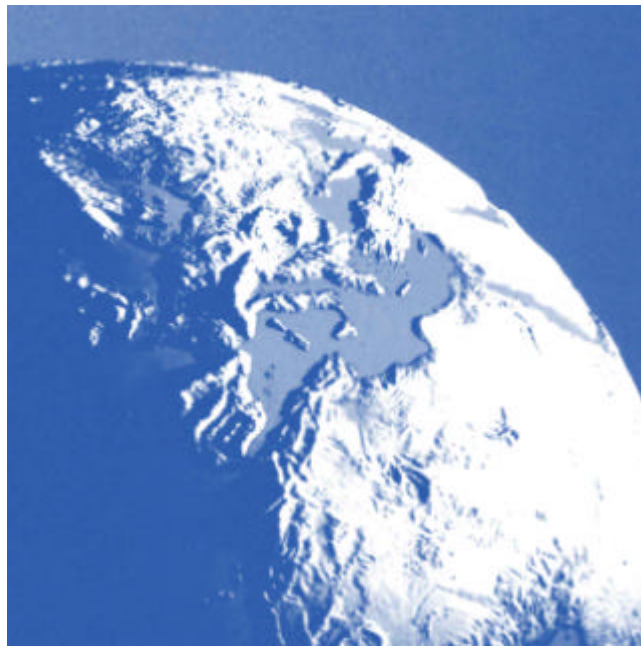




POLICY AND INSTITUTIONAL ASSESSMENT OF SOLID WASTE MANAGEMENT IN FIVE COUNTRIES

Cyprus, Egypt, Lebanon, Syria, Tunisia



Cedare



Blue Plan
Regional Activity
Centre

Sophia Antipolis,
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Regional Study on

**Policies and Institutional Assessment of Solid Waste
Management in Lebanon**

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CEDARE



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EXECUTIVE SUMMARY

The problems caused by MWS world wide are relatively new problem areas that the world did not have to deal with at the current scale, only 30 years ago. The relatively recent environmental concerns have made it even more difficult to tackle the issues without long range planning of the consequences.

In Lebanon, however, the country is just waking up from a nightmare that overshadowed environmental and social matters rendering plain survival the main concern of the day for over 15 years.

While most of the world was developing means to manage its waste, municipalities around Lebanon, with whatever capacity they had and acting each on its own, were piling up their garbage throughout the countryside and around the cities.

The first municipal election of 1998 brought municipal councils to the towns and villages that meant new blood. The prior elections were held 37 years before that. However, most municipalities inherited problems and de facto situations that were way beyond their capabilities to handle effectively. They just manage with what they have and the way they can. Some are successful, some are not.

This document represents the outcome of a study related to Municipal Solid Waste and those dealing with all its aspects in Lebanon. The study results shall be a synthesis report to be used as background material for a regional workshop to be held on Municipal Solid Waste co-sponsored and co-organized by CEDARE and the Blue Plan.

The study undertaken reflects the current practices, problems and planned solutions for Lebanon's Municipal Solid Waste Management. Although Industrial and Hospital Waste represent an important element in the country's Solid Waste situation, they shall not be covered by this study.

The aim of this study is to assess the policy and institutional frameworks for MSW management in five countries of the region, namely Egypt, Syria, Lebanon, Tunisia and Cyprus. The objectives are to identify appropriate strategies and solutions for improvement based on each country's needs and the broader political and social changes going on within that country.

The study is divided into 7 sections as per the Terms of Reference provided by CEDARE. The following is an overview of each section:

Section I provides *general country background* information providing the reader with brief history of Lebanon with an overview of the geography, the population, the political structure of the Central Government and a broad view of the current macro-economic situation.

Section II deals with the *regulatory framework* in Lebanon concentrating on those institutions involved with environmental matters in general and MSW in particular. The section offers an analysis of the current environmental legislation and concludes with a perspective of the Government's policy toward privatization.

Section III was devoted to the institutional framework reviewing the local governments with the organizations controlling them. The section discusses in details the

government both at the regional and district levels. It then analyzes the current situation of the municipalities and the municipal unions.

Section IV provides a look at the *private sector* profile. The section is mainly structured to understand the only private run MSW operation in the country. The section further depicts detail aspects of MSW management.

Section V is devoted to *practices* in the MSW sector. It further provides a comparative feature between MSW in developed countries, the Arab region and Lebanon. The section discusses the MSW composition and recycling involving the formal and informal sectors.

Section VI covers *performance assessment* incorporating a special type of SWOT that was conducted at the central government level and at the local government level revealing the main weaknesses at both levels of government.

Section VII presents *conclusions and recommendations* related to the central government as well as the local government authorities. The section consolidates the findings established throughout the study and highlights the main issues that are of interest to the project.

METHODOLOGY

The adopted methodology for this study was based on the developed Terms of Reference developed 10 January 2000 by CEDARE that specified a given approach to be applied for the purpose. It identified the Objectives of the study, the research methods with the overall guidelines required

The work plan was based on three independent but sequential phases that constituted the entire project tasks. The three project phases started by the identification of the required information for the study. The second phase entails the actual field work while in the third phase the final report would be compiled.

PHASE I INFORMATION REQUIREMENTS

Prior to commencing the fieldwork, a detailed plan was received from CEDARE for the approach and methodology of gathering the required data. This entailed the clear definition and understanding of the information type required in line with the project objectives.

The plan in question included general and specific items to be used in the final analysis and diagnosis of the situation at hand in order to provide CEDARE with the material conforming to its requirements.

The next task was to identify specific sources of information in line with the now established “lists” and developed a systematic approach of collecting, processing and, effectively managing the data at hand.

The information sources for the project included but were not necessarily limited to the following:

1. **Beirut and Other Municipalities** - the primary information sources of municipal related data;
2. **Ministry of Environment (MoE)** - legislation and guidelines related to Solid Waste Management;

3. **Ministry of Interior (MoI)** – Legislation, guidelines and directives for local governance;
4. **Ministry of Municipal and Rural Affairs (MMRA)** – directives and budget allocation for Municipalities;
5. **Council for the Development and Reconstruction (CDR)** – administrative body for all major projects including World Bank financed projects;
6. **The Office of the Minister of State for Administrative Reform (OMSAR)** Agency mandated to rehabilitate, modernize and reform the Lebanese Administration;
7. **The American University of Beirut (AUB)** – Data and information from studies related to MSW conducted by various departments;
8. **European Union Program Management Consultancy** Technical consultants assisting in Administrative Reform;
9. **World Bank Solid Waste Environmental/Management Project (SWEMP) Program Management Unit (PMU)** – Coordinators of SWEMP overseeing all aspects of the program throughout Lebanon (excluding Greater Beirut);
10. **Local NGO's** - information related to communal activities in the environmental sector;
11. **Local Consulting Firms** – Officially appointed consultants supervising the MSW collection and processing activities within the Greater Beirut area;
12. **LibanConsult** – Officially appointed Consultant undertaking Environmental Assessment for all Solid Waste projects throughout Lebanon (Excluding Greater Beirut);
13. **Ministry of Social Affairs (MoSA)** – Administrator of population related studies undertaken by the United Nations.
14. **Central Administration for Statistics (CAS)** – Official organization mandated to manage all statistical data for the government
15. **Local Contractors** – Handling all related collection, processing, composting, recycling and landfilling contracts;
16. **Local Informal Organizations** – Informal operators throughout the country handling recyclable materials.

PHASE II FIELD WORK

Having covered the logistics planning of the study, we were in a position to begin the necessary fieldwork identified earlier and defined in terms of the study objective requirements. This was conducted according to a pre-planned approach specifying the exact sources of needed information.

The actual contacts for conducting the study and providing the necessary information, for the most part, were already established due to the author's current involvement with the World Bank Solid Waste Environmental/ Management Project.

Data collection was based on pre-established questionnaires designed in conformity with the required study objectives. These were applied systematically according to an implementation schedule developed in coordination with concerned contributing parties.

The fieldwork constituted visits to the city municipality, the existing disposal facilities, the collection agency, the local NGO's, citizens, ministries, consultants and other identified parties.

Data collection was handled objectively through interviews of concerned individuals, research in available documentation and first hand observations of on-going operations. Supplied data was, when necessary, double-checked through secondary sources to confirm its accuracy.

PHASE III DATA ANALYSIS AND PRESENTATION

The analysis of the collected data was based on the outlined study objectives. Although the quality and conformity of the data was already scrutinized in the earlier phase, further editing and coding took place during the analysis in order to yield reliable and pertinent information adaptable within the framework of CEDARE's regional study.

With the understanding that the sources of data was, in some cases, less than reliable, the first task during this stage was to check completeness and consistency of all the data obtained during the survey and to make adjustments when necessary.

Editing for consistency was based on a comparative exercise in order to establish relationships between data referencing common matters but collected from different sources.

Editing for completeness established plug-in requirements for missing data not obtained during the survey part of the study due to its unavailability. The plug-ins were based on best estimate established from existing information obtained during the SIU-3 probes.

The final study result compilation was based on a proposed format approved by CEDARE and BP. The report format proposal and finalization were established once the study was officially underway.

SECTION 1 GENERAL COUNTRY BACKGROUND

1.1 Brief History

In 1516 the Ottoman Turks conquered Lebanon and ruled it until World War I (1914 - 1918) when Great Britain and France occupied it. Throughout the Ottoman rule, Mount Lebanon, the central part of the country, retained limited self-government under local rulers.

France assumed Lebanon's political affairs in 1922 and began preparing it for independence. The French united the Christians in Mount Lebanon and the Muslims who lived along the coast under one government. They further helped write Lebanon's constitution.

In 1943, Lebanon took its independence with Christians and Muslims agreeing to share power in the Government. Following its independence, Lebanon prospered as a centre of tourism, trade, and finance within its sovereign borders.

1.2 The Constitution

The Lebanese constitution was proclaimed on May 23, 1926 and since amended by several Constitutional Laws of 1927, 1929, 1943, 1947 and, 1990.

According to its constitution:

- The Republic of Lebanon is an independent and sovereign state;
- The city of Beirut is the capital;
- The official language of Lebanon is Arabic;
- Lebanon has no state religion;
- Personal freedom and the freedom of the press are guaranteed and protected by the constitution;
- The religious communities are entitled to maintain their own schools as long as the latter conform to the regulations set by the state;
- Upon completing twenty-one years of age, every Lebanese citizen becomes an elector and further qualifies to run for parliament.

Figure 1 - Political Map of Lebanon

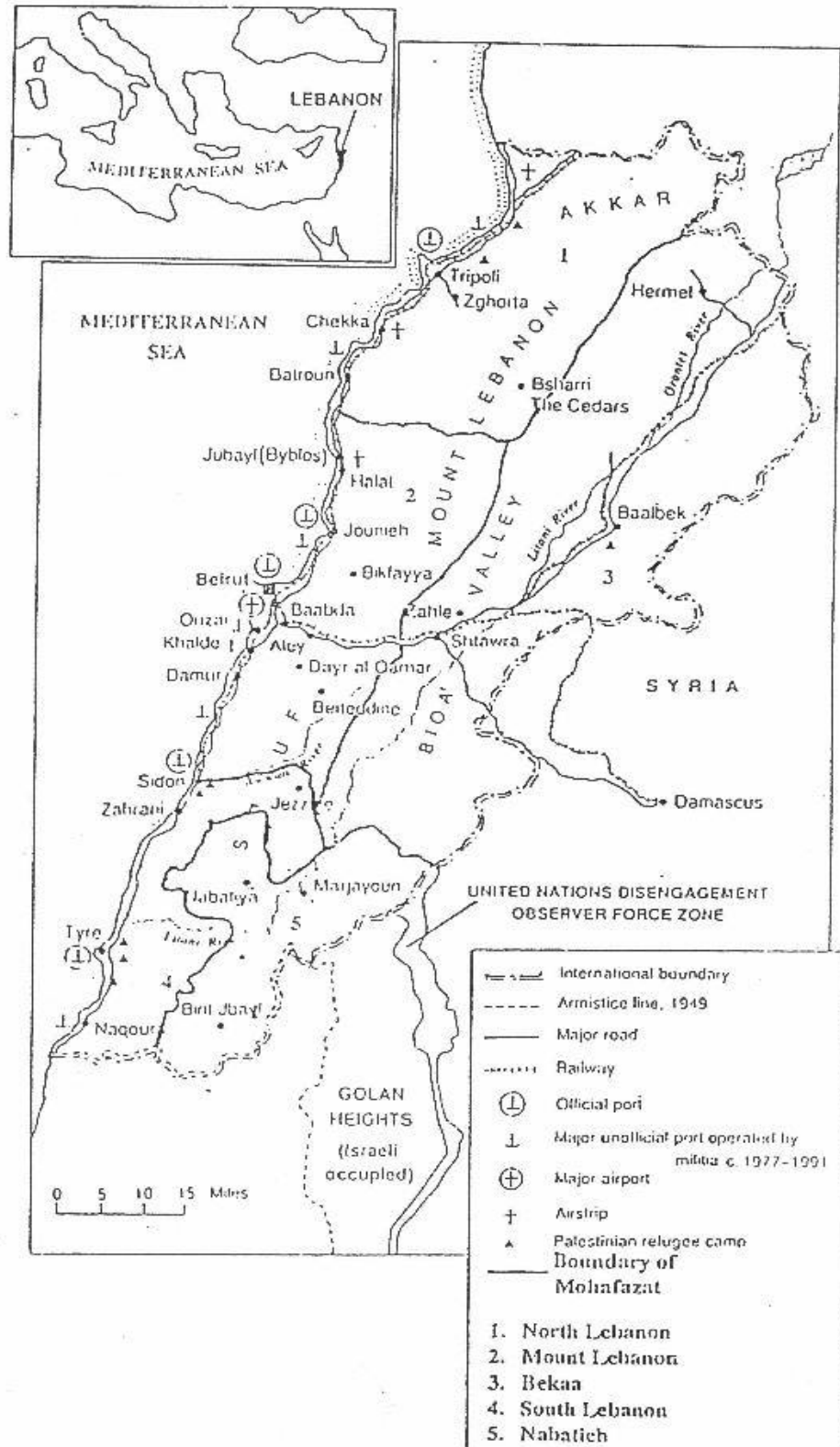


Figure 2 – Administration Map of Lebanon



1.3 The Geography

Lebanon spreads over some 10,452 square kilometres with an average length of 225 km and an average width of 48 km. It is located on the eastern shores of the Mediterranean between North Latitudes 34° 42' and 33° 3' and East Longitudes 35° 6' and 36° 37'. It is bordered by Israel to the South, Syria to the North and East and the Mediterranean to the West.

Lebanon has two mountain ranges. Mount Lebanon that runs parallel to the sea (NNE-SSW) overlooking the narrow coastal plains and the Anti-Lebanon range that runs parallel to Mount Lebanon. The elongated Bekaa plain separates the two mountain chains.

The country is split into five administrative areas (Mohafazats) that are further subdivided into 24 sub-districts (Cazas), each having a governor and a number of municipal councils. is an administrative map highlighting both Mohafazat and Caza boundaries.

1.4 The Geomorphologic Regions

Lebanon's physiographic structure includes a variety of contrasting features. There are five geomorphologic regions that can be identified and are schematically represented as follows:

The Coastal Zone that includes the shoreline, the coastal plain including the lower plateau of Akkar (till 500 m) and the foothills of Mount Lebanon (up to 250m).

Mount Lebanon including middle and high elevation zones.

Anti-Lebanon including Jabal Al-Sheikh.

The Bekaa Plain (or valley).

South Lebanon including Jabal Amel.

When addressing environmental issues that cut across administrative boundaries, the analysis in this report shall be based on the various geomorphologic regions discussed above.

Table 1 Illustrates the geomorphologic distribution of the Lebanese territory

Geomorphic Region	Area	
	Hectare	Percent
Coastal zone, including foothills (up to 250 m), the plains, the lower plateau of Akkar (till 500 m)	130,000	13
The Bekaa plain (excluding the foothills)	150,000	14
Total non-mountainous regions	280,000	2
Mount Lebanon range (to the Litani, excluding the southern hills and mountains)	480,000	47
Anti Lebanon (including Jabal Al-Sheikh)	187,000	19
South Lebanon (Lebanese Upper Galilee, Jabal Amel)	70,000	7
Total Mountains	737,000	73
Total Area	1 017,000	100

Table 1 - Geomorphologic Distribution of the Lebanese Territory

Source: Zurayk R, 1995

1.5 The Soils

The Lebanese soil is mostly Mediterranean in character. It is for the most part calcareous, except for the sandy soils formed on the basal cretaceous strata. The most widely represented soils are the Rendzina and Terra-Rossa. Where water erosions are extreme, the fersiallitic soils often develop into Lithosols.

The Lebanese soils are fragile and prone to erosion, especially in the mountain and hilly lands that form 73% of the country. The magnitude of the soil erosion in Lebanon is witnessed by the stratification of alluvial outwash terraces of the coastal rivers.

1.6 The Climate

Due to the zonal variation of the country there exists a wide variability of ecosystems and landscapes within a limited land area. A transect of 50 km can range from a coastal subtropical climate through middle slopes that are typically Mediterranean to high areas that are covered with snow for a good part of the year, ending in a sub-desertic plain almost too dry for agriculture.

1.6.1 Temperatures

Lebanon's mean annual temperature varies between 19.5°C and 21.5°C on the coast and decreases by about 3°C for each vertical 500 m, reaching an average of 15°C at altitudes of 1,000 m, while dropping to about 10°C at 2,000 m. The coldest month of the year is January with temperatures averaging around 8°C on the coast and -4°C in the mountains.

1.6.2 Precipitation

Compared to its neighbouring countries, Lebanon has a relatively high mean annual rainfall (893 in Beirut). Most of the rainfall (80-90%) occurs during the months of November through March with only 5% during the months of May through September.

The mean annual rainfall on the coast ranges between 700-1,000 mm. It increases along the south-north direction. Precipitation reaches 1,400 mm per year on Mount Lebanon, most of which is received as snow. It declines rapidly on the eastern facing slopes reaching only 600 mm on its foothills.

In the Bekaa plain, the rainfall ranges from 800mm in the southern Bekaa to less than 200 mm in the extreme northeast of the plain. On the Anti-Lebanon, precipitation averages 600 mm and sometimes exceeds 1,000mm in the Jabal Al-Sheikh.

1.6.3 Relative Humidity

The relative humidity is fairly uniform along the coastal line and averages around 70%. It decreases southward. In the mountains, the fluctuations are more significant and range between 70-75% in winter to 50-60% in summer.

In the Bekaa region, the humidity drops sharply in the summer months to reach mean values of 48% in the North Bekaa.

1.6.4 Winds

Wind direction is highly impacted by the two mountain ranges. These contribute to the strength and incident reduction of the northwesterly and southeasterly winds on the shorelines and in the Bekaa.

1.7 The Population

1.7.1 Population Size

The absence of official population counts for several decades especially during the past twenty years, due to the civil unrest in the country, has eliminated any basis for serious evaluation of the number of inhabitants in the country.

Furthermore, population data in Lebanon has always been viewed with hostile suspicion. It has consistently been seen as a means to reflect sectarian proportionality and tilt the delicate politico-religious balance of the country.

The French conducted the last official census in 1932 while Lebanon was under French mandate. Several attempts and projections have been made since then, the latest of which was conducted by the Central Administration for Statistics during 1997.

There have been several population figures proclaimed since 1932. However, for the purpose of this study, the adopted figures shall be the ones produced by the *Central Administration for Statistics (CAS)* in 1997 which are the result of a first-of-its-kind study since the administration's inception in 1960.

Table 2- represents the CAS 1997 population counts by sex and age group:

Age	Males	Females	Total
0-4	162,263	157,820	320,083
5-9	205,102	187,627	392,729
10-14	209,895	195,016	404,911
15-19	224,973	214,987	439,960
20-24	211,942	185,031	396,973
25-29	179,838	181,186	361,024
30-34	149,732	169,653	319,385
35-39	122,572	142,493	265,065
40-44	96,210	110,989	207,199
45-49	88,571	95,162	183,733
50-54	82,630	84,029	166,658
55-59	74,791	71,596	146,387
60-64	67,951	63,957	131,908
65-69	53,273	50,527	103,800
70-74	72,286	77,238	155,524
75 plus	3,295	5,991	9,286
15-64	1,299,210	1,319,081	2,618,292
Total	2,011,724	1,993,301	4,005,025

Table 2 - CAS 1997 Population Counts

Source: CAS Population Count, August 1998.7.2, Population Distribution

The population distribution by Mohafazat is based on the *1997 Central Administration for Statistics* study conducted under the "Household Living Conditions" in 1997.

Table 3 represents the population distribution by area. It does not include the foreigners present in the country neither on a permanent basis nor temporarily.

Area	1997 (000)	% Total
GREATER BEIRUT AREA	1,253	31.28
City	430	10.74
Suburbs	823	20.54
MOUNT LEBANON	747	18.66
Jbeil	71	1.77
Kesrewan	168	4.19
Metn	132	3.30
Baabda	27	0.67
Aley	156	3.89
Chouf	194	4.83
NORTH LEBANON	828	20.67
Tripoli (city)	823	8.05
Tripoli (caza)	57	1.42
Akkar	208	5.18
Zgharta	75	1.88
Koura	90	2.26
Bechare	24	0.59
Batroun	55	1.37
SOUTH LEBANON	683	17.05
Saida (city & suburbs)	101	2.52
Saida (caza)	118	2.95
Jezzine	27	0.67
Sour	195	4.86
Bint Jbeil	34	0.86
Nabatieh	124	3.09
Hasbayya	32	0.81
Marjayoun	52	1.29
BEKAA	495	12.35
Zahle (city)	86	2.15
Zahle (caza)	82	2.04
Hermel	37	0.91
Baalbek	190	4.75
West Bekaa	68	1.69
Rachayya	32	0.81
TOTAL LEBANON	4,005	100.00

Table 3 - Population Distribution by Area

Source: CAS 'Household Living Conditions' Feb 1998

Table 4 - The population distribution by Mohafazat is represented in:

Mohafazat	Population
Beirut	1,303,129
Mount Lebanon	607,767
North Lebanon	807,204
South Lebanon	472,105
Nabatieh	275,372
Bekaa	539,448
Total	4,005,025

Table 4 - Population distribution by Mohafazat

CAS 'Living Conditions' Feb 1998

It should be noted that the above numbers do not include the Palestinian refugees and other foreign workers present mostly in the south, north, Bekaa and, Beirut regions. Their numbers vary between 1,100,000 to 1,200,000 individuals.

Table 5 represents the Household distribution by Mohafazat. This entails primary and secondary family members living under the same roof.

Mohafazat	Households
Beirut	290,581
Mount Lebanon	138,936
North Lebanon	147,088
South Lebanon	95,120
Nabatieh	63,109
Bekaa	106,843
Total	841,677

Table 5 - Household Distribution by Mohafazat

CAS 'Living Conditions' Feb 1998

Table 6 represents the average size of a household in the different Mohafazats.

Mohafazat	Household Size
Beirut	4.1
Mount Lebanon	4.4
North Lebanon	5.3
South Lebanon	4.9
Nabatieh	4.6
Bekaa	5.0

Table 6 - Average Household Size

CAS 'Living Conditions' Feb1998

1.7.2 Population Density

The population density in Lebanon standing at 380 persons/km² is generally high by international standards compared to France 94 and Germany 248. Furthermore, 60% of the population lives in the coastal zones with an average population density of 1,600

persons/km². This is considered very high compared to the inhabited areas of Egypt where the comparable figure is around 1,040 persons/km².

There is further intense clustering of population in the urban areas of Beirut and Tripoli. represents the population density of persons/km² in areas along the coastal zones and within selected regions.

Table 7 - clusters of population in the urban areas of Beirut and Tripoli

Area	Region	1997 Population (000)	Area ('000 ha)	Population Density (persons/km ²)
Coastal zone	Total	1990	130.0	1,529.50
	Excluding Beirut	944	125.0	750.50
Within 250-500 m	Mount Lebanon	65	18.1	361
Within 500-1,000 m	South Lebanon	190	39.6	475
	Mount Lebanon	183	43.6	418
Within 500-1,000 m	South Lebanon	115	46.7	247
	North Lebanon	129	35.2	361
	Bekaa	390	335.5	114
Beirut	Municipal Area			31,350
	Inner Ring			38,000+
	Outer ring and Suburbs			4,180-14,250
Tripoli				11,400

Table 7 - Population Density Persons/km²

Source: IAURIF Transport Study (reviewed)

The figures in Table 7 depict the population concentrations demonstrating the waste generation rates within the coastal zone and the surrounding regions up to an elevation of 1,000 meters.

