted for Bsisien (1,000 households approx.)
Al-Haffeh	13,000 pop / 236 ha	Year 2000 /	25,000 / 450 ha	Year 2020 /2001	Total area in the city, about 1,000ha, unchanged even in the target year
Qardaha	20,000 pop / 226 ha	Year 2000 /	40,000 pop / 1,370 ha	Year 2020 / 2001	Actually 7 vicinity villages unifies in 2010 (1,370 ha.)

Source: Interview from Counterparts (interim results)

1.2 PRESENT CONDITION ON SOLID WASTE MANAGEMENT

1.2.1 Solid Waste Amounts

(1) General

The study area is consists of four (four) cities in Lattakia Governorate, Lattakia city, Jableh city, Al-Haffeh city and Qurdaha city. The collection of solid waste is the responsibility of each city government.

Solid waste collected in Lattakia city is transported to Al-Bassa disposal site. Existing compost plant is almost out of order and it operates only occasionally. There are many illegal dump sites for construction debris and other wastes around the city. The solid waste collected in Jableh city and Al-Haffeh city is transported to their own disposal sites. However, that of Qurdaha city is transported to Al-Bassa disposal site.

(2) Solid Waste Amount and Composition

The estimated amount of waste generated in Lattakia and the three surrounding cities in 2001 is approximately 390 tons/day as indicated in Table 1.2.1. Of this, 290 tons/day (76%) is domestic waste, and 280 tons (72%) is generated in Lattakia City.

Table 1.2.1 Waste Generation Amount in Lattakia and Surrounding Three Cities (2001)

Item	Lattakia	Jableh	Qurdaha	Al-Hahheh	Total (t/day)
Domestic waste	203.0	50.1	26.7	12.7	292.5
Commercial waste	65.7	8.9	1.5	1.7	77.8
Park & road waste	10.6	3.2	0.8	0.7	15.2
Total	279.3	62.2	29.0	15.0	385.5

The quality of waste differs according to the generation source. For example, 70% of domestic waste consists of kitchen waste. In the case of commercial waste too, the ratio of market waste and kitchen waste from restaurants and hotels is high. In carrying out the recycling and treatment of waste, it is necessary to adopt systems that are suited to high ratios of kitchen waste.

1.2.2 Solid waste collection and transport

(1) Waste Collection Services and Citizen Satisfaction

Waste collection, transport, treatment and disposal in Lattakia and the three surrounding cities are carried out based on the Local Autonomy Law. Waste collection rate and level of satisfaction regarding collection services according to citizen awareness surveys are as indicated in Table 1.2.2. In Lattakia City, the waste collection rate is approximately 70%, but citizen satisfaction is low at 50% or less. In Jableh, only 60% of waste is collected and the level of satisfaction is just 33%. It is necessary to increase collection rates in these two cities. In Al-Haffeh and Qurdaha on the other hand, these are small cities and collection rates are high. However, citizen satisfaction in Al-Haffeh is low and it is necessary to improve waste treatment services.

Table 1.2.2 Resident's Satisfaction on Waste Collection

Item	Lattakia	Jableh	Qurdaha	Al-Haffeh
Collection ratio (%)	68	58	92	88
Resident's satisfaction (%)	42	32	62	33

Source: Public awareness survey by the JICA Study Team

(2) Collection District and Characteristics in Lattakia

Lattakia city is divided into five administrative zones. To collect waste, these five zones are divided into fifteen districts. The population and area of the zones in 2000 are shown in Table 1.2.3.

Table 1.2.3 Lattakia city district for the collection of waste

Zone	Population in 2000	Area (ha)	Characteristics
A	137,000	464.75	This zone is recognized as main center of the city. The area is mainly used as commercial and institutional area with some residence. 36% of the population of Lattakia city lives in this area. This zone is very densely populated. It includes small workshops
B	46,900	840.50	This zone is located in the west of the city. There are small workshops and illegal houses beside the seashore in the district B2
C	86,700	1339.57	Located topologically in the center of the city. Middle and low-income housing area. There are new industry areas besides the road to Aleppo located in the western part of district C4
D	43,200	774.00	Northern side of the city, neighboring the other city boundary. Some outlying low-income housing of this zone is possibly illegal
E	51,800	1,110.00	this zone is located in the northern part recognized as a tourist area. The amount of waste in the tourist area in Lattakia will be much higher in summer than in winter
Total	365,600	4,528.82	

Source: Prime Minister Headquarter, the center bureau of statistics, Syrian Arab Republic "The inhabitants in Syria according to 1994 and their decrease during 1995 to 2005, as the administrative divisions, Lattakia Governorate"

(3) Cleansing Work in Special Area in Lattakia

It is necessary to consider the present special condition for solid waste collection and transport in Lattakia.

1) Port Area

Lattakia Port is managed by Lattakia Port Authority within Ministry of Transportation. The Maintenance section of the Construction department of the Authority is in charge on cleansing the area and has 140 staff of which 25 staff work in solid waste collection and street sweeping. Waste generated from the port activities and collected in the port is transported to the Al-Bassa disposal site and Berj Eslam disposal site. The Maintenance section has three (3) dump trucks (capacity 12 m^3), two (2) wheel loaders and three (3) small loaders. Solid waste swept and piled by the workers is loaded onto dump trucks using loaders. No container is used in the area and thirty barrels are distributed around administration building.

Solid waste mainly consists of package material such as cartons, plastic, wood and metal. It is maximum 5 trips/day and minimum 1 trips/day.

Although it is explained that the waste is transported to the Al-Bassa disposal site, there are lot of dumping of waste at south edge of port area. Also, seashore continuing to the south is old dumpsite.

2) Sports City

Sports City belongs to Sports Union and is managed by the Military Housing Establishment through a contract. To fulfill the contract, the Military Housing Establishment have 250 staff of which 100 staff are work on maintenance and cleansing of the whole area including gardening. Solid waste is collected manually and disposed of at the adjusted land near the seashore and burned. At the time of big festival such as Al Mahbbeh Festival (August 2 to 12), the Cleansing Department of Lattakia City joins to make clean up the area. Solid waste collection and street sweeping is done manually. However, a mechanical sweeper of the Lattakia City is used during big festivals.

Amount of solid waste in summer will be 30-36 m^3/day (150 – 180 barrel x 200 liter).

Visitors in summer (June – September) will be 2,000 person/day in average and 50,000 person/day in the big festival. It will be 2,000 person/holiday and 500 people in normal day in winter.

Equipment allocated for the area is as follows.

Container (800 liter)	15 units
Barrel (200 liter)	30 units
Grass cutter	4 units
Tractor	3 units
Wheel loader	1 units

Total contract cost between Sports Union and Military Housing Establishment is about 30 million S.P./year of which about 5 million S.P. is used for these maintenance and cleansing work.

3) Military Resort Area

Military Resort Area is 3.5 ha located along the Mediterranean seashore between Sports city and Meridian Hotel. The area has 118 houses and restaurant. There are 15 containers (1,200 liter), 15 staff for cleansing and 10 sweepers. Solid waste collection and street sweeping is done manually using a wheelbarrow. They work in morning, noon and evening. This container is emptied twice a day in summer by Cleansing Department of Lattakia City. But there are no visitors and no waste in winter. The Area has 25 wheelbarrows, 15 containers, one water tank truck (4,000 liter), one vacuum truck and one tractor. Tractor may be used for seashore cleansing. It may have another staff for seashore cleansing. It is forgotten to ask cost of cleansing.

No. of visitors in summer (June – September): 5,000 persons

4) Resort Area of Teachers Syndicate

The resort area is 5.0ha located just north of Military Resort area. The area has 34 houses and average number of visitor in summer is estimated to be 250 person/day. The resort is open from May 15 to September 30 and remaining period is closed.

There are 10 staff for cleansing works including street sweeping, solid waste collection, seashore cleansing and grass cutting. Solid waste is collected manually using plastic bags. The Syndicate make contract with private tractor to transport solid waste to outside. The area has no container but 1 grass cutter. Solid waste amount in summer is 1 tractor from houses and 2-3 tractors from seashore/day in average. The syndicate spends around 300,00 S.P. in a year for cleansing.

The syndicate is also in charge of Organic swimming area. Visitors in summer are estimated to be 1,500 people in average. The syndicate cleans up seashore using (8) staff and one (1) rental tractor. Solid waste amount in summer is 2-3 tractor/day.

(4) Operation System for the Collection and Transportation

1) Lattakia

a. Collection Point System and Container Number

Municipal waste is discharged with mainly following two ways.

- **Collection in the station**

Containers

Three quarters of the solid waste collected are discharged to 795 metallic containers distributed in main streets. Containers are mainly located in high-income and middle-income housing area. The two different types of containers exist, namely, 1.30m^3 and 0.80m^3. However, citizens have a complaint that the containers are not adequately distributed and the containers are not sufficient to deal with present waste amount.

Table 1.2.4 The Number of Containers in Lattakia

Containers' Capacity	Existing Number
1.30 m^3	575
0.80 m^3	220
Total	795

Source: Lattakia Municipality Cleansing department

In many part of the city, overflow of waste from the container is common. Also container condition is very poor. Castors are broken and side and bottom is cracked. These bad condition affect environment around the collection points. They cannot be used to their design capacities. This causes the scattering of much garbage around the container and barrels.

Barrel and open station

Barrels or open stations are located instead of container in the narrow road area inside middle and low-income area. There are 240 steel barrels distributed around the city and thirty open stations. The barrel capacity is 200 liters.

- **At the door (Hand to hand)**

In C2, D1 and D2 area, household owners discharge their waste with plastic bags in front of the gates. In the case that the cleansing department worker arrived, the waste is collected from hand to hand.

b. Equipment of Collection and Street Sweeping

In Lattakia and the three surrounding cities, there are 70 collection vehicles and 13 street sweeping vehicles. However, all these equipments are deteriorated and renewal is urgently needed.

Table 1.2.5 Waste Collection Equipment in Lattakia and Surrounding Three Cities

(Unit: nos)

Equipment	Lattakia	Jableh	Qurdaha	Al-Haffeh	Total
Collection					
Compactor (9 ton)	25	2	2		29
Compactor (6 ton)	8	1	1		10
Dump truck	3			1*	4
Tractor	13	3	1	2	19
Shovel loader	2	3	2		7
Wash container	1				1
Sub total	52	9	6	3	70
Sweeping					
Mechanical sweeper	5	2	1		8
Water tank	3		2		5
Sub total	8	2	3		13
Construction debris					
Dump truck	4				4
Tractor	3				3
Loader	5				5
Sub total	12				12
Total	72	11	9	3	95

Note: * Small dump truck ($1m^3$)

c. Collection Frequencies and Times

- **Manual street sweeping**

There are two working shifts for manual-street-sweeping.

The morning shift starts at 7:00 am and ends at 1:30 pm. 129 workers and 13 supervisors sweep streets and collect waste on the branch road. In addition to these workers, 16 workers are on stand-by as a substitution. The night shift starts at 7:00 pm and ends at 1:30 am. 210 workers and 23 supervisors do the same work as the morning shift 34 workers of 210 are on stand-by.

Cleansing department assign additional 50 workers for manual sweeping in the Summer in order to deal with the increased street waste amount.

- **Collection and transport to the final disposal site in Al-Bassa**

There are also two working shifts for transport of the waste from collection stations to the final disposal site and compost plant every day.

The morning shift starts at 7:00 am and continues till 1:30 pm. 54 workers operate vehicles. In this shift, 16 workers are on standby. The evening shift starts at 7:00 pm and continues till 1:30 am. 45 workers operate vehicles. In the evening shift, 10 workers are on stand-by.

d. Main Role of the Worker

- **Manual street sweeping and waste collection on the road**

The workers are responsible for sweeping, gathering the waste on the street and household waste in front of each house and then transfer it to containers or barrels.

Every worker has a handcart with two forty-litter-barrels and a broom.

- **Transport to the final disposal site and the compost plant**

Compactors with loading device: The workers set the container on the vehicle's loading device. If there is scattered waste around the container, they have to sweep in the collection time.

Manual fill compactor: Workers empty the barrel into compactors and load the compactors with waste in open station. They often collect the plastic bag on the street and from household directly.

Tractor and dump truck: There are two workers and a driver. They are in charge of mainly open station and scattered waste around containers. One worker operates a loader to lift up the waste to a platform of the vehicle. The other cooperates with a broom. On the route, each worker collects the plastic bag on the road.

e. Mechanical Street Sweeping

- **Sweeping equipment**

They have five mechanical street sweepers. However, 2 Elgen sweepers are under repair.

Table 1.2.6 The Mechanical Street Sweeper in Lattakia City

Type	Maker	Load capacity (t)	Nos.	Purchased year
Sweeper	Eveco	3.4	3	1994
	Elgen	3.0	2	1970
Water Tank	Fiat		1	
	Volvo		2	

Source: Cleansing department in Lattakia city municipality

- **Sweeping frequencies and times**

There are two working shifts generally. Considering manifest increasing of the waste in Summer season and special case, cleansing department increases the number of shift from two to three.

Table 1.2.7 Mechanical Sweeper Shift in Lattakia City

Shift	Time (summer)	Time (Normal)	Eveco sweeper		Elgen sweeper	
			S	N	S	N
Morning	6-9 (3 hrs)	6-11 (5 hrs)	+	+	+ (7-14)	+
Afternoon	11-15 (4 hrs)	None	+			
Night	20-24 (4 hrs)	17:30-22 (4.5 hrs)	+	+	(+)	
Total	10 hours	9.5 hours				

Source: Cleansing department in Lattakia city

There is a special disposal site for swept road waste at the west side of the city located in the area E-2. All the swept waste is discharged there at the end of each trip.

Total length of the main road in Lattakia is approximately 77km. Mechanical sweepers sweeps 160km in total for mechanical sweeping every day. This total length includes both inside and outside of the road.

f. Construction Debris

Cleansing department is not in charge of collecting construction debris same as another large-scale industrial waste. However, they have collected this waste if they are on the road. Transferring construction debris is done in the morning shift. The equipment used is shown in the Table 1.2.8.

Table 1.2.8 Equipments used for the Construction Debris

Type	Maker	Load Capacity (t)	Nos.	Purchased year
Dump truck	Volvo	12.0	1	1994
	Fiat	7.52	3	1983
Tractor	(Syrian)	4.1	2/1	74/99
Loader	Masi	1.0	1	95
	Volvo	1.0	1	76
	Case	0.6	1	83
	Bobcat	0.6	1	80
	Dumper	0.5	1	83

Source: cleansing department in Lattakia city municipality

2) Jableh

a. Collection Points and Containers

Most of the waste in Jableh city is discharged to collection points where containers are placed. They collect the waste from 160 containers located in all part of the city.

Table 1.2.9 The Number of Containers in Jableh

Capacity	Existing Number
1.20 m^3	20
0.80 m^3	160
Total	180

Source: Cleansing Department in Jableh city municipality

The other waste is discharged into 200 liter barrels. They have 48 barrels in 16 open stations mainly in the market area.

The container condition is relatively good, but occasio nally the waste overflows container and is scattered around.

b. Collection Equipment

The numbers of collection vehicles are shown in Table 1.2.5.

c. Collection Frequencies and Times

They collect the waste daily in the whole area. They have 2 shifts.

The morning shift starts at seven o'clock to two o'clock in the afternoon. In this shift, the three compactors collect the waste:

- The Heil compactor empties containers and barrels located in the northern area
- The Mack compactor empties containers and barrels located in the southern area
- Fiat compactor mainly collects the plastic bags discharged on the road in whole city area.

There are one driver and three workers for each compactor.

Additionally 40 handcart-workers sweep and collect plastic bags on the narrow street in the old city area. 15 handcarts are on standby.

The evening shift starts at two o'clock in the afternoon and continues till eight o'clock. Only the Heil compactor works in this shift. Compactor collects the waste on the street in the whole city and also collects the waste from collection station like the area of markets. In addition there are six street sweepers and one supervisor.

They transport the collected waste to the final disposal site southern part of the Jableh city area.

d. Mechanical Sweeping

They have 1 ARGEN mechanical sweeper purchased in 1999. 1 driver and 1 worker operate this vehicle.

They work only night shift that starts at five o'clock in the evening and continues till eleven o'clock. The length in one shift is approximately 25km.

3) Qurdaha

a. Collection Points and Containers

Waste is mostly discharged into 120 containers and the capacity is 1.4m^3. On the other hand, some waste from the household is discharged in front of their house.

A part of discharged waste on road is firstly collected with 10 handcarts with two fifty-liter-barrels and they transport to the container.

b. Collection Equipment

The numbers of collection vehicles are shown in Table 1.2.5.

Two Hell compactors collect the waste in the containers and on the road discharged by the citizens. The Fiat compactor is on standby against the breakdown.

c. Collection Frequencies and Times

There are two collection shifts.

The morning shift starts at six o'clock and continues till two o'clock. Collection by compactors is mainly implemented in this shift. The number of workers is 25. This number includes manual road sweeper. Two supervisors also work in this shift.

The evening shift starts at six o'clock in the evening and ends at two o'clock. Two manual road sweepers and one supervisor work in the evening shift.

They transport the collected waste to Al-Bassa final disposal site in the Lattakia.

d. Mechanical Sweeping

In this city, the main road is swept mechanically twice a day.

The first shift is from six o'clock to ten o'clock in the morning. The second shift is from six o'clock to ten o'clock in the evening.

e. Construction Debris

The vehicle for the collection of construction debris is following:

Table 1.2.10 The Equipment for Construction Debris in Qurdaha

Type	Maker	Load capacity (m^3)	Nos.	Purchased year
Tractor	Forat	4.0t	1	1996
Loader	Daewoo	0.7t	1	90'
	bobcat	1.0t	1	1987

Source: cleansing department in Qurdaha city municipality

According to the cleansing department, they collect construction debris once in a week to ten days. In one working time, they work for two to three hours.

4) Al-Haffeh

a. Collection Points and Containers

They used to locate containers at the discharge point. However, the habitants throw the waste without using the plastic bag. Even if they use the plastic bag, scavengers or animals tear the bag and scatter the waste around containers. That caused very bad odor around the containers. Therefore they decided to abolish container system. At present, there are 19 open stations in this city. That's why the municipality adopts the open station method for discharging

Additionally they collect road waste with 14 handcarts. The citizen is obliged to discharge the waste to an open station by eight o'clock in the morning.

b. Collection Equipment

The numbers of collection vehicles are shown in Table 1.2.5.

There is no mechanical sweeper.

c. Collection Frequencies and Times

In winter, there is one morning shift for the collection of waste every day. The morning shift starts at five o'clock to avoid traffic jam in the city center especially in the narrow road and continues to one o'clock in the afternoon. In this shift, 11 workers sweep the street with a handcart. Additionally 2 drivers and 4 crews work on tractors. For tractor, there is special shift that starts from 5 o'clock in the morning. Transporting starts at 8:30 and ends 11:00 am.

