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STAFF APPRAISAL REPORT

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

MAY 5, 1995

Private Sector Development and Infrastructure Division
Country Department II
Middle East and North Africa Region

CURRENCY EQUIVALENTS

(As of January, 1995)

Currency Unit = Lebanese Pound
US$1.0 = LL 1,650

WEIGHTS AND MEASURES

1 meter(m)	=	3.281 feet (ft)
1 kilometer (km)	=	0.621 miles (mi)
1 metric ton (ton)	=	2204 lbs.
1 hectare (ha)	=	10,000 m^2
	=	2.47 acres

ABBREVIATIONS

CDR	=	Council for Development and Reconstruction
CZM	=	Coastal Zone Management
CZMP	=	Coastal Zone Management Plan
EA	=	Environmental Assessment
EU	=	European Union
EDL	=	Electricité du Liban
ERRP	=	Emergency Reconstruction and Rehabilitation Project
GDP	=	Gross Domestic Product
GEF	=	Global Environmental Fund
GOL	=	Government of Lebanon
LL	=	Lebanese Pound
METAP	=	Mediterranean Environmental Technical Assistance Program
MMRA	=	Ministry of Municipal and Rural Affairs
MOE	=	Ministry of Environment
NERP	=	National Emergency Reconstruction Program
NGO	=	Non-Governmental Organization
OD	=	Operational Directive
PCU	=	Project Coordination Unit
PMU	=	Program Management Unit
REA	=	Regional Environmental Assessment
SIU	=	Sectoral Implementation Unit
SWM	=	Solid Waste Management
TAT	=	Technical Assistance Team
TCC	=	Technical Coordination Committee
TOR	=	Terms of Reference
UNDP	=	United Nations Development Programme

FISCAL YEAR

(January 1 to December 31)

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

STAFF APPRAISAL REPORT

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This report is based on the findings of an appraisal mission which visited Lebanon from November 28 to December 17, 1994. The mission comprised Mmes/Messrs. Douglas Graham, Senior Financial Analyst/Mission Leader, Hans-Roland Lindgren, Senior Environmental Specialist, Elizabeth Monosowski, Environmental Specialist, Allan Rotman, Solid-waste Specialist, Marie-Ange Le, Operations Assistant, Albert Peltekian and Guy Prenoveau, Consultants. Mrs. Tuyet Chuppe and Mrs. Terri Wells were responsible for coordinating report production. Messrs. Alastair J. McKechnie and Inder K. Sud are the Division Chief and Director, respectively, for the operation.

Contents (Cont'd)

Annexes

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

Loan and Project Summary

Implementing Agencies: Council for Development and Reconstruction (CDR)
Ministry of Municipal and Rural Affairs (MMRA)

Borrower: Lebanese Government

Beneficiaries: Council for Development and Reconstruction; Ministry of Municipal and Rural Affairs; Cazas and Municipalities; the people of Lebanon and visitors to the country.

Amount: US$55.0 million.

Terms: IBRD standard variable interest rate, with 17-year maturity, including 5 years of grace.

Project Objectives: The objectives of the project are to: (i) eliminate unsanitary and improper dumping of solid waste; (ii) improve methods of waste collection and disposal; (iii) improve cost recovery and modernize municipal management and finance systems; (iv) improve the quality and marketability of compost, through the introduction of upstream sorting of the waste; (v) increase the involvement of the private sector in solid waste management; (vi) strengthen MMRA and the participating municipalities; and (vii) develop instruments for the more orderly planning and development of the coastal zone.

Project Description: The project would comprise provision of: (i) refuse collection facilities - containers and compactor trucks; (ii) waste disposal facilities - sanitary landfills and compost plants; (iii) a hospital waste collection and disposal system; and (iv) technical assistance and preparation of a coastal zone management plan. It would meet the country's needs in solid waste management facilities, as foreseen in the NERP. It would strengthen the institutions responsible for solid waste management (SWM) and encourage private sector participation, not only in the collection services but in the whole sector, including the investment of capital in SWM. It would also help develop a Coastal Zone Management (CZM) plan that would serve as a tool to protect the Lebanese coast from further degradation.