1.7.3 Population shifts

As a result of the fighting in the various parts of the country during the civil strifes, Lebanon has experienced, at different intervals, a dramatic population displacement. The Ministry of Social Affairs raised a report in the Copenhagen summit on poverty in which it estimated that about 900,000 or almost 30% of the population then were displaced at one time or another, causing disruption in the social services and infrastructure functions.

Table 8- represents the displacement details by percent of the total as from 1975 until the end of the strives in 1991. The numbers reflect a shift in population among groups, mostly religious.

	Left the region (%)	Entered the region (%)
Beirut	8	20
Mount Lebanon	62	53
South Lebanon	24	16

Table 8 - Displacement Details

Source: ECE, Lebanon 1997

1.7.4 Population Growth Rate

Another important figure to consider in the growth rate of the population for the next fifteen years. This would be necessary to establish long term plans and programs for the management of MSW.

Table 9 - represents the growth rate in population in the various Mohafazats between the years 1959 and 1997

Mohafazat/Region	1959	1997
Administrative Beirut	2.0	3.0
Beirut Suburbs	1.5	4.1
Mount Lebanon	2.1	4.3
North Lebanon	2.4	2.7
South Lebanon & Nabatieh	3.0	3.5
Bekaa	2.6	2.3

Table 9- Population Growth Rate

Source: IAURIF Transport Study (reviewed)

Lebanon's population annual growth rate of 3.1% has substantially been lower than that in other countries in the region. This is mostly due to the fact that during the civil strives some 300,000 residents left the country.

This trend is now reversing and Lebanese expatriates are returning to their country. This is expected to increase the population growth rate by the year 2,000 to 3%.

1.7.5 Other Population data

The Lebanese population is young with the under-15 years old accounting to 29% of the total population. The 15-64 years old bracket accounts to 65% while the over-64 years old account to 6%. (Source: UNDP Study conducted for the Ministry of Social Affairs – 1996)

The overall sex ratio reveals a 0.95 male to female figure with the following details:

- At birth : 1.05 male to female
- Under 15 years old: 1.04 male to female
- Over 65 years old : 0.85 male to female

The average life expectancy is 68.5 years with the following details:

- Female life expectancy: 70.5 years

- Male life expectancy: 66.6 years

Health related factors reveal the following:

- Access to health services: 95%
- Access to safe water: 92%
- Access to sanitation: 75%

The ethnic division is as follows:

- Arab: 95%
- Armenian: 4%
- Other: 1%

There are 5 legally recognized Islamic groups (Shia, Sunni, Alawite, Isma'elite and Druze) and 11 Christian groups (6 Catholic, 4 Orthodox and 1 Protestant)

Table 10- lists some comparative data related to immediately neighbouring countries

	LEBANON	SYRIA	JORDAN	ISRAEL
Birth rate/1,000	27.8	45.2	40.6	22.6
Death rate/1,000	8.8	7.0	5.7	6.6
Infant mortality rate/1,000	32.2	48.1	54.0	10.0
Life expectancy, male	64.7	63.2	65.0	74.0
Life expectancy, Female	68.8	66.9	68.8	78.0
Calories/person/day	3247	3003	2634	3037

Table 10 - Population Comparative Data

Source – ECE, Lebanon 1997

1.8 Macro Economic Situation

1.8.1 Overall Context

Since the end of the civil strifes in 1990, Lebanon's economy has been continuously operating well below its known capacity. The economy remains overwhelmingly service-based. While, according to the 1999 UN Economist Intelligence Unit, in 1972 this (services) sector accounted for nearly 70% of GDP, in 1998, the year for which the most recent figures are available, it accounts for a little over 61%.

Within services in Lebanon, trade accounts for by far the largest single share of the economy and together with financial and other services, has held its position over the last two decades. However, the shares of other service-based activities, such as transport, communication, insurance and housing, have fallen dramatically over the same period.

Services are primarily based on banking, marketing and advertising. Agriculture and industry, meanwhile, remain neglected. Only about 30% of bank credits go to the private sector and, of this, most goes to finance trade activities and construction, leaving little for the medium- to long-term development of the agricultural or industrial sector.

1.8.2 Recent Developments

In recent years, economic growth has stagnated and the balance of payments has become more vulnerable. GDP figures for last year have not yet been released by the Ministry of Finance, but estimates of the 2000 Economist Intelligence Unit indicate an economic contraction of about 1 per cent. This follows a rapid slowdown in GDP growth from a high of 8.5 per cent at the peak of the post-war boom in 1994 to 2 per cent in 1998.

Servicing of the national debt grew to about 130 per cent of GDP last year - one of the highest rates in the world. This heavy spending on interest and debts (approx. 50 % of the 2000 budget) was complemented by a high bill for salaries and wages of the civil servants (approx. 20%) with subsidies and transfers (approx. 15%).

Limited government capital inputs go towards rebuilding essential infrastructure that is mostly financed by domestic borrowing and foreign inflows and supported by a policy of maintaining the value of the pound against the dollar. The high interest rates that resulted have slowed down private sector borrowing and contributed to higher capital costs.

Combined with a slowly appreciating currency, high capital costs have determined that the competitiveness of the economy eroded significantly in the latter half of the 1990s. In combination with an insufficient level of public revenues resulting from the fact that only 70,000 citizens pay taxes in Lebanon (UNDP figures), these factors are producing deficits that regularly exceed 15 % of GDP.

1.8.3 Current Situation

The total budget for the administration at large in 1999 was 5.6 billion USD, or 35% of GDP and is expected to increase slightly in 2000 to 5.7 billion USD. With generated revenue in 1999 of 3.2 billion USD, the budget deficit amounted to 2.4 billion USD in 1999. The ratio deficit/expenditures is 42.40% and is exceptionally high for a middle-income country such as Lebanon (GDP per head, according to World Bank figures was \$5,148 in 1999).

This was acceptable for the first phase of the reconstruction process, which was aimed at rapidly rebuilding the country's infrastructure, almost regardless of cost (during this period, the public sector grew at unsustainable rates, creating a public debt to gross domestic product (GDP) ration of 113% against 50% in 1993).

However, Lebanon is now entering the second phase of its economic reconstruction. In this phase of reconstruction, the Government is keen to curtail its expenditures and allow the private sector to take over as the engine of growth.

1.9 Political Structure

The Republic of Lebanon is an independent sovereign state. Legislative power is exercised by the National Assembly headed by the Speaker of the National Assembly, Executive power lies with the Council of Ministers, headed by the Prime Minister. The Prime Minister and the Ministers are appointed by the President in consultation with the Assembly. By law, the President must be a Maronite Christian, the Prime Minister a Sunni Muslim and the Speaker of the National Assembly a Shia Muslim.

1.9.1 Administrative Framework

The Lebanese public administration consists of a core of central bodies, civil service Ministries, public agencies and municipalities. In addition, the Lebanese administration features a corps outside the civil service, non-established staff and private enterprises with significant Government ownership

According to the figures of the Civil Service Board, the central administration comprises a total of 24,246 positions, excluding the police, the Lebanese army and the publicly paid teachers. Of these 24,246 positions, only 10,182 are actually filled with regular staff. Particularly at the senior and middle management levels (grade I, II and III), vacancies exceed filled positions.

1.9.2 The Central Government

There are 26 ministries as illustrated in . However, within the framework of the issues at hand in this study, only the following ministries and central government agencies that are most relevant to the Municipalities shall be considered. These are:

Ministry of the Interior

- In charge of organizing and supervising municipal and legislative elections
- In charge of the Mohafez and Qa'immaqam

Ministry of Municipal and Rural Affairs

- Dealt with in more details below

Ministry of Public Works (through its Directorate General for Urban Planning)

- In charge of urban planning
- Authorizes property and infrastructure development

Ministry of Finance

- With Ministry of Municipal and Rural Affairs, in charge of the Independent Municipality Fund

Civil Service Board

- Oversees decisions on employees, organizational structures, and salaries in larger municipalities

Bureau of Accounts

- Financial control over larger municipalities through the General Controller

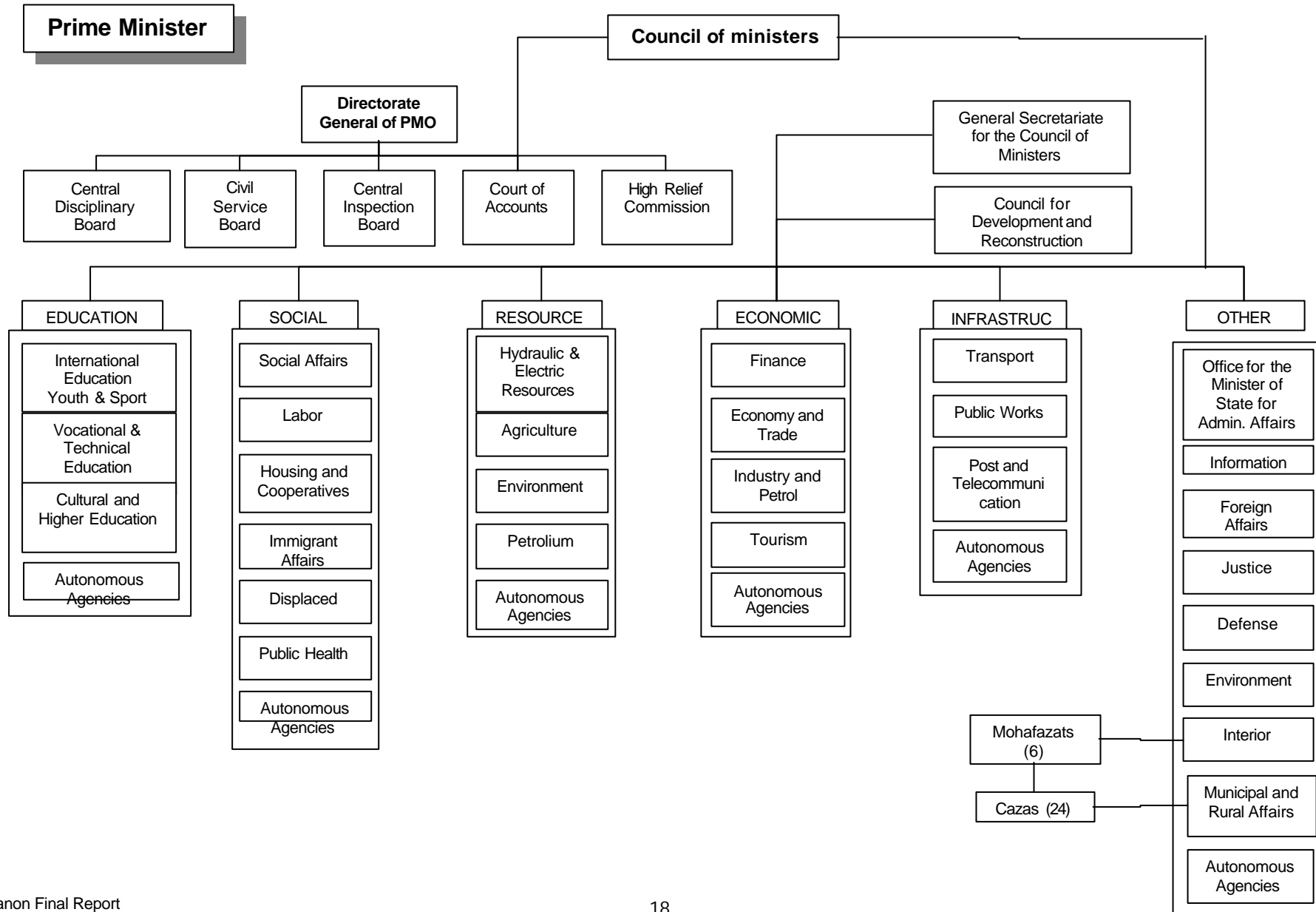
Central Inspection Board

- Powers delegated by Ministry of Municipal and Rural Affairs to inspect municipalities.

The Ministries that affect upon the municipalities either directly or indirectly in terms of their activities in their areas are the following:

The Ministry of Social Affairs, the Ministry of Health, and the Ministry of the Displaced. Other relevant agencies are the Council for Development and Reconstruction (CDR), the National Institute for Administration and Development (NIAD) and the Central Administration of Statistics (CAS)

Figure 3 - Current Institutional Set Up



SECTION 2 REGULATORY FRAMEWORK

2.1 The Ministry of Environment

2.1.1 Mandates of the Ministry

The Ministry of Environment (MoE) was created by *Law No. 216* of April 1994. *Article 2* of *Law No. 216* stipulates that the MoE shall have the following general duties:

- To formulate a general environmental policy and propose measures for its implementation in coordination with the various concerned government administrations;
- to protect the natural and man-made environment in the interests of public health and welfare; and
- to fight pollution from whatever source by taking preventative and remedial action.

Specifically, the MoE is charged with developing the following aspects of environmental management:

- A strategy for solid waste and waste water disposal treatment, through participation in appropriate committees, conducting studies and EIAs' prepared for this purpose and commissioning appropriate infrastructure works;
- Permitting conditions for new industry, agriculture, quarrying and mining, and the enforcement of appropriate remedial measures for promulgation of this law;
- conditions and regulations for the use of public land, marine and riverine resources, in such way as to protect the environment;
- specification of species of birds and animals that may be hunted, the hunting seasons and hunting areas;
- organization of nature conservation awareness campaigns, conferences and exhibitions, approval of international agreements covering projects related to the environment;
- encouragement of private and collective initiatives which improve environmental conditions;
- classification of natural sites and landscapes and to make decisions and issue decrees concerning their protection;
- preparation of natural disaster emergency protection and relief plans; and
- establishment of nature reserves and development of public parks and open areas.

2.1.2 Organizational Structure of the MoE

The organizational structure of the MoE consists of three main services, in addition to the Directorate General of Environment that is the main body concerned with administrative affairs and the general monitoring of the Ministry's work. These activities are:

- **Nature Conservation Service:** supervises preservation of public lands and forests, ensures protection of natural sites, protection of sands and beaches from pollution, supervises all excavations which might disfigure the environment, organizes hunting and fishing seasons in coordination with the Ministry of Agriculture.
- **Protection of Urban Environment Service:** supervises waste treatment and wastewater drainage methods, protection of atmosphere and waters from pollution. It also determines lands qualified to become natural reserves, public gardens and swimming pools.
- **Protection against Natural and Technology Hazards:** studies and advises in relation to applications for the import of chemical products. Supervises local chemical plants and methods used for the disposal of industrial wastes in order to ensure safety of citizens and the protection of nature and environment from pollution. The current organizational structure however does not have any provisions for protection against natural hazards.

As already noted, the Planning Department falls within the Nature Conservation Service. Similarly, the Documentation and Information Department falls within the Nature Protection Service; and the Department for Environmental Awareness and Education is presently in the Service for Urban Environment.

2.2 Institutions Involved in Environmental Protection

2.2.1 Overview

There are numerous other organizations with a role to play in environmental protection and management. The main organizations are:

- Ministry of Public Health;
- Ministry of Hydraulic and Electrical Resources;
- Ministry of Public Works, Directorate General of Urban Planning;
- The Ministries of Agriculture, Industry, Oil and Transport also have direct responsibilities within their own sectors;
- At a regional level, the Mohafazat and the Municipalities have direct responsibilities relating to the environment; and
- Council for Development and Reconstruction is leading the reconstruction and recovery program and has effectively taken over responsibility from the line ministries in areas with direct environmental implications.

2.2.2 Overlapping Activities

Illustrates the overlapping institutional responsibilities for environmental issues, the main duties and resources of the various institutions (where data are available) are summarized in.

Table 11 - *Waste Water and Sewer*

- *The MoE* prepares studies for wastewater treatment and participates in committees appointed to review and approve design and implementation of schemes, in accordance with the methods and standards specified in the studies.
- *The Ministry of Hydraulic and Electrical Resources* prepares studies, tender documents and supervises work execution. However, municipalities can execute sewerage projects with their own means.
- *The Ministry of Public Works, Directorate General of Urban Planning*, prepares designs for sewerage networks, is responsible for the treatment of sewage water, prepares tender documents and supervises execution of all sewerage works undertaken on behalf of the municipalities.
- *The Ministry of Public Health* is responsible for the proposal of technical specifications and conditions to be applied for public and private sewerage projects. The Health Bureau of each Mohafazat should advise on the health related aspects of any sewerage projects planned for the Mohafazat.
- *The Municipal Council (Municipalities)* is responsible for the installation of sewers. The Executive Authority issues permits to connect private sewers to the public sewerage network within the municipal framework.
- The Municipalities law conferred on the *Municipal Union* the powers to decide on all matters related to sewage networks and treatment of wastewater projects in Municipalities within the Union's framework

Source: CDR, Project Department

There are at least four separate institutions involved in solid waste management, and while the overlaps are less complex than for wastewater, there is still considerable overlaps and gaps.

Table 12 - Municipal Solid Waste Management

- *The Ministry of Environment* prepares studies concerning solid waste treatment, participates in the preparation of tender documents for infrastructure and engineering works, advises on the construction and equipping of solid waste treatment plants.
- *The Ministry of Municipal and Rural Affairs* processes all invoices submitted by private contractors for collection and processing and pays out of the Independent Municipal Fund on behalf of every municipality benefiting from the services.
- *The Ministry of Public Health* is empowered to propose technical specifications and terms which should be followed in solid waste collection and disposal projects.
- *The Ministry of Public Works* (Road Building and Sanitary Engineering Department and the Directorate General of Urban Planning), undertake the preparation of projects for collection and disposal of domestic garbage, draw up the tender documents for such projects and supervise their execution.
- *Municipal Unions* deal with common interest projects benefiting all municipalities and in particular common garbage treatment projects. Outside Beirut, Municipalities are responsible for waste collection.

Solid Waste Source: CDR, Projects Department

2.3 Environmental Legislation

Environment related laws have existed in Lebanon since the early 1930s' but the environment was an issue taken for granted for so many years. It is relatively recently that it started to pop up as a major concern not only to environmentalists but also for the general populous as well.

The following is a listing of excerpts from existing legislation related to MSW and other closely related issues:

- Decree 8735 of August 23, 1974 relating to the general cleanliness and the sanctions relative to this effect.

It is forbidden to place refuse, industrial and agricultural waste, construction waste, junk cars and, all other types of waste on street sides and public places, inside rivers, under private properties of the state or the municipalities and, in maritime areas.

It is strictly forbidden to throw any type of waste such as paper, empty boxes, fruit peels, cigarette butts and, other waste on roads and public places and, inside official buildings.

It is forbidden for municipalities to gather garbage on roadsides and in public places in non-closed containers prior to transport and to use transport means that are open and non-hermetically sealed.

All residents and shop owners must deposit their garbage inside hermetically sealed containers or inside leak-proof plastic bags. This must start within one month of the publication of this law.

Municipalities are allowed to impose garbage delivery inside plastic bags or offer such bags at a maximum rate of 30 per month to every home and charge for them.

The chief of municipality shall determine the time at which garbage shall be picked up in order not to let the latter accumulate on the street sides.

Every person found guilty of breaking the above law shall be charged an amount equal to 25 LL (\$.016). In case a minor breaks the law, his parents shall pay the fine.

Any driver found guilty of throwing garbage out of his car shall be imprisoned for a period between two weeks and one month and fined an amount between 250LL and 500LL (\$0.16 to \$0.32) and his car shall be impounded for a period of one month at his own expenses.

The above applies for any other person inside the car as a passenger.

Note: In 1974 US\$1 = 3.25 LL. Today 1999, US\$1 = 1,500 LL

- **Decree 197 of February 18, 1993 related to the creation of the Ministry of Municipal and Rural Affaires.**

The Ministry of Municipal and Rural affairs (MMRA) shall propose strategies and prepare studies related to the development of local activities in order to encourage citizen participation and guaranty the execution of laws and regulations related to municipalities.

The MMRA shall further supervise municipalities and municipal unions and control their activities.

- **Decree 216 of April 2, 1993 related to the creation of the Ministry of Environment.**

The Minister of Environment (MoE) shall be responsible to establish policies related to environmental protection and implement them in cooperation with concerned administrations.

The MoE shall fight all sorts of pollution and undertake studies related to the means and conditions of processing solid waste and wastewater.

- Article 164 and 165 of diverse laws concerning the Ministry of Interior.

Article 164: The municipalities may undertake certain projects necessary to guaranty public health and security should the concerned responsible abstain from doing so.

Article 165: The fines imposed by the courts for infractions related to public health and safety are the property of the municipal fund of the region where the infraction took place.

- **Decree 14469 of May 15, 1970 relating to the distribution of fines to municipalities.**

The fines imposed by the courts for the infractions of laws and regulations shall be paid to the municipality where the infractions were committed.

- **Decree 425 of September 8, 1971 concerning the use of plastic bags for waste disposal.**

This law imposes the use of plastic for the disposal of garbage.

- **Decree 7975 of May 5, 1931 relating to residential cleanliness.**

It is forbidden to throw or deposit garbage next to residences. These residues must be gathered and buried or delivered to the municipal department responsible for cleaning.

- **Decree 118 of December 27, 1977 relating to the collection and disposal of solid waste by the Municipalities.**

This is known as the Municipal Law. It gives the municipalities the power to organize solid waste collection and disposal.

- Decree 11/78, 1978 related to the use of insecticides.

No insecticide may be imported into the Lebanon if it is banned for use in the country of origin.

- Decree 64/88, 1988 related to the protection of the environment and the importation of various types of waste.

It was made the duty of every person to preserve the safety of the environment from pollution.

Importation or possession of radio active or poisonous waste was prohibited. In extreme cases the death penalty could be applied.

2.4 MSW National Policy

2.4.1 Policy Overview

The general policy relating to MSW is very blurry and contains many gray areas especially due to the lack of well defined and structured laws and regulations established at a national level. However, there are a few areas where the government's policies are voices in one way or another. The following reflects these policies:

2.4.1.1 Incineration

The government's policy toward incineration is very loud and clear. Incineration is totally banned from the MSW process in Lebanon. The two existing incinerators that were operating in the Greater Beirut area were totally shut down. The Quarantina incinerator was closed down while the Amroussieh incinerator was never repaired following the riots that resulted in the burning down of the incineration plant.

2.4.1.2 Landfilling

A program for landfills and composting plants throughout the entire country is in place as per the Solid Waste Environmental Management Project (SWEMP). Although the issue of how the existing uncontrolled dumps are closed and cleaned up is addressed, however, it remains unresolved. Only the Normandy dump of West Beirut is being worked on under the SOLIDERE land reclamation program where over 609,000 sq. m of land is being reclaimed for infrastructure construction in the Beirut Central District.

The difficulty of identifying landfill sites may not allow the government to realize the ambitious landfill program. Because generation rates have been improperly estimated in the planning assumptions, the increasing volume of solid waste will put pressure on the planned system. Also the current plans do not allow for the mixing of industrial waste with municipal wastes in these sites. There is a very strong case for encouraging formal and informal waste minimization in both the domestic and industrial sectors.

Direct cost recovery is essential for the sustainability of waste management programs, and its introduction in a number of municipalities is positive. There remains scope for structuring charging systems for waste collection and disposal to provide a greater incentive for waste minimization than at present.

2.4.2 Institutions Involved in MSW Management

2.4.2.1 Mohafazats

By law, the Mohafazats have to approve all disposal sites and the way waste is handled within these sites, but there is little evidence that this duty has had much effect on the way in which refuse is disposed of. It might be appropriate for the Mohafazats to take on a more active and participative role of monitoring and advising on solid waste management.

2.4.2.2 Cazas

Due to its size, Lebanon does not need more than six or seven disposal facilities, which would benefit from economies of scale and which could be run by experienced engineers. The social and political system being as they are, it has been recommended that each caza have its own disposal facility, so that wastes are not transported across sensitive boundaries and each caza is responsible for its own waste. This is reflected in the World Bank SWEMP strategy for the construction of some 28 landfills throughout the country to accommodate almost every caza individually and avoid political and social controversy.

2.4.2.3 Ministry of Industry

The Ministry of Industry, that has an important roles in developing environmental standards for industries could be involved in the management of industrial waste. The program for industrial zones provides a framework for proper waste management, and efforts to introduce an awareness of concepts such as ISO 9000 provide an opportunity for encouraging waste minimization as well as better disposal practices.