In summer, there are two shifts every day. Morning shift is from 5:00 am to 1:00 pm. Evening shift is from 5:00 pm to 1:00 am. Al-Haffeh is very famous place for tourism and a lot of tourists produce the wastes in the summer. The amount of the waste increases in the summer and they need to collect the waste twice in a day.

They transport the collected waste to the final disposal site near the Al-Haffeh city.

(5) Collection and Transportation Issues

The main issue on collection and transport is the following ones based on the interview with the cleansing department.

1) Collection Coverage Rate

According to Solid waste amount survey at source and Solid waste amount survey at compost plant and final disposal site, the produced amount of solid waste in Lattakia is estimated as approximately 280 ton/day. The amount of collected solid waste will be 200 ton/day. At present the collection coverage rate is calculated approximately 70%.

2) Collection Fringe Area

Port area and sports city have their own disposal site. It will be taken into consideration in the collection in future.

3) Suitability of Collection Equipments

Containers and some equipment are poor. Therefore waste is scattered, crews do not operate efficiently and the environment is unhealthy for workers and inhabitants.

4) Efficiency

According to solid waste amount survey at compost plant and final disposal site, the average trip per vehicle in one shift is calculated as 1.38 times/veh/shift. Overload of first trip can be observed.

(6) Collection Service and Residents Satisfaction

In an interview survey, the residents reported that collection covered 68 % of the area in Lattakia city and 58 % in Jableh city. For the low income area in Jableh coverage is only 35 % as shown in Table 1.2.11. Resident satisfaction with the service is lower, only 42 % in Lattakia, 32 % in Jableh, 62 % in Qurdaha and 33 % in Al-Haffeh, as shown in Table 1.2.12. Solid waste collection service shall be improved step by step.

Table 1.2.11 Is There Collection Service in Your Area

Income level	Lattakia	Jableh	Qurdaha	Al-Haffeh
High	65 %	75 %		
Middle	74 %	74 %		
Low	63 %	35 %		
Total	68 %	58 %	92 %	88 %

Table 1.2.12 Are You Satisfied with the Collection Service

Income level	Lattakia	Jableh	Qurdaha	Al-Haffeh
High	44 %	20 %		
Middle	53 %	46 %		
Low	30 %	22 %		
Total	42 %	32 %	62 %	33 %

1.2.3 Treatment and Disposal of Solid Waste

(1) Existing Disposal Site

1) Lattakia

Lattakia and surrounding three cities (Jableh, Al-Haffeh and Qurdaha) have been using the Al-Bassa disposal site jointly since it opened in the early 1970`s. Al-Bassa disposal site is located about 15km southeast from the city center of Lattakia (outside of Lattakia municipality), along the shore of Mediterranean and between Alkabir and Snober river. The site is composed of three zones; i.e. Zone-I (approx. 18ha), Zone-II (approx. 14ha) and Zone-III (approx. 60ha). Wastes are spread and accumulated to average height of 1-3m from access road level. Estimated amount of the waste is one million cubic meters in total.

One bulldozer (52HP) is temporally operating at the site when the need arises, on a daily rental base. The personnel of compost plant visit the site on that particular

occasion for its operation. No daily operation and/or inspection are carried out by the municipality.

Al-Bassa disposal site has become one of the urban public nuisances in Lattakia Govenorate. Open dumping is practiced at the site. Wastes are spread disorderly and accumulated in each zone without any control. The site is characterized by open burning, stinking odor, and scattering of waste, many flies and free puddles/ discharge of leachate. Scavengers are active and flocks of grazing sheep are found. Recently, some complaints from residents of Al-Bassa, El Hemi village etc. located northeast of the site are reported.

The following major issues are identified at Al-Bassa disposal site.

- Sanitary/ environmental condition of the site is very poor (open dumping)
- No control for incoming waste/vehicles, site operation etc. by the municipality (no specific municipal organization in charge of final disposal site exist)
- All types of waste, including municipal, industrial and hospital waste (which may contain toxic/ infectious waste) are hauled to the site in mixed form
- No facilities and access/ operation road condition is poor
- Scavengers are active and animals graze in unsanitary conditions
- Green houses for vegetation are located adjacent to the site
- Huge area of beautiful sandy seashore along Mediterranean ocean which might have potential as a tourism area is spoiled by un-controlled waste at the

In the port area, it was explained by the personnel concerned, that the waste collected in this area is transported to Al-Bassa disposal site; however, many waste dumping sites are found at the southern edge of the port area including old dumpsite.

In the sport city, collected waste is hauled to adjacent land near Mediterranean ocean and burned by the staff concerned.

As for intermediate treatment, composting is the major treatment system of municipal waste introduced in Syria. Recently, four compost plants have been operating in major cities in Syria; i.e. Damascus, Alleppo, Hama and Lattakia. Compost plant in Lattakia was constructed in 1979 by French technology and started operation in 1981. The detail of the plant is described in section 3.4 of this report.

2) Jableh

Besides Al-Bassa disposal site as an inter-municipal disposal site, Jableh city has its own waste-dumping site located about 5 km south of the city center. The site area is about 2.5ha facing the Mediterranean ocean.

Open dumping is practiced at the site so the sanitary condition of the site is very poor. Major issues at the dumping site in Jableh are quite similar to that of Al-Bassa disposal site. It should be noted that non-separated medical wastes which may contain infectious waste are hauled to the site in mixed form with municipal waste. Child scavengers are active this dangerous situation.

3) Al-Haffeh

In Al-Haffeh city, collected waste used to be disposed to the valley adjacent to a quarry located in the northwest of the city. Even the amount of disposed waste is limited; there is open dumping at this site.

4) Qurdaha

No waste disposal site is located in Qurdaha city. Collected municipal wastes are transported to Al-Bassa disposal site.

(2) Selection of New Inter-municipal Disposal Site

As described in above Section 3.3.1, Al-Bassa disposal site has caused environmental problems for surrounding residents and environs. According to the city plan of Lattakia, the Al-Bassa site area will be incorporated into the city as a tourist zone.

In 1995, MED URBS Program identified 2 possible sites for a new waste disposal facility for Lattakia and surrounding cities to replace the Al-Bassa site. Both sites, *Mangila* and *Katrieh*, are unsuitable because they are located on irrigated farmland, called "green area". Therefore, Lattakia city rejected both sites. To date no decision has been taken on selection of an appropriate site.

Therefore, in order to select a satisfactory future inter-municipal disposal site for Lattakia and surrounding cities, the JICA Study Team recommended a re-examination of possible sites by Syrian side with technical assistance from the JICA Study Team. The preliminary criteria for the primary selection of the site proposed by the JICA Study Team are as follows:

- The site should have enough capacity to operate more than 20 years (100hectare is desirable)
- The distance from the nearest residential area (villages and/or housing area) shall be more than 200m
- Intake facilities from rivers and/or deep wells for drinking water shall not be located within 1.0km radius
- Little conflict with other land-use including development plan
- No serious problem for the land acquisition
- Nature conservation area, habitat area of precious/ protected fauna and flora and/or historical/ religious/ valuable places shall be avoided

Base on the joint understanding of the necessity of new inter-municipal disposal site between Syrian side and JICA Study Team, the Syrian side has organized a site selection program. The 1st site selection committee meeting chaired by the Deputy Governor of Lattakia was held in February 11, 2001 at the governor's office.

Based on the result of several procedures on the selection of candidate sites carried out since the 1st committee meeting, in June 26, 2001, 2nd site selection committee meeting chained by the Governor of Lattakia was held. In the meeting, two candidate sites; i.e.

one is located across the Lattakia-Aleppo road (Site 1) and another is located at Qasia (Site 2), were proposed by the Syrian side.

For these 2 sites, JICA Study Team carried out the site reconnaissance survey and prepare/submit the preliminary comparison from the technical point of view, as shown in Table 1.2.13.

Table 1.2.13 Comparison of the Two Candidate Sites

Items	Criteria	Site 1	Site 2
1. Required area	More than 50 ha	Slightly less	O
2. Distance from colletion area	Less than 50 km	O	O
3. Distance from village and housing area	Morethan 200 m	O	O
4. Distance from water resource	No intake and well for drinking water with 1 km	Further information is required	O
5. Relation with other land use	Less conflict	O	Near military area
6. Distance from an airport	More than 4 km	O	Army property
7. Land acquisition	No serious problem	O	O
8. Ecology	No rare species	O	O

Note: O: satisfied

After several discussions between Syrian side and the JICA Study Team, in August 16, 2001, 3rd site selection committee meeting were held. In the committee, it was confirmed that the Site 2 (Qasia) will be the future disposal site in Lattakia Governorate.

(3) Recycling

In order to understand the recycling activities in Lattakia city and surroundings, JICA Study Team carried out the interview survey of five mediators in Lattakia city and several waste-pickers in Al-Bassa disposal site. The following is the result of the survey.

There are no formal recycling activities carried out by the municipality. In private sector, between 30-40 mediators in Lattakia and surrounding cities exist and about 100 waste-pickers in Al-Bassa and Jableh disposal site activity recycle waste materials. In addition collection crews are used to separate/ collect and sell the recyclable materials to the mediators, and individual collectors also do same activities with their own three-wheel vehicles. Total amount of recyclable materials handled by the mediators in Lattakia; i.e. cardboard, plastic, clear bottles, ferrous metal, non-ferrous metal etc., are estimated to 47- 50 ton per day.

No end-users exist in Lattakia and surrounding cities, therefore, most of the recyclable materials collected by the middlmen are sold/transported outside the city; i.e. Alleppo, Armanaz, Homs, Hama and Damascus.

Table 1.2.14 shows the prices of all purchased/re-sold recyclable material and estimated amount of all material hauled in total in Lattakia.

Table 1.2.14 Price of Recyclable Materials

Recycled Materials	Recycled Amount (ton/day)	Purchase Price (SP/kg)	Re-sold Price (SP/kg)	Location of End-users
• Paper (Cardboards)	5 - 6	--	2	Aleppo
• Plastic (Bottles)	4 - 5	6 - 7	7 - 8	
• Plastic (Green-house sheets)		6	6.5 - 7	
• Glass (Clean bottles)	5 - 6	1 - 2.5	1.5 - 3.5	Amanaz/Homs
• Ferrous metal	15	0.75 - 4	0.8 - 4.5	Hama
• Aluminum (Cans)	15	25 - 28	27 - 30	Damascus
• Aluminum (thin/ soft)		60 - 63	64 - 65	Aleppo
• Aluminum (hard)		35 - 38	37 - 41	
• Copper (thin/ soft)	3	55 - 57	57 - 60	
• Copper (hard)		32 - 50	35 - 55	
• Car battery	--	10	11	
Total (estimation)	47 - 50			

Source: JICA Study Team

1.2.4 Compost Plant

(1) Operation of Compost Plant

1) Outline of The Plant

Lattakia compost plant is located near the El Hemi village in Al-Bassa about 15 km from the center of Lattakia city. The plant, which has the capacity of 100t/day, was constructed 1979 to1980 by French technology and started operation in 1981. It is now almost nonfunctional.

2) Present Operation Condition

Operation record of the plant in the year 2000 is shown in Table 1.2.15.

Table 1.2.15 Operation Records of Compost Plant in 2000

Month	TREATED GARBAGE QUANTITY (TON)	Sold compost quantity (ton)	Maintenance & operation cost (SP)			
			Elec.	Salary	Mainte-na nce.	Total
Jan.	390	55	12,400	145,000	10,500	167,900
Feb.	330	57	12,000	145,000	15,010	172,010
Mar.	480	39	12,950	145,000	-	157,950
Apr.	420	46	12,500	145,000	-	157,500
May	360	64	12,100	145,000	-	157,100
Jun.	300	-	11,990	145,000	-	156,990
Jul.	390	-	12,450	145,000	18,250	175,700
Aug.	420	48	12,550	145,000	-	157,550
Sep..	390	49	12,500	145,000	-	157,500
Oct.	360	115	11,000	145,000	3,100	159,100
Nov.	300	97	12,800	145,000	11,450	169,250
Dec.	360	49	12,200	145,000	-	157,200
Total	4,500	619	147,440	1,740,000	58,310	1,945,750

Source: Compost plant operation record

The present operation conditions of the plant are summarized as follows:

- The annual total treatment amount of 4,500 ton is only 15% of the plant capacity i.e. 100t/d x 300day/year =30,000ton/year.
- The ratio of compost quantity sold against incoming waste amount was 14% average and 32% maximum in October and November.
- The unit-selling price of the compost produced in this plant was 350 S.P. per ton. This is the lowest unit price for compost for any plant in Syria i.e. Damascus: 450 S.P., Aleppo: 370 S.P. for 1st grade and 140 S.P. for 2nd grade. Lattakia compost is the cheapest because it is the poorest quality.
- The annual income for 2000 was 216,650 S.P. (619ton x 350 S.P./ton). It covered only 11 % of annual operation and maintenance costs (1,945,750 S.P.).
- The old equipment does not produce good quality compost and demand for compost is low. Therefore very little compost is sold.

3) Treatment Process

The treatment process of the plant is composed of the following three stages shown in Figure 1.2.1. The general plant layout is shown in Figure 1.2.2.

a. Primary Treatment Stage

At the Primary treatment stage, the non-compostable substances i.e. plastic, textiles, leathers, and metals are removed by sieve and magnetic separator. The raw compost materials are pulverized and homogenized by the crusher (RASP). Main equipment and facilities are:

- Weighbridge
- Receiving pit with volume of 300m^3
- Primary sieve
- Magnetic separator
- Crusher (RASP)

b. Biological Treatment Stage

At the biological treatment stage, the raw compost materials are transformed into compost by fermentation. During this process the raw materials are turned over 4 times for fermentation period of 8 to 10 days by the turning machine (SILODA) with paddle wheel.

However, SILODA broke down in 1995, the present turning over is done by wheel loader. The fermented compost is then left to cure in the open air for maturing for several weeks.

c. Final Treatment Stage

At the final stage, the matured compost is conveyed by wheel loader to the vibrating sieve with 16 mm holes for removing foreign substances such as glass, metals and plastics.

4) Organization of Compost Plant

The plant is operated by 2 sift team from 7:30 to 14:30 and from 15:30 to 22:00. The organization chart is shown in Figure 1.2.3.