Benefits and Risks: The principal project benefit would be a major improvement in the environment and in public health conditions through the elimination of accumulated refuse and uncontrolled dumping. Future development of the Coastal Zone would be controlled. The main

risks relate to the weakness of the municipalities which are responsible for collection and disposal services and to the difficulties of finding suitable land for sanitary landfills.

Estimated Project Cost:

	Local	Foreign	Total
	------- (US$ Million) ------		
1. Civil Works	13.0	12.0	25.0
2. Goods and Equipment	2.7	20.9	23.6
3. Disposal Plant	8.5	51.5	60.0
4. Technical Assistance	1.1	9.9	11.0
Total Base Cost	25.3	94.3	119.6
Physical Contingencies	0.7	3.2	3.9
Price Contingencies	2.0	9.5	11.5
Total Contingencies	2.7	12.7	15.4
Total Project Cost	28.0	107.0	135.0

Financing Plan:

Funding Agency	Local	Foreign	Total
	------- (US$ Million) -------		
1. IBRD	3.0	52.0	55.0
2. Government	25.0	-	25.0
3. Cofinanciers	-	55.0	55.0
TOTAL	28.0	107.0	135.0

Estimated Project Completion Date: June 30, 2001

Estimated Disbursement:

	IBRD Fiscal Year (US$ Million)						
	1996	1997	1998	1999	2000	2001	2002
During the Year	2.6	6.6	15.6	13.4	11.0	4.2	1.6
Cumulative	2.6	9.2	24.8	38.2	49.2	53.4	55.0

Economic Rate of Return: n.a.

Poverty Category: n.a.

Map: IBRD 26530

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

STAFF APPRAISAL REPORT

I. BACKGROUND

A. The Economy

1.1 Lebanon, a prosperous upper middle-income country in the mid-70s, has been devastated by 15 years of turmoil as a result of violent civil strife and military occupation. In the period between 1950 and 1975, Lebanon's free market economy expanded by about 6 percent per annum. This growth was largely driven by the service sectors, namely, trade, tourism, and finance, which attracted business from surrounding oil-based economies. After the eruption of civil war in 1975, the economy deteriorated markedly, with intermittent recovery during the two periods of relative calm, 1978 to 1981, and 1986 to 1988. The civil war had a severe impact on the socio-economic conditions in the country. Lebanon's per capita income, about US$1,900 in 1993, in real terms was only about half of the 1975 level, and income inequalities have been accentuated. The total damage to physical assets during the war period was estimated by the United Nations at US$25 billion. All principal sectors of the Lebanese economy - physical and social infrastructure, office and factory buildings, and housing - have been affected. Damage is both a direct result of the war, as well as the accumulated effects of a near total disruption in capital investment and maintenance.

1.2 The impact of the civil war on social conditions has been equally grave. The loss in human resources has been considerable; apart from the tragic loss of life and the disabling of hundreds of thousands of people, about 200,000 professional and skilled Lebanese have sought employment in other countries. While this has resulted in major shortages of skilled workers in various sectors of the economy, unemployment nevertheless is estimated at 35 percent of the resident labor force, and is believed to be particularly high among urban youth. Nearly one quarter of the population of 3.6 million has been displaced and now lives in unhealthy shanty towns, and in semi-destroyed and vacated buildings, with severe overcrowding and inadequate housing quality. Urban poverty problems are especially pressing in Beirut. Public and social services are either non-existent or of poor quality, with only about one-third of power capacity operating, water treatment and sewerage virtually nonexistent, and most schools and hospitals damaged.

1.3 Against this background, the Government of Lebanon has prepared a three-year National Emergency Reconstruction Program (NERP) which has recently been extended to the ten-year Horizon 2000 program. A large part of the investment program is projectized, but many of the projects need to be further developed in terms of consistency with sectoral policies, engineering soundness, and economic feasibility. The first five years of the Horizon 2000, which includes the NERP, amounts to approximately US$5 billion (in constant 1992 prices).