2.4.2.4 Ministry of Agriculture

The Ministry of Agriculture could be involved in solid waste management, quality assurance testing, and promotion of compost made from municipal waste. Very little research has been done in this connection to date, but there is significant interest in the possibilities offered by compost. A study currently underway under the World Bank SWEMP shall provide the government with marketing strategies for the Coral compost plant and for any future compost generated throughout the country.

2.4.3 Public Awareness and Participation

Attitudes and public co-operation have a major influence on the success of solid waste management schemes. If residents do not use storage containers properly, more resources must be committed to collecting wastes from the streets and vacant land. Conversely, intense opposition to treatment and disposal projects is often based on the perception that all such schemes are as offensive and polluting as an uncontrolled open dump.

In a recent survey of industries in three regions in Lebanon, it was observed that some industrialists were quite prepared to admit practicing clandestine methods of disposal demonstrating a lack of environmental awareness.

Several seminars and workshops on the general topics of environmental issues and specifically on MSW have been planned and prepared for public awareness and for information dissemination. Some of these have already taken place either at the Ministry of Environment, the MMRA and other premises in Lebanon.

The policy here is very clear regarding the approach to public awareness. Although the budget is very limited and tight, several publications have been put out by the Information Center at the Ministry of Environment. Furthermore, a regular monthly publication on environmental issues is distributed to over 5,000 institutions and individuals through the country.

2.5 1st. NGOs

Several NGOs have been established by local researchers and scientists since the early 1970's. Their role has been to draw attention to pressing environmental problems and human health issues and to increase environmental awareness amongst the general public. As the fighting decreased and the reconstruction phase started, public concern for the environment that had almost disappeared began to reappear and environmental NGOs were reformed. By the late 1980s,

there were 32 institutions and societies, distributed throughout Lebanon, which were concerned with environmental issues. Their activities focused primarily on urgent local issues. provides a list of environmental NGOs.

Eight NGOs recently combined to create *The Lebanese Forum for the Protection of the Environment*. This Forum undertakes reforestation, establishment of sanctuaries, restoration of old churches and mosques, in addition to campaigning for protecting the environment. Member organizations hold monthly coordination meetings with the Minister of Environment and other concerned decision-makers. Nevertheless, it seems that the work of most of the NCOs remains theoretical rather than practical and their performance is limited.

Other smaller organizations carry out sporadic campaigns for improving or cleaning public areas in their respective localities. In general, NGO activities are not coordinated together or with public sector institutions. Their activities are limited to narrow geographic areas.

These environmental NGOs have the possibility to play an important role in public awareness and implementation of local projects and programs. However like NGO's everywhere, they suffer from lack of funds and human and technical resources to support their activities. Presently, the main sources of NGO funds are donations, individual sponsors, and membership fees.

NGOs in Lebanon have proved that given the opportunity there is a lot they can accomplish. During the war, they had the financial resources and the opportunity to prove their capabilities in the medical and health fields, in emergency and disaster management, in social development and other areas.

NGOs in Lebanon have proved that given the opportunity there is a lot they can accomplish. During the war, they had the financial resources and the opportunity to prove their capabilities in the medical and health fields, in emergency and disaster management, in social development and other areas.

Public awareness in Lebanon is generally low in spite of the existence of a number of environmental NGOs, and the incorporation of environmental issues into school curricula as evidence of initial public concern about the environment.

Table 13 - Environmental NGOs in Lebanon

<ul style="list-style-type: none">• Society for Protection of Nature Resources in Lebanon• Lebanese Committee for Environment and Development• Greenline.• Ligan Nature Environment• The Committee for the Protection of the Environment in North Lebanon• Friends of Nature• Friends of Horsh Ehden• Association for Social and Cultural Development - Nabatiyeh.• Societe de Protection des Animaux - SPA• Centre form Environmental Development in Hermel.• National Committee for Environmental Activities.• Association for Environmental Conservation• Movement de l'homme-Antelias and Beirut• Man and Environment Society• Association for Environmental Conservation - Bcharre.• Friends of Cedar Forest• Society for Protection of Nature - Sh'hym• Man and Environment Association - Beit Shaar.• Committee for Environmental Protection and Cultural Preservation - Nabatiyeh.• Environment Protectors Party - The South• Protection of the Environment Committee - Chekka.• Bird Society - Hazmieh.• Environment Sans Limites - Maghdousheh.• Protection and Development of Forest Resources Society• Scientific Society for Environmental Education and Development – Tripoli• Environmental Council - Akkar.• Society for Conservation of Nature – Bekaa• Environmental Committee – Baallbek• Rene Moawad Foundation, Centre for Research and Education for Democracy - CRED.• Human Rights Society• Animal Encounter• Consumer Protection Society• L'Association Libanaise Pour La Maîtrise De L'Énergie (ALME).
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Source: Ministry of Environment

2.6 Solid Waste Environment Management Project

The Solid Waste/Environmental Management Project (SWEMP) is a World Bank financed project planned for the entire country excluding Beirut and its suburbs. It comprising the provision of the following:

- Refuse collection facilities, containers and, compactor trucks;
- waste disposal facilities, sanitary landfills and, compost plants;
- separate collection and disposal of hospital waste and;
- technical assistance and the preparation of a coastal zone management program.

The project, as planned in the National Emergency Reconstruction Program (NERP), is intended to meet the country's needs in solid waste management facilities. It would strengthen the institutions responsible for solid waste management and encourage private sector participation, not only in the collection services but also in the whole sector, including the investment of capital in solid waste management.

The project's main objectives are:

- Elimination of hazardous and unsightly dumping of solid waste;
- improvement of waste collection and disposal methods;
- improvement of cost recovery and modernization of municipal accounting systems;
- improvement of the quality and marketability of compost through the introduction of upstream sorting of the waste;
- increasing the involvement of the private sector in solid waste management;
- strengthening of the MMRA and participating municipalities and;
- developing instruments for the more orderly planning and development of the coastal zone.

2.7 Privatization Strategy

2.7.1 Background

Private ownership and management of businesses and economic enterprises has a long and successful tradition in Lebanon; competitive free enterprise has given the Lebanese a relatively high standard of living and rapid economic growth in the past. Ever since the mid 1960s' until the start of the civil strifes the average real annual growth rate was around 6%.

The Government's portfolio entails a range of assets, including large monopoly providers of basic utility and communal services, real estate and shares in private enterprises through the involvement of Banque du Liban (Central Bank). Some of these assets, such as real estate and some shares in private enterprises, can be transferred to the private sector quickly. Others such as utility and communal providers require complex preparations to maximize asset value and to protect consumer interests.

In a widely acclaimed move, the Government of Lebanon (GOL) plans to transfer ownership and/or management of substantial portions of state-owned or state-managed firms and assets to the private sector.

The transfer of these assets to the private sector is intended to ensure service quality, promote new investment and protect consumers. It is meant to provide citizens with better services and free the Government to divert its attention and limited resources to other sectors mainly education, health, economic and environmental, further improving conditions for economic growth and quality of life.

2.7.2 Objectives of Privatisation

The main objectives of the privatization program are to increase private sector participation and/or to transfer the ownership and management of Government owned assets to the private sector in a transparent and competitive manner which:

- promotes greater competition and higher service quality;
- encourages long term growth and investment;
- provides an effective and accountable regulatory framework; and
- maximizes the revenue realized by the state so that the net sales proceeds can be used to reduce the accumulated public debt.

The benefits of the GOL's privatization program are many. The most important of which can be briefly listed as follows:

- The global benefits to the economy as a whole through a fiscal adjustment allowing for the reduction of public debt and, consequently budget deficit;
- The general benefit to individual consumers through increasing competition in key sectors of the economy, and improving service quality and efficiency;
- The attraction of new investment to expand utilities and services, including telecommunications, power, transport, water and community management (Municipal Solid Waste), to meet growing demand or improve the quality of service in keeping with world-wide technological progress;
- The business liberalization that will enhance the competitiveness of Lebanese businesses.

2.7.3 Scope of the Public Sector

2.7.3.1 *The Traditional Public Sector*

The public sector, as an agent of economic activity, has played a minimal role in the Lebanese economy. This is due to the fact that Lebanese social and economic traditions have imposed limits on the expansion of the public sector and have favored private initiative.

Privatization, therefore, is part of the natural growth of the Lebanese economy and it builds upon its strengths. The liberal economic tradition of the country, based on a market economy, a robust and entrepreneurial private sector, a free

exchange regime with no capital controls and an open economy, has served Lebanon well before the civil strifes.

The Lebanese tradition is rich with examples of private sector provision of infrastructure. The relative prosperity of the pre-civil strifes Lebanese economy gave limited opportunities or incentives for the public sector to expand. This was the case up until the post-war reconstruction period.

2.7.3.2 The Post War Reconstruction Period

The civil strifes that destroyed Lebanese society's fabric and its economy and devastated its public administration and infrastructure lasted for fifteen years. During that period, various forms of private provision of infrastructure and makeshift operations emerged to make up for the loss of services provided by the public sector.

Privately operated telephone networks maintained Lebanon's continued link with the rest of the world. Most of the power produced for domestic and industrial use was generated by privately owned and operated generators. Privately run ports kept the flow of merchandise trade unaffected. Individual entrepreneurs assumed the functions of MSW collection in several areas of the country but kept the burden of disposal on the local government by simply uncontrolled dumping and burning in empty lots, ravines and along coastal areas. Not all of this was legal and much of this activity flourished because of the absence of state authority. But this activity allowed the economy to operate despite wartime conditions.

Post-war Lebanese governments opted for a reconstruction policy that was mostly driven by public spending and that focused primarily on infrastructure. This has required a large portion of the yearly budget to be allocated to such expenditures as health service improvement, educational reform, and other services. By 1997, budgeted public expenditures peaked at 40% of GDP, while servicing the national debt accumulated by these expenditures became back breaking for the government.

Post-war governments have also ventured in Build-Operate-Transfer (BOT) and other types of concessions to allow private sector participation in infrastructure and services. But the decision to opt for the private sector has been made primarily for budgetary reasons rather than broader economic objectives. The primary motive and rationale for the BOT-type of concession has been the inability of the public sector to finance, implement, and manage such a project.

The decisions for BOT-type projects have also been made in isolation from one another and without a sector strategy. As a result, very little effort went into preparing for what happens after the transaction is concluded. The legal basis for these concessions remains outdated and uncertain to the point that it does not give sufficient comfort to investors, nor does it give adequate protection to consumers.

A number of BOT-type projects have been executed thus far, the most important of which are:

- MSW Collection and Street Cleaning: Sukleen
- MSW Processing (sorting, ,composting and landfilling): Sukomi

- MSW facilities construction: Sukkar Engineering Group
- Cellular phones: Cellis and Libancell
- Postal services: LibanPost
- Beirut Airport ancillary services: duty-free shopping, car park, fuel farm, etc.
- Container terminal at Port of Beirut (which is a Furnish-Operate-Own contract)
- Miscellaneous projects such as the rehabilitation of the Jeita Grotto, etc.

This piece meal approach has resulted in several main deficiencies the most important of these which has been the virtual abdication of the role of the state as regulator of markets where competition does not exist, such as telecommunications, waste-disposal, postal delivery, etc. A related weakness of BOT projects implemented in Lebanon has been that BOTs amounted to a straightforward transfer of a public monopoly to the private sector.

In order to avoid mistakes of the past and still encourage private sector participation in infrastructure, the GOL has developed a clear strategy for privatization, with well-defined goals and objectives, and a process that is transparent, fair, and competitive. Prior to the privatization of a public utility or infrastructure, the GOL will adopt a sector strategy that aims at delivering better quality more efficiently. In order to do that, sector liberalization will be an integral part of the reform process and competition will be introduced to sectors that have seen either no competition or very limited competition.

The aim here is to have the sector strategy redefine the role of the state. The state will cease to be a provider of “public utilities and communal services” but will become a regulator of markets for the same services. The state, through the regulatory institutions that will be established, will be called upon to play an even more important role than that of provider of services and infrastructure.

SECTION 3 INSTITUTIONAL FRAMEWORK

3.1 Overview

The Taef agreement of 1989 was the basis upon which the Lebanese government was reconstituted following the end of the civil strives. Inter alia, this confirmed the principles of expanding the powers of central government representation at the regional level and strengthening the functions and autonomy of local government. To develop the municipal several actions were undertaken.

3.2 The Ministry of Municipal and Rural Affairs

The Ministry of Municipal and Rural Affairs (MMRA) was established in 1993 and allocated a budget that constitutes approximately 0.4% of the total state budget. The MMRA's main responsibilities, according to Law 197 of 1993, are:

- i) Supervising municipalities, municipal coalitions, and all local authorities subject to administrative controls and decisions auditing;
- ii) ensuring the enforcement of laws and regulations related to local and municipal affairs, municipal coalitions, and councils of mayors;
- iii) broadening and encouraging citizens' participation in developing local life;
 - undertaking studies to develop and improve local life;
 - co-operating with administrations established to enhance village and community life.

A Director General is in charge of four main departments within the ministry:

1. *Municipal Projects* - the first minister of the MMRA established a division to deal with municipal projects funded through the Independent Municipal Fund.
2. *Rural and Municipal Affairs* – dealing with municipal decisions that are subject to MMRA approval
3. *Direction and control*- developing and implementing financial control of municipalities
4. *Secretariat* - sectioned into Accounting, Human resources and Registration of all incoming and outgoing documents.

A fifth function was added by the first minister of the MMRA - developing information systems on municipalities.

Funds from the Independent Municipal Fund are distributed by the MMRA along with the Ministry of Finance.

The MMRA has started to develop components of a computerized system to provide:

- i) electronic filing of incoming and outgoing documents;

- ii) a database for a 1995 census of municipalities and rural areas, including demographic and residential data, infrastructure and general information on the municipalities;
- iii) a database on municipal budgets and municipal income statements;
- iv) accounting software both for MMRA activities and the Independent Municipal Fund;
- v) a database on municipal projects financed by the Independent Municipal Fund.

The Ministry is currently heavily understaffed and has neither the capacity nor the capability to perform its mandated functions.

3.3 Government at the Regional and District Level.

Lebanon is divided into 6 regions (Mohafazat), and 26 districts (Caza). The Mohafazat is an administrative subdivision of central government with no independent authority. It is headed by a Mohafez, a grade 1 civil servant (there are 5 grades in the Lebanese Civil Service) located at the Ministry of Interior.

At the Mohafazat level, most central government ministries are represented. Staffs are accountable to their individual ministries, but supervision of their work, with the exception of those in the Ministries of Justice and Defense lies with the Mohafez. The Mohafez, as the representative of the Ministry of the Interior is responsible for its functions in the region. He has his own administrative support.

The Mohafez is responsible for administrative control over certain types of decisions of Municipal Councils and has powers to undertake remedial works, normally under the jurisprudence of a municipality, if the latter cannot will not undertake them.

The Qa'immaqam is the head of a district. He is a grade 2 civil servant whose role is similar to that of a Mohafez, but at district level. In the regional centers, the Mohafez also assumes the role of Qa'immaqam. Certain types of Municipal Council decisions must be referred to the Qa'immaqam for confirmation.

3.4 The Municipalities

3.4.1 Legal basis

The Law of the Municipalities (118/1977) is the legal basis for municipalities. The main points of that law are:

- a) municipalities are local administrations that undertake community-related functions within their geographic area according to the law;
- a) municipalities are financially and administratively autonomous;
- b) the criteria for the establishment of a municipality are: 1) a population of at least 300. 2) an annual estimated revenue exceeding 10,000 Lebanese Pounds (US\$6).

3.4.2 The Municipal Council

The Municipal Council is elected for six years. The number of members is determined by the size of the population within the municipality, as follows:

- For a population up to 2,000, 9 members.
- For a population up to 4,000, 12 members.
- For a population up to 12,000, 15 members.
- For a population up to 24,000, 18 members.
- For a population over 24,000, 21 members.
- Beirut and Tripoli 24 members.

Councils are legally required to meet monthly, but can increase this frequency if pressure of work dictates. Council meetings are held in private. Councils can also establish committees to deal with functions. Certain councils have committees dealing with issues such as: engineering, urban planning, covering finance, construction, environment, law, sport, tourism, media, tendering and education, public relations, traffic.

Approximately 50% of municipal councils have no official municipal hall to meet. Generally, members have not been trained in their roles and responsibilities. There are no guidelines or codes of practice for the conduct of meetings, etc.

- c) The decision-making authority within a municipality lies with the Municipal Council, whose members are elected by public voting. The exception is Beirut where 16 members are elected and 8 appointed by ministerial decree. A Council can be dissolved for serious breaches of the law. Its main areas of competence are:

- The municipal budget and closure of accounts.
- Setting of municipal fees within legal limits.
- Tender documents for supplies, services and projects.
- Programs relating to public works, waste collection, health, water supply and street lighting.
- Planning roads, naming street, establishing public open spaces, urban design in conjunction with the Directorate General of Urban Planning.
- Establishing markets, playgrounds, beaches, hospitals, dispensaries, libraries, houses, sewage systems, etc.
- Contributing to the expenses of public schools and supervising educational activities.
- Assisting the needy, clubs organizations and socio-cultural activities.
- Personnel and labor regulations, including salary scales and grades.
- Supervising the work of public activities.
- Providing permits for the establishment of shops, restaurants, beaches, hotels and amusement centers.

The executive authority lies with the Mayor or Head of the Council except in Beirut where it lies with the Mohafez. All decisions of the Mayor must be notified to the Qa'immaqam.

- d) The Mohafez and the Minister of the Interior exercise administrative control over the decisions of the Municipal Council. Some decisions do not need ratification. These mainly relate to expenditure below specified levels and the collection of municipal fees. The Qa'immaqam endorses decisions relating to contracts and expenditure of higher specified values, the municipal budget and the level of municipal fees.

The Mohafez deals with contracts above the values within the Qa'immaqam's competence. Decisions to be endorsed by the MMRA Minister include loans, general regulations, compensation to mayors and vice-mayors, the administrative structure of municipalities, tender documents for project and service contracts and the sale of municipal property.

The execution of decisions by municipal councils can be temporarily postponed by the Minister, the Mohafez or the Qa'immaqam for security reasons. In such cases, Municipalities have a right of appeal to the Council of State.

3.4.3 The Revenue Sources of Municipalities

Revenue sources of municipalities are:

- Municipal fees
- Fees collected on behalf of Municipalities by the State
- Fees from the utility agencies on flat percentage basis
- Assistance and loans, municipal property rents, fines, donations.

Fees collected on behalf of all municipalities are held in the Independent Municipal Fund in the Ministry of the Interior, and distributed according to regulation.

The government sets accounting standards for municipalities. Beirut and other municipalities identified by ministerial decree are subject, in terms of accounting, to the control of the Bureau of Accounts, and, in terms of other financial activities, to the control of the General Controller, who is administratively controlled by the Minister of the Interior.

3.5 Municipal Unions

A Municipal Union (or Federation) is composed of a number of municipalities and is established and abolished by ministerial decree on proposal of the Minister of Interior. The Union has financial autonomy and independent status. The union's decision body is the Council of the Union, which consists of the constituent municipalities' mayors. Executive authority lies with the Head of the Council, elected by the members and assisted by a Director of the administrative body, the latter being composed of engineers, doctors, administrators, financial staff and police.

The responsibilities of a Municipal Union entail:

- Plans and tender documents for projects
- Common public works

- Ratification of the union's budget and closure of accounts
- Co-ordination between municipalities
- Ratification the structure and staffing complement of the administration
- Managing loans.

3.5.1 The Revenue Sources of Municipal Unions

Revenue sources of the Municipal Union are:

- a) 10% of the revenues of the constituent municipalities.
- b) A percentage from municipalities benefiting from a common project.
- c) Allocations from the Independent Municipality Fund contributions from government towards studies and projects.
- d) Grants, loans and revenues from municipal land.

The decisions of unions are dealt with exactly as the ones of the municipalities.

Although this is the main piece of legislation in terms of the municipalities, there are others that also have an effect on municipal activity. Examples are Law 60/88 - Municipal Tariffs and Fees, Law 1917/1979 - The Basis of the distribution of the Independent Municipality Fund, Law 5595/1982 - Accounting Principles for the Municipalities and Unions of Municipalities.

SECTION 4 PRIVATE SECTOR PROFILE

4.1 Overview

Throughout the country, the private sector is, in certain cases, only involved in the collection aspect of MSW. The private collectors would then dump the waste in areas designated by the concerned authorities where it is either burnt or simply covered with sand.

The only organized MSW management in the entire country is within the Greater Beirut area where private contractors collect, sort, bail, landfill, compost and recycle the MSW. At one time the same contractors were also operating the government owned incinerators.

However, the appearance of the private sector on the scene was somehow forced onto the government due to several factors brought upon by the civil strifes. These could be better understood following a review of the events that led to the Government to involve the private sector in the municipal services.

4.1.1 The 1975 Civil Strives

On April 15, 1975, the first spark of the civil strife ignited. The civil disturbance lasted until 1990. Beirut was divided into two sectors, East Beirut and West Beirut. The Municipality of Beirut continued to collect from both sectors. Collection was sometimes interrupted when the fighting between the two sides got too heavy. House to house collection was ceased. Residents put their waste in plastic bags and gather it in empty lots where the municipality trucks would collect it.

Since Quarantina was in the eastern side of Beirut, the hydraulic garbage trucks remained in east Beirut. For west Beirut the municipality had to rent dump trucks for garbage collection. An alternative to the Quarantina dump had to found so garbage dumping started on the Western edge of the Beirut Airport in a privately owned 100,000 square meter lot. The garbage was dumped in layers then covered with sand. This continued through 1978.

When scavenging birds feeding on the garbage started to present a risk to air traffic, the municipality moved the dumping to the Normandy area on the edge of the Beirut Central District.

As the fighting went on and got heavier, garbage piled up around the city and was impossible to collect causing rodents and insects to multiply uncontrolled. Municipal fees for garbage collection and other taxes were no longer paid, and the Beirut Municipality went bankrupt.

Various militias around the city commandeered the garbage trucks and popular committees were created to handle sanitation. Empty lots where used for makeshift sites where garbage was dumped and burnt.

In 1982, following the election of Amine Gemayel, the war temporarily stopped. All the governmental institutions were reinstated, and the municipality of Beirut was active once more.

The dumpsite of Quarantina reopened for the Eastern sector, while the Normandy dumpsite continued to be used for the Western sector of the city. Solid waste management became an important issue, subject for several studies.

The mandate of President Gemayel lasted until 1988, when civil disturbances started again and lasted until 1990. Again, the Beirut municipality was paralyzed and garbage piled up around the city.

In 1990, the election of President Elias Hraoui brought an end of the fighting. However, solid waste, scattered around the city, still presented a serious hazard.

In the absence of an active municipality, the ministry of Interior stepped in, and took charge of garbage collection from 1990 until mid 1991 when the CDR took over and allocated funds from a Saudi loan for the cleanup of the city of Beirut. A committee called "The Joint Committee for Beirut and its Suburbs" was formed and assumed the solid waste management. The project was financed by a World Bank loan.

By 1993, the Normandy dump was closed and land reclamation started by SOLIDERE. The Quarantina plant was overhauled where solid waste was sorted, recyclable, composted and incinerated. A French company, OTV was in charge of administering the disposal process. Collection was still the responsibility of the Municipality of Beirut until the first half of 1994.

On 1 August 1994, Succar Group was awarded the contract for the solid waste management, and Sukleen took over the task of garbage collection and sweeping in the greater Beirut area while Sukomi assumed its processing and disposal.

4.1.2 The Beirut Emergency Plan

Prior to the civil strifes that started in 1975, the plan was for the Beirut Municipality to collect the municipal solid waste and incinerate it in two plants, one at Amroussieh, in the southern end of the city and the other at Quarantina, in the northern end. The two plants were enough to dispose of the entire city's waste. The ashes would be dumped in various areas scattered around the city.

With the population shifts resulting from ethnic migration from the countryside, the city's population increased drastically at a very fast pace. The incineration plants, due to a lack of maintenance, were shut down and the city's waste was dumped in the Normandy region at the tip of city's central district.

The dumping went on past the end of the events, until in 1993 SOLIDERE (an organization created for the reconstruction of Beirut) took over the Beirut Central District and started its reconstruction program. The dumping was ordered to stop. The garbage, by then, had covered an area of over 600,000 square meters, mostly into the sea, reaching depths of over 17 meters off the seashore.