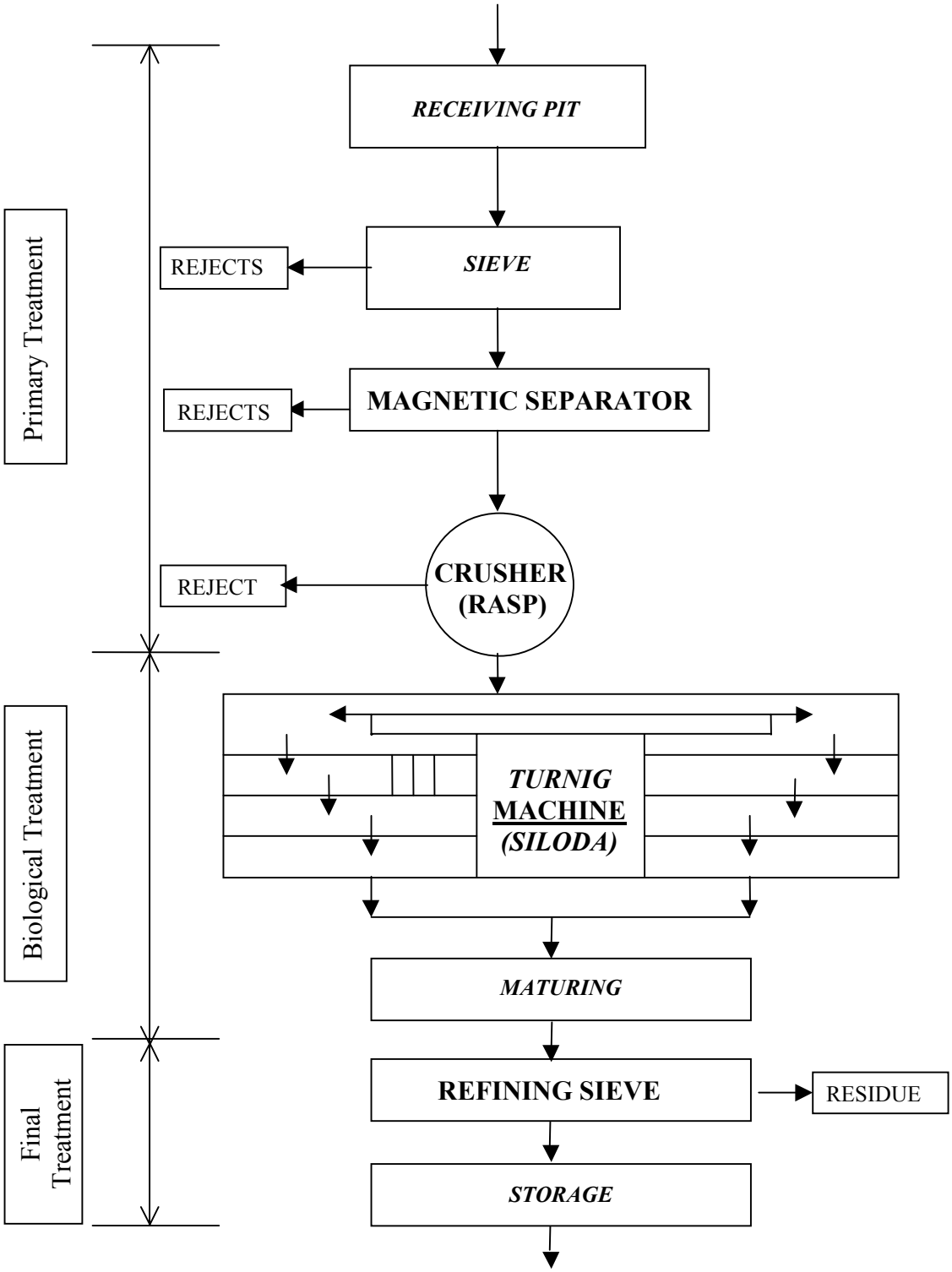


Figure 1.2.1 Treatment Process

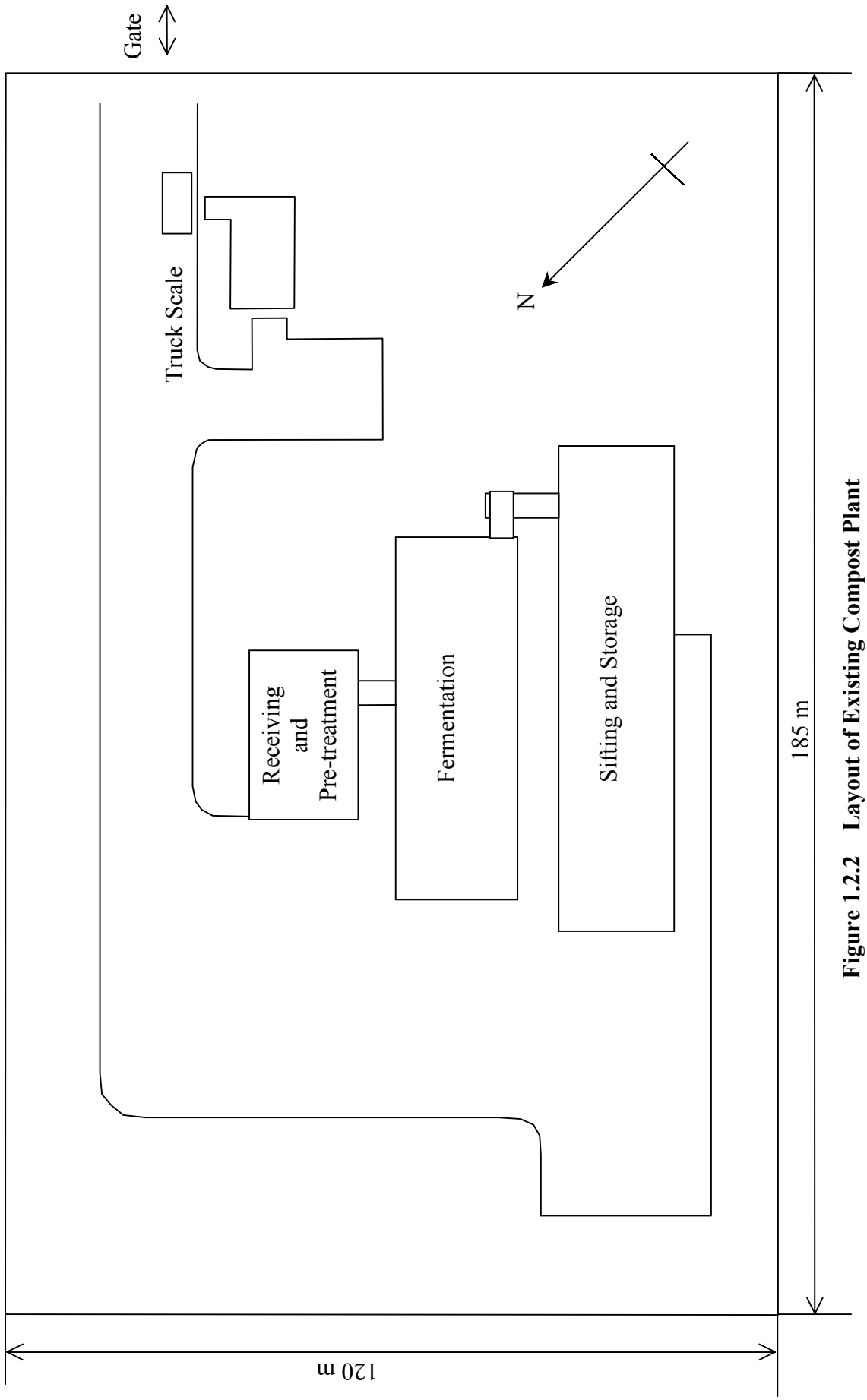


Figure 1.2.2 Layout of Existing Compost Plant

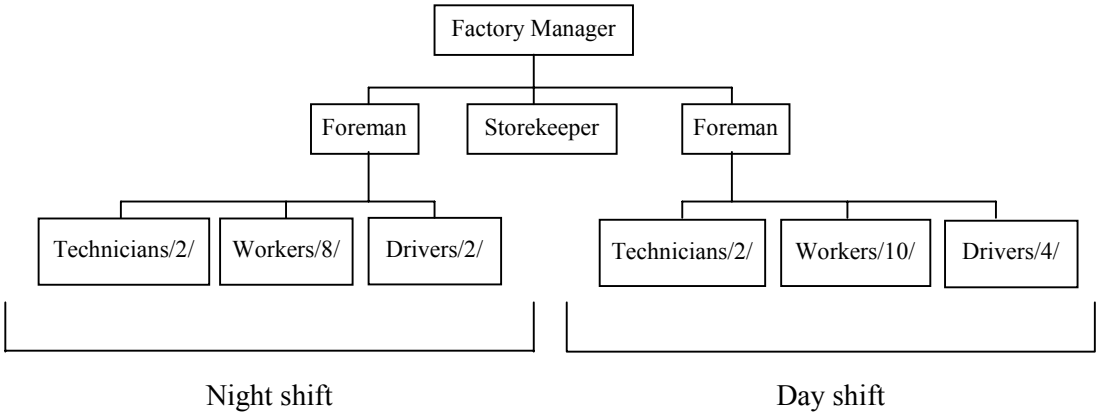


Figure 1.2.3 Compost Plant Organization Chart

(2) Actual Market Condition of the Compost in Lattakia

1) Compost Production and Quantity of Compost Sold

More than 2,800 ton of compost was produced and more than 1,500 ton of compost was sold in 1995 as shown in Table 1.2.16. However, in 2000 only 619 ton of compost was sold due to the poor quality of the compost. These amounts of compost sold are less than 1 % of organic fertilizers.

Table 1.2.16 Compost Production and Amount of Sold Compost

(ton)

Year	1995	1996	1997	1998	1999	2000
Production	2,820	2,370	2,040	1,600	1,470	1,350
Compost sold	1,565	1,412	1,395	1,122	1,023	619

Source: Compost plant record

2) Compost Selling Price

The compost selling price in Syria is shown in Table 1.2.17.

Table 1.2.17 Compost Selling Price

(S.P. per ton)

Class	Price		
	Lattakia	Aleppo	Damascus
First Class	350 (No separated)	370	450 (Mixed)
Second Class		140	

Source: Interview results in each compost plant

3) List of Farmers

Table 1.2.18 shows the quality of compost bought by formers from Lattakia compost plant in the last six months.

Table 1.2.18 List of Farmer Who Bought Compost During Last 6 Months

No.	Farmer's Name	Quantity (ton)	Address
01	Saleh Issa	15	Al-Hanadeh Village
02	Ssuhail Nasser	27	Al-Hanadeh Village
03	Agriculture Management	1	Agriculture Research Center
04	Samer Zahra	5	Al-Hanadeh Village
05	Akel Zahra	8	Al-Hanadeh Village
06	Ibrahim Ttarraf	20	Fideo Village
07	Gaiath Yassin	10	Jableh City
08	Basem Arous	18	Al-Hanadeh Village
09	Daoud Jaloud	14	Al-Bassa Village
10	Ssafi Ttaman	9	Al-Bassa Village
11	Kaser Arous	15	Al-Hanadeh Village
12	Daniel Arous	12	Al-Hanadeh Village
13	Ali Gharib	7	Al-Bassit Town
14	Ibrahim Grarib	6	Al-Bassit Town
15	Habib Al-Kkaddar	9	Al-Hanadeh Village
16	Nafie Issa	9	Al-Hanadeh Village
17	Atta Arous	9	Al-Hanadeh Village
18	Adel Jaloud	15	Al-Bassa Village
19	Shahdeh Arous	45	Al-Hanadeh Village
20	Nasser Ghadban	30	Fideo Village
21	Amin Kassem	30	Fideo Village
22	Shaaban Hamdan	20	Al-Bassa Village
	Total	334	

Of the 334 ton compost sold in total, 172 ton (50%) was sold to the Al-Hanadeh Village located 5km away from the Lattakia compost plant, followed by 80 ton in the Fideo Village located 10km away. The farmers in Al-Bassit Town located more than 50km away from the compost plant were the most distant purchaser with small quantity of only 13 ton.

1.2.5 Environmental Conditions

(1) Environmental Administration and Legislation

1) Administration

The Syrian Government established a ministerial post for the environment in 1987 titled Ministry of State for Environmental Affair (MSEA). The minister oversees the General Committee for Environmental Affairs (GCEA) and ten intersectional committees. The Scientific and Environmental Research Center (SERC) serves as the research arm of the Ministry.

The highest authority responsible for implementing environmental protection resides in the Higher Council for Environmental Safety, which is chaired by the Prime Minister and has as its members a number of relevant ministers.

MSEA has appointed ten (10) local administrative offices as Environmental Directorate. There is one in Lattakia and the Lattakia Environmental Directorate composes of eight departments with sixty six (66) staff as of March 2001; organization chart is shown below, is responsible for the Lattakia Governorate area.

Concerning about waste disposal management, there has hitherto been no national strategy or coordination of these activities, however, the MSEA is currently coordinating a number of regional action program aimed at training local staff in solid waste management.

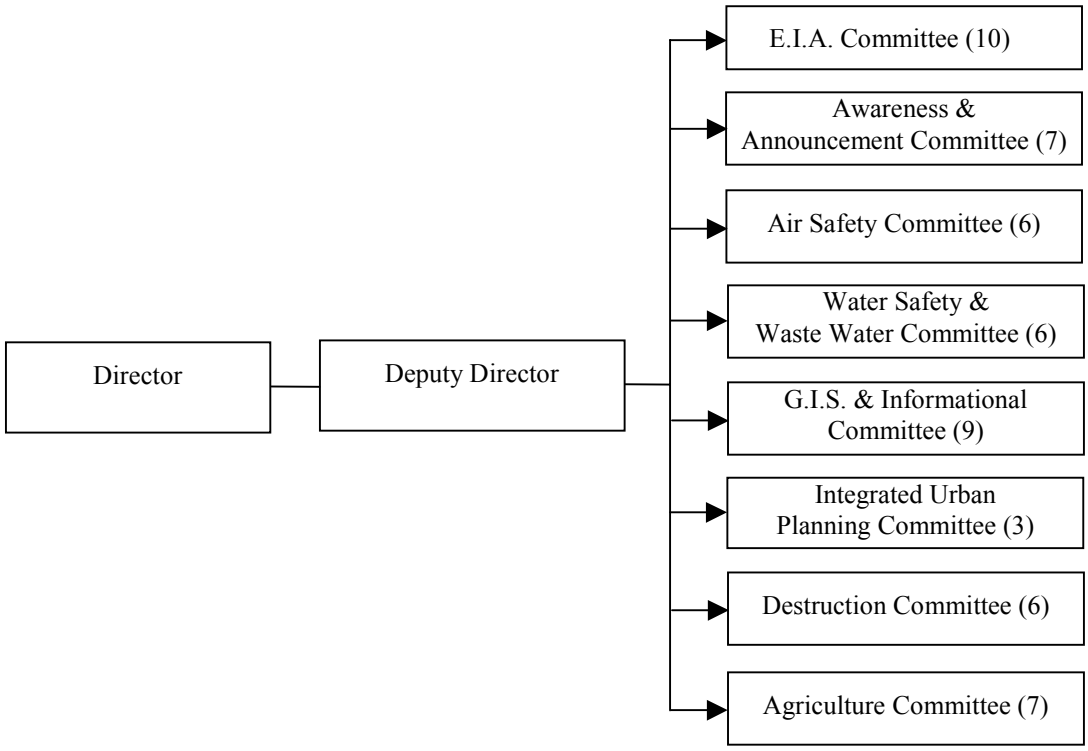


Figure 1.2.4 Organization Chart of Lattakia Directorate, Ministry of State for Environmental Affairs

2) Environmental Legislation

Since 1995 there have been a number of Environmental Protection Laws, the latest is in September 2000 and this bill is expected to be approved by cabinet and president soon. The new bill has proposed some epoch-making aspects as follows;

a. Enhancement of authority power to Minister of State for Environment Affairs, and the Minister is appointed to Chairman of Supreme Council for Environment instead of Prime Minister

b. Enactment of Environmental Impact Assessment (EIA) and formulation of EIA procedure

c. Decentralization of authority power to Local Environmental Directorate and its organization capacity building

d. Establishment of Environmental Fund for rehabilitation of environmental pollution

e. Formulation of ambient quality standard such as water quality standard by areas of water, discharge water quality standard, air quality standard by zones, etc.

3) Implementation of Environmental Impact Assessment

Current Environmental Law has excluded EIA aspects nevertheless EIA has been carried out referring to EU or International Organizations' system since realization of environmental importance arisen in Syria. Following to this condition, the latest bill which include EIA shall be considered for application of EIA study on this study even it is not enacted yet.

According to the bill, the Annex indicates activity types that are required EIA Study. Regarding solid waste projects, it is categorized as urban sanitation on the Activity No.11 shown in following table which are required EIA.

Table 1.2.19 Requirement of EIA for Urban Sanitation Projects

No.	Subjects	Descriptions
No.11.1	Sanitary Landfill	more than 5ha landfill
No.11.2	Urban Sanitation Master Plan	more than 100,000 population
No.11.3	Waste Disposal Plant	more than 250,000 tones of annual disposal capacity
No.11.4	Harmful Waste Disposal	all of the projects

Source: Environmental Protection Law-Annex, Ministry of State for Environmental Affairs, Sep. 2000

4) Proposed Procedure of EIA

a. The procedure of EIA is proposed to formulate after the bill is approved by the Government, whereas the is already discussed in the Ministry. The procedure is briefly explained as follows:

b. Registration of EIA; a project proponent shall submit activity plan to the Ministry

c. EIA Unit in the Ministry shall inspect type of project whether EIA is required or not based on the Guideline. The Unit informs the result to the proponent within six days.

d. If it is required, EIA Unit carry out preliminary EIA in order to judge whether full scale EIA is required or not, and the Unit shall inform the results to the proponent within three weeks.

e. If it is judged that full scale EIA is required, the proponent shall carry out EIA, and the result as a report shall present to the Ministry and stakeholders. In addition to this public hearings shall be held in order to get consensus from them. Moreover the Ministry shall make comments on the within thirty days.

f. The proponent shall submit final EIA report in consideration of the resolution of the public hearing and the comments made by the Ministry.

g. The Ministry shall inspect the report and judge the project authorization, then inform the final result to the proponent within six working days.

h. The Ministry shall issue the project authorization to the proponent.

(2) Current Solid Waste Management and Predicted Environmental Impacts

1) Current Solid Waste Management

Municipal waste is largely dominated among the waste generated by human activities. Cleanliness department of municipalities is responsible for collection and transport to disposal site of the municipal solid wastes. In general, of which 90% in urban area and 60% in rural area are collected properly[2] in Syria. Majority of waste collected is disposed to land located on the skirt of the cities as shown in Table 1.2.20. A few municipalities, Damascus and Doma, have been operating sanitary landfill sites, while the other municipalities have deposited collected wastes on the dumping sites designated by municipalities.

Table 1.2.20 Solid Waste Management in Several Municipalities

Municipality	Type of Landfill	Location	Available composting capacity
Jbab	Open dump with burning	1 km east of the village	none
Al Zabadanee	dump with burning followed by application of soil cover	near by mountain	none
Daraa	Open dump	city edge	none
Daraa	Open dump with burning	13km from the city center	none
Al Swida	Open dump with burning	4km southwest of the city	none
Harrasta	Open dump with burning	city edge	none
Doma	Sanitary landfill	25km southeast of the town	none
Lattakia	Landfill and compost	16km form the city	60-70t/day
Hama	Cemetery	1km north of the city	none
Homs	Open dump	3km north of the city	none
Allepo	Open dump	5km northeast of the city	none
Damascus	Sanitary landfill	35km south of the city	700t/day

Source: State of the Environment, April 1998 World Bank/UNDP (ASCWA/WHO, 1993)

There are some designated dumping sites in the Study Area, one is in Lattakia called Al-Bassa dumping site that is being operated by Lattakia and Qurdaha Municipalities jointly, and the others are in Jableh and Al-Haffeh municipalities. As well as the other municipalities in Syria, the municipalities have been mainly deposited wastes collected in the dumping sites. However, there is a reasonable recycling aspect that the collected organic wastes are used for producing compost nearby the Al-Bassa. In addition, it is observed that indiscriminate wastes are separated to pick metals up by Gypsies, then sell them to factories as a recycling.

The most important of solid waste management is disposal. The dumping sites are likely to be rarely controlled. The haulage of wastes from cities is properly done, however disposal of the wastes are improper management. Al-Bassa dumping site, which is located on the Mediterranean Sea coast and tiny seaside vegetation and dunes has been receiving and dumping municipal wastes from Lattakia and Qurdaha without proper sanitary foundations since 1970's shown in following pictures. In addition to the dumping sites, some of informal wastes dumped in the Study Area are observed.

Indiscriminate dumping causes contaminate surface, subterranean and the sea waters easily. Decomposition of organic wastes in landfill, untreated leachy water pollutes soil and surrounding water bodies.

[2] State of the Environment, April 1998 World Bank/UNDP

Lattakia urban area scene from Al-Bassa dumping site

Leachate water from indiscriminate wastes

Haulage of municipal waste to dumping Site

Informal waste separation activities

Figure 1.2.5 Scenes of Al-Bassa Dumping Site

2) Predicted Environmental Impacts

Negative environmental impacts are only a result of solid waste disposal. Improper solid waste management causes all type of environmental degradation; air, soil and water. Indiscriminate wastes dumping generate odor and greenhouse gases, cause degradation of subterranean and surface waters and contaminate soil.

Health and safety issues arise from improper solid waste management. Human fecal matters are commonly found in municipal waste. Insect and rodent vectors are attracted to the waste and can spread disease. Using polluted water by solid waste for bathing, irrigation, and drinking water can also expose individuals to disease organisms and other contaminants.

Adverse effects on dumping site is associated with following impacts:

- Surface and subterranean water pollution
- Air pollution (smoke and odor)
- Public health risks (communicable disease passed on by vermin, insect, scavenging animals, etc.)
- Public safety impact

- Visual impact and littering

(3) Issues And Potential Solutions

Four points are identified for the issues and the possible solutions based on the preliminary study in terms of environmental considerations.

1) Lack of Administrative Capacity of Landfill Site Management in terms of Environmental Protection and Urgent Requirement for Rehabilitation of Al-Bassa Dumping site and Others

Existing dumping site is insufficient management and the environmental condition of the site is seriously threatened by the solid waste dumping. The management capacity of the municipalities and Lattakia environmental Directorate should be enhanced through proper trainings such as series of training program for solid waste management provided by MSEA.

In addition, as earlier as possible, Al-Bassa dumping site should be rehabilitated properly in terms of environmental protection. The site located in environmentally fragile areas on the coastal line and the wastes are scattered and dumped widely in disorder. This causes serious environmental impacts in the site and surrounding areas. There is no accurate environmental inspection data, however it seems to be major source of pollution in the area. Environmental monitoring or inspection of the site and surrounding area is also required.