B. The Solid Waste Management Sector

1.4 Solid waste collection and disposal services deteriorated greatly during the civil war. Refuse collection trucks and containers, often used as barricades during the fighting, were destroyed. The remaining equipment has either lived beyond its effective life or was prematurely damaged because of lack of maintenance. Thus, refuse collection services deteriorated to the point where they became almost non-existent and solid waste was haphazardly dumped on the streets, vacant lots and the coastline, with frequent intermingling of hospital and other hazardous wastes.

1.5 Refuse collection and disposal have always been the responsibility of the municipal authorities. The service is funded, along with other municipal services, from the fungible revenues of the municipalities. These consist of: (i) a municipal tax equivalent to 11 percent of the imputed rental value of property, and the proceeds from land sales and construction permits, all of which are collected directly by the municipalities; and (ii) a share of certain revenues, such as a 10 percent surcharge on telephone, electricity and water bills, and duties on imports, liquor and fuel, collected by the Central Government and distributed to the municipalities on the basis of population and the size of the previous budget, Beirut being limited to 60 percent of the total under the existing formula. In the past, municipalities were capable of providing adequate refuse collection services, although the development of sound disposal systems had only just started when the civil war broke out. With time, the resource base of the municipalities was eroded because: (i) the Lebanese Pound has slid to about one-thousandth of its value in 1975; (ii) Lebanon, until July 1992, practiced absolute rent control, leaving revenues from the municipal tax frozen in terms of Lebanese Pounds; recently, however, rental values have increased between 15- and 80- fold, according to the age of the property; (iii) during the war there was a drop in the revenues from electricity, water and telephones; however, the revenues from surcharges on these services are expected to increase substantially as the major service bottlenecks are removed with the help of the NERP, and follow-on projects; and (iv) because of Central Government budgetary constraints, the share of the municipalities has not been paid from the Municipal Fund although transfers are expected to resume in the not too distant future. Pending resumption of transfers from the Municipal Fund, the municipalities have to rely in part on ad-hoc advances from the Central Government to meet priority needs. Government has recently undertaken a study (funded by the Bank) for the development of a long-term strategy for solid-waste management, anchored on the achievement of full cost recovery in the sector (para. 3.8).

1.6 Until recently, municipalities were under the tutelage of the Ministry of Interior (MOI), which gave priority to matters of public security over the provision of municipal services. In recognition of this difficulty, the Government has established a Ministry of Municipal and Rural Affairs (MMRA) whose primary role is to assist the municipalities, as described in Annex 1. MMRA's capacity to assist municipalities would be strengthened under the project through the

provision of technical assistance and training. A sector development policy statement has been prepared by Government (Annex 11).

1.7 Although Lebanon's physical features sometimes make it difficult to find sites for sanitary landfills with suitably large capacity for refuse disposal, this is still the least cost and simplest method of disposal (see Annex 8). Composting is also considered an appropriate technology for the disposal of large volumes of waste, particularly where there is a potential market for the product, as market studies (available on file) indicate for agricultural areas. Incineration is rarely a viable option in Lebanon due to the substantial investment cost, high ratio of organic matter in the refuse, and the extremely high operating costs. The Public Sector Investment program for the sector under Horizon 2000, which consists mainly of the proposed project, amounts to about US$200 million.

C. Environmental Management

1.8 One of the results of the civil war in Lebanon was the deterioration of public services, particularly water supply, waste water disposal, solid waste collection, power supply, and public transport. The deterioration of solid waste services has created a severe risk to public health and the environment due to: pollution of water sources and distribution systems; discharge of waste directly into the sea and into irrigation canals; scattered piles of haphazardly dumped solid waste throughout the country; mixing of hospital waste with domestic waste; and air pollution caused by burning of solid-waste. The situation has been further exacerbated by the lack of a country-wide land use system which has led to haphazard expansion of dwellings on the sea coast, on fertile agricultural land and on sensitive natural ecosystems; pollution of surface waters and underground aquifers caused by uncontrolled pumping to provide the new communities with running water; pouring of sewage into disused wells; widespread deforestation; destruction of the cultural heritage; and degradation of marine and coastal areas.