As a result of SOLIDERE's program, the dumping of the city's municipal waste and construction rubble shifted to the northern boundary, specifically to the

Bourj Hammoud sea side area where the waste started piling up taking the shape of a mountain in the middle of the sea.

By 1996, the Bourj Hammoud dump side became an embarrassment to the city when the local residents, mostly Armenians, threatened to riot if the dumping continued. The mountain had reached 650 meters in length, 350 meters in width and 72 meters in height. Its estimated volume was 5 million cubic meters made up of 40% municipal waste and 60% construction waste.

As a result, the Government adopted the Beirut Emergency Plan in December 1996 and promised to close the dumpsite by the middle of June 1997. The Beirut Emergency plan adopted of sorting, composting, incineration, bailing and landfilling.

By January 1997, implementation of the plan started by Sukomi, a Sukkar Group company, with the refurbishing of the Karantina and Amrousieh sites, which soon turned into a complete reconstruction program due to the very poor condition of the existing plants. In parallel, a composting plant was erected next to the Karantina plant. Meanwhile, dumping went on in Bourj Hammoud.

In April of the same year, the South Beirut residents protested against the intended plans, attacked the Amrousieh plant and burned down the existing incineration plant. With no alternative at hand, garbage from the related areas was diverted to an area known as “Maramel” next to the Beirut airport. Soon the unpleasant garbage odors became unbearable and the Government was again under pressure to find a solution.

In June 1997, the Bourj Hamoud dumpsite was officially closed down and all 1,400 tons of municipal waste was diverted 70/30 to the newly built processing plants at Quarantina and Amroussieh. There, the waste was processed as follows:

- Sorting 5%
- Composting 50%
- Bailing 25%
- Incinerating 20%.

The recyclable waste was given free of charge to whoever requested it. Of the organic waste which constituted over 60% of the waste composition, about 50% was extracted and sent to the composting plant while the remaining 45% of the waste was bailed and sent to a warehouse for storage pending the construction of an engineered landfill.

It was not until three months later, by the end of September, that a landfill site at Naameh, south of the City, was identified and deemed acceptable for controlled land filling following a positive EIA conducted by a local engineering firm.

By the time part of the landfill was constructed by Sukkar Engineering, a Sukkar Group company, and prepared to receive the bailed waste, the warehouse used for temporary storage had been completely filled up with over 37,000 bails of waste, the volume of each being approximately one cubic meter and weighting 1.5 tons.

As a result of the situation at hand, Sukomi was facing a dilemma created by the logistics requirements for the transportation of the waste from the Beirut plants to the landfill at Naameh. This included the 400 plus bails generated daily along with the 37,000 plus bails waiting inside the warehouse starting to rot and smell very bad.

With the average payload of a truck being 20 tons, this meant 20 trips a day for the daily output and 1,850 trips for the waste inside the warehouse. It took several months of trial and changes in the existing waste processing system to empty the warehouse and coordinate delivery of the bailed waste from the processing plants to the landfill.

During this time, a decision to shut down the incinerator was taken and implemented. In addition, the amount of waste collected by Sukleen increased to 1,800 tons per day due to additional towns. Although things were kept under control, processing capacity problems started to surface due to bulk waste that was never a part of the picture.

What made things even worse are the odors resulting from the processing plant, the warehouse and the compost plant that were polluting areas around the plant reaching at times major residential areas west of the plant.

The warehouse odors were not so much an issue as other sources such as the processing plant at Quarantina which eventually was solved through the installation of an odor control system. The only source that could not be controlled was that of the composting plant. As a result it was shut down pending finding a solution. All 1,400 tons were then bailed and sent to the Naameh landfill.

A solution for the compost plant was then developed and a plan to install a biofilter was established. The system was contracted out to an American/Dutch consortium and, six months later, the compost plant was restructured to process 250 tons per day.

In addition, a large quarry in Bsalime, north of Beirut was expropriated for the landfilling of the bulk waste.

Greater Beirut's municipal waste management has been referred to by World Bank experts as the "Lamborghini" of solid waste management due to the costs involved and the great effort in its coordination and execution.

The concerned official bodies that oversee the operation are the Ministry of Environment, the Ministry of Municipal and Rural Affairs and the Council for Development and Reconstruction and other international and local consultants.

4.1.3 The Private Contractors

The contracting of waste collection in the Greater Beirut area to Sukleen and of waste processing and composting to Sukomi, has been going smoothly ever since the organization took over this task from the government. It is proposed to expand the use of private sector waste management, and contracts have been (or are in the process of being) worked out for waste collection and waste processing (sorting, composting and landfilling) in other areas of Lebanon.

There are clear advantages in involving the private sector in waste collection, as they can relieve the labor constraints faced by Municipalities, and private collection contracts can be structured so as to encourage waste reduction. When the Sukleen contract was initiated, Sukkar took on personnel from the municipality, ensuring continuity of employment. The contracts for MSW collection, processing and landfilling for the Greater Beirut area are listed in.

The first collection contract for the Greater Beirut area was based on weight. This had the advantage of being straightforward and transparent, and was aimed to encourage the contractor to maximize the weight collected. However, basing payment on weight alone provides an incentive for the contractor to increase weights by adding soils or heavy construction materials. Furthermore, in the rains, the bins are heavier since the lids of containers are rarely closed.

These problems have been dealt with through effective monitoring and management of the contracts. Another problem with weight based contracts is that they discourages resource recovery (scavenging) from the containers and the streets of Beirut.

The policy adopted for the Greater Beirut area concerning the MSW related contracts, the latter were structured on the basis of area or numbers of dwellings served, and the payments were based on expected tonnages from each area. This gave the contractor an incentive to minimize the quantity of waste carried, saving costs, and hence encouraged informal recovery methods. The effectiveness of the contractor was then monitored against quality standards in each area.

Table 14 - Greater Beirut MSW Contract Summaries

Contract Number	Contract Purpose	Contractor	Contract Date	Contract Duration	Location	Contract Value (\$)	Remark 1
2315	Engineered Landfill	SUKOMI	19/1/1998	10 years	Naameh Bsalim	14,000,000 25/t 30/t	Transport & Landfilling less than 400,000 tons/y For quantities exceeding 400,000 tons but less than 500,000 tons/y For quantities exceeding 500,000 tons/y
1348	Collect	SUKLEEN	1/1/1996	Till 31/12/2000	Greater Beirut & Suburbs Caza of Chouf	23,486,513 &25,210,688 +26,231,007 of	For 1996 For 1997 For 1998/9
6315	Supervision of SUKLEEN	D.G.JONES	22/3/1195	Till 31/12/2000	Greater Beirut & Suburbs + Caza of Chouf	175,000	
2378	Processing	SUKOMI	1/6/1998	10 years	Karantina Amrousieh Nahr Beirut Borj Hammoud	25,161,398	For quantities not exceeding 620,000 tons/y of domestic waste And 73,000 tons of bulky items As well as the importation, installation and operation of a biofilter at the CORAL plant
6854	Supervision of SUKOMI	LACECO	16/6/1998	10 years	Karantina Amrousieh Nahr Beirut Borj Hammoud	4,50% of SUKOMI's billed amounts	
6823	Supervision of landfills	LACECO	16/6/1998	10 years	Amrousieh Bsalim	4,5% of SUKOMI's billed amts.	

Source: CDR Projects Department

Private sector involvement offers the only realistic means of providing a reliable service in the larger urban areas. However, at present there is only limited waste management capability in Lebanon, and very few contractors tendered for Tripoli, Baalbek and Chouf contracts, reflecting the weakness in the sector. However, as the potential profitability of waste collection and management becomes apparent through the Sukkar experience of the Greater Beirut area, this situation may begin to change and a great many companies, both local and international, would want a piece of the action.

4.1.4 Financing Sources

Capital and operating costs of solid waste collection and treatment in the Greater Beirut are financed through the Independent Municipal Fund. Outside Beirut each municipality is responsible for operational costs, but some assistance with equipment costs is provided by the central government. It has been suggested that such central funding gives the government influence over local bodies to encourage them to maintain satisfactory standards of disposal. However, this policy shall no longer stand once collection and disposal at local levels are contracted out to private organizations.

4.1.5 MSW processing Costs

A 1992 estimate for the second largest city in Lebanon, Tripoli, put the cost of collecting and dumping one ton of waste at US\$ 8.6. This was equivalent to a cost of US\$ 2.6 per family and represented only 0.3% of the median Tripoli family income in 1992 (AUB Study-96). In contrast, a 1982 estimate for Beirut put the cost of collection and disposal at 2.5% of the lowest family income, which suggests that some form of cross-subsidy from households with higher incomes is called for.

The costs of processing of waste in engineered sanitary landfills for five towns, outside the Greater Beirut Area, has been estimated to be between US\$ 4.65 and US\$ 6.01/person/yr, or between US\$ 38 and US\$ 49/t (World Bank SWEMP). This estimate is for disposal only, and to this basic cost should be added the capital and operational costs of storage and collection.

In Beirut the cost of managing MSW is around US\$100/t. This does not take into account capital costs but incorporates the collect, collect supervision, sorting, baling and landfilling with the latter's supervision. Should capital costs be taken into consideration then this cost would go up tremendously according to the Sukkar sources.

4.1.6 Cost recovery

With the new plan for landfills under the SWEMP, it is proposed that two-thirds of landfill construction costs should be recovered by a direct charge to the households and one-third should come from municipal taxes. It is not clear how household charges are to be levied. It is suggested that a simple mechanism is to attach a charge to bills for other utility services, water supply or electricity. This conforms to the existing practice of paying back to the municipalities a percentage of the overcharge on the utility bills currently being in place.

4.2 The Greater Beirut Experience

1. General Overview

In the Greater Beirut area, the MSW management is totally contracted out to the Sukkar Group of Companies that are performing the activities of collection (Sukleen), processing (Sukomi) and landfilling (Sukomi). The supervision of the collection is handled by D. G. Jones S.A.R.L. while the supervision of the processing plants and the landfill is done by LACECO.

4.2.1 Greater Beirut Definition

When the Beirut Emergency plan was first implemented in mid 1997, it covered the City of Beirut and its immediate suburbs. Today, the Greater Beirut region, as defined under the Sukleen contract covers the city of Beirut and all the Mount Lebanon Mohafazats excluding Jbeil. This includes the cazas of Kesrewane, Chouf, Metn, Baabda and Aley.

There are towns and villages outside the realm of the Greater Beirut area that are covered under the current collection contract. Those villages and towns are services under the Sukleen contract after having applied and obtained approval from the CDR.

The inclusion under the Sukleen contract was dependent at first on the influence of the area representative and his connections to the CDR decision makers. However, things are different today and inclusions are a function of feasibility.

4.2.2 MSW Collection

The MSW collection within the Greater Beirut area is handled solely by Sukleen under their contract number 1348 that stipulates the following:

- importation/procurement of all vehicles, equipment, and containers in sufficient numbers and designs to suit the requirements of the quantities agreed upon;
- securing the skilled and non-skilled labor, the drivers and the supervisors;
- operating and maintaining all equipment and structures with the procurement of all spare parts, consumables, fuel and insurance;
- equipping and maintaining garages and motor pools as well as laborer quarters;
- administering the clean-up operation with all its administrative and logistics aspects.

MSW collection in the Greater Beirut area is based on a single-haul operation without any transfer stations. Two plants are used for the primary processing. The Amroussieh plant serves the southern suburb of the area while the Quarantina plants handle the remaining sectors.

The collection fleet operating out of Amroussieh comprises the trucks depicted in.

Table 15 - Amroussieh Collection Fleet

Type of Truck	Average weight (t)	Number of Trucks	Trips per Day
Renault	8.5	15	2 - 3
Leach	9.0	5	2 - 3
ERF	18.0	4	1
Mitsubishi	25.0	1	1
Mini Compactor	1.9	12	3 - 4
Pick up	2.25	11	3 - 4
Pick up	1.5	10	1

Source: LACECO 1999 Annual Report

The collection fleet operating out of Quarantine comprises the trucks depicted in

Table 16 - Quarantina Collection Fleet

Type of Truck	Average weight (t)	Number of Trucks	Trips per Day
Renault B-160	5.5	8	3
Leach	6.0	3	2
ERF (medium)	5.5	14	2
ERF (large)	7.5	35	3
ERF (X-Large)	25.0	1	1
Lifter	1.0	2	2
Mini Compactor	1.75	21	5
Pick up	1.2	7	1
Roll off	6.0	2	1

Source: LACECO 1999 Annual Report

Although most collection is scheduled during the evening hours to avoid traffic jams and other logistics problems, some difficulties are still being encountered in the process of collection. These are:

- Intermixing of different container types requiring two types of trucks to visit the same area.
- Lack of suitable location for placing containers resulting in traffic obstruction and pick up difficulties due to parked cars.
- Insufficient capacity in certain container location resulting in over-spillage and area littering.
- Absence of lids on most containers resulting in odors, flies and other insect infestation in the container area.

4.2.3 Processing (extracts from the LACECO Annual Report)

The processing facilities are located at the Amroussieh and Quarantina sites. presents a flow chart illustrating the routing of the MSW through the various process activities at the sites as per the contractual agreements. It further shows the quantities of MSW as measured in the field during the period between June 1, 1998 and May 30, 1999, as reported by LACECO.

At the Quarantina and Amroussieh processing facilities, the average daily quantity of raw MSW received was 1,800 t/d. The routing of this waste was as follows:

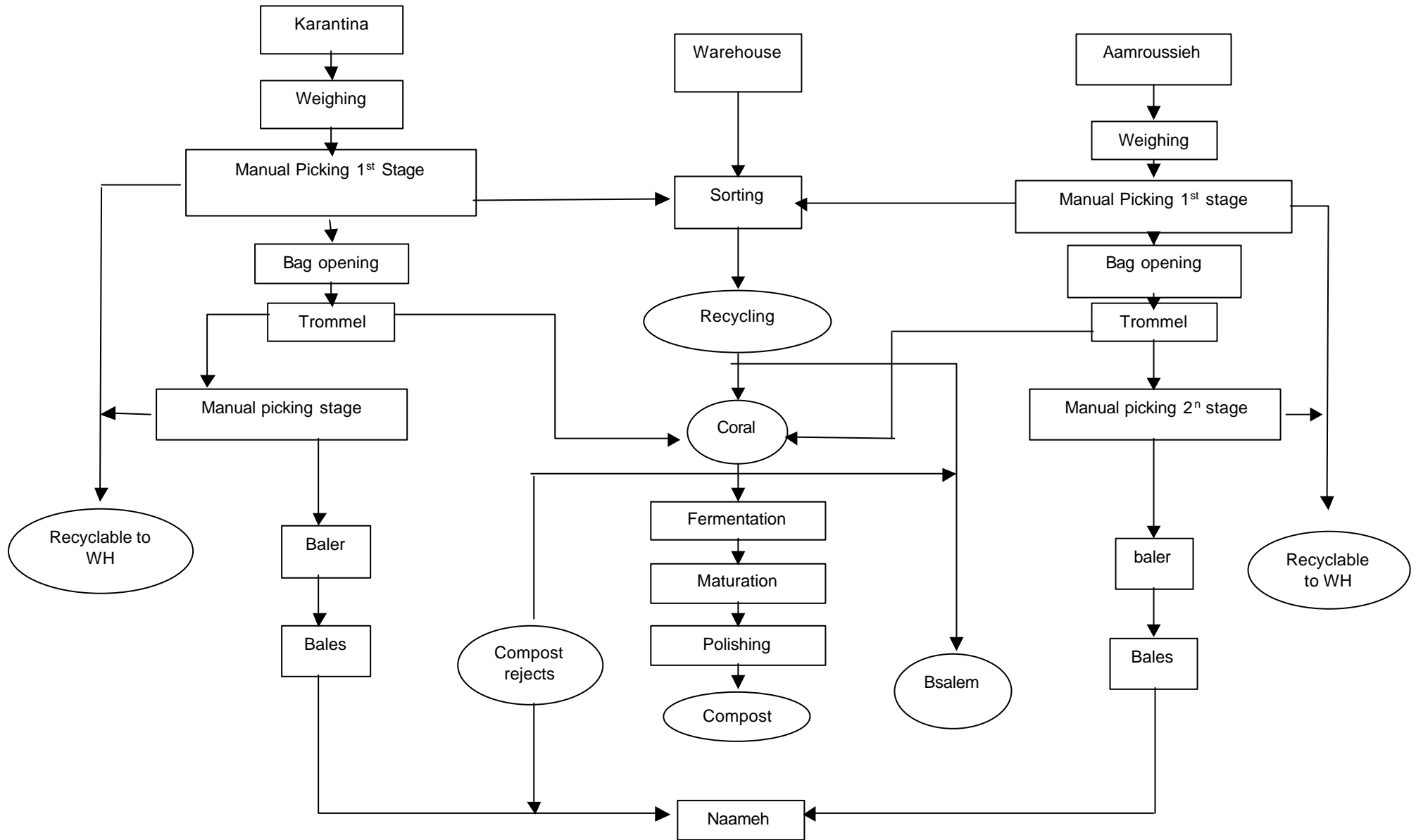
- Transfer of sorted organic material to the Coral 125 t/d facility for composting
- Recovery of recyclable materials (such as glass, 13 t/d cardboard, tin, aluminium and plastic)
- Transfer of bulky wastes to the Warehouse for 3.5 t/d further processing
- Transfer of bulky and inert material to Bsalim 0 t/d landfill
- Transfer of baled rejects to the Naameh landfill 1,652 t/d

Although the contracted amount of MSW to be processed was 620,000 tons/year at both sorting plants, the actual amount processed was 660,000 tons/year. Further increases were noted due to the shut down of the composting facilities for the installation of the biofilter. This resulted in a total increase of processed materials at the two processing plants for the contracted year amounting to 343,246 tons. These were all sent to the Naameh landfill.

It would be interesting to compare the above to the figures established in the emergency plan adopted by the CDR, MoE, and the SIU-3. These are:

- 1700 t/d or 620,000 t/year of incoming solid wastes shall be subjected to sorting at both the Amrousiyeh and Quarantina sorting plants.
- 300 t/d or 109,000 t/year of organic material shall be transferred to the Coral composting plant for further processing. 160 t/d or 58,000 t/year of recyclable materials shall be recovered from the waste stream.
- 1,240 t/d or 452,000 t/year of waste rejects shall be transferred from the sorting plants to the Naameh landfill. After the provision of the additional land for composting, this quantity shall decrease to reach around 690 t/d or 252,000 t/year. The prime contract quantities were originally based upon 400,000 t/year only going to the landfill. 200 t/d or 73,000 t/year of inert and bulky material shall be transported to the Bsalim landfill.

Figure 4 - Greater Beirut MSW Processing



4.2.3.1 Amroussieh Sorting Plant (extracts, LACECO Annual Report)

The Amroussieh processing facility is located southeast of Beirut, in a growing and densely populated area. The general area was to be the site of an incinerator with a total capacity of about 200 t/d. The incinerator was relatively old and resulted in severe environmental disturbance to the neighbouring community that led to its shut down.

The site was later transformed under contract 2238 – Plan d’urgence pour le traitement des déchets solides du Grand Beyrouth – into a two-line solid waste processing facility which was then modified under contract 2378 to a two line waste treatment facility that includes the following activities:

- Weighing of the entering waste at the entrance weighbridge.
- Receiving area for the emptying of trucks.
- Manual picking for the removal of big and bulky items.
- Bag opening.
- Mechanical separation (trommel) and transfer for composting.
- Manual sorting for the recovery of recyclable materials.
- Baling and wrapping of waste rejects for sending to the Naameh landfill.

Raw MSW, after being weighed on a platform scale, is deposited in the receiving area where manual picking of cardboard and glass is practised. Conveyor belts carry the waste stream into the bag-opening machine, where bags are torn with blades to prepare the waste for the subsequent mechanical separation in a Trommel.

In this equipment, large sized materials are separated from non-recyclable small sized organic materials, which are transported to the Coral site for composting. After the Trommel, the waste stream is conveyed towards the baling machine. Hand pickers remove recyclable materials all along the conveyor belts leading into the baling system where the remaining waste are compressed, enveloped with a thin white plastic film, and briefly stored before being transported in the form of bales to the Naameh landfill.

At the Amroussieh processing facility, the average daily quantity of raw MSW received was 582.9 t/d. The routing of these wastes is as follows:

- Transfer of sorted organic material to the Coral facility for 43.3 t/d composting
- Recovery of recyclable materials (such as glass, 4.8 t/d cardboard, tin, aluminium and plastic)
- Transfer of bulky wastes to the Warehouse for further 1.72.1 t/d processing
- Transfer of bulky and inert material to Bsalim landfill 0 t/d
- Transfer of baled rejects to the Naameh landfill 519.3 t/d

4.2.3.2 Quarantina Sorting Plant (Extracts, LACECO Annual Report)

The Quarantina processing facility is located along the seashore, north-west of Beirut, not far from densely populated residential areas (Quarantina, Bourj Hammoud). Similar to Amroussieh, the Quarantina facility was the site of an incinerator with a total capacity of about 150-200 t/d. The incinerator was relatively old and resulted in uncontrolled air emissions and was shut down by the government.

This facility was initially conceived as a processing and composting facility however, the fermentation operations were cancelled and were transferred to the Coral composting facility.

The site was transformed under contract 2238 – Plan d’urgence pour le traitement des dechets solides du Grand Beyrouth – into a two-line solid waste processing facility which was later modified under contract 2378 to a four line solid waste treatment facility.

The activities performed at the Quarantina plant include the following:

- Weighing of the entering waste at the entrance weighbridge.
- Receiving area for the emptying of trucks.
- Manual picking for the removal of big and bulky items.
- Bag opening.
- Mechanical separation (trommel) and transfer for composting.
- Manual sorting for the recovery of recyclable materials.
- Baling and wrapping of waste rejects for sending to the Naameh landfill.

The operation at Quarantina is similar to that described earlier for Amroussieh.

At the Quarantina processing facility, the average daily quantity of raw MSW received was 1,227 t/d. The routing of these wastes is as follows:

- Transfer of sorted organic material to the Coral facility for composting 81.7 t/d
- Recovery of recyclable materials (such as glass, 8.3 t/d cardboard, tin, aluminium and plastic)
- Transfer of bulky wastes to the Warehouse for storage 1.8 t/d
- Transfer of bulky and inert material to Bsalim landfill 0 t/d
- Transfer of baled rejects to the Naameh landfill 1,113.6 t/d

4.2.4 Coral Composting Plant (Extracts, LACECO Annual Report)

Similar to the Quarantina site, the Coral facility is located along the seashore, Northwest of the city of Beirut, not far from densely populated residential areas (Quarantina, Bourj Hammoud). This facility was initially conceived for compost maturation and polishing. Fermentation processes were transferred from the

Quarantina to the Coral under contract 2238 – Plan d'urgence pour le traitement des déchets solides du Grand Beyrouth.

The process components available at the Coral composting plant include:

- Weighing of the entering waste at the entrance weighbridge;
- unloading of the trucks in the waste receiving area;
- introduction of the organic material inside the fermentation hall via the conveying system;
- aeration and turning of windrows;
- transfer of the mature organic material for polishing;
- production of mature polished compost ready for marketing.

Early during the month of May 1998, this facility was shut down for the construction of the Biofilter odour control system. The system installation was completed during the month of October of that same year, however the plant was not operational until 9 November 98. The reasons were due to the presence of offensive odours from the nearby abattoirs that would have resulted in negative public feelings toward the Coral plant.

The objectives of the bio-filter were to treat and dampen the odour generated during the fermentation process of the organic material. The biofilter is built as a set of parallel tunnels. Each tunnel is 6 m wide and 42 m long. The grid floors is placed 0.6 m above ground and the total height of the housing is 3.9 m. There are two set of tunnels facing each other, each consisting of four inner tunnels next to each other. Between the two sets, which are placed with the short side to each other, the ductworks are located to connect the biofilter with the fans.

The total surface of the installation is 2064 m². The fans and humidifiers are placed on top of the concrete housing and the ducts run inside the biofilter at the outer sides of the tunnels. Control of the different parameters of the biofilter media is made through PLCs. These could be checked and read from the newly constructed control room next to the office building at the rear side of the plant.

Over the past period, the delivered quantity of substrates potentially suitable for composting was very large. Problems were encountered due to insufficient maturation period. This was in addition to the overlapping of raw materials, creating anaerobic conditions that resulted in the accumulation of leachate at the base of the piles and the dispersion of objectionable odours. This necessitated a review of the design and a reduction in the quantities of compostable organic material delivered to the plant.