2) Lack of Environmental Legislation for Waste Disposal Management

There is neither proper institutional system for environmental protection nor proper practice on waste disposal management. Without any legal support, it is hardly to manage the waste disposal. Currently the new bill of Environmental Protection Law is proposed although it takes long time to realize practical manner on that. Proper environmental legislation for solid waste disposal management is required.

3) Necessity of Strategic Solid Waste Management in Terms of Environmental Impact Mitigation

In order to carry out effective solid waste disposal management, a strategic management is required to formulate. In addition enhancement of the management is also important. Currently approximately 260 tones/day of waste are generated from Lattakia and Qurdaha municipalities. Of which 12 tones/day of waste is used for composting. However half of produced compost is unsold due to lower quality and compost left is disposed as dump. Effectiveness (wastefulness) shall be considered in the management.

Waste hierarchies[3] are usually established to identify key elements of the management plan comprised of the following order:

- reduce
- reuse
- recycle
- recover

[3] What a waste: Solid Waste Management in Asia, May 1999, The World bank

- waste transformation through physical, biological, or chemical process (e.g. composting, incineration)
- land fill

4) Necessity of Environmental Awareness on Solid Waste Management to the People and Business Proponent

Successful management comes with much effort of participants involved. Environmental awareness of the management must be a good tool for both citizens and business proponents in order for reducing an amount of solid waste and proper disposal. There are some experimental activities on that. Environmental labeling helps rising consciousness and momentum of the management. The labeling is to provide accurate information of products what shall be disposed. Environmental education is another idea. The education shall be done through existing education system at school especially for primary education and various kinds of social groups. This will enhance to give knowledge of the practical management.

1.2.6 Medical Waste Management

(1) Law and Legislation

1) Law

There is no law related to the medical waste management, however Syrian Government is recently preparing a new law related to the medical waste management. According to Director of Health Department of Lattakia Governorate, the new law is scheduled to be enforced within this year.

2) Guideline

There is no official guideline related to the medical waste management. However, one manual was proposed as a guideline in the study for medical waste management targeted for Lattakia Municipality conducted by Syrian Environmental Technologies and Tebodin Consultants & Engineers in August 1999.

The proposed manual was prepared for three types of responsibilities of generating, collecting and treating medical wastes.

The manual is summarized in Table 1.2.21.

Table 1.2.21 Summary of Manual

	Responsibilities for Management for Medical Waste		
	Generator	Collection Establishment	Treatment Establishment
1. Organization	4 functional levels: - Waste manager - Waste coordinator - Waste contact person - Waste employees	3 functional levels: - Waste manager - Waste coordinator - Waste employees	3 functional levels: - Waste manager - Waste coordinator - Treatment workers
2. Waste Management System	General rules for the followings: - Waste segregation and collection at source - Packaging - Labelling - Placement of collection containers/points - Handling /transport - Storage and delivery - Recommended treatment and disposal - Wastewater - Pressurized containers	General rules for the followings: - Waste collection - Handling and transport - Storage and delivery	General rules for the followings: - Receipt of the waste at treatment facility - Storage of waste at treatment facilitity. - Treatment of waste at treatment facility.
3. Emergency Action	- Contingency and emergency arrangement - Training	- Contingency and emergency arrangement - Training	- Contingency and emergency arrangement - Training
4. Monitoring and Control	Monitoring / controlling by internal waste coordinator and inspection by external public authority for the followings: - Segregation of waste source - Collection of interim collection points/central storage area - Transport - On-site treatment	Monitoring/controlling by internal waste coordinator and inspection by external public authority for the following : - Waste storage condition in the central storage area - Collection and transport equipment - Transfer of waste procedure and practices	Monitoring/controlling by internal chief of treatment and inspection by external public authority for the followings: - Transport of waste producers and practices - Storage conditions in the central storage area - Periodic check of the treatment installations.
5. System Management Review	System manager's review for the followings: - Participation in informative meetings - Arranging the regular meetings - Conducting regular management review meetings - Updating of waste management procedures.	System manager's review for the followings: - Participation in the informative meeting - Arranging the regular meeting - Conducting regular management review meetings - Updating of waste management procedures.	System manager's review for the followings: - Participation in the informative meeting - Arranging the regular meetings - Conducting regular management review meetings - Distributing minutes of management review meetings - Updating of the Waste management procedures
6. Training	Training for the followings: - Senior and middle management - Waste coordinator - Waste contact persons - Waste employees	Training for the followings : - Senior and middle management - Waste coordinator - Waste employees	Training for the followings : - Senior and middle management - Waste coordinator - Treatment workers
7. Waste Information Manual	Waste information Manual for manifest system	-	-

3) Official Notice for Request

There is one official notice from the Lattakia Governor to all medical establishments in Lattakia Governorate. The notice is summarized as follows:

- National Hospital in Lattakia City shall treat its own medical waste and the waste of other medical establishments in the surrounding cities (Dr.Ibrahim Naameh Hospital in Jableh City and Bassel Al-Assad Hosoital in Qurdaha City).
- Al-Assad University Hospital shall treat its own medical waste and the wastes of other medical establishments of blood bank, Martyr Zahi Azrak Hospital and Military Obstetrics/Gynecology Hospital by the incinerator of Al-Assad University Hospital.
- Private hospital shall place the medical wastes in the bags colored yellow, white or black. They shall also be tightly closed and leakage-proof. The bags shall be transported and buried in a special place at Al-Bassa area by the municipality after sterilization in the autoclave.
- The municipal council in Lattakia City shall designate a special vehicle to collect waste from all private hospitals from 2 to 4 p.m. and transport them to Al-Bassa area to be buried in a proper depth.
- All public and private hospitals shall use special autoclave apparatus in order to sterilize their medical waste.
- All public and private hospitals shall preferably maintain special grinding equipment to grind the heads of syringes and sharps before sterilization.
- All public and private hospitals shall train their staff how to sort their medical wastes from any general waste and how to handle the medical waste as dangerous material for public hygiene.
- Lattakia Municipal Council shall be assigned to follow up the implementation and inflict penalties upon any breaching party.

(2) Administration

1) Central Government Level

There is no definite role of ministries related to the medical waste management. However, three ministries, Ministry of Health (MOH), Ministry of Local Administration (MOLA) and Ministry of Environment (MOE) are involved in the medical waste management. The functions of above ministries are listed below.

Ministry of Health:

- To establish the laws/guidelines/criteria related to health issues including medical waste management
- To disseminate the laws/guidelines/criteria to local governorates

Ministry of Local Administration:

- To order the approval regarding the important decision such as changing the final disposal site which is done in the council of the local municipality

Ministry of Environment:

- To supervise the medical wastes as dangerous wastes

There is one council composed of above three ministries under the Prime Minister to deal with health issues.

2) Local Government Level

There is no definite department related to medical waste management only. However, health issues are treated in the health department under the executive office of Lattakia Governorate. The cleansing departments of each municipality conduct the collection/transportation service of medical wastes.

The on-site treatment of the medical wastes is left to each medical establishment, and there is no inspection/audit by the external public authorities.

As for the medical waste management by the medical establishments, a new office has been established in a public hospital in Lattakia City.

(3) Current Situation of Medical Waste

1) Medical Establishment

According to the interview survey with the relevant authorities, four types of medical establishments were confirmed in Lattakia Governorate. The establishments are listed as below:

- Public hospital
- Private hospital
- Health center
- Clinic

a. Lattakia Municipality

The hospitals in Lattakia Municipalities are shown in Table 1.2.23. There are 5 public hospitals, 8 private hospitals, 27 health centers and 550 clinics. There are 2 public hospitals equipped with incinerators.

Table 1.2.23 Public Hospitals in Lattakia Municipalities

Type of Hospital	National Hospital	Total Number of Bed
Public Hospital	5	840
Private Hospital	8	169
Health Center	27	-
Clinic	550	-

b. Jableh Municipality

There are 1 public hospital, 2 private hospitals, 26 health centers and 100 clinics as shown in Table 1.2.24.

Table 1.2.24 Public Hospitals in Jableh Municipalities

Type of Hospital	National Hospital	Total Number of Bed
Public Hospital	1	132
Private Hospital	2	20
Health Center	26	-
Clinic	100	-

c. Qurdaha Municipality

There is 1 public hospital and 18 health centers as shown in Table 1.2.25.

Table 1.2.25 Public Hospitals in Qurdaha Municipalities

Type of Hospital	National Hospital	Total Number of Bed
Public Hospital	1	128
Private Hospital	0	-
Health Center	18	-
Clinic	20	-

d. Al-Haffeh Municipality

There are 22 health centers and 15 clinics as shown in Table 1.2.26. A new hospital is under construction.

Table 1.2.26 Public Hospitals in Jableh Municipalities

Type of Hospital	National Hospital	Total Number of Bed
Public Hospital	0	-
Private Hospital	0	-
Health Center	22	-
Clinic	15	-

2) Generation of Medical Waste

There is no official statistical data regarding the generation amount of medical waste.

Table 1.2.27 shows the amount of the medical wastes generated in Lattakia Governorate from the results of the public awareness survey for the types of the medical establishments.

Table 1.2.27 Daily Generation Amount of Medical Waste

Type of Medical Establishment	Number of Bed	Generation of Amount (kg/day)
Public General Hospital	132 - 650	16 – 77
Private Hospital	0 - 30	1.5 - 40
Health Center	0 - 6	6.5 - 28
Clinic	5 - 12	4 - 8
Laboratory	-	21

According to “Determination of Medical Solid Wastes generated at Hospital in Syria” (written by Dr. Eng. Mohammed Qasem Kayall, Lecturer in the Faculty of Civil

Engineering at Damascus University), the 158 ton/year of medical waste is reported for Lattakia City as of 1997, approximately 430 kg daily.

(4) On-Site Treatment

The on-site treatment inside the medical establishments was surveyed for the following treatment conditions by conducting the questionnaires, the interview survey with the persons concerned and the inspection of the facilities:

- Separation
- Packaging
- Labelling/color coding
- On-site transport
- Storage
- On-site treatment
- Training Program
- Management

1) Separation

Separation was confirmed in the establishments of National Hospital, Al-Assad Universal Hospital in Lattakia City and Dr. Ibrahim Naameh National Hospital in Jableh City.

The medical waste was separated in a corrugated carton or a vinyl bag. The separation was carried out based on their own definition of medical wastes, since there is no regulated definition for medical wastes.

By the results of the questionnaires targeted for the medical establishments, the following wastes were classified as medical wastes:

- Syringe after injection
- Organ after the examination in laboratories
- Secretion
- Bandage/gauze contaminated with blood
- Plastic tubes/glass contaminated with blood
- Plastic tubes/glass after the examination in laboratories

2) Packaging

Most of the packaging is carried out by the following manner:

- Infectious wastes such as syringes/plastics/glasses are put in a corrugated carton without covers.
- Bandages and gauzes are put in the vinyl bags closed at the openings.

The above packaging methods/protocols may have the risks of infection caused by the breakage of the weak material of corrugated carton or vinyl during the transport.

3) Labeling/Color Coding

JICA Study Team confirmed no labeling or color-coding during the inspection. The result was same in the questionnaire survey. Most of the establishments apply no Biohazard mark on their containers.

4) On-site Treatment

The medical wastes are collected in the corrugated carton box or the vinyl bags as mentioned before at the entrance of the nurse centers and the wards. In the cases of the hospitals that have incinerators, the transport is carried out from the collection points at the entrance of the nurse station and the wards to the incinerators by the internal staff. Most of the establishments transport the medical wastes to the temporary collection points outside the facilities to be collected/transported by the municipalities. In most cases they do not use specifically assigned cart for the transport.

5) Storage

Most of the medical facilities have no storage places of medical waste. They are placed at the entrance of nurse station or wards and transported to the temporary collection points outside the facility.

6) On-site Treatment

The most common sterilization methods in the medical establishments were the dry thermal treatment and autoclave. These were followed by the incineration, boiling and ultraviolet ray.

Two hospitals have the incinerators in Lattakia City. They incinerate the medical wastes including other wastes from the surrounding three municipalities.

The outlines of the incinerators are shown in Table 1.2.28.

Table 1.2.28 Outlines of Incinerators

Name of Hospital	National Hospital	Al-Assad Universal Hospital
Operation Year	2000	1984
Operation Frequency	Nonregular (1 time/day)	Every day except Friday (2 times/day)
Capacity	100 kg/h	100 kg/h
Fuel	Diesel oil	Diesel oil
Source of Wastes	Martyl Bassel Hospital, Ibrahim Naameh Hospital, National Hospital	Al-Assad University Hospital (40kg/day), Military Hospital (6.5 kg/day), Blood Bank (39 kg/day), Military Obstetrics/Gynecology Hospital (5kg/day)
Flue Gas Treatment	Flue gas treatment	No flue gas treatment
Combustion Temperature	550 degree centigrade (primary combustion), 850 degree centigrade (secondary combustion)	r 2 minutes

7) Training Program

According to the questionnaire survey, some medical facilities have their own training programs for medical waste management (50 to 70 % of the facilities).

8) Management

According to the questionnaire survey, only few facilities have the specific department / organization for medical waste management.

New office for medical waste management was established only in National Hospital on February 22nd 2001.

The organization was composed of the following staff:

- 1 mechanical engineer
- 1 agricultural engineer
- 2 hygiene technicians
- 1 worker

(5) Off-Site Treatment

1) Collection/Transport

Some medical wastes of private hospitals in Lattakia City were collected and transported to National Hospital by the cleasing department of Lattakia Municipality.

According to the Director of Health Department of Lattakia Governorate, the medical wastes of the surrounding three cities are transported to National Hospital of Lattakia City. However, the medical wastes of Ibrahim Naameh Hospital were directly transported in the open dumpsite of Jableh City without separation in the compactor truck that was used for collection of the general wastes during The First Work in Syria. The cleaning/sterilization of the collection vehicles is not done regularly.

According to the results of the public awareness survey, the following results were obtained:

- Most of the medical establishments were satisfied with the collection/ transportation services in Lattakia and Jableh Municipalities.
- 50 % of the surveyed establishments were not satisfied with the services because of the irregular and infrequent collection services.
- 50 % of the medical establishments were not willing to pay for more efficient services in Lattakia Municiality, while 67% of the establishments were not willing to pay in other three municipalities.

2) Intermediate Treatment

There are no intermediate treatment between the medical establishments and the final disposal sites.

3) Final Disposal

There are two open dumpsites of Al-Bassa area in Lattakia City and Al-Qumere area in Jableh City. The residue after the incineration by two hospitals in Lattakia City is transported to Al-Bassa open dumping site. However, some medical wastes of the facilities in Jableh City were directly transported to the open dumpsite without transporting to the above incinerators.

The open dumpsites had no special area designed for the medical wastes (separation from other general wastes, burying at appropriate depth)

1.2.7 Organization and Institution

(1) Responsible Authority on Solid Waste Management

1) Outline

The local government such as cities, towns, villages and rural units are responsible on solid waste management in own territory based on the Local Administration Law issued on October 10, 1974. The Ministry of Local Administration (MLA) is the central authority that supervises the local administration system in Syria.

Ministry of Health (MOH) is responsible to maintain public health and Ministry of Environment (MOE) is responsible for environmental affair in Syria. MOH and MOE have regional office called Directorate of Health and Directorate of Environment respectively in Lattakia Governorate.

2) Local Government

Local government consists of Governorate (Mohafaza), cities (Madina), towns (Balda), villages (Qasia) and rural units (Wahda Reefeah) formulated with several small villages. As mentioned above, local governments excluding Governorate is conducting actual works of solid waste management such as solid waste collection, street sweeping and disposal.

Lattakia Governorate is one of 14 Governorate in Syria and consists of four (4) Regions. There are 4 cities in Lattakia Governorate, Lattakia City, Jableh City, Qurdaha City and Al-Haffeh City that are included in the Study area. Urban area of above four (4) cities are shown in Table 1.2.29.

Table 1.2.29 Number of Cities, Towns, Villages and Rural Units in Lattakia Governorate

Region Name	City	Towns	Village and rural units	Total	Remarks (Small villages)
Lattakia	1 (Lattakia)	6	17	24	87
Jableh	1 (Jableh)	3	27	31	89
Haffeh	1 (Haffeh)	4	17	22	106
Qurdaha	1 (Qurdaha)	3	16	20	74
Total	4	16	77	97	356

Note: * Small villages have not nominal status.

Organization chart of Lattakia Governorate is shown in Figure 1.2.6.

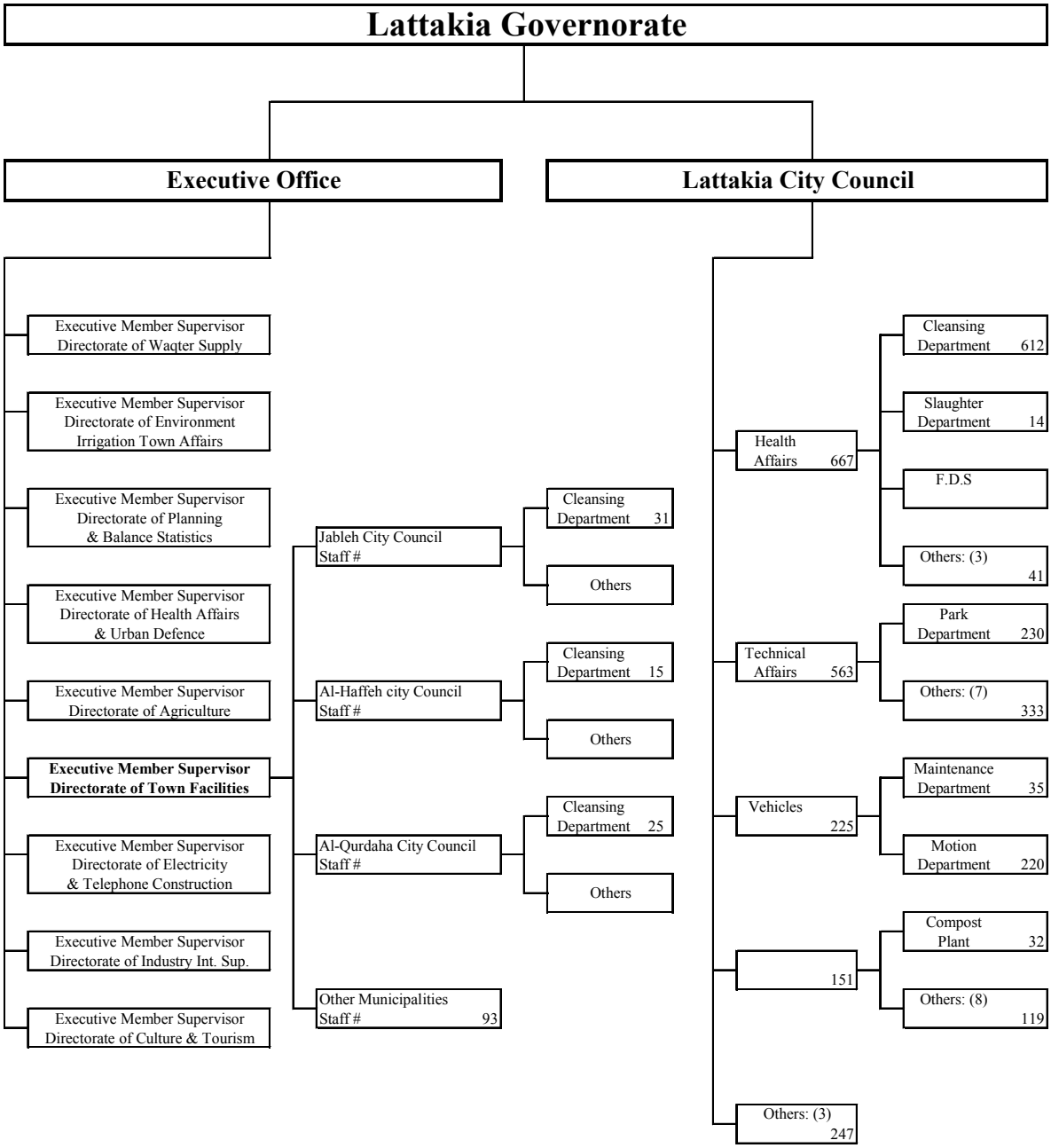


Figure 1.2.6 Organization Chart of Lattakia Governorate

Table 1.2.30 Outline of urban area in four (4) cities.