The general criteria that were developed are the following:

- The capacity of the composting plant is set to be 300 t/d. One third of this quantity (100 t/d) is received from the Amroussieh sorting plant while two thirds (200 t/d) is received from the Quarantina sorting plant.
- The dimensions of the windrows are 4.5 m wide and 3.0 to 3.5 m high. The length of each windrow is 160 m. When filled, the hall will contain 12 windrows (fermentation and maturation).
- Filling of the windrow takes 5 to 6 days.
- Aeration of the windrow is achieved using a Scatt turning machine. This machine allows to turn the windrow, and to aerate it in place. In addition, blowers will assist in the forced aeration, when needed.

- The time frame for the composting cycle is around 65 to 70 days.
- A system of leachate treatment is still under development. However, leachate is being processed by the methods for the short-term leachate treatment system, which involves the batch processing by aeration and flocculation to reduce the primary chemical activity of the effluent.

During this period, the organic wastes received at the plant were coming from both the Quarantina and Amroussieh sorting plants.

The total amount of organic material received at the Coral composting plant was 45,648.6 tons, of which 34.7 % came from Amroussieh, while 65.3 % came from the Quarantina sorting plant.

7,814.1 tons of compost was produced during this period. Compost rejects amounting to 7,469.2 tons were transferred to the landfill. Meanwhile, 6,794 tons of compost was delivered since the process start in November 1998.

4.2.5 Warehouse Storage Facility (Extract, LACECO Annual Report)

The Warehouse storage facility is located along the seashore, Northwest of Beirut, next to the entrance of the old Bourj Hammoud dumping site. This facility was initially conceived for the storage of bulky and recyclable materials.

The facility was constructed and equipped under contract 2238 – Plan d'urgence pour le traitement des déchets solides de Beyrouth. Some minor modifications were implemented under contract 2378.

This facility was initially conceived for the storage of bulky and recyclable materials. All the stored materials are either sold to recycling agents or manufacturers or are transported to Bsalim landfill after being sorted on site. Wastes are transferred to Bsalim landfill either as bulky material or as shredded material (tires and wood).

During the reporting period, the total amount of waste material received at the Warehouse storage facility was about 80,304.4 tons, thus resulting in an average of about 220 t/d. The major contribution of wastes transported to the Warehouse was attributed to the collection from the streets.

The mass balance of the daily quantity of waste that was handled at the Warehouse storage facility is represented as follows:

- The total amount of recyclable material transported out of the Warehouse to the customers was 7.1 % of the total amount of waste that was transported out of this facility.
- The total quantity of bulky and shredded material transported from the Warehouse to the Bsalim landfill is equivalent to 90.8 % of the total waste transported out of this facility.
- The amount of waste transported out of this facility as refused waste amounted to 1.5 % of the total waste transported out of this facility.

SECTION 5 PRACTICES

5.1 General Overview

The Swiss law on environmental protection defines waste as “all movable property which the owner wishes to dispose of or whose reclamation, neutralization or disposal is necessary in the public interest”.

Solid waste in general includes all the rejected solid material from agricultural, industrial and municipal activities. This document however deals with the Municipal Solid Waste MSW generated generally throughout the entire country and specifically from the Greater Beirut area.

Effective MSW management involves the collection, processing, utilization and disposal of solid waste in the most economical way consistent with environmental and public health protection. It further

involves the control of waste generation through waste minimization programs implemented through public awareness programs.

The sources of solid waste can be classified as follows:

- Residential
- Commercial
- Industrial
- Agricultural
- Institutional
- Construction/Demolition
- Treatment plants.

The nature of waste is important and can be classified as:

- Organic
- Inorganic
- Putrescible
- Non-putrescible
- Combustible
- Non-combustible.

Municipal Solid Waste includes all community waste with the exception of agricultural and industrial waste. These entail the putrescible or biodegradable food waste referred to as garbage and the non-putrescible materials referred to as rubbish. The rubbish may contain material that is combustible or noncombustible. Furthermore, rubbish could contain, in some cases, small amounts of hazardous waste from household materials.

5.2 Waste Generation Rates

Two main factors, urbanization and industrialization affect MSW quantities generated in a community. Urbanization, i.e. the influx of people to metropolitan areas affects the way people live that denotes the waste characteristics.

Industrialization on the other hand has created a “throwaway” society where it is cheaper to get rid of packaging material, appliances and other items, instead of reclaiming them. “Throwaway” has resulted in the direct increase of MSW quantities and variety along with the main contributor of this increase the packaged-and-processed food industry.

Other factors have also contributed to the increase in quantity and variety of MWS. These are:

- *Per capita income* – It has been noticed that the lower income category produced less total waste but with a higher food content.
- *Trends in lifestyles* – With the increase of the two-income households, eating habits and food preparation have changes resulting in an increase of food packaging material.
- *Degree of urbanization* – Residents of large cities tend to generate more waste than residents of smaller cities on a per capita basis although the families tend to be smaller in size.
- *Prevalence of built-in garbage grinders* – Grinders reduce the amounts of organic waste in MSW through the process of liquefaction and disposal in the sewage system.
- *Seasonal variations* – These have shown to directly affect the waste generation rates by affecting the waste composition. Organic waste from fruits and vegetables tend to increase in summer.
- *Frequency of collection* – With more frequent collection, there is a tendency to generate more waste at the household level.

5.2.1 MSW Generation in Non-Arab Countries

For the purpose of practicality, estimates of MSW quantities shall be based on the amount of waste generated per person per day. Although the amount of waste generated may be different from the amount of waste collected, we shall ignore this difference and base the MSW quantities strictly on amount collected.

It should be noted that in wet regions, due to moisture absorbed by the solid waste, the amount collected might be more than the amount generated. The opposite stands for dry regions.

Furthermore, with the use of kitchen built-in sink grinders, the practice of on-site storage of recyclable material and several other conservation methods here again collected amounts might be less than generated amounts.

Reflects that different amounts of MSW generated per person in various countries around the world. These figures are based on a WHO survey conducted on MSW in 1995. We feel that these figures still stand today.

Table 17 - MSW Rates in Various Countries

COUNTRY	kg/per/day
India	0.3 - 0.55
Philippines	0.4
Brazil	0.54
Indonesia	0.6
Argentina	0.6 – 1.0
Mexico	0.68
Venezuela	0.91
Japan	0.91
Singapore	1.0
Austria	1.18
France	1.43
United Kingdom	1.55
Sweden	1.6
Honk Kong	1.68
Australia	1.87
Korea	2.0
New Zealand	2.0
Canada	2.8
USA	2.9

Source: 1995 MSW WHO survey

As seen from the above, the quantities generated per person varied from 0.3 kg/day in countries like India to as high as 2.9 kg/day in Canada and the USA.

The above rates clearly indicate an obvious increase of MSW generated quantities as the country is more industrialized and economically developed. The range of values however, depends on the period in which data were reported and the industrial operations considered in each country.

5.2.2 MSW Generation in Arab Countries

Typical MSW quantities for some Arab countries are represented in as per the WHO 1995 survey and a UNPD 1994 study. These values, as depicted, vary from one country to another and from one city to another within the same country ranging from 0.2 to 1.9 kg per person per day.

The Arabian Gulf states show an average amount of 1.6 kg/per/day as opposed to other Arab countries, which is about three times the average amount of 0.6 kg/per/day. These amounts are generally lower than those of the USA and Canada that are estimated at 2.9 kg/per/day as reported by Tchobanoglous et al. (1993). However, the rates are close to those generated in the Western European continent.

The rates shown in have been compiled from various sources as indicated in the reference column.

Table 18 - MSW in Arab Countries

Country / City	Population (Million)	Generation Rate (kg/per/day)	Year	Reference
BAHRAIN	0.35	1.26	1984	ROPME (1984)
EGYPT	51.00	0.67	1988	WHO (1995)
Cairo	8.10	0.81	1988	WHO (1995)
Alexandria	2.70	0.5	1988	WHO (1995)
Port Said	0.37	0.73	1986	WHO (1995)
JORDAN	--	0.55	1991	Natour (1993)
Amman	1.4	0.60	1991	Natour (1993)
Irbid	0.17	0.78	1986	Abu-Qdais (1987)
KUWAIT	1.69	1.62	1984	ROPME (1984)
Kuwait	--	1.37	1995	Koushki et al. (1995)
MOROCCO	25	0.33	1990	Naji (1993)
OMAN	2.0	1.46	1984	ROPME (1984)
QATAR	0.49	1.44	1984	ROPME (1984)
SAUDI ARABIA	1.28	1.58	1984	ROPME (1984)
SYRIA	14	0.29	1993	WHO (1995)
Damascus	4	0.2 - 0.33	--	WHO (1995)
TUNISIA	8	0.5	1993	WHO (1995)
Greater Tunis	1.8	0.9	1993	WHO (1995)
Sousse	0.7	0.75	1993	WHO (1995)
U.A.E.	2.0	1.6	1995	Hamoda (1994)
Abu Dhabi	0.7	1.76	1995	Abu-Qdais et al. (1987)
Dubai	0.6	1.91	1994	UNDP (1994)
YEMEN	15	0.3 - 0.6	1993	El-Zaemey (1994)

Source: WHO 1995

There is a considerable difference in the MSW amounts generated in the Arab countries. This is due to the increase in the per capita income and in the difference in lifestyles.

The average MSW generation rate in the Arab world, extrapolated over the entire region, as estimated by the WHO is about 0.6 kg/per/day. This includes the two extremes in the rate generation spectrum.

The amounts of MSW in the Arab countries are on the increase with the increase in the population. The WHO estimated that the generation of MSW would about double by the year 2005 in many Arab countries. Moreover, as the economic growth continues in most of these countries over the next decade, so would the MSW generation per person by about 40%.

5.2.3 MSW Generation in Lebanon

Until very recently the available information and data on the generation rates of solid waste by various communities throughout the country and the characteristics of waste generated are generally still very unreliable and imprecise. (see MSW historical background at end of this section)

Recently a hand-full of organizations have conducted scientific research and studies in order to remedy this situation and come up with beneficial information in order to develop appropriate programs for solid waste management. The figures and information depicted in this study are adopted from research results whenever relevant.

5.2.3.1 National Solid Waste Generation

The Department of Civil and Environmental Engineering of the American University of Beirut (AUB) undertook a study for the cities of Beirut and Tripoli. The studies were carried out over a period of two years and included two field surveys. One survey covered the dry season in 1994 and the other covered the wet season in 1995/1996.

- Dry Season Survey

Collection and weighing of refuse generated at the household levels were conducted by AUB students from the Faculty of Engineering and Agriculture throughout the different regions in the country. The total number of students was 216 representing the same number of households, one student per household.

The student surveys covered a population of 1,129 residents distributed among a number of communities throughout the country. The results of these surveys were consolidated and are reflected in Figure 5.

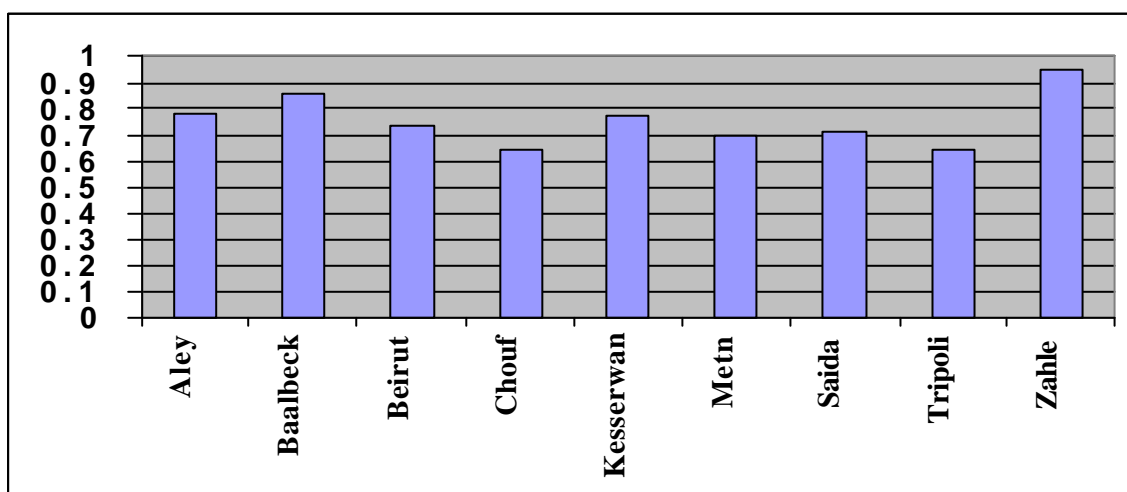


Figure 5 - Comparative Nat'l Rates (Dry Season) kg/per/day

Source: AUB study depicts the national solid waste generation rate per person per day as obtained from the AUB dry season survey.

Table 19 - National Generation Rates for Solid Waste-Dry Season

Casa	Sample	Mon (kg)	Tue (kg)	Wed (kg)	Thu (kg)	Fri (kg)	Sat (kg)	Sun (kg)	Ave (kg)
Aley	7	0.6	0.62	0.79	0.96	0.97	0.69	0.81	0.78
Baalbek	17	0.8	0.92	0.96	0.79	0.93	0.86	0.75	0.86
Beirut	74	0.7	0.68	0.75	0.76	0.81	0.73	0.71	0.74
Chouf	8	0.7	0.56	0.72	0.62	0.58	0.68	0.66	0.64
Keswan	12	0.7	0.75	0.71	0.82	0.78	0.89	0.78	0.77
Metn	45	0.7	0.68	0.71	0.78	0.69	0.69	0.68	0.7
Saida	12	0.7	0.83	0.64	0.73	0.68	0.79	0.68	0.71
Tripoli	15	0.6	0.56	0.68	0.68	0.61	0.65	0.61	0.64
Zahle	11	1.0	0.97	0.86	0.95	0.88	0.93	0.97	0.95
Average		0.7	0.7	0.75	0.78	0.77	0.75	0.73	0.75
Min		0.6	0.62	0.64	0.62	0.61	0.65	0.61	
Max		1.0	0.97	0.96	0.96	0.97	0.93	0.97	

Source: AUB study 1994

The dry season survey took place during the months of April to September inclusive. The survey was carried out on a daily basis spread out over an interval of two weeks and repeated each month.

The highest daily generation rate of 0.95kg per person was recorded for the Caza of Zahle. In contrast, the Cazas of Chouf and Tripoli yielded the lowest rate of 0.64kg per person. The national average generation amounted to 0.75kg per person, a value that corresponds with that for the city of Beirut.

It should be noted that the number of samples collected from different Cazas varied appreciably from 7 to 74. Therefore it should be realized that statistical validity is expected to vary from one Caza to another.

- **Wet Season Survey**

Similar to the dry season survey, collection and weighing of refuse generated at the household levels were conducted by the same AUB students from the Faculty of Engineering and Agriculture throughout the different regions in the country. The total number of students was 117 representing the same number of households, one student per household.

The student surveys covered a population of 768 residents distributed among a number of communities throughout the country. The results of these surveys were consolidated and are reflected in .

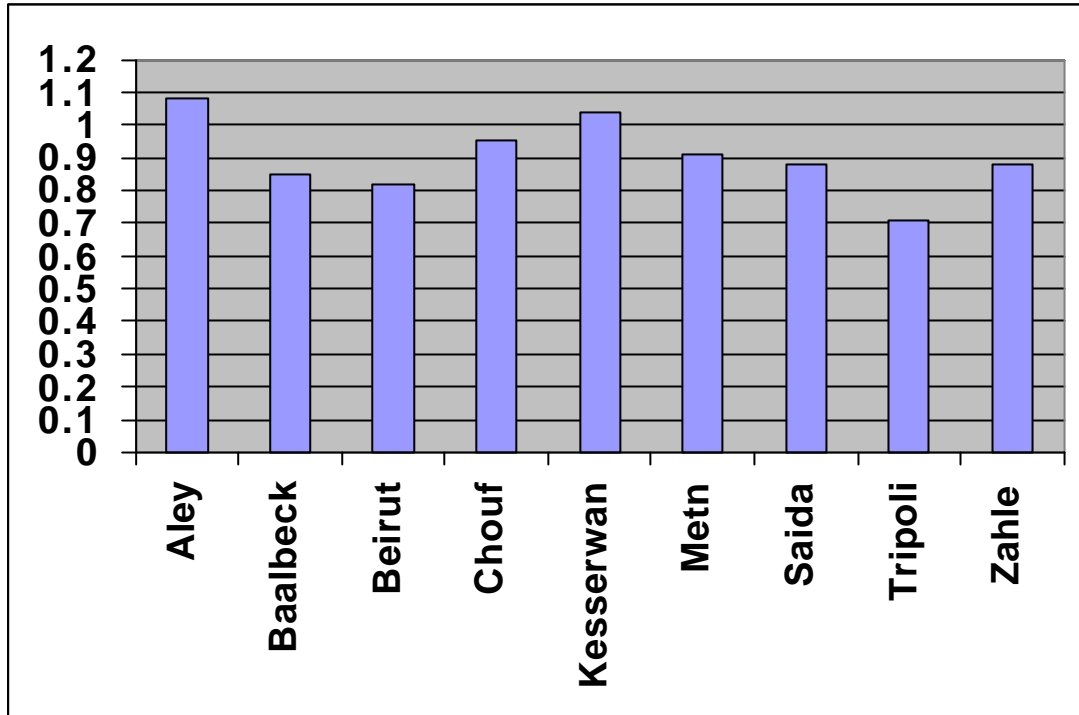


Figure 6 - National Comparative Rates (Wet Season) kg/per/day

Source: AUB study 1994

The wet season survey took place during the months of December to February inclusive. The survey was carried out on a daily basis, on waste collected directly from the homes, spread out over an interval of two weeks and repeated each month.

The highest daily generation rate of 1.08kg per person was recorded for the Caza of Aley. It should further be noted that the wet survey took place during the holy month of Ramadan, with the rainwater weight, has resulted in higher than average weights for similar ordinary months. This explains the relatively high numbers obtained.

Table 20 - Depicts the national solid waste generation rate per person per day as obtained from the AUB wet season survey

Casa	Mon (kg)	Tue (kg)	Wed (kg)	Thu (kg)	Fri (kg)	Sat (kg)	Sun (kg)	Ave (kg)
Aley	0.92	0.97	0.94	0.99	1.00	1.16	1.61	1.08
Baalbek	0.74	0.93	0.61	0.68	0.80	1.01	1.18	0.85
Beirut	0.84	0.87	0.80	0.83	0.78	0.89	0.76	0.82
Chouf	0.89	0.92	0.83	0.94	0.95	1.09	1.07	0.95
Keswan	0.83	0.95	1.10	1.23	1.06	1.34	0.81	1.04
Metn	0.89	0.87	0.88	0.92	0.94	0.99	0.86	0.91
Saida	0.93	0.86	0.79	0.93	1.07	0.86	0.86	0.88
Tripoli	0.68	0.67	0.70	0.66	0.72	0.82	0.75	0.71
Zahle	0.94	0.85	0.80	0.92	1.05	0.88	0.86	0.88
Average	0.84	0.88	0.83	0.90	0.91	1.02	0.99	0.91
Min	0.68	0.67	0.61	0.66	0.72	0.82	0.75	
Max	0.93	0.97	1.10	1.23	1.07	1.34	1.61	

Table 20 - National Generation Rates for Solid Waste - Wet Season
(kg/person/day)

Source: AUB study 1994

- Annual Weighted Rates

Both the wet and dry season surveys were consolidated and a seasonal weighted generation rate was calculated taking into account the weather trends during months where no sampling took place. Consideration was given to the fact that these months are neither all wet nor all dry. The results are depicted in and respectively

It should be noted that the national weighted annual generation rate obtained came to 0.83kg per person per day. Aley rated the highest with 0.92kg per person per day while Tripoli rated the lowest with 0.67kg per person per day.

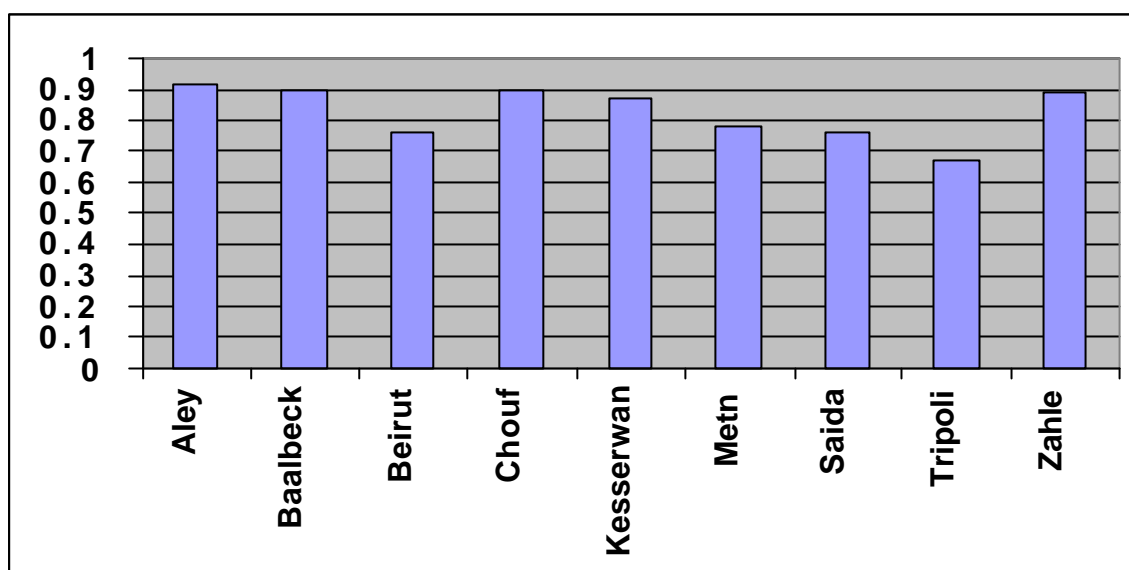


Figure 7 - Weighted Annual Generation Rate (kg/person/day)

Source AUB study 1994

The inevitable statistical outcome of the following table could be attributed to the fact that the number of households surveyed in summer is much larger than that of winter.

Caza	Summer Generation Rate	Winter Generation Rate	Weighted Annual Generation Rate
Aley	0.78	1.08	0.92
Baalbeck	0.85	0.94	0.89
Beirut	0.74	0.82	0.76
Chouf	0.86	0.95	0.90
Keserwan	0.77	1.04	0.87
Metn	0.70	0.91	0.78
Saida	0.74	0.84	0.76
Tripoli	0.64	0.71	0.67
Zahle	0.93	0.88	0.90
AVERAGE	0.78	0.91	0.83

Table 21 - Weighted National Generation Rate for Solid Waste (kg/person/day)

Source AUB study 1994

It is then based on the above scientific surveys and further confirmation by specialists in the field that the adopted rate of MWS generation per person per day for this study shall be 8.3 kg.

Based on the above, an extrapolation of a detailed rate generation has been established taking into consideration previous data relating to population in the various regions of the country.

Is based on the figures generated by the CAS and the AUB study on MSW generation rates in Lebanon. The adopted generation rate in this table is 8.3 kg per person per day.

Table 22 - MSW Generation for Lebanon

Area	1997 (000)	MSW (kg/day)
GREATER BEIRUT AREA	1,253	1,039.64
City	430	356.96
Suburbs	823	682.68
MOUNT LEBANON	747	620.21
Jbeil	71	58.90
Kesrewan	168	139.21
Metn	132	109.76
Baabda	27	22.31
Aley	156	129.40
Chouf	194	160.63
NORTH LEBANON	828	687.14
Tripoli (city)	823	267.72
Tripoli (caza)	57	47.30
Akkar	208	172.23
Zgharta	75	62.47
Koura	90	74.96
Bechare	24	19.63
Batroun	55	45.51
SOUTH LEBANON	683	566.67
Saida (city & suburbs)	101	83.89
Saida (caza)	118	98.16
Jezzine	27	22.31
Sour	195	161.52
Bint Jbeil	34	28.56
Nabatieh	124	102.63
Hasbayya	32	26.77
Marjayoun	52	42.83
BEKAA	495	410.50
Zahle (city)	86	71.39
Zahle (caza)	82	67.82
Hermel	37	30.34
Baalbek	190	157.95
West Bekaa	68	56.22
Rachayya	32	26.77
TOTAL LEBANON	4,005	3,324.17

The rate obtained in Table 22 can be confirmed by a mere comparison between them and the amounts collected by Sukleen and confirmed by D. G. Jones for the Greater Beirut area including most of Mount Lebanon with the exception of Jbeil. Further confirmation can be obtained from the amounts processed by Sukomi and checked by LACECO.