City Name	Present urban Area	Urban area in years targeted in the plan	Remarks
Lattakia	2,300 ha.(2000 based on plan in 1963) 372,472 people	4,760 ha.(Year 2010) (Green area:800 ha. Industrial a:360 ha. Expansion:1,300 ha. 500,000 pop.(2010)	Urban plan with target year 2010. Expansion of tourist areas along the north-south coast areas with tourist facilities
Jableh	320 ha. Nominal:52,000 Actual :80,000	600 ha.(Year 2020) 70,000 people	President's approval of the unity with Homimien and Bsisien villages in process since 1991, albeit waste col-lection targeted for Bsisien (1,000 households approx.)
Al-Haffeh	236 ha. 13,000 people	450 ha.(Year 2020) 25,000 people	Total area in the city, about 1,000ha., unchanged even in the target year
Qardaha	226 ha. 20,000 people	1,370 ha.(Year 2020) 40,000 people	Actually 7 vicinity villages unified in 2010 (1,370 ha.)

3) Directorate of Environment in Lattakia (MSE)

The directorate is active for the territorial areas of Lattakia governorate in checking and examining polluted objects and substances in cooperation with other institutions such as the directorate of agriculture, the port authority, the directorate of health affairs of municipalities, and the like case by case.

The directorate is composed of 56 engineers and staff. One director, one deputy director, 10 staff in the EIA section, 7 staff in Awareness & announcement section, 6 staff in Air safety section, 6 staff in Water safety & waste water section, 9 staff in the GIS & information section, 3 staff in Integrated urban planning section, 6 staff in Destruction section and 7 staff in Agriculture section. In addition, a new laboratory is under construction now (as in February, 2001) which will be equipped with an atomic absorption device to analyze heavy metals, devices to make chemical and bacteria analyses and to examine organic pollutants.

The directorate examines imported-spoiled foods (e.g., rice, fruits etc.) piled at the port in cooperation with the other authorities concerned and decides whether the foods are still suitable for feed. If unsuitable, the foods are transferred to Al-Bassa dumping site at the account of the port authority. The directorate instructs a responsible person and/or institution to transport construction debris to Al-Bassa dumping site after checking it together with the relevant authorities.

(2) Lattakia City

1) General

Lattakia City has 15 departments employing a total of 1,888 workers. Departments related to waste management are the Sanitation Department, Engineering Department and Compost Plant Section.

The Cleansing Department belongs to the Sanitation Department and has a work force of 612 employees. The Cleansing Department carries out waste collection (487

workers and 54 drivers also covering manual street sweeping), street sweeping (59 workers and 22 drivers), road encroachment management (23 workers and 3 drivers), and other work (43 workers). Collection of construction waste is carried out together with street sweeping.

The Vehicle Section of the Engineering Department manages waste collection vehicles and mechanical street sweepers. The Vehicle Section is made up of the maintenance section (35 engineers) and work section (220 drivers and engineers). Currently, 52 vehicles carry out waste collection and eight vehicles carry out street sweeping.

The compost plant was closed down in March 2001, however, prior to that 32 engineers and operators were working in two shifts here. Moreover, concerning Al-Bassa disposal site, this is supposed to be managed by the Compost Plant Section, however, there has been absolutely no management until now and there are no responsible staffs at the site. Accordingly, rehabilitation of the final disposal site setup in Lattakia and the three surrounding cities is a highly important issue.

SWM related personnel in Lattakia, including Jableh, Qurdaha and Al-Haffeh city is shown in Table 1.2.31.

Table 1.2.31 Personnel of Cleansing Section in Each City

Personnel	Lattakia	Jableh	Qurdaha	AL-Haffeh	Total
Municipality (Total)	1,888	N/A	56	40	1,984*1)
Cleansing Section	612	65	25	15	717
・ Collection	158	20	8	4	190
・ Sweeping	454	45	17	11	527
Compost Plant	32	-	-	-	32
Collection Drivers	79	12	7	3	101
SWM related personnel (Total)	723	77	32	18	850

Note: *) Personnel in Jableh is not included.

2) The cleansing activity

- Waste collection areas are divided into 23 parts of the areas in the city. The waste collection is carried out by workers and an inspector in the respective areas. A two-shift-system for the waste collection is introduced, 220 workers for the morning shift collect the waste from 07:00 to 13:30 and 313 workers for the night shift collect the waste from 19:00 to 01:30.
- No source separation of the wastes is implemented.
- The number of collection vehicles is 29 compactors and 7 vehicles without compactors, which are old. Since new ones are very few, tractors are used waste collection.
- The number of waste containers is 190 in the city. 13 containers should be distributed to put in each area but shortage of the containers makes it impractical.
- Manual collection and sweeping section with 487 workers is responsible for the collection of construction debris and for wastes in 3 sewer channels. Hence, the old and short equipment makes it practically impossible to bring the wastes out of the channels.

3) Vehicles affairs (Workshop)

- The affairs with 255 staff/engineers are divided into 2 departments, i.e., the maintenance department with 35 engineers and the operation department with 220 drivers and engineers.
- The workshop have occupied the 0.6ha. of land (the used part albeit the total area is about 1.6ha) to perform their duties for providing the cleansing department, inter alia, the manual collection & sweeping section, with vehicles with drivers to engage in the waste collection activity.
- The workshop holds 220 vehicles and the equipment (which belong to the city) with 200 drivers and the other staff/engineers. The number of the vehicles is much less than the required one.
- The operation department is checked by drivers' cards which the respective drivers have to sign everyday and is conducted in a close cooperation with the collection & sweeping section of the cleansing department applying 2 shifts to the operation of the waste collection.
- As to the maintenance department, it can be fulfilled to change the fuel-oil for vehicles and to repair small parts of the damages. Big repairs have to be conveyed to private repairing companies since those are beyond capabilities of the equipment.
- There exist 32 collection vehicles, a half (16 units) for the morning collection and rest (16 units) for evening collection. The latest vehicle is the model 1994-1995.
- An incentive system is introduced to drivers' remuneration which is bigger than a basic salary. That matter is liable to facilitate two shift-work of the same drivers.
- The present utilizing space of 0.6ha is too small to park 80 vehicles maximum, albeit the total space is estimated to be 1.6ha, approximately. The land belongs to the defense-military force. That is why it is essential for the department to move to the other place of about 3.5ha, which is located around a boundary far just 6km from the present place.

4) Compost plant

- The plant division belongs direct to the city council apart from the health affairs, inter alia, the cleansing department.
- The plant is located outside the city i.e., in Al-Bassa village where there is Al-Bassa waste final disposal site separated by two rivers east and west respectively on the coastal side far about 12km south from the city.
- The plant made in France was established in 1979.
- The designed capacity of compost products was 300,000 ton per year (100t/day).
- The plant was operated for about 200 days but only 4,500 ton of waste was treated in 2000.
- The plant is operated by 32 personnel being divided into 2 shifts, the morning shift (17 persons) and the night shift (13 persons).

(3) Jableh, Qurdaha and Al-Haffeh City

1) Jableh City

a. Organization

The mayor, the head of the city council (consisting of 19 members), manages the 4 departments, namely the health affairs, the administrative affairs, the finance department and the technical department. The health affairs is divided into the inspection section for the commercial shops and the cleansing section.

b. Cleansing section

The section is composed of a head of the section, 2 workers' foremen, 1 shift inspection & store keeper, 3 drivers for 3 waste collection vehicles (the morning shift), 9 workers accompanying to the drivers, 1 truck driver (the morning shift), 2 tractor & bobcat drivers, 2 sweepers, 1 driver for a tractor, 2 evening workers, 1 driver for a tractor, 2 workers for the removal of construction debris, 1 driver for a waste vehicle and 2 workers (30 persons in total). In addition, it is reported that there are 35 door-to-door waste collection workers.

2) Qurdaha City

a. Organization of the city council

The city council manages 4 departments, i.e., the garage department (10 drivers), the cleansing department (25 persons), the financial departments (11 staff) and the technical department (10 persons).

b. The cleansing department

The department keeps the 2 sections, i.e., the fixed workers' section (5 workers) and the seasonal workers' section (20 workers) and carries out the waste collection operation in a close cooperation with the vehicle section (10 drivers) and park section.

3) Al-Haffeh city

a. Health affairs department

The department (consisting of 17 staff) holds the two sub institutions, i.e., the slaughter house (2 staff) and the cleansing department (15 staff).

b. Cleansing department

The department manages the waste collection section (with 4 workers) and the waste sweeping section (with 11 workers).

1.2.8 Economic and Financial Conditions for SWM

The proper operation of a SWM system is essential for public health, and is normally regarded as a basic requirement in any city. Rather than try to justify such services on a cost-benefit basis, it is usual to treat SWM and similar services as essential services, and

to choose management systems that minimize the overall cost. This is the approach taken in the current study. Undoubtedly such essential services are justified on a cost-benefit basis, but the estimation of the monetary value of the benefits would be extremely difficult.

Additions to the basic service, such as recycling schemes, composting plants etc. should be justified by showing that economic benefits exceed the economic costs. The economic costs of these incremental schemes are often less than their direct operating costs, as they may help reduce the costs of the basic service (e.g. by reducing the cost of land-fill operations). Economic benefits may also exceed the financial receipts from these incremental schemes (e.g. the economic value of compost to farmers may exceed the price they are willing or able to pay).

This study is examining the feasibility of compost plants. Prima facie the economic value of soil conditioners in the local region is high given the relatively low organic content of local soils, so that potentially the economic benefits may exceed the economic costs. A proper cost-benefit analysis to verify the economic feasibility of such plants will be undertaken once the possible options for compost plants are more clearly identified. At this stage the prime concern of the study team is the financial viability of such a plant. This will depend on the ability and willingness of local farmers to pay for such compost. This is being checked through surveys of farmers in the region.

However the most immediate concerns of the study team are the financial stability and sustainability of the basic SWM service. We are still awaiting a full set of accounts for the SWM operations of the Municipal Council in Lattakia. Never the less it is quite clear that the current system is not sustainable, and that substantial changes will be necessary to local financial systems.

(1) Current Financial Conditions

Virtually all the capital assets of the SWM system are heavily depleted. External assistance can assist with the rehabilitation or replacement of these assets. However it is essential that local financial systems are modified to ensure that there is sufficient recurrent funding available for ongoing operations and maintenance, and for the creation of reserves for replacement of capital assets in future.

Over recent years there has been virtually no capital expenditure on the system and no creation of reserves to fund such expenditures. On the contrary it appears that some reserves of the municipal authorities have been used to meet ongoing cash operating costs of the existing system. This is not sustainable.

The municipal authority cannot continue to use cash reserves for such purposes. Further it would be imprudent to rely on continued “one-off” grants from either the governorate or national ministry to operate such basic services. The municipal authority therefore has little choice but to change the level of service fees and improve their collection to ensure that revenues meet the ongoing costs of the system.

The METAP-EIB study of SWM in Homs city has reviewed the accounts for SWM in that city, where service charges are very similar to those in Lattakia. This review was carried out by the local economist, who estimated the cash operating costs of the service by apportioning items from the consolidated budget of the city. The estimate of the cash

operating costs of the service for 1999 was 112 million SYP, while estimated collections of service charges amounted to 80 million SYP, just over 70% of the cash operating costs. This review did not estimate non-cash operating costs, and so does not provide an estimate of the long term average cost of providing the service.

Assuming the plant and equipment in Homs is near the end of its operational life (as in Lattakia), current non-cash costs may be low. However when this equipment is replaced depreciation charges will rise dramatically, and substantial financing charges may be incurred (depending on the manner of financing the rehabilitation of the service). Replacement of vehicles in particular will create some off-setting savings in fuel and maintenance costs, but the overall costs of operating the system are likely to be significantly higher than the current cash costs of 112 million SYP.

(2) Gross Regional Domestic Product (GRDP) and GRDP Per Capita in Lattakia Governorate

Gross domestic product in Syria in 1998 was SP 790,440 million and the per capita GDP was SP 46,500 (population 17,010,000). Within this, the gross regional domestic product (GRDP) of Lattakia Governorate was SP 39,940 million, accounting for 5% of the national GDP, and per capita GRDP was SP 41,000 (Governorate population 975,000), equivalent to 88% of the national average. The gross regional domestic product of Lattakia and the three surrounding cities is estimated as SP 20,593 million (1998) judging from the ratio of population there.

Whereas it is estimated that population will increase at an annual rate of around 2.7%, economic growth is estimated as around 2%, and it is thought that harsh economic conditions will continue. The estimated population of Lattakia and the three surrounding cities in 2001 is 541,000. Assuming the economic growth rate from 1998 onwards to be 2%, the GRDP of these four cities is estimated as SP 21,853 million and the per capita GRDP is estimated as SP 40,400.

(3) Household Income and Expenditure

Judging from the findings of citizen awareness surveys, household income per person works out as SP 17,180 per year and expenditure is SP 23,409, which means that income only covers approximately 73% of expenditure. These figures for household income and expenditure are equivalent to approximately 43% and 58% of per capita GRDP respectively. 14.3% of households have income of SP 4,000 or less and account for just 3.4% of total expenditure.

(4) Financial Situation in Lattakia and Three Surrounding Cities

Financial conditions and waste management costs in Lattakia and the three surrounding cities are as indicated in Table 1.2.32.

Table 1.2.32 Financial Condition of Lattakia and Three Surrounding Cities in 2000

(Unit: Million SP)

Item	Lattakia	Jableh	Qurdaha	Al-Haffeh	Total
Population (2000)	365,600	90,300	40,880	22,900	519,680
a. Income	445.0	31.8	2.8	1.6	481.2
b. Expenditure	521.0	21.2	6.0	3.4	551.6
c. Income on SWM	33.5	0	0	0.1	33.6
d. Expenditure on SWM	93.1	11.2	2.1	0.9	107.3
d／b	17.9%	52.8%	35.0%	26.4%	19.5%

Note: Budget in Al-Haffeh is estimated based on the budget in Qurdaha.

Cleansing-related income based around revenue from collection of fees only amounts to 31.3% of cleansing-related expenditure and most of this income is generated in Lattakia City. Greater efforts to secure income are required in the other three cities. However, in Lattakia City, 90% of cleansing-related income is collected from stores, etc. and the burden of stores generally covers the management costs. Accordingly, in future it will be necessary to boost income by strengthening fee collection from households.

Total cleansing-related expenditure in the four cities in 2000 was SP 107.3 million, accounting for just 0.5% of estimated GRDP (SP 21,424 million), and it is necessary to consider expanding this expenditure in order to improve the cleansing activity. Moreover, since current revenue from fee collection is SP 33.6 million, which is merely 0.15% of GRDP, drastic revision of the cleansing-related fee collection system is required.

The summaries for the two years aggregate incomes and expenses differently and so the breakdowns of these budget totals are tabulated separately.

Table 1.2.33 Variances in 1999 Budget

Item	Budget Million SYP	Actual Million SYP	Actual/ Budget (%)
INCOME			
Taxes & Fees Group 1	268	257	96
Receipts from investments	79	54	69
Other Local Fees and Taxes	168	45	27
Other income	78	34	44
TOTAL	593	391	66
EXPENDITURE			
Salaries	121	116	96
Administrative Expenses	119	102	86
Capital Expenditures	318	184	58
Transfers	6	5	90
Debt Service & Commitments	30	29	96
Cultural Centre	3	5	138
TOTAL	597	441	74

From these tables it is clear that the major problem is a shortfall in revenues. This is most serious in local fees and taxes. Until administrative procedures for the collection of these local taxes and charges are improved, it will be impossible to administer the

local budget effectively. Attempts are clearly made to cut expenditures during the year as revenues fail to meet targets. Given the inflexibility of many expenditure items such as salaries, this is done mainly by cutting back on capital expenditures. Never the less there is often a shortfall and the local authority is then dependent on supplementary funding in the following year to bridge this gap.

Table 1.2.34 Receipts by Source, Year 2000

Source	Actual Receipts Million SYP	Proportion of receipts (%)
Local taxes and charges	126	28
Revenue shares received from other authorities	134	30
Ministry of Local Admin.	74	17
Aid from P.M. special account	65	15
Budget assistance from Govt.	46	10
Total	445	100

The table above identifies further problems in the structure of revenues. The first two items should produce a predictable source of revenue, if local administration can be improved. Local taxes and charges should generate a stable cash flow for the municipality, but unfortunately at present collections appear to be well under 50% of budget estimates. In a developed country a deviance of more than a few percent for such an item would instigate a major review of the efficiency of budget administration.

The revenue share received from other authorities appears to produce a predictable revenue stream already. (It is thought that this is a major part of the item classified as "Taxes & Fees Group 1" in the 1999 budget where actual collections were close to the budget estimates). Our understanding is that there is an agreed revenue sharing procedure, making the income from this source predictable.

However more than 40% of total receipts consist of one-off grants that may vary greatly from one year to another, and are likely to be cut very severely when the central government has to exercise fiscal restraint. This makes it almost impossible to budget effectively for local services.

(5) Scope to improve Financial Conditions

Fortunately there appears to be considerable scope within the existing legislation controlling the levying of service fees to improve their collection and to adjust rates to better reflect the actual costs of service once these are established. Firstly there is scope to improve collection of the existing charges. The preliminary estimate that we have received from the financial controller is that approximately 75% of fees that are due according to current records are actually collected. This figure seems too high when compared with the deviances noted between budgeted and actual receipts in the municipal budget.

Further there is an unknown number of residences and businesses that are liable (according to current legislation) to pay the current charges but are not recorded in the relevant tax records. Thus there is already scope to increase revenues through better administration without even altering the rules determining liabilities for these charges or the rate of these charges.

The expansion of the local economy mentioned in Section 2.5.2 has the potential to create a very significant expansion of the tax base for the municipal and Governorate authorities. However we have yet to establish whether planning and land use controls are sufficiently developed and linked to tax records to ensure that the tax base is expanding as rapidly as it should. Some comments by municipal authorities are particularly worrying in this regard. It is our understanding no surveys have been conducted for four years to update the records for collection of SWM service fees. These comments cause concern for two reasons:

- It would seem to indicate that records of the tax or service fee base for SWM fees and possibly many other local taxes and charges are deficient and this lack of information may be adversely affecting the collection of these fees and taxes;
- The fact that periodic surveys are necessary to update the tax and fees base records indicates serious weaknesses in planning and tax records, and more particularly in linkages between the two. Such weaknesses almost inevitably mean that there is under-collection, not just of SWM service fees, but of many local taxes and fees.

In addition there appears that there is a willingness and ability to pay a more realistic fee amongst the very substantial group of middle income consumers of this service as long as the service meets their expectations. Anecdotal evidence from the waste generation surveys indicates that there is a well established pattern of informal payments in middle class areas for augmentation of the basic service. The challenge then to the planners of the service is to adjust service levels to meet these expectations and to capture these informal payments within the formal system. This will augment the funds available for operation of the main system.

(6) Current Accounting Problems

Determining the ongoing financial viability of the service is however complicated by the structure of the existing accounts of the municipality. We understand that no cost centre based accounts are available. There do not appear to be any accounts available based on the functions of the council. Expenses are classified only by type (such as salary etc.), aggregated across all the functions of the council. Separating out the receipts of the council that are directly related to SWM will be relatively easy. However identification of the actual operating costs of the SWM service will have to be based on a number of guesstimates using a similar approach to that used in the review in Homs. Quite clearly a major overhaul of the council's accounting systems is necessary to determine the real costs of each of the functions and services provided before major progress can be made in improving the efficiency of any of its services, including SWM. At this stage managers of the SWM service (and other services) do not have control of (or even have access to) the budget for their operations and thus are not in a position to improve its financial efficiency.

(7) Changes needed in Accounting and Financial Systems

An overhaul of the municipal accounting and financial system is needed both to identify and control expenditures more effectively and also to improve revenue collection. These changes are needed to improve all the services of the municipality, not just SWM. An overhaul needs to cover the following points:

- The accounting and budgeting system needs to identify the costs attributable to each function or service of the council
- The system should update the records of residents and businesses liable to pay service fees automatically. Ideally this would involve better linkages to planning and building approval records if indeed these records provide a reasonably accurate picture of actual building development, land and building use. At this stage each service department which levies charges for its services keeps separate records of residents' liabilities for these charges. These need to be integrated;
- Better fee collection systems to increase the rate of collection, if necessary introducing effective penalties for non-payment such as the suspension of other municipal services;
- Revision of levels of service to reflect consumers' demands;
- Adjusting fee levels to better reflect the service provided, keeping in mind the ability of the consumer to pay. For example for larger commercial or industrial undertakings the fee might be directly linked to the service provided such as a charge per container emptied. Given the seasonal nature of activities in Lattakia, such charges would have to include a capacity component to cover the costs of capacity provided to meet peak summer loads;
- A full evaluation of the long term operating costs of the system that includes the costs of depreciating capital assets. This may include setting up reserve accounts into which depreciation charges are transferred to provide a future source of funds for future capital investments.

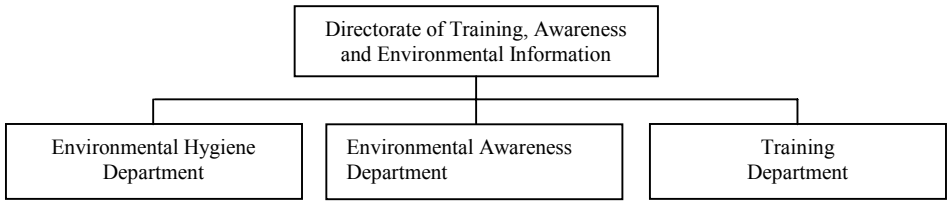
Many of these issues are outside the scope of the current study, but wherever possible the team will provide assistance to the municipal authorities to follow up these issues. It must be stressed however, that undertakings to improve recurrent funding of the service will be sought before formal requests for assistance to provide new capital assets can be considered, and we recommend to the local authorities that they should start looking at options to improve recurrent funding without delay. The reform of accounting budgeting and taxation collection systems will take considerable time even within the municipality, but it is important that consideration of the issues starts immediately to prevent a proliferation of ad hoc "solutions" to the recurrent funding problems of each of the functions of the municipality.

1.2.9 Environment, Health and Hygiene Education, and Public Awareness Activities

(1) Ministry of State for Environment (MSE)

1) System of Environmental Education

The Ministry of State for Environment (MSE) handles environmental education in Syria. The MSE modified its organizational structure in January 2001. The new organization set up the Directorate of Training, Awareness and Environmental Information to execute environmental education at the national level. The Directorate consists of three departments: the Environmental Hygiene Department, the Environmental Awareness Department, and the Training Department, as shown in Figure 1.2.7. The main functions of each department are summarized as follows.



Source: MSE

Figure 1.2.7 Directorate of Training, Awareness & Environmental Information

a. Environmental Hygiene Department

- To analyze samples of processed foods
- To hold meetings in the field of environmental hygiene in cooperation with other related Ministries such as the Ministry of Health
- To prepare printed materials on environmental hygiene
- To grant licenses with a special "logo" to environmentally sound products (under preparation)

b. Environmental Awareness Department

- To prepare plans to heighten environmental awareness in cooperation with related authorities
- To work with the Ministry of Education as well as UNESCO to include concepts on environment in schoolbooks to heighten students' awareness on environment
- To hold workshops and seminars with official unions such as a women's union or a youth union to heighten public awareness on environment
- To prepare campaigns for cleansing, garbage collection to heighten public awareness on environment in cooperation with other governmental authorities
- To prepare printed materials to heighten public awareness on environment and disseminate related information

c. Training Department

- To prepare plans on training courses in the field of environment
- To hold internal and external training courses for the staff of the MSE
- To keep records of the staff training courses in the MSE

2) Previous Accomplishments

The MSE has implemented several activities in the field of environmental education as summarized in the following:

The MSE has;

- Set up a national strategy on environmental information in *Syria*

- Accomplished a program on heightening environmental awareness in Syria financed by the Center for Environmental Development for Arab States and Europe (CEDARE)
- Implemented capacity building of a national project on environment in rural areas in cooperation with UNICEF and the Ministry of Health
- Carried out a health and environmental training project (aimed at women & children).
- Conducted a project for a comprehensive pollution control in Aleppo City
- Participated in a project of the national action program to control desertification
- Cooperated in several activities on environment for the Ministry of Education
- Participated in campaigns of public organizations (like youth unions)
- Produced radio and TV programs related to environment
- Coordinated with local official entities to celebrate Arabian Day of Environment, and International Day of Environment
- Cooperated with the *Lebanese* Environmental Ministry through the highest council (*Syria-Lebanon*) on environmental information & awareness, especially on related campaigns
- Contributed to establishing an Arabian network for environmental education supported by CEDARE

3) Plan for 2001

The MSE has prepared an action plan on environment for the year 2001. Information and ideas on environmental education and public awareness discussed in the plan are shown as follows.

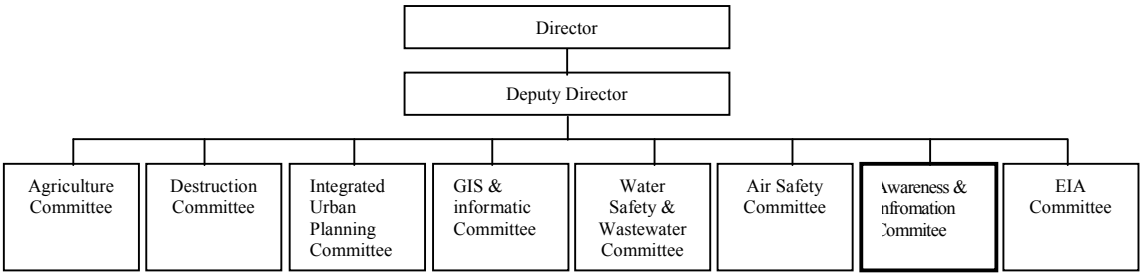
- To get financial assistance from the GTZ (*Deutsche Gesellschaft für Techniche Zusammenarbeit*) for an environmental education project in cooperation with the Ministry of Education
- To publish an environmental magazine called "Human and Environment"
- To prepare a weekly TV program on environment in cooperation with the General Commission of Radio and TV of the Ministry of Information
- To work with UNESCO through the National Committee of Education, Culture and Science
- To work with the Arabic Environment & Development net on environmental education and heightening public awareness on environment
- To cooperate efficiently with the CEDARE
- To look for financial assistance for environmental education from the Arab League
- To create a center of environmental education in the MSE
- To cooperate with the Syrian Red Crescent
- To cooperate with other public organizations

- To prepare lectures on environmental awareness

4) The Lattakia Environment Directorate

The MSE has established several environmental directorates in accordance with a seven-basin regional system, by which the MSE divides Syria into seven river basins, to enforce its environmental administration at the local level. In the Coastal Basin, the *Lattakia* Environmental Directorate was established by the MSE in 1998.

Under the Director of the Directorate, specific sections have not been set up yet. However, there are eight committees in the Directorate to discuss and coordinate various environmental administration and issues in *Lattakia*. The Awareness and Information Committee is organized to carry out environmental education among them, as shown in Figure 1.2.8.



Source: The Lattakia Environmental Directorate

Figure 1.2.8 The *Lattakia* Environmental Directorate

The Awareness and Information Committee consists of seven staff at present. Table 1.2.35 shows each expertise of the staff of the committee. The committee, however, has not implemented all activities on environmental education and heightening public awareness on environment since the establishment. In addition, due to financial difficulties, specific equipment and devices are not available in the directorate to carry out environmental education. Namely, it can be said that the committee is in the preparation stage to carry out its expected activities.

Table 1.2.35 Expertise of Awareness & Announcement Committee

Expertise	Number
Civil Engineer	2
Architecture	3
Mechanical Engineer	1
Electrical Engineer	1
Total	7

Source: The Lattakia Environmental Directorate

(2) The Ministry of Health (MOH)

1) System of Health Education

The Ministry of Health (MOH) is the sector Ministry for enforcement of public health administration including prevention of epidemics, control of environmental health and hygiene, and other issues related to human health and disease in the Syria. In the

MOH, there are several assistants to the Minister. Each assistant deals with specific fields of health issues respectively. One assistant is in charge of primary health care (PHC) issues. Under the assistant, the Directorate of Communicable Diseases and Health Education is organized. The directorate consists of six departments in the field of communicable diseases and health education as shown in Figure 1.2.9. The Health Education Department is the key office handles health education of the MOH.

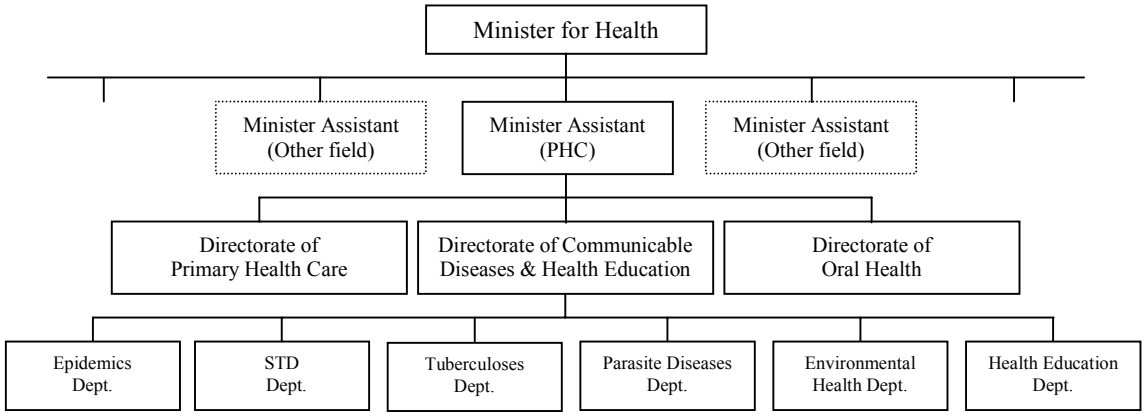


Figure 1.2.9 Organization Chart of the MOH

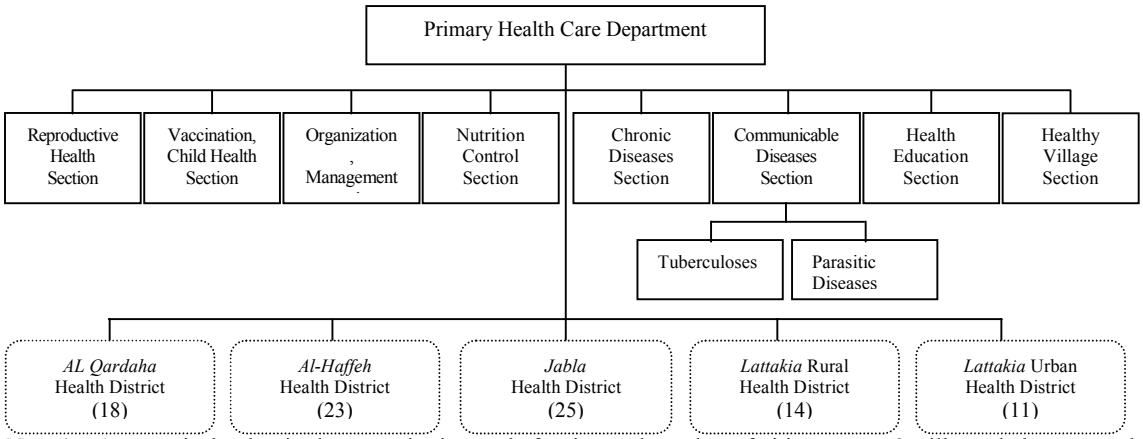
a. The *Lattakia* Health Directorate

The MOH has established a health directorate in each governorate to implement its health administration and pollicies at the local levels. Accordingly, in *Lattakia*, there is the *Lattakia* Health Directorate.

Under the Director of the Directorate, the Primary Health Care Department is set up to handle health and environmental sanitation issues at community levels in *Lattakia* governorate. The Department consists of eight sections, and divides the governorate into five "*Health Districts*" as shown in Figure 1.2.10. In the Directorate, however, there are presently no specific sections and activities related to solid waste management from viewpoint of environmental health.

b. Health District

Each health district provides primary, secondary and general health services. The services are a similar system to Primary Health Care (PHC) discussed and defined in the *Alma-Ata* declaration by WHO and UNICEF in 1978. As for primary health services, one health center is principally set up at every city, township and village respectively which belongs to each health district. There are 92 health centers in the governorate at present.



Note 1: A numerical value in the parenthesis stands for the total number of cities, towns & villages belong to each heath district

Source: Lattakia Health Directorate

Figure 1.2.10 Primary Health Care Department of the *Lattakia* Health Directorate

Each health district has a health district supervisor. Under his supervision, a chief of health education deals with health education in each district. The chief (or other related professionals) carries out health education at the health centers.

c. Health Education Section

The Health Education Section is in charge of health education in the directorate. Principal activities of the section are summarized in the following;

- To disseminate information on symptoms of, and preventative measures for prevailing infectious and parasite diseases in the governorate, such as *leishmaniasis*.
- To educate the population about STD (*Sexually Transmitted Diseases*), HIV (*Human Immunodeficiency Virus*) and AIDS (*Acquired Immune Deficiency Syndrome*) issues.
- To inform the population about non-communicable diseases and other health issues such as symptoms of, and preventative measures for diabetes, nutrition control of pregnant women and so on.
- To hold training courses on health education for specific staff of the department.
- To prepare a monthly plan for each health district.

As noted above, the section conducts one-week training courses in health education for staffs like nurses of the directorate as well as other official entities. Each course has special topics. Most of them are health-related topics such as first aid, non-smoking, seasonal health issues and so on. As an example, Table 1.2.36 gives the topics of "*the program on first aid and nursing course, 27th January - 1st February 2001*", which was delivered to the *Lattakia* Youth Union in cooperation with the Health Education Section;

Table 1.2.36 Example of Health Education Topics

Day	1st	2nd	3rd	4th	5th	6th
Topic	-Burns -Basic Nursing	-Wounds -First Aid	-Fractures -AIDS	Practical Training	Practical Training	Practical Training

Source: Health Education Section, the Lattakia Health Directorate

At present, approximately 100 officials have finished above mentioned training courses to instruct health issues and other information related to health care to the population in the governorate. Every city, township and village in each health district has at least one such a trained official for health education activities.

Table 1.2.37 shows equipment and tools available in the *Lattakia* Health Directorate. These audiovisual aids, however, are mainly for education of the staff, and conferences or meetings of the Directorate.

Table 1.2.37 Equipment and Tools

Equipment and Tools	Quantity
Television set	5
VTR	5
OHP	4
Slide Projector	2
Computer	2
Photocopy	2
Related posters & publications	some

Source: The Lattakia Health Directorate

d. The *Lattakia* National Hospital

In addition to the Primary Health Care Department, national hospitals in *Lattakia* have an internal system of health education for nurses and paramedical staff. For example, the *Lattakia* National Hospital (*Al-watani* Hospital of *Lattakia*), the biggest national hospital in *Lattakia* with 450 inpatient beds and 150 - 200 outpatients/day, conducts the following related activities on health education.

- The hospital operates a specific training section
- From 2001 the section conducts a one-week training course on heightening public awareness on health for the nurses.
- 11 health instructors instruct the following topics to the nurses;
  - Family Planning
  - Breast breeding
  - Teenager (14 - 18 years old) health (the danger of drugs, smoking etc.)
  - STD/AIDS
  - Communicable diseases (*Measles*, *Tuberculoses* and so on)
- However, there are no topics related to the link between sanitation and health.
- The health instructors visit all health centers in *Lattakia* to instruct above noted topics to both of stuff of health centers and the population.

- The section prepares several printed materials on health education.