We feel that these figures are representative of the entire population since they constitute over 40% of the population.

5.3 MSW Composition

Since MSW is generated from various sources, it is composed of many types of material that ranges from specks of dust to discarded vehicles. However, the major components of MSW are food waste, paper products, plastics, metals, textiles, glass, wood, rubber, garden trimmings and other components.

The composition of MSW varies throughout the year with season climate, it varies within the same city due to different area demographics and lifestyles affected by income, education, culture and social class. The waste in urban areas often differs from that in suburban areas within the same country.

The methods for analyzing the MSW composition depend on the purpose of the analysis. The parameters considered are different and the accuracy established is also different.

Composition for the purpose of this study is expressed in terms of the percentage of the wet weight that is contributed by the particular component. The MSW compositions adopted are based on analysis after collection as opposed to “at point of generation”.

5.3.1 MSW Composition in Non-Arab Countries

In order to better understand the trends of waste composition in Lebanon, an overview of MSW composition throughout the world must be presented and used for comparative purposes. reflects the MSW composition in various countries.

Table 23 - MSW Composition in Various Countries

COUNTRY	Waste Component (%by weight)						
	FOOD	PAPER	PLASTIC	METAL	GLASS	TEXTILE	OTHERS
CANADA	15.0	45.0	4.7	10.0	10.0	NA	15.3
FRANCE	24.0	30.0	6.9	4.0	4.0	NA	31.1
GERMANY	29.9	20.0	5.0	5.0	10.0	2.0	28.1
INDIA	65.0	3.0	0.5	0.4	0.2	NA	30.9
INDONESIA	82.0	2.0	3.0	4.0	0.5	NA	8.5
IRAN	70.7	10.3	5.7	1.4	2.8	2.8	6.3
JAPAN	37.0	25.0	5.0	3.0	3.0	NA	27.0
NIGERIA	76.0	6.6	4.0	2.5	0.6	NA	10.3
PERU	34.3	24.3	2.9	3.4	1.7	NA	33.4
PHILIPPINES	72.0	5.0	1.0	0.1	0.2	3.0	18.7
SWEDEN	12.0	55.0	4.0	6.0	15.0	NA	8.0
U.K.	28.0	37.0	3.0	8.0	8.0	3.0	13.0
U.S.A.	8.4	42.0	6.9	9.4	9.0	1.8	22.5

Source: Tchobanoglous (1993)/WHO (1995)/UNDP (1994)

From the above table 23, it is evident that MSW composition varies drastically from country to country due to industrialization and level of development. The difference is very sharp when it comes to food waste and packaging products such as paper, plastics and glass.

5.3.2 MSW Composition in Arab Countries

Reflects the MSW composition in Arab countries. The food waste occupies 5th the highest rate positions regardless of the industrialization or development level.

Table 24 - MSW Composition in Arab Countries

COUNTRY	Waste Component (% by weight)						
	FOOD	PAPER	PLASTIC	METAL	GLASS	TEXTILE	OTHER
EGYPT	51.0	16.5	3.7	3.3	1.8	3.1	20.6
JORDAN	49.5	25.9	6.6	2.5	3.3	NA	6.6
KUWAIT	51.1	18.6	13.4	5.0	4.5	NA	7.4
MOROCCO	67.5	19.0	2.5	2.0	1.0	NA	8.0
S. ARABIA	53.0	24.0	2.0	9.0	8.0	NA	4.0
SYRIA	60.0	11.0	2.5	3.0	3.0	NA	20.5
QATAR	53.3	17.7	15.0	4.3	3.1	NA	6.6
U.A.E.	47.0	12.0	13.0	9.0	9.0	NA	10.0
YEMEN	47.0	9.0	9.0	5.0	3.0	NA	27.0

Source: Abu-Qdais (1997)/WHO (1995)/UNDP (1994)

5.3.3 MSW Composition in Lebanon

Several studies were conducted at various times for the analysis of the MSW composition in Lebanon. Some were done at the source, some were done at the primary deposit stage and some at the processing plants. The following are the results obtained:

5.3.3.1 The AUB Study

The AUB study determined the composition of solid waste throughout sampled regions within the Greater Beirut area and the city of Tripoli by sorting and separating the refuse components present in random batches obtained from the surveyed areas. Separation was performed daily for a period of seven days, distributed over the days of the week, and spanned over a period of three months both during the wet and the dry seasons.

In situ separation was achieved on batches ranging in weight from 113 to 217kg. The components were categorized as plastics, metal, glass, textile, paper and cardboard, organic materials and, others. The results are depicted in .

Table 25 - MSW Composition

Components	Summer (%)	Winter (%)	Annual (%)
Organic material	62.4	61.03	61.7
Paper & cardboard	11.3	16.14	13.7
Plastics	11.4	10.87	11.1
Metals	2.9	2.63	2.7
Textiles	4.2	2.4	3.3
Glass	5.6	4.84	5.2
Others	2.6	2.04	2.3
Moisture content	63.2	65.3	64.2

Source: AUB Study 1994

5.3.3.2 LibanConsult/Creed Study

A study conducted in 1995 by LibanConsult, a Lebanese consulting firm to the Council of Development and Reconstruction, in association with Creed International has yielded results concerning the composition of solid waste in Lebanon. This is illustrated in.

Table 26 - Waste Composition

Composition	Percentage
Organic material	52 to 63%
Paper & cardboard	15 to 18%
Plastics	10 to 12%
Metals	2 to 4%
Textiles	2 to 4%
Glass	7 to 9%
Others	2 to 3%
Moisture content	55 to 65%

Source: LibanConsult/Creed Study 1995

It should be noted that the sampling in this case was done during the summer months where the consumption of fruits and vegetables increases considerably in comparison with winter months. However, since the collection bins are open, the winter rainwater would increase the refuse humidity and therefore its weight.

The LibanConsult Study concluded that the waste composition in all cities around the country is very close to the national average that was determined based on survey conducted in the following cities:

South Lebanon:	Saida, Sour and Nabatieh
Mount Lebanon:	Jounieh, Broumana and Bikfaya
North Lebanon:	Tripoli, Bishmezzine and Byblos
Bekaa:	Zahle and Baalbek
Beirut:	Achrafieh, Ras Beirut and Bourj el Barajneh

5.3.3.3 Sukomi Sampling Survey

The most up-to-date survey (Winter 1998) was conducted by Sukomi, the Sukkar Group Affiliate responsible for operating the sorting and processing plants within the Greater Beirut area. The two plants operated by Sukomi receive about 2,000 Tons of garbage per day which constitutes about one third of the total garbage generated throughout the country.

The collection undertaken by Sukleen, a sister company to Sukomi, covers all of Beirut and its immediate suburbs, parts of the Metn, parts of Keserwan and, parts of the Chouf. This covers all classes of the population and represents a very accurate representative population for the entire country.

The Sukomi surveys, conducted at different intervals throughout the year represent the MSW composition both in winter and in summer. It should further be noted that the survey was conducted after reception of the waste at the sorting plants. This meant that in certain cases scavengers had already gone through the waste and collected what they wanted. This mainly involves carton, recyclable plastics, aluminum cans and glass.

Depicts the generalized results of the Sukomi winter and summer surveys and estimates an average annual result on the basis on the two seasons surveys.

Table 27 - Sukomi 1998 survey (G B area)

Components	Summer 98 (%)	Winter 98 (%)	Annual 98 (%)
Organic material	70.6	52	61.3
Paper & cardboard	7.2 ^a	16.9	12.05
Plastics	3.3	3.6	3.45
Metals	2.6	2.8	2.7
Textiles	1.5	3.4	2.45
Glass	3.1	4.6	3.85
Others†	11.7	16.7	14.2

Source: LACECO Annual Report

† Others include Styrofoam, diapers nylon, shoes and wood.

^a The discrepancy between the rates obtained for the summer and those obtained for the winter could be due to that fact that scavengers are very active in the summer and only collect carton that is clean and dry. In winter, the carton is wet. It is therefore left in the containers thus reaching the processing plants.

It should further be noted that the Sukomi figures reflect the waste sorted at the plant level and do not represent the actual waste generated due to the fact that scavengers collect such recyclable items as cardboard, aluminum cans and water bottles (PVC). The quantities scavenged are discussed in a later section.

5.3.4 MSW Composition Analysis

A better understanding of the MWS composition factors necessitate a comparative exercise between the MSW composition in low, middle and high-income countries. This would allow us to position ourselves in terms of the rest of the world, our neighbors and countries at the same stage of development.

Represents the MSW composition is the three-income level countries.

Table 28 - MSW Composition Analysis

Component	Low-Income Countries	Middle-Income Countries	Upper-Income Countries
Organic			
Food Wastes	40 – 85	20 - 65	6 - 15
Paper/Cardboard	1 – 10	8 - 30	20 - 45
Plastics	1 – 5	2 - 5	2 - 8
Textiles	1 – 5	1 - 4	2 - 6
Rubber	1 – 5	1 – 4	0 – 2
Leather			0 – 2
Yard wastes			10 – 20
Wood	1 – 5	1 - 4	1 - 4
Inorganic			
Glass	1 – 10	1 - 10	4 - 20
Tin cans			2 - 8
Aluminum	1 – 5	1 - 5	0 - 1
Other metal			1 - 4
dirt, ash, etc	1 – 40	1 - 30	0 - 10

Source: P. Hermens (Ministry of Housing, Spatial Planning & Environment) The Netherlands

5.3.5 MSW Moisture Content

Moisture content of MSW varies depending on the composition of the waste and the weather related factors such as temperature, humidity and precipitation as depicted in where a comparison is made.

Table 29 - MSW Moisture Content

COMPONENT	MOISTURE CONTENT (%)		
	Range	Typical	Lebanon
Food Waste	50 – 80	70	75
Paper	4 – 10	6	5
Plastics	1 – 4	2	3
Metals	2 – 6	3	3
Glass	1 – 4	2	2
OVERALL	15 – 50	40	65

Source: AUB Study 1994

5.3.6 MSW Composition Comparison

And depict the MSW composition in the USA, the Arab countries and Lebanon respectively. This comparison allows a better understanding of the trends and peculiarities of MSW related issues in Lebanon.

In it it is clear that the content of organic matter in Lebanon's MSW is much higher than that of the USA and slightly higher than that in average Arab countries. The rest of the components in the waste are somehow comparable to those of the Arab neighbors.

5.3.7 MSW General Analysis

Several field studies have been conducted in various countries to determine the MSW generation rates and composition and to construct models to yield forecasts of daily quantities. These studies have shown the following:

- Household related factors such as family size, family income and level of education of family members directly affect the quantity and composition of MSW generated by the family;
- the average quantity generated per person is best estimated between 0.8 and 0.85 kg per day. This is based on results of many studies conducted on the subject;
- the rate of MSW generation reported by the household is usually more than that reported by the organism processing the waste, this due to considerable amounts of recyclable material being scavenged right out of the MWS containers;
- rural areas generate far less quantities of MSW (about 50%) than urban areas;
- area within the same regions.
- the composition of MSW varies moderately from region to region and slightly from area to Lebanon's MSW is over 60% organic with paper and cardboard being the next component at about 15%;
- moisture content does not much vary between winter and summer. The rainwater in winter is offset by the increase of juicy fruit leftovers in summer.

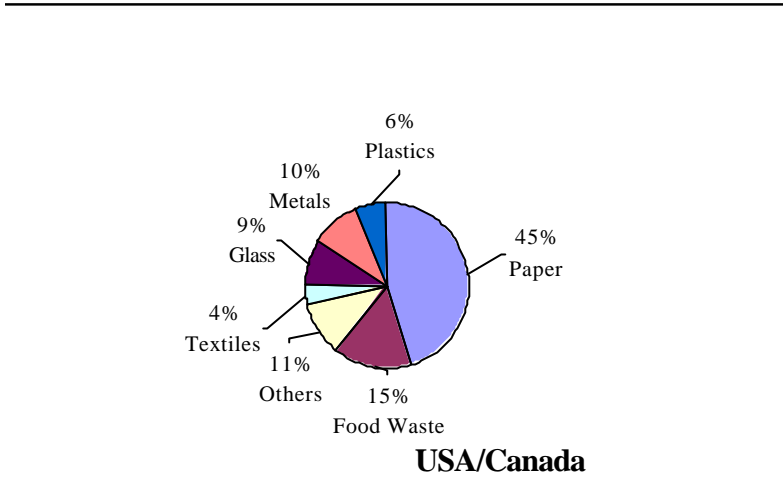


Figure 8 – Waste Composition USA

Source: Tchobanoglous 1994

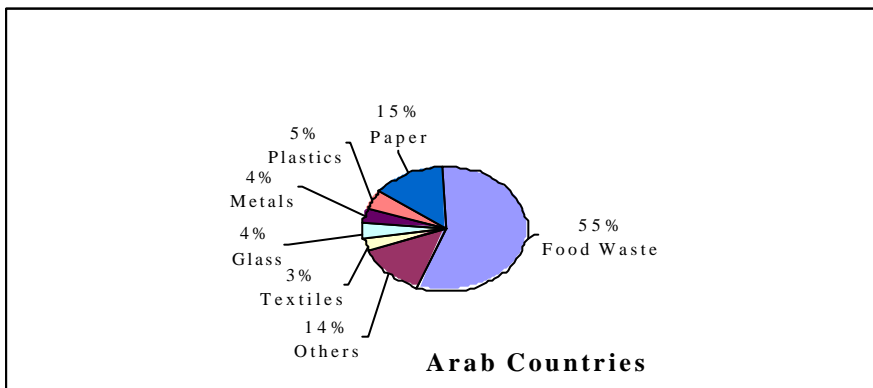


Figure 9 – Waste Composition Arab Countries

Source: Abu Qdais 1997

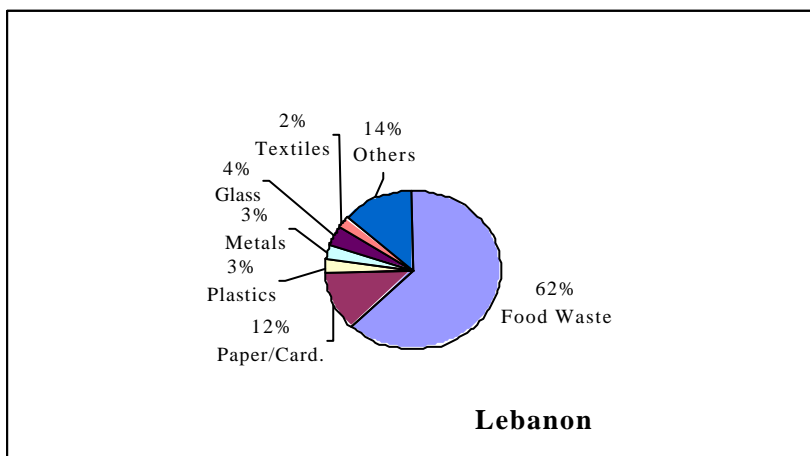


Figure 10 - Waste Composition Lebanon

Source: Sukomi 1999

5.4 Recycling

5.4.1 Recycling Overview

Recycling by definition is the process of utilizing raw waste as a source of raw material and re-introducing them into industry. It is simply the practice of reusing waste in a beneficial manner.

In Lebanon recycling has never been considered as a source of income until the civil strife when scavengers first appeared at dumpsites picking whatever could generate cash. The matter was seen as a social disgrace until it proved profitable to those practicing it.

Today recycling is viewed from a different perspective by different parties. To some it is an ecological issue related to environmental protection based on the assumption that at one point or another, the country will run short of both disposal sites and certain mineral and forest products leaving no option but resource recovery and recycling. To others it is a business opportunity with open horizons.

To everyone, recycling is a very important practice for the management or renewable and non-renewable resources. Solid waste must not therefore be considered as worthless material that should be disposed of by the cheapest way possible. As a valuable resource, it can be recovered and re-utilized.

There are no laws on the books concerning recycling and waste minimization. The industry controls itself and the few that are involved make their own rules and compete for the available materials.

Throughout Lebanon, recycling is an activity practiced either at the primary disposal or final disposal stages. It is never the concern of the generating parties at the source. In Beirut, the only open recycling activity taking place is implemented by Sukomi at the plant levels. They get the leftovers after the scavengers have made their rounds. Several other operatives are popping up continuously and some existing ones are closing down.

In the rest of the country, recycling is practiced as a result of scavenged efforts mainly at the final disposal sites. Recycling operations relative to the Beirut operations are small and not worth mentioning. Most of them end up bringing their products to the larger Beirut operations.

The following section deals with the issue of recycling in Lebanon. Since the bulk of the recycling activities take place within the Greater Beirut area, concentration shall be made on this area. However, the rest of the country shall also be reviewed and results incorporated to yield a comprehensive outlook on recycling as a whole.

5.4.2 Sources of Recyclable Waste

In order to better understand the source of recyclable material, a comprehensive picture was established to determine the local conditions affecting recycling. This includes the followings:

- Major waste generators;

- the basic waste stream they generate and;
- the specifics of the recyclable materials generated.

5.4.2.1 Major Waste Generators

The major waste generators analyzed earlier in the study have been identified to include both residential and non-residential sources. These are:

- Single Family Residence:
- Multi-family Residences:
 - Apartment buildings (high rises).
- Commercial/Institutional:
 - Hotels, Restaurants, Shops, Souks,
 - Offices,
 - Schools, Universities, Hospitals.
- Industrial:
 - Factories, Light industry,
 - Warehouses,
 - Construction sites.

The single-family residential sector is defined as any residence that places its garbage out for collection on an individual household basis.

The multi-family residential sector is any residence that places its garbage in a common storage and collection area with other households.

The commercial/institutional sector accounts for a substantial portion of the municipal waste stream as well as a number of valuable recyclable materials.

The industrial sector includes a wide variety of diverse waste generators and specific materials, although the type and mix may differ significantly from the typical commercial sector recyclable materials.

Table 30 Recyclable Materials in MSW
illustrates the potential source of MSW within a community

Recyclable material	Types of materials or uses
Aluminum	Soft drinks and beer cans
Paper	
Old newspaper (ONP)	Newsstand & home delivered newspaper.
Corrugated Cardboard	Bulk packaging (largest single source of waste paper).
High-grade Paper	Computer papers, white ledger paper, trim cuttings.
Mixed paper	Various mixtures of clean paper, including newsprint, magazines, and white and colored long-fiber paper.
Plastics	
Polyethylene terephthalene (PETE/1)	Soft drink bottles, salad dressing and vegetable oil bottles, photo film.
High-density polyethylene (HDPE/2)	Milk jugs, water containers, detergent and oil bottles
Polyvinyl chloride (PVC/3)	Home landscaping irrigation, some food packaging, and bottles.
Low-density polyethylene (LDPE/4)	Thin-film packaging and wraps, dry cleaning film bags, other film material.
Polypropylene (PP/5)	Closures and labels for bottles and containers, battery casings, bread and cheese wraps, cereal box liners.
Polystyrene (PS/6)	Packaging for electronic and electrical components, foam cups, fast food, containers, tableware and microwave plates.
Multi-layer and other (PS/7)	Multi-layered packaging, ketchup bottles.
Mixed plastics	Various combinations of the above products.

Recyclable material	Types of materials or uses
Glass	Clear, green, and brown glass bottles and containers.
Ferrous metal	Tin cans, white goods, and other metals.
Nonferrous metals	Aluminum, copper, lead, and stainless steel.
Organic fraction of MSW	Used to prepare compost for soil applications, compost for use as intermediate landfill cover, methane, ethanol and other organic compounds, refuse derived fuel (RDF).
Construction and demolition wastes	Soil, asphalt, concrete, wood, drywall, cement, metals.
Wood	Packing materials, pallets, scraps and used wood from construction projects.
Waste oil	Automotive and truck oil, reprocessed for reuse.
Tires	Automobile and truck tires, road building material.
Lead-acid batteries	Automobile and truck batteries shredded to recover individual components such as acid, plastic, and lead.
Household batteries	Potential recovery of zinc, mercury, and silver.

Table 30 - Recyclable materials in MSW (cont'd)

5.4.2.2 Major Recyclable Waste streams

The major recyclable waste stream refers to the flow of materials that can be recycled. It is formed of dry recyclable materials, food waste and special waste.

The dry recyclable materials represent the so-called “dry fraction” of the waste stream. They include such materials as paper, metal, glass, plastics and other recyclable non-organic materials.

The food waste represents the organic or “wet fraction” of the recyclable waste stream. These are the materials that normally represent feedstock for the composting operation.

The special waste represents all other waste that has potential recycling value such as tires, motor oil and household appliances.

Since composting shall be treated in details within another section, we shall concentrate within this section on the dry recyclable materials.

5.4.3 Dry Recyclable Materials

These constitute the central focus of our recycling program. For the most part, these are generated by all the major waste generators, although some produce specific materials in larger quantities than others.

5.4.3.1 Paper and Cardboard

Since paper constitutes the single largest type of recyclable material in MSW (in most Western countries). It is therefore important to distinguish between the many types of waste paper available for recycling. These are:

- Corrugated Cardboard Boxes (CCB) used for outer packing in shipping and bulk deliveries;
- Carton Boxes (CB) used for packaging of consumer goods and light materials;
- Old Mixed Paper (OMP) these include newspapers and magazines;
- High Grade Paper (HGP) these include ledger papers from offices, trim cuttings from print shops and waste paper from manufacturers.

As a source of secondary fiber, waste paper can be used by mills for the production of newsprint, consumer paper products, stationary and office paper, paperboard, tissue paper and shredded paper for packing.

5.4.3.2 Plastics

As the generation of post-consumer plastics continues to grow, so is the plastic recycling industry. Currently plastics recycling is largely focused on beverage containers, mostly water. The three main recyclable plastic materials are Polyethylene terephthalate (PET), high-density polyethylene (HDPE) and low-density polyethylene (LDPE).

PET is widely used in bottling of water and can be recycled for use in the manufacturing plastic fiber-fill clothing and other insulated products, non-food containers, injection molded products, structural foam molding and chemicals.

HDPE is used for fresh juice bottling and milk jugs. It can be recycled for use in the manufacturing of a variety of products including outdoor recreation equipment, fencing piping, sheet plastic, crates and pallets.

LDPE is used for the manufacturing of plastic bags. It can be recycled back into plastic bags, plastic lumber and other products.

In addition to the above, mixed plastics, representing a variety of plastic resins and films can be recycled into trash containers, park benches and car stops.

5.4.3.3 Glass

Glass is 100% recycled. It is a closed-loop recycling, and no other ingredients are necessary to be added to the recyclable items. One ton of recycled glass produces one ton of glass ready for reuse. Glass is still very much in demand for its many qualities: Impermeable, transparent, and sanitary. Furthermore, a glass container is cheaper to produce than a plastic container.

Not all kinds of glass can be recycled. Mirrors, Pyrex, and light bulbs are made of different kinds of glass thus making them non-recyclable. Some other non-recyclable glass include: window glass and car windshields, heat resistant glass, light bulbs, opaque glass, and laboratory glass equipment.

Recyclable glass includes: glass containers such as soft drink bottles, beer bottles, wine bottles, liquor bottles, and containers of food and juice. It can be of all colors, but for recycling, colors must be separated. There are three categories of colored glass: White, green, and amber. Containers of different colors are taken to recycling plants. At these plants, contaminants such as metal, plastic, china, ceramics and stones are removed and the glass sorted by color and crushed.

When collection agents deliver the glass to recycling plants, it is color separated and crushed into cullets. In some cases, the collection agent will crush the glass into cullets first and deliver it already broken to the recycling plant. The cullets are run through different machines to remove metals, plastic and paper. After that it is melted down and poured into molds to produce clean glass for new bottles and jars.

5.4.3.4 Metals

Aluminum represents the most valuable recyclable metal in MSW. Due to its high production cost from primary feedstock, recycled aluminum is in high demand in secondary-use markets. In the manufacture of beverage containers, aluminum saves 95% of the energy normally required for primary production.

In addition to aluminum, other ferrous metal is further collected from scrap and is highly recyclable. Metals such as tin, steel, auto parts and eaves are highly demanded for recycling.