(3) The Ministry of Education (MOE)

The Ministry of Education (MOE) is in charge of primary and secondary education in Syria. The MOE has prepared a national policy on education. The environmental health and preventive medicines are included in school curriculums.

In the organization structure of the MOE, the School Health Directorate is set up to handle school health and sanitation issues, and to prepare school health programs. The MOE has organized an education directorate in each governorate to enforce the educational administration at local levels as shown in Figure 1.2.11.

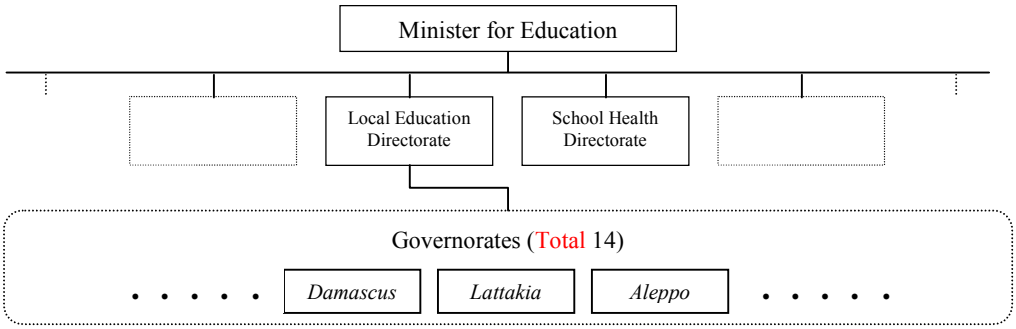


Figure 1.2.11 Ministry of Education

1) Primary and Secondary Education

a. Public Education System

The public education system of Syria is formulated in the law of education (Law No.35/the year 1981). Table 1.2.38 shows school systems of primary and secondary education of Syria. According to the law, primary education usually starts at 6 years old. However, depending on health problems, personal abilities and other circumstances, every pupil of primary school may study till 14 years old. The school year of primary, preparatory and secondary schools starts in September and ends in May.

Table 1.2.38 Primary and Secondary Education of Syria

School	School Years	Basic School Age	Compulsory Education
Primary school	6 years	6 – 12	Compulsory
Preparatory school	3 years	12 – 15	Not compulsory
Secondary school	3 years	15 – 18	Not compulsory

Source: Lattakia Education Directorate, MOE

The language of public education is Arabic. As for studying foreign languages, each pupil can choose either English or French as one of curricula of the primary education. Generally, some 70 % of the pupils choose an English course nowadays. In the school year 2001, the curriculum for foreign languages in the primary education starts from the fifth grade. According to the Lattakia Education Directorate, the curriculum is going to start from the forth grade in next year.

b. Education in the *Lattakia* Governorate

The following tables show data on primary and secondary education of the governorate. Based on Table 1.2.39 and 1.2.42, it is identified that the ratio of pupils who go on to preparatory and secondary schools in Lattakia is more than 99.5% from 1996 to 2000.

Table 1.2.39 Number of schools

(The School Year 2000-2001)	Lattakia Urban	Lattakia Rural	Jableh	Al-Haffeh	Qurdaha	Total
Primary school	53	141	148	157	124	624
Preparatory school	4	24	36	26	12	99
Secondary school	23	17	24	17	18	99

Source: Planning Statistics Department, Lattakia Education Directorate

Table 1.2.40 Pupil Number of Primary School

Lattakia Governorate	1996	1997	1998	1999	2000
Male	61,209	63,503	61,375	59,543	57,494
Female	55,766	59,222	57,061	55,411	53,796
Total	116,975	122,725	118,436	114,945	111,290

Source: Planning Statistics Department, Lattakia Education Directorate

Table 1.2.41 Student Number of Preparatory & Secondary School

Lattakia Governorate	1996	1997	1998	1999	2000
Males	60,398	63,095	60,997	59,128	57,287
Females	55,539	59,047	56,902	55,276	53,698
Total	116,337	122,242	117,899	114,404	110,985
Pupils who go on to secondary education	99.5 %	99.6 %	99.5 %	99.5 %	99.7 %

Source: Planning Statistics Department, Lattakia Education Directorate

Table 1.2.42 Student Number of *Lattakia*

(The School Year 2000-2001)	Lattakia Urban		Lattakia Rural		Jableh		Al-Haffeh		Qurdaha	
	M	F	M	F	M	F	M	F	M	F
Primary school	22,512	22,210	8,959	8,249	12,347	11,659	5,758	5,308	5,164	4,618
Preparatory school	11,334	9,861	3,777	4,035	6,900	6,841	2,306	2,492	3,232	2,876
Secondary school	4,609	4,173	1,087	949	2,213	2,665	570	610	715	846

Note: M: Male, F: Female

Source: Planning Statistics Department, Lattakia Education Directorate

According to the *Lattakia* Education Directorate, both the school attendance rate and the literacy rate of primary schools in the *Lattakia* governorate is approximately 100%.

2) School Health Education

a. Teacher's Manual on School Health Education

The MOE has published a teacher's manual on school health education. The manual, "*School Health Course and Project for the 3rd Grade in Primary Schools*", was prepared by the School Health Directorate in the year 2000. It discusses various questions and problems in the field of school health and sanitation. The topics of the

manual are food safety, dietary matters, personal cleanliness, oral hygiene, health education, educational methods and tools, insect and rodent vectors, water pollution and other instructions.

b. School Health Program

A School Health Program is prepared by the MOE every year to supervise school health and sanitation issues, which is principally composed of the following programs:

- Supervision of school environment and sanitation
- Vaccination
- Heightening health awareness
- Periodic health examination
- Clinic work of school health centers
- Health curriculum
- Clinic and preventive oral medicine
- Health care in youth and vanguard camps

c. School Health Department

A school health department is set up in each education directorate of Syria. The main purposes and tasks of the department are as follows:

- To heighten health awareness among students
- To attain a clean school environment
- To provide requirements and necessities for making use of clinical and preventive medicine in collaboration with other Departments of the Education Directorates

Activities and programs conducted by each Department are summarized as follows:

- To provide medical services to all students and workers concerned
- To offer free vaccination to all students to prevent communicable diseases
- To execute prevention programs on the spread of communicable disease in schools
- To conduct health and sanitation programs to heighten students' awareness on personal health and school environment
- To implement a periodical health examination for all school students
- To supervise school health programs

d. School Health Center

In order to provide medical services for pupils, students, teachers and other staffs concerned in schools, school health centers are organized under each School Health Department. In *Lattakia* Education Directorate, eight school health centers are available as shown in Table 1.2.43.

Table 1.2.43 School Health Center

City	Number of School Health Center
Lattakia	5
Jableh	1
Al-Haffeh	1
Qurdaha	1
Total	8

Source: Lattakia Education Directorate

Each school health center conducts the following activities on health education in addition to general medical services including a medical check, immunization, first aid and so on:

- To hold a 15-day training course on health education for teachers each summer
- To go camping in summer for primary schoolchildren
- To give lectures on health and environment at each primary, preparatory and secondary school
- To prepare printed materials on school health and sanitation

(4) The Ministry of Agriculture and Agrarian Reform (MOAAR)

The Ministry of Agriculture and Agrarian Reform (MOAAR) conducts activities related to environmental education and heightening farmers' and peasants' awareness from the viewpoint of agricultural development. The following shows the basic focus on environmental education and heightening the awareness applied by the MOAAR:

- Principle of biological controls
- Non-use of poisonous agricultural pesticides
- A rational utilization of organic fertilizers
- Importance of well-balanced fertilizing
- Protection of water pollution and soil erosion
- Research on utilization of organic fertilizers, heavy metals and poisonous pesticides

As educational tools, the MOAAR has produced several videotapes on agricultural and environmental awareness as well as printed leaflets on pollution control, health and environment as follows:

Table 1.2.44 List of Education Tools of MOAAR

Videotape	Leaflet
・Dangers of a random use of fertilizers & its impacts on the environment	・The use of Fertilizers
・A use of agricultural pesticides and its poisonous impacts on the environment	・The use of agricultural pesticides
・Water quality conservation & environmentally sound water sterilization methods	・Water and population.

Source: Lattakia Agriculture and Agrarian Reform Directorate

1) Local Agriculture and Agrarian Reform Directorate

At the local level, a Guidance Authority is organized in each local Agricultural and Agrarian Reform Directorate to heighten especially rural women's awareness in the field of health, environment, culture and agriculture. An annual program for rural women related to agriculture concentrates on the following two subjects:

- Public health and food
- Healthy housing in rural areas

The directorate implements the following methods to heighten the awareness and promote environmental education:

- To distribute printed materials such as instructive leaflets
- To visit farmers
- To hold related seminars
- To arrange and produce a special TV program on heath & environmental protection
- To instruct for farmers in making use of a principle of biological controls, a non-utilization of agricultural pesticides and a reasonable use of fertilizers according to the needs of their lands

2) Collaborative Relations

a. The Agricultural Directorate and Health Directorate

There are several collaborative relationships between the Agricultural Directorate and other official entities.

- The *Lattakia* Agricultural Directorate and the *Lattakia* Health Directorate coordinate seminars and meetings on public health and sanitation of villages in cooperation with the Guidance Authority and health centers in villages.
- Between the Land Department of the Agricultural Directorate and the Health Directorate in *Lattakia,* there is a cooperative relation in analyzing Zinc in soil, water and plants, and its effects on the children's health.

b. International Collaboration

- The project of healthy villages in cooperation with WHO
- The Project of Inhabitant Education in cooperation with MOAAR, UNDP and FAO

(5) The Ministry of Culture

The Ministry of Culture (MOC) has built five culture centers in cities of the *Lattakia* governorate as shown in Table 1.2.45.

Table 1.2.45 Culture Centers

City	Number	Note
Lattakia	1	Existing one is built in 1944, new one is under construction
Jableh	2	One is in the *Jableh*, another is in the *Biet Yashoot* Township of the *Jableh*
Al-Haffeh	1	-
Qurdaha	1	-
Total	5	

Source: Lattakia Culture Center

Each center has a hall for conducting lectures, seminars, concerts, and cinemas and so on as one of its functions. There are four movie houses in the *Lattakia* city and one in the *Jableh* city, however, no specific theatre hall in *Lattakia*, except the culture centers. Therefore, in accordance with requests from official entities related to environment and health issues, the centers hold lectures and seminars making use of the halls.

The *Lattakia* Culture Center has a theatre hall having about 300 spectators' seats. At the hall, the following seminars related to environment and health were conducted in the year 2000.

- "The Dangers of Smoking"
- AIDS
- "Our Health in a Sound Environment"

In addition to the hall, the center has the following equipment could be used for the education activities.

Table 1.2.46 Equipment

Equipment	Quantity
TV Sets	1
VTR	1
35mm Movie Projector	1
Sound Device	1

Source: Lattakia Culture Center

(6) The Ministry of Information (MOI)

1) Directorate for TV & Radio Center

The Ministry of Information (MOI) controls communication, information, intelligence and the mass media of Syria. The MOI has organized the General Directorate for TV & Radio Centers for managing the mass media (TV & radio) in the country. There are three governmental TV and two governmental radio stations available in Syria as shown in Figure 1.2.12.

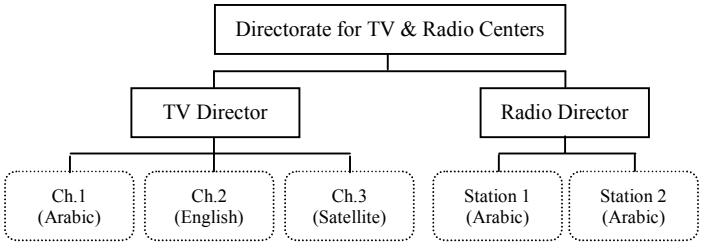
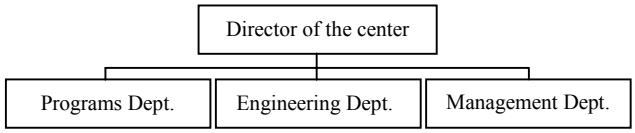


Figure 1.2.12 TV & Radio Stations of Syria

2) Lattakia TV & radio center

In *Lattakia*, the MOI has established the *Lattakia* TV & radio center in 1987. The *Lattakia* center functions as a local office under the General Directorate of TV & radio Centers of the MOI as shown in Figure 1.2.13. The center operates two local TV channels (ch.1 and ch.2) and one radio program. Most of the programs are produced by the *Damascus* TV & radio center under supervision of the General Directorate for TV & radio Centers. Namely, a basic role of the *Lattakia* center is to be a relay station of the *Damascus* center.



Source: Lattakia TV & Radio Center

Figure 1.2.13 Lattakia TV & Radio Center

However, the *Lattakia* center is permitted to produce and broadcast its own programs in the following broadcasting allotment. As for hygiene, health and environmental education, the *Lattakia* center doesn't have special programs on such fields, but some programs related to environmental awareness broadcast occasionally.

Table 1.2.47 Broadcasting Allotment

Media	Broadcasting Minutes
TV	15min./day
	25min./week
Radio	30min./day

Source: Lattakia TV & Radio Center

Table 1.2.48 shows diffusion ratios of TV sets and radio receivers in each city of the *Lattakia* governorate. According to the data, it can be evaluated that almost every household in each city has at least one TV set and one radio receiver at present. Therefore, radio and television are one of the most effective tools for heightening public awareness on environment and health.

Table 1.2.48 TV sets and radio Diffusion ratio (%)

Media	Lattakia	Jableh	Al-Haffeh	Qurdaha
TV sets	95	95	90	99
Radio receiver	100	100	100	100

Source: Lattakia TV & radio center

(7) The Women's Union

1) Central Level

The Executive Bureau of the Women's Union is set up in *Damascus* at the central level under the supervision of the Ministry of Social Affairs. The Executive Bureau prepares an annual plan and a program in the field of environment and sanitation and holds seminars about subjects of these fields, from the viewpoint of women's issues. Usually, the seminars discuss agendas on environment, health, sanitation, food, communicable diseases, and reproductive health. Especially, the seminars are going to be executed in the following commemoration days in accordance with various international organizations:

- International Women's Day
- Countrywomen's Day
- World AIDS Day
- The environment Day
- No-Smoking Day

The Executive Bureau concentrates environmental awareness on the following points:

- The role of women in domestic hygiene
- Preventative health-kitchens/sanitation
- Precaution against making use of chemical fertilizers
- Food hygiene (including milk, yogurt and cheese)
- Preparing and issuing printed materials such as brochures and booklets in cooperation with the branch offices in each governorate

2) Local Level

A branch office of the union in each directorate follows the plans and the seminars above at the local level. The office of health services of each branch is in charge of environmental and sanitation education. These offices execute the plan through an annual program on the education and awareness.

The following are the cooperative relationship among the Women's Union, the MSE and the MOH:

- Occupational safety
- Communicable diseases
- Reproductive health

- National vaccination project
- Other sanitation matters
- Lectures to women in such fields

3) The *Lattakia* Women's Union

The *Lattakia* Women's Union organizes the Health Service Office to handle environmental and sanitation education in the *Lattakia* governorate. The following show problems and difficulties that the women's union faces in heightening public awareness on environment and sanitation:

- Shortage of equipment and materials
- Shortage of transportation and communication, specially, to visit and communicate with the far places and countryside
- Shortage of specialized staff to spread the awareness widely (usually, the staff rely on a university or the MSE)

As for education equipment, screen projectors, audio-visual aids, computers and videos are not available in the *Lattakia* branch.

There is a cooperative relationship between the women's union and the official entities in the *Lattakia* governorate as follows:

- To cooperate with other public organizations
- To hold special exhibitions of women art
- To discuss women's role in health and sanitation
- To participate in finding solutions for sanitation issues and communicable diseases

(8) City Councils

1) The *Lattakia* City Council

The *Lattakia* City Council organizes specific offices to manage environment and health issues:

- Directorate of Health Affairs: to handle public sanitation, medical treatment and slaughterhouses
- Department of Sanitary Sewerage: to prepare a strategic plan and to construct a sewerage treatment plant
- Department of Traffic Engineering: to control air pollution caused by traffics
- Department of Urban Planing: to develop the city including ensuring a clean environment

These directorate and departments are supervised by the city council with several committees. They supervise a process for preparing city development strategies and plans. In addition, the city council considers setting up an environmental department in the organizational structure to deal with environmental issues of the city.

In the committees, there is a health council headed by the *Lattakia* Governor. The council studies environment and health issues and prepares plans on health.

As for environmental and sanitation education, several projects are being prepared by the Cleansing Department of the City Council. The projects' goal shall be to heighten public awareness on environmental and sanitation. Plans for these projects are summarized as follows:

- Preparing stickers distributed regularly to the citizens. The stickers include a phrase: "*Keep the schedule time for waste discharge - Keep your city clean*".
- Preparing small stickers to be distributed to primary schools. These stickers, saying "*Keep your city clean- the cleanness is the title to Civilization*", are put on school bags.
- Distributing plastic bags to households all over the city for collecting of waste. On the bags several phrases are written to heighten awareness of cleanness, and importance of waste disposal timing. The distribution is implemented in cooperation with committees in quarters of the City.
- Issuing the public awareness article, "*Keep the City Clean*", in a local newspaper.
- Constructing bulletin boards in main city squares to instruct the citizens to keep the city clean.
- Putting containers, being made now, with phrases for the necessity of keeping environment clean, and importance of a waste disposal time schedule.
- Directing supervising staff to instruct the citizen in importance of the public awareness, and in laws and rules on cleansings and sanitation.

The following show problems and difficulties perceived by the City Council to implement a sound environmental and sanitation education for the citizens:

- Lack of experts to execute specific programs
- Lack of skills for the education and heightening of public awareness
- Lack of cooperation and understanding of citizens

2) The *Jableh* City Council

In the *Jableh* City, public education on environment, health and sanitation are usually executed by the following organizational arrangements:

- The City Council holds a regular meeting
- The City Council holds a meeting with an official circle of representatives of the MOH, the MSE and the MLA (Ministry of Local Administration)
- The City Council disseminates information discussed in the meetings to the citizens in cooperation with a city quarter committee

In addition to these arrangements, the *Jableh* City Council prepares related awareness campaigns in cooperating with the following entities:

- Public organizations (such as the youth union and the women's union)

- The City Council members and a public quarter committee
- Mosque (Islamic) preachers

The City Council organizes regular cleansing campaigns all the quarters.

As well as such campaigns, the *Jableh* City Council prepares printed materials such as labels, and provides the following information to the citizens in cooperation with the Council members.

- To put garbage in a suitable bag
- To keep a waste disposal (collection) schedule time
- The necessity of public cleansing

In order to implement the education and heighten the public awareness, the main problems perceived by the City are as follows:

- Financial difficulties
- Luck of qualified and specialized staff

3) *Al-Haffeh* City Council

In *Al-Haffeh* City Council, there is no a specific division or section that handles environmental and health education at present.

The City Council consists of 20 members. The Council represents all quarters of the city and provides the following information to the citizens to heighten public awareness on solid waste management.

- Schedule of discharging waste
- Incinerating waste and burying the residual ash in soil to whom those have own land

The City Council prepares and distributes printed materials such as labels and posters to instruct the citizens in keeping the environment clean.

In addition to official functions of the City Council, the following public entities in the city play a specific role to disseminate environment and health information to the population.

- ***Mosques and Churches***: health awareness to all worshippers.
- ***Schools***: Setting up a cleansing day to explain to the students the importance of cleansing and keeping the environment clean.
- ***Al-Haffeh Health Center***: information to the citizens through a sound car with a loudspeaker, and printed materials

The main problem perceived by the City is as follows:

- No specialists in the field of environmental and health education are available due to financial difficulties of the City.

In the field of environmental and health education, the City has collaborative relation with the public organizations as follows:

- ***Women's Union***: education housewives in the Union
- ***Youth Union***: holding a summer camp to learn the city service of collecting and transporting waste.
- ***Farmer's Union***: instructing farmers not to dispose the fruits and the vegetables in streets, but to put them in specified holes in their orchards

4) *Qurdaha* City Council

In the *Qurdaha* City Council, a specific section that deals with environmental and health education has not been set up yet. Occasionally, the city council conducts related activities on environmental and sanitation education.

As a matter of fact, specific education tools such as audio-visual aids are not available presently. According to the city, there is a collaborative relation with *Lattakia* City Council in the matters.

1.2.10 Public Awareness on Solid waste management

As for "public awareness on solid waste management (SWM)" in the study area, the JICA study team conducted a public awareness survey on SWM to identify the present situation of the awareness. The survey methods and the survey results, namely "public awareness on SWM in the study area" are summarized as follows.

(1) Survey Methods

1) Objectives

The following shows principal objectives of the survey:

- To review public habits on discharge of solid waste
- To find public needs for the present SWM
- To identify public satisfaction with the present SWM

In addition to a basic understanding of the present situations above, all results including data and information of the survey are expected to be utilized for preparing the following plans:

- A public awareness campaign
- A suitable system for a collection of solid waste
- A suitable charging system for a SWM
- Other related plans and actions

2) Description of the Survey

a. Survey methods

The following method was employed in the pubic awareness survey;

- A door-to-door interview with a questionnaire

b. Sampling

Based on a discussion between the JICA Study Team and the Counterpart Team about the public awareness survey, sampling areas and numbers for the survey were decided taking account of the following ideas and concepts:

- Distribution of area
- Distribution of population
- Distribution of income levels (high incomes, middle incomes and low incomes)
- Principal categories of business establishments
- Other related characteristics of the study area

559 samples of households and business establishments were interviewed with questionnaires as shown in Table 1.2.49.

As for the detailed survey locations, see Appendix PAS-1

Table 1.2.49 Sampling Number

City	House holds				Business Establishments		Total
	High Income	Middle Income	Low Income	Sub total	Commercial	Medical	
Lattakia	45	140	120	305	18	9	332
Jableh	20	50	49	119	6	3	128
Al-Haffeh	43				7	2	52
Qurdaha	39				6	2	47
Total	506				37	16	559

Source: The JICA Study Team

c. Questionnaires

Three kinds of questionnaire forms were prepared in cooperation with the JICA study team and the counterparts in charge of the public awareness. The forms are designed to suit the conditions of the survey areas. They are composed of four conceptions as described in Table 1.2.50. The questionnaires appear in Appendix PAS-2.

Table 1.2.50 Questionnaires

	1. General Information	2. Interviewee Description	3. Waste Disposal Practices	4. Awareness on SWM
Residential	- Location - SWM conditions - Others related information	- Number of family member - Type of dwelling - Unit rent or ownership - Household income - Others related information	- Waste containers used - Waste discharge habits - Discharge location - Separation and recycling - Waste collection system - Charge paid	- Conception on SWM - Willingness to pay - Women's Roles - Others related information
Commercial	- Location - SWM conditions - Others related information	- Type of commercial - Number of employees - Floor areas - Others related information	- Waste containers used - Waste discharge habits - Discharge location - Separation and recycling - Waste collection system - Charge paid	- Conception on SWM - Willingness to pay - Others related information
Medical	- Location - SWM conditions - Others related information	- Number of beds - Hospital specialization - Others related information	- Waste containers used - Hazardous and non-hazardous waste separation - Discharge location - Waste collection system - Treatment system	- Conception on SWM - Willingness to pay - Others related information

Source: The JICA Study Team

(2) Survey Results

Results of the public awareness survey are summarized as follows:

1) Households

a. General Situation

a.1 Type of Households Interviewed

- In all income areas of each city, most of the households (84.8%) interviewed own their houses and premises.
- There are more rented houses and premises in the low-income areas.

a.2 Availability of Utilities

- All income levels of each city have public utilities (including gas, electricity and water supply services).
- A limited number of the low-income houses in *Lattakia* City do not have any utilities services

a.3 Average Income

- The households' income is based mainly on each household owner having occasionally the housewife's income. (especially for the middle incomes)
- There are limited supports from other family members such as sons (mostly), owner's sisters or brothers.
- Average income in the cities interviewed is evaluated between 4,000 and 10,000 SP, with several exceptions for the high-incomes in *Lattakia* City.

b. Solid Waste Practices

b.1 Dustbins at house

- 98.6% of the households have a container or a dustbin for waste in their houses and on the premises.
- Most of the dustbins (71.7%) have a lid, especially for the high-incomes in *Lattakia* City and *Jableh* City.
- Most of the households keep a main dustbin at a kitchen, and a secondary one (if any) in a bathroom.

b.2 Problems on waste-storage in houses

- For the middle and the low incomes in *Lattakia* City, and the high-, the middle-, the low incomes of *Jableh* City, the main problems on waste-storage perceived by the households are an offensive odor and appearance of harmful insects and pests.

b.3 Source Separation

- Most households (73.6%) do not execute source separation before the discharge.
- There are, however, the households (26.4%) who do separate their waste at sources.
- Main items of the separation are food and followed by plastics and then glass.
- Those people dispose the separated items mainly by putting them at the collection points.
- In the low-incomes, the separated items (food waste and so on) might be sold or given away to friends.

b.4 Self treatment of domestic waste

- 97.2% of the households do not treat their domestic waste.
- There are, however, exceptions of the low-incomes, especially in *Jableh* (*Al Faid*) City, where they incinerate their waste in their field.

b.5 Waste amount fluctuations by season

- In all households interviewed by:
  - The amount of waste increases in summer
  - In some cities, especially for the low-incomes in *Jableh* City, solid waste increases in the month of "*Ramadan*" (*A fasting month for Muslims. Every night during the month, they enjoy gathering and cooking for the whole family and friends.*)

b.6 Discharge practices

- Husbands (fathers) are usually the people responsible for discharging waste from houses and premises. (This is, however, not necessarily a rule as any member of families could discharge the waste according to their circumstances.)

- 68.7% of the households discharge their waste to each collection point where communal containers are available.
- Most common containers used to dispose waste from houses are plastic bags.
- People tend to discharge waste once a day (73.8%) (and some time twice a day), usually between 6:00 and 8:00 in the morning, or after 8 p.m.

b.7 Waste collection services

- The collection services cover most of the high and middle-income areas, but some of the low-income ones.
- Most of the households (79.4%) do not want to pay further charge for such services.
- Most of them (85.2%) do not know the people responsible for cleaning the collection points.
- Main problems perceived by the households are an offensive odor and scavengers scattering the waste at the collection points.
- Harmful insects and rodents are other problems at the collection points perceived by the households.
- Waste in most of the survey areas is collected once a day at the collection points.
- The low-income areas in *Lattakia* City and *Jabra* City replied that waste is collected irregularly.

b.8 Payment of the collection services

- Most of the households usually pay for the collection services to the city council they live in.
- Some of them additionally pay to collection workers
- The fee paid for such services is assumed to be reasonable.

b.9 Regulations

- Most households (86.5%) have not ever heard about regulations on SWM.
- Some of the households have heard it through the mass media like TV, and sometime from *Mosques*.

b.10 Clean-day

- 90.4% of the households have not participated in a campaign such as a cleansing day.
- 57% of households would be willing to participate in such a campaign.

b.11 Degree of satisfaction

- Residents of all areas are not fully satisfied with the present collection services, especially the low-income areas in each city of *Lattakia*, *Jableh* and *Al-Haffeh*.

b.12 Willingness to pay

- 56.1% of the households, there is no "willingness to pay" for improving the services.
- The main reason for the "no willingness to pay" is that they cannot afford to pay any additional payment for improving the SWM.

b.13 Contribution to source separation

- Nearly half (43%) of the households are able to contribute to source separation.
- About 30% to 40% of the households in *Lattakia* City (all incomes) and *Jableh* City (the middle- and low-incomes) are willing to contribute by separating wastes on their premises.
- This percentage of willingness to contribute increases in *Qurdaha* City and *Al-Haffeh* City (all incomes) and in the high incomes of *Jableh* City from 50% to 70%.
- Those who are willing to contribute (59.6%) are ready to use plastic bags for waste packaging especially in the high-incomes households.
- Some of the households of low- and middle-incomes in *Lattakia* City and *Jable* City, and of *Al-Haffeh* City and *Qurdaha* City hesitate to use plastic bags, probably because the bags are too expensive (for the middle and low incomes).

b.14 Collection frequency

- 87.2% of the households reject reduction in the collection frequency to less than daily through out the year.
- A few households would accept twice or three times a week.

b.15 Illegal dumping

- 47.7% of householders, especially in the low-income, reports an illegal dumping at their surroundings with problems including offensive odor, insects, pests and scavengers.
- This percentage decreases in the middle and high-incomes but the same problems exist there as well.
- However, the actions to close down the illegal dumping are a few(21.4%), most of which are in a form of a complaint to the Municipalities or the City Councils.

b.16 Women's role

- Women in the survey areas participate in many of the social activities (72.4%).
- This is a general trend in the middle and high-incomes, however, there are some limitations in the low-incomes.
- The main roles of women are family care and childcare, domestic work (kitchen and sanitation) and daily education to children.

2) Commercial Establishments

a. General Situation

a.1 Commercial Establishment

- 61.1 % of the commercial premises interviewed in *Lattakia* City are rentals.
- Two-thirds of commercial premises in the other three cities are rentals.

a.2 Availability of Public Utilities

- Most of the commercial establishments interviewed have the services of water and electricity.
- Other services of gas and heated water supplies are not so important for small businesses, and only a few number (medium and large establishments) have such services.

b. Solid Waste Practices

b.1 Dustbins at premises

- Some of the commercial establishments do not have main dustbins on the premises (of which garbage collectors daily empty waste into plastic bags, then discharge them to public collection services).
- Those who have main containers usually use plastic bags or metal dustbins (61.1 % of which in *Lattakia* have a lid, however 68.4 % of which in other cities do not have a lid).
- Most of the commercial establishments keep the main containers (when available) on the premises.

b.2 Problems on waste-storage on the premises

- Most of the commercial establishments interviewed have a few problems
- The problems are offensive odor, insects and pests.

b.3 Discharge practices

- There is no person responsible for waste discharge in most of the small establishments.
- In the large establishments, there are specific employees to handle waste discharge.
- Most of the commercial establishments interviewed discharge their wastes to the nearby collection points or in front of the main doors, at least once a day (or some times twice a day).
- Most of the commercial establishments interviewed discharge their wastes at a fixed time between 8:00 p.m. and 6:00 a.m. the next day in most of survey areas, and between 12:00 and 18:00 in *Jableh* City, 6:00 – 10:00 in some cases in *Al-Haffeh* City.

b.4 Source separation

- Most of the commercial establishments (80.6%) do not separate waste before discharge.
- However, of those who do separate waste, the main separated waste is food followed by plastics, paper and glass.
- The commercial establishments dispose the waste separated mainly at collection points, or sell them to people who would like to purchase like waste collectors (especially in *Lattakia* City and *Jableh* City).

b.5 Problems at collection points

- The main problems at the collection points perceived by the commercial establishments are an offensive odor followed by scavengers, harmful insects then pests.

b.6 Frequency of collection and collection services

- Many establishments are satisfied with the present collection services, especially in *Lattakia* City and *Jableh* City.
- Some of the establishments in *Lattakia* City, as well as the establishments of *Al-Haffeh* City and *Qurdaha* City are not so satisfied with those services for the following reasons.
  - The containers are in poor condition and waste is scattered around them.
  - The containers are not properly emptied.
  - Behavior of collection workers
- All commercial establishments are not willing to accept any decrease in waste collection frequency to less than once a day through out the year.

b.7 Payment for collection services

- The establishments interviewed usually pay a collection charge to each city.
- Some establishments in *Lattakia* City and in *Jableh* City perceive that the charge is a reasonable price.
- Small business establishments in *Jableh* City and in *Al-Haffeh* City perceive that this charge is high.

b.8 Regulations on the collection services

- All commercial establishments interviewed have never had any guidance or specific regulation of proper waste discharge and collection.

b.9 Cleansing days

- 51.3% of the commercial establishments interviewed could participate in cleansing day or campaigns.

b.10 Willingness to pay

- 61.7% OF the commercial establishments do not like to pay a higher charge for more efficient services (especially in *Lattakia*) with the following reasons:
  - They can not afford to pay more.
  - The present charge is already high for shops and retailers.

b.11 Contribution to source separation

- More than 70% of the commercial establishments and small businesses interviewed in *Lattakia* City and *Qurdaha* City are not willing to contribute to source separation.
- However, the remainder in *Lattakia* City, *Jableh* City and *Qurdaha* City is willing to contribute to source separation.
- Those who are willing to separate are able to separate their waste into organic, plastics and glass, especially if there is an incentive for source separation.
- Most of those who are willing to separate (67.6%) are ready to use plastic bags for waste packaging, especially in *Lattakia* City and *Al-Haffeh* City.
- Those who are not willing to contribute say poor quality bags (54.2%) and plastic bags too expensive (25%).

b.12 Degree of satisfaction

- 43.2% of the commercial establishments are not fully satisfied with the collection services.
- Most of the dissatisfaction concentrates on waste collection and street sweeping.
- The other point of the dissatisfaction concentrates on green and open spaces.

b.13 Illegal dumping

- 54.1% of the commercial and business establishments interviewed report illegal dumping nearby.
- The main problems exist at these illegal dumps are offensive odor, insects, pests and scavengers. This is a general trend in all cities, except *Jableh* City.
- Actions taken by the commercial and business establishments to close down these illegal dumps are very limited (17.1%). They are mostly complaints submitted to each city or council.

b.14 Total Income of the business within a month

- This is a sensitivity question, it is expected that the answer to it is not accurate.
- Hence the average income assumed from most of the answers is less than or within the range of 10.000 – 20.000 SP.

3) Medical Establishments

a. General Situation

a.1 Type of Medical Establishment

- The survey conducted at the following medical establishment
  - Hospitals
  - Medical clinics
  - Medical laboratories.

a.2 Specific Organization for SWM

- A few medical establishments have a specific organization to handle waste management, most of which are private medical establishments.
- The main roles of such an organization are to create norms for SWM (40%), supervise waste sorting (20%) and maintain waste records (20%).

a.3 In House Education Program & Regulations

- Most medical establishments (50-70%) have education programs on SWM.
- Each establishment prepares the programs with governmental regulations on the Management of Hospital Waste

b. Hospital Waste Management

b.1 Hospital Waste Storage and Discharge

- 91.7% of the medical establishments conduct a waste separation.
- They separate food waste, surgery waste, syringes, blood and body fluid
- In most of the medical establishments (78.6%), especially in *Lattakia* City and *Jableh* City, blood and body fluid are discharged in special containers.
- 58.3% of the establishments apply no sterilization to the wastes before discharging systems.
- In all of the medical establishments in the four cities, there is no standard for separating certain waste materials from other waste.
- Syringes and used needles are not reused in all the establishments interviewed.
- 75% of the medical establishments not use a “biohazard mark” for contagious waste
- 66.7% of the medical establishments do not display any mark at storage areas (there is some exceptions in public hospitals in *Lattakia* City).
- In most of the medical establishments, contagious waste is not stored in a separate storage area (66.7%) nor carried by a specific cart (81.3%) .
- In most of the medical establishments, the storage area is mostly locked (80%).

- In most of the medical establishments, documents and records of stored waste are not maintained (73.3%), and different colored bags are not used for different types of waste (87.5%).

b.2 Collection and Transportation

- 81.3% of the medical establishments do no contracts for transporting their medical waste.
- All medical establishments transport the wastes by themselves every day.
- The authority responsible for collection services for all medical establishments in the four cities is each city.
- 64.2% of the medical establishments do no pay collection charges to collection workers or other entities.
- The establishments mainly pay collection charges to each city.
- 81.3% of the establishments, especially in *Jableh* City and *Lattakia* City, are satisfied with the present transportation services.
- However, 50% of these establishments in *Qurdaha* City and *Al-Haffeh* City are not satisfied with the present transportation services.
- The reasons for dissatisfactions are as follows;
- The collection schedule is not kept
- The collection frequency is not enough
- 50% of the medical establishments in *Lattakia* City are not willing to pay more for more efficient services. This percentage increases to 67% in *Jableh* City.
- The main reasons of the disagree to pay more are as follows;
- Present charge is high in *Lattakia* City
- The establishments in *Jableh* City, *A-Qurdaha* City and *Al-Haffeh* do not trust the collection service provided

b.3 Final Treatment

- The most common sterilization methods in the four cities are drying and autoclave, followed by boiling and incineration.
- There are no problems or complains for using incinerators
- The incinerators are equipped with dust collectors but without scrubbers.
- The ash of the incinerators is transferred to the containers outside the facilities.

b.4 Satisfaction with solid waste collection services

- 50% of the establishments in the four cities dissatisfy with the present waste collection service.
- The reasons for this dissatisfaction are as follows
  - The containers are not properly emptied
  - Wastes are burned inside the containers

- The collection workers in *Lattakia* City and *Jableh* City are crude
- The collection frequency is not enough
- The collection time is not regular in *Lattakia* City and *Qurdaha* City.

b.5 Illegal dumping

- 75% of the medical establishments answered that there are no illegal dumping sites nearby.
- The main problems at the illegal dumps perceived by a few remaining establishments are an offensive odor, insects and pests and scavengers.
- No actions are taken to close down these illegal dumps in *Lattakia* City
- A few actions have been taken in other cities in a form of a complaint to each city.
- There is one establishment in *Jableh* City, which actually participated in cleaning up such an illegal dumping.