5.4.4 Recycling Industry in Lebanon

An analysis of recycling trends in Lebanon has been conducted by the AUB School of Civil and Environmental Engineering in 1996. For the purpose of our study, we have based our investigation on the groundwork established by the AUB study. This has resulted in a comprehensive analysis reflecting the current national situation related to recycling.

Recycling can not be discussed without taking into consideration the entire network involved in the process. Major players in this network are the scavengers who contribute tremendously to the industry.

To present a comprehensive aspect of recycling, a major survey on scavengers was conducted to better understand their mode of operation and the extent to which it affects the recycling industry in Lebanon. The results are discussed in the following section.

5.4.4.1 The Informal Players

The informal players of the scavenging operation, involve the scavengers, the collection point bosses and the certain unlicensed recycling operations within Beirut and the rest of the country. In Beirut scavenging is done from curbsides while in the rest of the country it is done from dumpsites.

Scavenger surveys were conducted throughout the country with special concentration on the Greater Beirut area since it incorporates more than half of

the entire country's MSW. However for other parts of the country, only major cities were considered since the scavengers only operate at the dumpsites which are concentrated around those big cities.

The terminology used in the surveys conforms to our best understanding of the field operations and the scavengers' own terminology. The titles they hold and the privileges they have according to their hierarchy in the operation, all have been considered.

i) Informal Recycling Hierarchy in Beirut

Scavenging is a whole industry by itself. It is a very well organized business with a set hierarchy controlled by a few entrepreneurial individuals directing an army of scavengers.

The scavenging hierarchy starts and end at the recycling plant levels. The next stages down are the collection point operators "owners" followed by the curbside bin scavengers.

Collection points are scattered throughout the city in empty lots and other empty wide spaces as per . These are operated "owned" by individuals who normally deal with a single recycling plant depending on the goods available for recycling. They have their own army of scavengers working for them. They provide them with a homemade cart to haul the scavenged goods along with food and shelter.

The recycling plant owners, on the other hand, provide the collection point owners with pick-up trucks to transport recyclable items from the collection points to the recycling plants.

ii) Scavenger Categories

Scavengers operating in Lebanon can be divided into three types. Scavengers who work for collection points and who push carts are called "Arabatji" or cart pusher. They collect recyclable items, and whatever they can find in the curbside bins. They work for the collection point owners and are paid weekly or monthly based on the amount of materials they collect.

Other kinds of scavengers are independent individuals who work for themselves. They carry bags on their shoulders, and collect what they consider to be valuable items. This category of scavengers is called "Tabbeeb". They collect mainly clothes, shoes, ornaments, lamps, kitchenware etc. that they sell at the "Souk el Ahad" (the Sunday Market).

A third category of scavengers operates as freelance by roaming around collecting the same type of items as the Arabatjis. They sell their materials to the smaller collection point operators or directly to the recycling plants. Most of these scavengers are Sudanese and Egyptians. They do this work on the side, especially on Sundays when the other scavengers are not working.

All but the third category of scavengers and collection point owners interviewed declared that they work six days a week, 6 to 8 hours a day. They have no regular time for collections. Their schedule is 6 to 8 hours a day spread between 6 A.M. and 11 P.M. depending on the area they are covering, on weather conditions and on scheduled Sukleen pick ups.

Table 31 - Scavengers Collection Points (Beirut)

Owner(s)	Location	Area covered	Manpower	Carts	Trucks
Ghazi Hamdan	Zalka	From Jounieh to Nahr El Mot	45	70	6
Sami Keyrouz	Kaliounji cold storage	Frm Nahr el Mot to Sin el Fil	32	50	4
Khalaf Mohamed	Nabaa	Achrafieh, Sin el Fil, Museum	36	60	6
Ayoub	Farhat street, Chatila	West Beirut	15	24	3
Abou Ammar	Farnat street, Chatila	West Beirut	20	25	3
Mohamed Wehbeh	Farhat street, Chatila	West Beirut	16	20	3
Ahmad Kanaan	Farhat street, Chatila	West Beirut	25	40	3
Abou el Abed	Farhat street, Chatila	West Beirut	18	20	3
Ahmad Khneiser	Farhat street, Chatila	West Beirut	14	20	2
Abou Mazen	Farhat street, Chatila	West Beirut, Chyah, Badaro	40	75	6
Abou Ibrahim	Farhat street, Chatila	West Beirut	30	60	5
Abou Ali	Hadeth road, Mar Mkhayel	Hadeth, Hazmieh	16	25	4
Hazzaz el Ezz	Choueifat, Laylaki	Baabda, Bsalim, Bsous	12	19	2
Abou Lattouf	Choueifat, Laylaki	Hadeth, Baabda, Aley	20	27	4
Mohamed Osman	Mkalles, Mar Roukoz	Metn villages	25	23	5
Khaled Misto	Mkalles, behind Kneider	Metn villages	18	20	4
Abou Abbas	Near Ministry Of Labour	Dahieh, Choueifat, Hadeth	20	25	5
Abou Ghazi	Airport road, after the bridge	Dahieh, Chyah	14	20	3
Abou Ali	Airport road, after the bridge	Dahieh, Chyah, Laylaki	18	20	3
Abou Hicham	Mar Elias, Wazzan Center	UNESCO, Tarik Jedideh	17	26	3
Abou Ahmad	Corniche Mazraa, Peugeot	Mazraa, Mar Elias	15	18	3
Jamal Kiwan	Raouche	Raouche, Hamra	18	23	4
Abou Ahmad	Beginning Hamra, Caracas	Hamra	12	16	4
El Haouch	Airport road, Chatila	Sabra, Chatila, Chyah	20	30	4
Atef Mehyo	Ouzai cross road	Ouzai, Laylaki, Jnah	15	20	4
Abou el Ezz	Fouad Chehab bridge	Mohamed el Hout, Achrafieh	17	20	3

iii) Greater Beirut Scavenger Force Size

Information as to the number of scavengers working in the Greater Beirut Area has been very controversial. Some concerned individuals interviewed gave an estimate between 2,000 and 4,000 scavengers working in Beirut. The reason behind the discrepancy is seasonal. The scavengers, being for the most part Syrian, go back to their villages when it is harvest time in Syria.

The collection points visited revealed that the number of scavengers working for them are around 550. Furthermore, major collection point owners told us that they estimate the number of independent small collection points to be around 20 or 30 with 4 to 8 scavengers working at each making a total of 200 to 300 additional scavengers at work. These scavengers collect items, store them and the trucks from the big collection points pick them up.

The “tabbeeb” are around 200 in Beirut. The owners of the two biggest collection points in Beirut claimed that 2 years ago, there were more than 2000 scavengers working on the street, and that there were more than 400 collection points. However, due to police crackdowns and municipal limitations, the number has significantly dropped.

Based on the above information, we can safely make the following estimations concerning the scavengers operating in Greater Beirut.

- There are approximately 1,000 scavengers in the greater Beirut Area.
- 98% of the scavengers are Syrians.
- 2% of the scavengers are Egyptians, Sudanese, Palestinians, and Lebanese.
- There are about 27 major collection points and about 20 small ones where the scavenged materials are stored before being sold to recycling plants.
- 60% of the brokers who own the collection points are Lebanese.

iv) Scavenged Materials from Greater Beirut

The items collected by scavenger are broken down as follow:

- Plastics (other than water bottles)
- Craft cardboard
- Water bottles
- Glass bottles
- Scrap Iron
- Tin
- Copper from electric wire
- Aluminum can
- Car batteries
- Household equipment (fridge, washing machines, TV set etc)
- Styrofoam trays (for vegetables)
- An active scavenger collects the following amounts daily: Plastics (other than water bottles 10 to 15 kgs)

- Water and soft drink bottles 12 to 15 kgs
- Craft cardboard 100 to 130 kgs

All other items are collected depending on their availability in the canisters.

The total quantities collected by scavengers in the Greater Beirut area is illustrated in . The figures are based on extrapolated amounts obtained through the survey and confirmed by the operators of the largest recycling operations interviewed.

ITEM	QTY/C. P.	UNIT	FREQUENCY	TOTAL
Plastics	2	T	Weekly	3,000
Cardboard	12	T	Weekly	15,000
Water Bottles	500	KG	Weekly	875
Glass	5	T	Weekly	7,500
Iron	10	T	Weekly	17,500
Tin	5	T	Weekly	7,500
Copper	600	KG	Weekly	900
Aluminum	600	KG	Weekly	900
Car Batteries	1	T	Weekly	1,500
Scrap Metal	1.5	T	Weekly	2,250
Milk Cans	200	PC	Weekly	300,000
Electric Wire	700	KG	Weekly	1,050
Styrofoam	300	PC	Weekly	450,000

Table 32 - Recyclable Material Collected by Scavenger in GB Area

v) Scavenged Material Value from Greater Beirut

Illustrates the value of recyclable material to both the scavenger and the collection point owner.

ITEM	PAID TO SCAVENGER	SOLD BY OPERATOR
Plastics	50LL/KG	\$50/T
Cardboard	35LL/KG	\$30/T
Water Bottles	200LL/KG	\$200/T
Glass	100LL/PC	150LL/PC
Iron	30LL/KG	\$30/T
Tin	15,000LL/T	25,000/T
Copper	1,300LL/KG	1,400LL/KG
Aluminum	1,000LL/KG	1,400LL/KG
Car Batteries	150LL/KG	200LL/KG
Scrap Metal	100LL/KG	150LL/KG
Milk Cans	75LL/PC	100LL/PC
Electric Wire	400LL/KG	500LL/KG
Styrofoam	75LL/PC	110LL/PC

Table 33 - Value of Scavenged Materials (\$1=1,500LL)

vi) Scavenging in North Lebanon

Scavenging in Northern Lebanon is done in the same manner as in areas where municipalities are responsible for waste collection. Scavengers are very active at the dumpsite. There are also scavengers roaming the streets of Tripoli, but in much smaller numbers than in Beirut.

In Tripoli, there are two major scavenger bosses:

- Abdelkader Al Joujou AKA Abou al Jouj, with his collection points in Bab el Ramel
- Mohamed Abdel Aal AKA Abou Ahmad, with his collection points in Beddawi.

The scavengers working for Abou Al Jouj are mostly Syrians with some Lebanese and Palestinians. The ones working for Abou Ahmad are mostly Palestinians from the Beddawi Camp.

In Tripoli both bosses cooperate very closely in their work, and they always exchange requests from customers for materials scavenged. According to the scavenging bosses the scavenging is done at the dumpsite by 5 teams of workers that are assigned different types of recyclable material to collect. Each team is made up of 8 or 12 men with a supervisor. The scavengers plow through the garbage, and collect recyclable items that they gather in their assigned spot. The collected items are similar to those in Beirut.

When the garbage trucks arrive to the dump, scavengers have to hurry and do their work before the bulldozers level the garbage and start covering it with dirt.

At the end of each day, the collected items are weighted and loaded into pick-up trucks to be transported to the collection point. The daily averages of collected material is listed in .

ITEM	QUANTITY	UNIT	FREQUENCY
Plastics	3 to 3.5	T	Daily
Cardboard	3 to 3.5	T	Daily
Water Bottles	1.5	T	Daily
Glass	200 to 300	KG	Daily
Tin Cans	1,800 to 2,000	PC	Daily
Copper	400 to 500	KG	Daily
Aluminum	700 to 900	KG	Daily
Car Batteries	75 to 100	PC	Daily
Electric Wire	250 to 300	KG	Daily
Styrofoam	300 to 400	PC	Daily
Car Tires	70 to 100	PC	Daily

Table 34 - Recyclable Material Collected by Scavenger in N. Lebanon

Table 35 illustrates the value of recyclable material to both the scavenger and the collection point owner.

ITEM	PAID TO SCAVENGER	SOLD BY OPERATOR
Plastics	45 - 50LL/KG	\$50/T
Cardboard	35 - 40LL/KG	\$50/T
Water Bottles	175LL/PC	\$200/T
Glass	75LL/PC	100LL/PC
Iron	30LL/KG	\$30/T
Tin	15,000LL/T	30,000/T
Copper	1,300LL/KG	\$1,000/T
Aluminum	1,000LL/KG	\$750/T
Car Batteries	150LL/KG	\$135/T
Scrap Metal	100LL/KG	150LL/KG
Electric Wire	450LL/KG	\$350/T
Styrofoam	75LL/PC	100LL/PC
Tires	50 - 100LL/PC	150 - 200LL/PC

Table 35 - Value of Scavenged Materials in N. Lebanon (\$1=1,500LL)

Scavengers are paid on weekly basis. Plastics are sold to Lebanese Recycling Works. Cardboard and paper are sold to Ninex in Zouk Mikael and Al Najma paper mills in Batroun. Metals are sold to exporters in Tripoli and Beirut.

vii) Scavenging in South Lebanon

The largest concentration of MSW in the South is located in the Saida municipal dump. Other areas in the South do not contain a consolidated area where enough recyclable materials justify a large scale scavenging operation. For this reason, we have concentrated our survey on the city of Saida.

There is only one group of scavengers in Saida working for a man called Abou Izzat, a Palestinian naturalized Lebanese. He has been doing this work since 1979. All scavengers in the south are Palestinians from the Ain El Heloueh camp.

Abou Izzat's men work in 8 different groups of 6 to 8 men. Seven of his sons supervise the groups, and even his 13 grand children aged between 9 and 17 work with their fathers. Each group occupies a section of the dumpsite, and they work at sorting the different recyclable materials.

Abou Izzat owns a building in a big plot near the dumpsite. There, he stores all the recyclable items collected by his teams of scavengers. The type of material collected is the same as elsewhere in Lebanon.

Two of Abou Izzat's sons own pick-up trucks. They roam the area and its surroundings collecting paper, cardboard and old household items. These are processed with the recyclable materials collected from the Saida dump.

ITEM	QUANTITY	UNIT	FREQUENCY
Plastics	2 to 3	T	Daily
Cardboard	3 to 3.5	T	Daily
Water Bottles	2	T	Daily
Tin Cans	2,000 to 3,000	PC	Daily
Copper	200 to 300	KG	Daily
Aluminum	800 to 900	KG	Daily
Car Batteries	60 to 70	PC	Daily
Electric Wire	200 to 250	KG	Daily
Styrofoam	400 to 450	PC	Daily

Table 36 - Recyclable Material Collected by Scavenger in S. Lebanon

Table below illustrates the value of recyclable material to both the scavenger and the collection point owner.

ITEM	PAID TO SCAVENGER	SOLD BY OPERATOR
Plastics	30 - 35LL/KG	\$45/T
Cardboard	30 - 40LL/KG	\$40/T
Water Bottles	150LL/PC	\$200/T
Iron	30LL/KG	\$30/T
Tin	1,500LL/KG	\$60
Copper	1,200LL/KG	\$1,000/T
Aluminum	800LL/KG	\$600/T
Car Batteries	100LL/KG	\$135/T
Scrap Metal	100LL/KG	150LL/KG
Electric Wire	300LL/KG	\$300/T
Styrofoam	75LL/PC	100LL/PC

Table 37 - Value of Scavenged Materials in S. Lebanon (\$1=1,500LL)

Recyclable materials are sold to factories in Saida and in Beirut.

viii) Scavenging in the Bekaa

The survey in the Bekaa valley was conducted mainly in the town of Zahle where the centralized repository of garbage justifies the existence of such scavengers.

Scavenging in the Bekaa is performed mainly at the dumpsites. In Zahle where the municipality is tough on street scavenging activities because of the narrow streets and the traffic jams caused by the scavengers carts there, some scavengers manage to collect items off the streets. These mainly constitute of cardboard and paper.

In Zahle, scavengers are all Syrians, and they work for one boss, a Syrian by the name of Ahmad Khadra AKA Abou Azzam. There are no collection points where different bosses gather their reclaimed material. Abou Azzam has two collection points where he takes his scavenged material from the dumpsite and stores it.

At the dumpsite, scavengers are divided into groups and they gather different recyclable materials there. Pick up trucks belonging to Abou Azzam transport the daily collection to two different sites, one located near the industrial zone (plastics, metal, glass and junk) and one located near Anjar (paper and cardboard).

The scavengers are paid daily based on the quantities they gather at the dumpsite. There are six different points at the dumpsite where reclaimed items are stored. At each point, there are 6 to 10 scavengers working under a supervisor. Abou Azzam supervises the six groups and the pick-up trucks transporting the material to his collection points.

At the end of each day, the reclaimed items are sorted and weighed and each supervisor gets paid according to how much and what his group has reclaimed. The supervisor then pays his team accordingly.

Table 38 - Recyclable Material Collected by Scavenger in the Bekaa

ITEM	QUANTITY	UNIT	FREQUENCY
Plastics	2 to 2.5	T	Daily
Cardboard (Strs)	3 to 3.5	T	Daily
Cardboard (dump)	200 to 300	KG	Daily
Water Bottles	2	KG	Daily
Glass	1	T	Daily
Metals	1 to 2	T	Daily
Car Batteries	20 to 30	PC	Daily
Electric Wire	150 to 200	KG	Daily
Styrofoam	100 to 150	PC	Daily
Tires	30 to 35	PC	Daily

Table 39 - Value of Scavenged Materials in the Bekaa (\$1=1,500LL)

ITEM	PAID TO SCAVENGER	SOLD BY OPERATOR
Plastics	45LL/KG	\$40/T
Cardboard	35LL/KG	\$30/T
Water Bottles	150LL/PC	\$175/T
Glass	50,000LL/KG	\$45/T
Iron	40LL/KG	\$40/T
Tin	15,000LL/KG	25,000/KG
Copper	1,200LL/KG	\$1,500/T
Aluminum	1,00LL/KG	\$600/T
Car Batteries	100LL/KG	\$200/T
Scrap Metal	100LL/KG	150LL/KG
Electric Wire	400LL/KG	500LL/KG
Styrofoam	75LL/PC	100LL/PC

Paper and craft cardboard are sold to recycling plants in Zahle and in Beirut. Part of it is smuggled and sold in Syria.

There are a few factories that use recycled plastic for their industry in Zahle. The most important is SOMOPLAST in Maallaka. It manufactures cages for vegetables, plastic electric tubes and plastic furniture. SOMOPLAST buys all the plastics reclaimed by Abou Azzam.

There are two factories in the Bekaa that use recycled paper and craft: MIMOSA in Zahle produces tissue paper, craft cardboard and fluting sheets; and SICOMO that produces duplex boards. Both factories buy their recycling material from Abou Azzam. The rest of the recyclable material reclaimed is sold in Beirut to different factories, and metal is sold to exporters because there are no local foundries to work with reclaimed metal.

ix) Scavenging National Totals

Scavenging on a national level can now be estimated based on the results obtained from the scavenger survey conducted. reflects these results.

Table 40 - Scavenged Recyclable Material in Lebanon

ITEM	Greater Beirut	North Lebanon	South Lebanon	Bekaa	UNIT	TOTAL
Plastics	3,000	900	750	600	T	5,000
Cardboard	15,000	900	900	900	T	17,000
Water Bottles	875	450	600	600	T	2,525
Glass	7,500	75	*	300	T	17,875
Iron	17,500	*	*	*	T	17,500
Tin	7,500	120	100	75	T	7,795
Copper	900	150	75	50	T	1,175
Aluminum	900	240	270	150	T	1,560
Car Batteries	1,500	450	390	300	T	2,640
Electric Wire	1,050	90	60	50	T	1,252
Styrofoam	450,000	105,000	127,500	37,500	PC	719,500
Tires	*	22,500	*	9,000	PC	31,500

* : Not collected

Table 40 represents the total scavenged recyclable material throughout the country as best estimated from the various resources quoted earlier and the survey conducted for the purpose of this study. The figures are based on a workweek of seven days with fifty workweeks per year or 300 days, depending on the related frequency used by the interviewed parties.

5.4.4.2 The Formal Players

The formal players in the recycling industry in Lebanon are those parties that are established and officially performing this activity. They are legitimate businesses registered with concerned official authorities and acting within the realm of their officially licensed entities. These constitute the recycling plants for the various recyclable materials and the sorting and processing plants operated by Sukomi within the Greater Beirut Area.

i) The Processing Plants

Currently there are two processing plants operating in the entire country. Both these plants are located in the Greater Beirut area. These are the Quarantina plant and the Amroussieh plant. They are both operated by Sukomi. These have both been discussed in details in previous sections.

It should be noted that the amount and types of material these sorted for recycling purposes are affected by the informal recycling industry operating strongly in the Greater Beirut area due to the absence of formal legislation forbidding them to do so.

Represents the amounts of recyclable material sorted at the two plants based on figures submitted by LACECO.

ITEM	Quarantina Plant (000)	Amroussieh Plant (000)	UNIT	TOTAL (000)
Plastics	1,004	654	T	1,658
Cardboard	414	56	T	470
Glass	37	162	T	199
Tin	989	865	T	1,854
Aluminum	78	15	T	93
Scrap	37	18	T	55

Table 41 - Processed Recyclable Material in Greater Beirut

5.5 Final notes on Recycling

Recycling in Lebanon is an issue that is almost foreign to most citizens. The idea is acceptable but totally alien. When a scavenger is seen going through refuse, the average individual will feel sorry for him because “he has to go through garbage to live.”

There are enough recyclable material being generated from MSW throughout the country to justify a careful review of “harvesting” them. Previous sections detailed their compositions, percentages and sources.

The idea of sorting at source is still too far-fetched with Lebanese society. The logistics involved make it extremely impractical and totally rejected in the urban areas when over 75% of the total nation’s MSW is generated. The high rise building type lifestyle does not allow for the separation of waste in several bins due to the lack of space to place them within the flat.

Another factor that hinders recycling is the percentage of organic waste in the MSW. At rates as high as 70% in certain areas sorting becomes a nuisance most people do not want to be bothered with.

However, for recycling to be adopted, economies of scale are the decisive factor. In Lebanon, too many parties want a share of the same pie making it not worthwhile considering.

The scavengers who constitute a major part of the recycling informal players operate in wide numbers and are relatively well organized. They're all over the country and are for the most foreign nationals. It would be difficult to get the Lebanese to practice this business.

Recycling plants for paper, plastics and glass operate in Lebanon because there is a market for their end products. However recycling plants for metal are non-existent. This makes it necessary to export the recyclable metals narrowing down the players involved.

As for the processing plants, they get the leftovers. This is why it is not worth their while to put the energy and investment required for recycling. They merely sort and sell to the recycling plants just like the scavenger bosses.

Several companies approached the Lebanese Government for setting BOT projects related to waste sorting and recycling. They have later withdrawn their proposals due to the fact that, in the absence of law forbidding scavenging, what reaches the sorting plants is not worth the investment.

SECTION 6 PERFORMANCE ASSESSMENT

6.1 The Central Administration

6.1.1 Current Macro Economic Context

The Lebanese public administration suffered from both the physical and the moral effects of the civil strifes which started in 1975 and spanned some 15 years. The strifes exacted a heavy toll in human and material terms and caused fundamental changes in the Lebanese economy. In particular, it suffered from the destruction of industrial and infrastructure facilities, while the reluctance to invest in the local economy resulted in the obsolescence of whatever remaining production capacity in the private sector.

Mass emigration furthermore resulted in a significant loss of local professional and entrepreneurial skills. Meanwhile, as put by the IMF, "Lebanon's public finances deteriorated owing to the lack of central government authority in the country and the consequent inability of the authorities to collect the necessary revenues for rebuilding the country's physical and institutional infrastructure.

Lebanon's economy suffers from a large public sector deficit and heavy foreign debt servicing needs. In addition, the high interest rates resulting from heavy borrowing by the Government reduced the authorities' ability to conduct flexible fiscal policy and respond to unforeseen tremors in the fragile economic structure. It further burdened private sector borrowing. As a consequence, the private sector, which accounts for 80 percent of aggregate demand, currently operates well below capacity and is thus unable to play a strong role in building up the Lebanese economy.

To overcome the current deadlock in the country's economic and social development, fuelled by high budget deficits and increasing public debt, the Government launched a fiscal reform plan in 1999, consisting of measures to enhance revenues, contain expenditures, improve debt management, and privatize selected public enterprises (using net proceeds to lower the national debt).

The logic behind such economic and financial reforms is improving economic efficiency and paving the groundwork for a resumption of healthy GDP growth. The aim is also for providing the economic context within which the administrative reforms and modernization measures as envisaged under the present ARLA Project would have to be implemented in the coming years.

6.1.2 The Move Toward Administrative Reform

The prime focus in the early 1990s was rebuilding the country's physical infrastructure after the devastating civil strifes of the 1970s and 1980s. Along with the physical reconstruction there was a strong belief that the governmental apparatus itself, including its capacity to steer the economy, required urgent strengthening and modernization as well.

Various studies by administrative reform experts had noted that “the regulatory regime, embodied in the role of the various core administrative agencies in Lebanon, had evolved into a bewildering patchwork of overlapping responsibilities. Furthermore, the control regimes exercised by these core administrative agencies are equally diverse, though all share a rather legalistic approach in interpreting their mandate, leading to a mostly unresponsive attitude towards their main client institutions”.

6.1.3 The Human Resources Situation

Regarding ministries and autonomous agencies, it can similarly be observed that several of them are not structured in the most rational way. As a result, the current system is characterized by notable overlaps, duplications and unclear mandates between Ministries and agencies. The main weaknesses of the Lebanese administration are listed in , as far as they relate to institutional capacity, human resources management and administrative procedures within the service delivery mandates of the Lebanese central administration.

Table 42 - Main Weaknesses of Lebanon's Public Institutions

<p>Institutional Capacity.</p> <ul style="list-style-type: none">• programming and budgeting• project identification and management• organization and procedures• management information systems• public expenditure management• policy formulation and implementation <p>Human Resources Management.</p> <ul style="list-style-type: none">• lack of an overall policy for human resources development; no legal support for developing HRD-policies at the sector-level• severe shortage of qualified personnel for senior and middle management level positions, combined with overstaffing at the lower levels• overtly legalistic background of civil servants, rather than technical expertise• aging civil service, with the average age for those in office attaining 52 years, leading to a rapidly evaporating "corporate memory" of the public administration• lack of training; particularly in the sphere of modern management and sector-specific training• absence of merit based promotion policies/career development programs• low salaries; lack of motivation <p>Administrative Procedures/Service Delivery.</p> <ul style="list-style-type: none">• highly centralized and authoritarian management practices• over-reliance on legal documentation• lack of delegation of responsibilities to subordinate staff• overtly complex administrative procedures• lack of initiative throughout all layers of the civil service• slow and unresponsive service to the citizens/lack of client orientation
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6.2 The Local administration

6.2.1 Current Situational Context

After 37 years, the first municipality election took place during April-June 1999, aiming to re-establish the legitimacy of municipal councils and the mayors who are the executing agent. In spite of overwhelming enthusiasm and commitment of the council members, the capacity of the municipalities in all aspects, i.e. personnel, equipment, working systems, financial means and even office space are very limited and in considerable number of cases non existence.

The following key issues, in the context of municipal government revival and development, are identified:

6.2.1.1 Central Government Level

- A formal national strategy for the decentralisation of power and responsibility to the municipalities has not yet been established. A draft law on deconcentration and decentralisation is under discussion in the Council of Ministers.
- No formal national strategy for the public administration reform has yet been established although there is a strategy under discussion.
- There are plans to dissolve the Ministry of the Municipality and Rural Affairs (MMRA) and transfer its functions and duties to a directorate general in the Ministry of Interior. The structure and function of the organization, which will succeed the current structure, are not known, although it is assumed that this Ministry will be replaced by the creation of a new directorate general within the Ministry of Interior, with the structure similar to that prior to 1993.
- Because of the government policy regarding the freeze on the recruitment of contracted staff as well as slow process of filling vacant civil service posts, MMRA is significantly understaffed. This raises two issues:
 - a) it will gradually exacerbate the difficulty in supporting and co-ordinating municipality affairs,
 - b) it will not be able to furnish a basis on which effective donor assistance towards institutional development and capacity building can be provided.
- There are three criteria for the allocation of funds to municipalities from the Independent Municipality Fund, i.e. size of population in a municipality, its level of tax collection in the previous two years, and the need for investment projects. These in themselves do not fully reflect the needs of municipalities. Moreover, the second of these militates against those municipalities, particularly the smaller ones, who do not have the resources or systems for effective tax collection.
- One of the main sources of income for the Independent Municipality Fund is custom duty. The Euro-Med Association Agreement between the European Union and Lebanon may result in a reduction of the income from this source.

6.2.1.2 Local Government Level

i) Financial issues

The operational flexibility and power of municipalities are restricted, as a result of a range of factors including:

- a) In smaller municipalities, the tax base is narrow, and the capacity and ability to collect taxes is limited.
- b) There is an over dependence on funding from central government through the Independent Municipal Fund. The slow rate at which funds are released from the Fund can restrict the rate of expenditure of municipalities, causing cash flow problems and affecting investment decisions.
- c) One source of income is a surcharge on consumers' bills from the utilities companies (electricity, water and telephones). The utilities companies do not have effective and efficient billing and accounting systems to assist in identifying the appropriate level of transfers to the municipalities. There are also delays in payments to the municipalities and in some cases no payments at all.
- d) Increases in the levels of local taxes are in the control of central government.

An important local tax in terms of revenue is that applied to building permits. However, it discriminates in favor of those municipalities with a high rate of land use development. Income from this source is currently at a relatively high level, nationally, because of the major reconstruction resulting from damage caused by the civil war. Through time, this rate of activity may decline, and, therefore, is not a long-term secure or predictable source of revenue.

ii) **Administrative Issues**

- There are 708 municipalities in Lebanon. The number and average size militate against effective, efficient and economical municipal government.
- The laws, bylaws, regulation and guidelines governing the operation of municipal government and regulating the linkages and relation between the municipal government and the ministries and public agencies are old and do not comply with the Government's envisaged dynamic and autonomous rule of municipalities.
- Lack of a proper organizational and institutional structure with lack of standard administrative and working procedures and guidelines. Municipalities do not have codes of practice for decision making, implementation of decisions and monitoring thereof, financial activities and the conduct of council and committee meetings.
- Significant proportions of decisions by the municipal councils require confirmation by central government at Caza, Mohafazat, or ministerial level.

- Procurement procedures for works over a certain value involve central government approval. This can lead to long delays in implementation, or even refusal of consent.
- Decisions on major investments, which legally fall within the remit of municipalities, can, in effect, be limited to requests for their provision by central government.
- The equipment base of most municipalities is weak and often obsolete, and support resources, e.g. IT equipment, often non-existent.
- There are about 1,000 villages, which rely on the Caza for the delivery of services. Some of these are now as large as, or larger than, existing municipalities.

iii) Human resources Issues

- There is a lack of experience of modern local government, and, therefore, no full understanding of what municipalities can do amongst both councilors and staff. This will have major implications for any training program.
- Human resource management skills are absent in most municipalities.
- The municipalities, at both member and staff level, do not have the expertise for or experience of long term planning, procurement, procedures, and the monitoring and evaluation of service delivery.
- Staffing level in most, if not all, municipalities are at a minimum, inadequate to meet even the basic needs. Many smaller municipalities have no staff at all.
- Salaries are low, particularly in comparison with the private sector. This can lead to lack of motivation, transfer out to the private sector, and will exacerbate the problems of attracting suitably qualified staff.
- There is a national freeze on staff recruitment to the municipalities including the non-filling of vacancies. Due to the current economic position of the country, it is not known when this will be lifted.

- Because of the freeze on staff recruitment, municipalities use casual labor on a daily basis. Whilst this is a pragmatic solution in the short term, it raises two issues:
 - a) It exacerbates the difficulty of attracting staff at the professional level
 - b) It is not a basis on which effective assistance with capacity building, including training, can be provided.
- In some smaller municipalities, because of the absence of staff, elected members are undertaking the administrative role. Again, whilst this is a pragmatic and understandable approach, it is not one which can be, or should be, sustainable in the long term.

iv) Communication between Central Gov. and Municipalities

- Communications between central government and municipalities are slow and circuitous and there is a need for a comprehensive and systematic flow of information between the two levels.
- Need for a systematic mechanism of dialogue between the central level and municipalities.

v) Communication between municipalities & population at large

- Need for a comprehensive awareness of the population about the role and responsibilities of the municipalities and the potential benefits accruing to communities from their development
- Lack of public participation in enforcement of urban development plans and environmental laws.
- There is no mechanism for communication between municipalities as a whole, in order to share experiences and best practice, or to make representations to central government on issues affecting them.
- In some instances, there is a lack of transparency in the dealings of the municipal council, which militates against the development of relationships with the public they serve.

6.3 Activities of Foreign Donors and Other Organizations

The full range of donors and other organizations involved in the municipal sector is not known, however of those that are registered with the CDR the following programs could be identified:

6.3.1 USAID

USAID are currently on a pilot project in 70 municipalities on enhancing financial and administrative capacity, and improving links with the electorate. Components of the program include development of financial systems, transaction-tracking systems, complaints systems and, with the seven largest municipalities, personnel management systems. Activities include workshops, IT training, and dialogue with US municipalities.

6.3.2 The World Bank

The World Bank has started the First Municipal Development Project with five pilot municipalities in the Metn, Kesrewan, the North and the South. The objectives of the this project are listed below:

- To provide basic municipal infrastructure, primarily small and simple investments designed to achieve adequate and efficient levels of municipal services in all the municipalities and villages in Lebanon.
- To formulate the sector policy framework and strategy for municipal development
- To build the institutional capacity of Ministry of Municipality and Rural Affairs

The program has yet to be finalized, and circumstances have changed since the draft was produced. A major study, "An Institutional and Fiscal Review of the Municipal Sector in Lebanon" was prepared to inform the direction of the program.

6.3.3 The European Union

The EU is in the process of preparing a Social Economic Fund. It is envisaged that this will cover:

- Micro credit and business development services;
- social development and;
- local development, including municipal infrastructure.

6.3.4 La Fédération Mondiale des Cités Unies

The FMCU is active in the Lebanon. The Federation is concentrating on two lines of activity:

promotion of transnational co-operation on issues such as Agenda 21. This is project based, as opposed to twinning,

training in Lebanon, the priority will be on training elected members first.

There are 40 member municipalities in the country and activity is coordinated by a committee of 7 current and 3 former mayors. Each committee member takes responsibility for a region of the country.

6.3.5 Other Institutions

There are several other institutions that are involved in research on municipal matters. These include:

- The Lebanese Centre for Policy Studies.
- CERMOC, the Centre d'Etudes et de Recherches sur le Moyen-Orient Contemporain, based in Beirut.

SECTION 7 Conclusions and recommendations

7.1 Conclusions

The problems of MSW in Lebanon are relatively new to the Lebanese since they have been in the background of matters throughout the fifteen years of civil strifes the country has experienced. The resulting population shifts and the changing lifestyles have only increased these problems to the point that they became health hazards. Even then, concerns were elsewhere.

There were no municipal councils to assume the civil responsibilities of collection and disposal. The last municipal elections prior to 1988 were held over thirty plus years before. NGOs, whenever effective voiced some concerns but those were very few and mostly went unheard. Survival for the most part was the issue of the day, and garbage was never noticed in the middle of rubble.

When the civil strifes were over, The situation became evident and the heaps of garbage that were a part of the war scene began to clash with the surroundings. While large cities had erected mounts of garbage around them smaller towns and villages were strewing their refuse in the valleys and prairies of the countryside.

The Largest Cities along the coast such as Beirut, Tripoli and Saida whose municipalities were operational throughout the events assumed the tasks of collection and disposal. Of these only Beirut was incinerating part of its MSW. All were practicing uncontrolled dumping, until the late nineties when the Government introduce the Beirut Emergency plan and contracted out the MSW management to private contractors.

The Greater Beirut Emergency plan that was thoroughly described in the document is aimed to be an example for the rest of the country to follow and implement on relatively corresponding scales depending on the strategic location and communities benefiting from the project. To do so, the Government has to resort to deconcentration and decentralization. Privatization is also a prerequisite for such a plan.

However, there are other essential mandatory requirements that must exist before anything can happen. These requirements can be summed up very simply by the following:

- Communal commitment and concern about the environment
- Applied laws and regulations related to environmental issues
- Executive bodies committed to enforcing the environmental laws
- Appropriate local governments capable of monitoring the process of
 - MSW
- Available resources necessary for carrying out the task of MSW
 - managing
- Qualified contractor for the required process of effective MSW
 - management.

7.1.1 Points of Interest

7.1.1.1 Communal Commitment and Concern about Environment

It is not until lately that the environment is becoming an issue of concern to the average Lebanese. For the later part of his life his concerns were elsewhere and his interests were totally committed to survival and sustainability. Fifteen years of civil unrest does that to a people.

The younger generation, however, is very concerned and is very active in environment oriented projects. They are growing up in a setup that allows them to do so without disturbance. Instead of seeing houses destroyed, they are seeing them being built. Instead of seeing trees burning down, they are seeing them being planted and watered. They are the children of construction rather than destruction.

The clash currently is between generations. A lot of the older generation talk about a clean environment, only if its their own. When it comes to their neighbor's it does not really matter. They are concerned with the cleanliness of their homes yet they have no problem with sweeping the dust under the carpet or throwing it out of their windows. As long as they do not have to stare at it, its acceptable wherever it goes.

The majority of the younger generation is genuinely caring and truly concerned about the effects of their behavior on the environment and about their future within it. They represent the true custodians of the natural beauty of their country. Whatever plans made must be made with that in mind because without this concern nothing will work.

The examples are scattered all over the country. The difference is so blatant between those regions with concerned communities and those regions without. It is the attitudes of the residents that will change things, nothing else. Beirut is definitively not the rule, it is the exception.

7.1.1.2 Laws and Regulations Related to Environmental Issues

The environmental laws on the books are archaic and very unreflective of the times. In certain instances no law exists to cover certain aspects of environmental issues. They just have not been developed yet.

At present, there is no new MSW law or general environmental law. The old laws dating back to the 1950s' site solid waste as a municipal public health issue making it the responsibility of the municipalities when the latter are not ready to deal with it.

The new code of Environment prepared the MoE (yet to be approved by the Council of Ministers), addresses SWM among other environmental issues, which are further to be developed into separate decrees. The code suggests to first develop a decree on classification of solid waste (domestic, industrial, hospital, hazardous waste, etc...) and then other SWM decrees.

The short and long term public health and environmental issues that should be taken into consideration are:

- a) Open dumps are chosen for convenience without regards to environmental impacts.

- b) The presence of limestone in abundance and lack of top soil in Lebanon causes water to pass quickly into the ground, such as runoff and leachate from open dumps can contaminate groundwater sources.
- c) Coastal dumps deposit directly into the sea.
- d) Industrial wastes and its hazardous components (biological, chemical, flammable, radio active, etc...) require special handling and treatment.
- e) Hospital wastes which are a major source of pathogenic bacteria, viruses and other organisms have no specific treatment regulation. The subject considered a taboo is totally ignored and rarely discussed by concerned responsables.

7.1.1.3 Executive Bodies Committed to Enforcing Environmental Laws

Since the issue of MSW has been sought of as being the responsibility of the municipality, enforcing MSW related laws is therefore supposed to be the task of the municipalities also. However, there is no municipality that has the ability to do so.

There are distinct limitations to the municipal police capabilities. They have no mandate to take action except giving out a contravention in situations where environmental "laws" are broken. The municipal police have to revert to the National Gendarmes (Internal Security Forces) for any arrest. And very rarely do they do it.

The Ministry of Environment has no executive authority either to take any action except sending inspectors to prepare and submit report for later action by some other concerned agencies.

The Ministry of Municipal and Rural affairs is only responsible for municipal support and thus deals strictly with the revival and institutional reform of the municipal sector. It has no power either to implement or carry out actions for enforcing environmental laws.

In many instances, it is purely the Ministry of Interior that has the sole authority to handle infractions of environmental laws that are interpreted haphazardly with double standards depending on the political clout of the offender.

7.1.1.4 Local Governments Capable of Monitoring Process of MSW

The concept of administrative deconcentration and decentralization was aimed at developing the ability of municipalities to deliver essential services that are important to the local and regional development. Elections took place and municipal councils were formed and given the responsibility to manage their communities.

As explained earlier, most municipal councils are made up of elected individuals who are volunteering their services to their communities. Some are professionally qualified while others are merely popular within their communities due to their political affiliations or family ties.

Municipal capacity building is a subject of concern to the Central Government and is also very dependent of the structure of the latter. The issue is very political and is currently awaiting major developments following the presidential elections of

2000. This is why most foreign donor programs have been frozen for the moment including environment-related project in general and MSW management projects in particular.

Very few if any of the small municipalities has the capability of handling issues related to the MSW management process applied in Beirut. Generating tender documentation, appraising offers, warding MSW related contracts and monitoring them are all far-fetched issues at the present. It would require a lot of capacity building to reach that stage with the current municipal councils. This is why the government is giving this task to the CDR and to other trained bodies and institutions, but not to the municipal governments.

7.1.1.5 Available Resources for Carrying out Task of MSW Mgmt

The resources deemed necessary to carry out the tasks of MSW management are various but are here mostly designated as both Human and Financial and neither are available to the authorities mandated to manage MSW.

The Beirut Emergency Program that is currently carried out by the Sukkar Group is running into financial problems due to the high costs incurred for the purpose of running an operation by international standards. The Independent Municipal Fund that is funding such a project is, according to several politicians, inadequately appropriated for this purpose. It is the property of all municipalities but the majority of it goes to Beirut.

The local governments' sources of revenues that would be partly used to finance the MSW management are the municipal revenues consisting of:

- a) 11% municipal tax on rental values, and proceeds from land sales and construction permits that are collected directly by the municipalities (direct taxes).
- b) A share of the revenues collected by the Central Government (10% surcharge on telephone, electricity and water bills, and duties on imports, liquor and fuel) and distributed to the municipalities on the basis of their registered population and size of the spent previous year's budget.

However, the flow of these revenues was severely affected during the civil strives years leaving the municipalities with an eroded resource base. Currently, due to governmental budgetary constraints, municipalities can not depend on transfers from the Independent Municipal Fund, but rather on ad-hoc advances from the Central Government just to meet priority needs.

7.1.1.6 Qualified Contractors for Process of Effective MSW Mgmt

The process of MSW management entails collection, transferring, sorting, bailing, composting and landfilling. It also entails all the logistics related to the above. In Lebanon, only one company has these capabilities that it has acquired through an on-the-job learning process put forth by a de facto situation.

The Sukkar Group that is currently handling the MSW management for the Greater Beirut area has achieved this learning the hard way. Even the supervising consultants assigned to monitor this process followed suit.

When the tender for the cities of Tripoli, Zahle and Baalbek were announced, there was no significant competition for the Sukkar Group except from a European firm that has formed a joint venture with a local contractor with no previous experience in MSW management. Although Sukkar did not win these contracts, they were not too unhappy about it because they have more than their hands full with the Greater Beirut area.

Following the noise that was generated after the Sukkar contract terms were made public, several individuals rushed to form associations and express interest in performing the tasks of MSW management in various areas of the country, including the Greater Beirut area.

The learning process achieved by the Sukkar group and both LACECO and D.G. Jones in all aspect of the MSW management in Lebanon can not be easily passed by to other organizations wishing to perform the same services. The Government should be willing to put up with further mistakes and foul-ups should it accept to deal with inexperienced new comers. The costs are too high and the outcome is uncertain making this uncomfortable situation for the Government and pushing it to merely expand the Sukkar territory until it covers the entire country. But is this good practice?

7.2 Recommendations

7.2.1 Overview

Rebuilding the country's physical infrastructure after the devastating civil strives of the 70s and 80s was given the prime focus in the early 90s. As this reconstruction regained impetus, so did the belief that the government apparatus itself, including its capacity to steer the economy, required urgent strengthening and modernization as well.

The main weaknesses that had been highlighted earlier affect the Central Government's institutional capacity, human resources management and administrative procedures

Lebanon has a large environmental agenda with limited resources; financial, human, institution and technical, that are available for the environmental management in the short run. This bring on the challenge of focusing limited resources on selected priorities to attain the largest possible social benefits in the most effective way possible.

From the previously established conclusions the general recommendation would be to set a consistent macro framework for MSW management in order to improve the effectiveness of specific recommended necessary actions while reducing the costly requirements for command-and-control activities that would normally burden the existing environmental institutions.

The objectives here would be to reach acceptable results through a combination of overall economic, institutional and regulatory policies aimed at actions to tackle

the key MSW management related priorities for the entire country conforming to acceptable best practices applied within the region.

7.2.2 Courses of Action

7.2.2.1 Consolidation of Environmental laws

The UNDP Capacity 21 project is currently preparing a proposal for the “*Basic Environmental Law for Lebanon*”. This project should consolidate all the environmental laws and regulations including those related to MSW management.

However, experience has shown that such projects could take quite a long time to be established leaving a void in the meantime. The inconvenience of such a void is justified by the end result once the project is completed and should therefore not result in temporary ad hoc legislation very common in Lebanon.

7.2.2.2 Strengthening of Existing Enforcement Capabilities

Whatever existing legislation there is, it needs to be enforced until the new legislation is developed and adopted. For that purpose, the safe action to take at the present time is to require mandatory Environmental Impact Assessment (EIA) for any major development project both private and public. In cases where a full-blown EIA is not necessary, a form of summarized EIA should be established instead and presented to the concerned agencies for review and approval.

The procedures for all sorts of EIAs’ have already been developed and would simply need to be properly adopted for conformity to the various situations. This process is currently being practiced for the construction of sanitary landfills throughout the country.

7.2.2.3 Development of Best Practices Guidelines

Due to the chaotic periods the country passed through, several industrial sectors popped up within residential areas without proper permits and licensing. Waste from these makeshift industries is mixed with that of residences and treated as MSW regardless of its source or composition.

A temporary solution while awaiting the consolidated environmental laws would be the development of Best Practices Guidelines for controlling and monitoring operations that have not yet been properly classified due to the lack of applicable standards for evaluation and assessment of their waste.

Furthermore, registering potential pollution sources will provide authorities with the proper and essential information for developing effective waste management systems that would include hazardous waste along with MSW.

7.2.2.4 Increasing Commitment to Cost Recovery Programs

The current policy of the Government is to rely on the private sector for growth and prosperity. Its strategy has been, among other moves, the removal of subsidies for services and utilities. So far, this strategy has worked even in the absence of established mechanisms for cost recovery.

By establishing principles and mechanisms for cost recovery in situations where otherwise subsidies were applied, the Government could directly recuperate its investment while indirectly controlling and reducing waste generation and the problems that come with it.

The cost recovery could be in the form of mandatory charges for waste collection and treatment with special emphasis on hazardous and hospital waste. This would be over and above the indirect taxes levied as explained earlier by the utilities agencies.

7.2.2.5 Use of Economic Incentives

The use of economic incentives is a necessary element in financial sustainability attained through focusing on cost recovery and promotion of private sector involvement. This involvement could be in various aspects of environmentally oriented projects where the private sector could be more effective than the bureaucratic public sector.

Even more interesting than the plain use of economic incentives would be the use of incentive that could bring about environmental gains. This could be implemented in the form of tax rebates for waste reduction or total tax exemption for the use recyclable materials in an industrial environment. Or it could be further applied through a deposit refund scheme on potential polluting material or even through low interest loans for environmentally friendly projects.

7.2.2.6 Building Institutional Capacity

Strengthening of the existing institution is a must for carrying out mandates, especially those institutions with major responsibilities for environmental management such as the Ministry of Environment, the Ministry of Municipal and Rural Affairs and the Ministry of Ministry of Agriculture among others. This would be:

- a) Improved capabilities of the Ministry of Environment in policy formulation and legislation along with providing guidelines on environmental management to both the public and private sectors.
- b) Strengthened local governments through the Ministry of Municipal and Rural Affairs for better handling of MSW management among other environmental related matters.

Increased capabilities of the Ministry of Agriculture for better coping with MSW bi-products such as compost.

7.2.2.7 Involving Private Sector/NGOs'

The private sector and local NGOs' must play a bigger role in environmental monitoring under the supervision of, say the Ministry of Environment. On the other hand, enforcement could be delegated to local administrations thus separating regulatory and enforcement functions from any operating responsibilities.

7.2.2.8 Expanding and Disseminating Information.

The absence of measured information about the environment in Lebanon complicates the development of a strategic view and the checking of compliance with the environmental regulations.

The expansion of environmental information is through the development of an effective database for monitoring and measuring environmental performance indicators for strategic environmental decision making.

The dissemination of environmental information to the general public as well as targeted bodies is necessary for awareness creation and response seeking on environmental issues that otherwise would be ignored or simply overlooked.

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