1.9 The coastal zone has been particularly affected by these impacts, and is suffering severe environmental degradation. The destruction of the Central Business District (CBD) of Beirut and the separation of communities during 15 years of strife, led to the development of major commercial and industrial centers along the sea coast, which themselves triggered the construction of large housing settlements for employees. The sea coast from Tripoli in the North to Tyre in the South has become a continuous stretch of densely populated urban settlements, many of which are lacking in services. In several areas along the coastline, solid waste dumps and outfalls of untreated sewage pollute the sea, while emissions from traffic, power stations, cement plants and other industries, mostly using fuel of doubtful cleanliness, contribute to the atmospheric pollution.

1.10 Lebanon is in the process of preparing a comprehensive national framework for environmental protection. Recently, there have been several initiatives towards strengthening

the recently created Ministry of Environment (MOE) to enable it to carry out its role of setting, monitoring and enforcing environmental standards. Assistance is being provided by the Mediterranean Environment Technical Assistance Program (METAP) for the preparation of a national environmental strategy, which will identify the priorities for action and the policy, institutional and investment tools for their implementation. This will contribute to the definition of the MOE long-term program and provide inputs to establish the broad institutional framework for environmental management. The United Nations Development Programme (UNDP) is providing a complementary program of technical assistance and training to MOE for the review and consolidation of environmental laws and regulations, institutional development, capacity building for environmental assessment, and creation of public awareness and participation mechanisms. Although the enforcement of environmental regulations is feasible under the existing legal framework, it is expected that actions will be accelerated when the revised framework is approved by Parliament later in 1995. MOE has recently moved into new premises, which will permit an expansion of staff from the present level of approximately 20 people to the planned level of about 150 people.

1.11 CDR, which has the overall responsibility for planning and coordination of investment programs (see Annex 1), also needs strengthening in its environmental review functions. In view of the need to integrate environmental considerations at the earliest stage of the planning process, CDR will use the services of the European Union (EU) funded Program Management Unit (PMU) to provide a senior environmental expert to train CDR staff and to coordinate environmental review activities. The expert, who started in post on April 20, 1995, will also coordinate the inclusion of environmental mitigation and monitoring actions into the construction and operation of disposal sites (para. 3.3).

D. Rationale for Bank Involvement

1.12 In March 1993, the Bank approved a Loan in the amount of US$175 million for the Emergency Reconstruction and Rehabilitation Project (ERRP) to finance high priority components of GOL's NERP, including US$30 million for solid waste management. Implementation of the ERRP is progressing well. Bank involvement in the proposed Solid Waste/Environmental Management Project would help Government to complete the rehabilitation of the country's municipal solid waste management systems begund under the ERRP, providing a safe and clean environment for its citizens and for the foreign businesses and tourists that are crucial to the country's future development. Above all, it would help to establish a technically and financially viable development policy in the sector. The project is consistent with the Country Assistance Strategy for Lebanon which, inter alia, supports rehabilitation of infrastructure, addressing environmental concerns, increasing the role of the private sector in the provision of public services and strengthening the core functions of public administration.

II. THE PROJECT

A. Project Objectives

2.1 The main objectives of the project are to: (i) eliminate unsanitary and improper dumping of solid-waste; (ii) improve methods of waste collection and disposal; (iii) improve cost recovery and modernize municipal management and finance systems; (iv) improve the quality and marketability of compost, through the introduction of sorting of the waste at the entrance to the compost plant; (v) increase the involvement of the private sector in solid waste management; (vi) strengthen CDR and MMRA and participating municipalities; and (vii) create instruments for the more orderly planning and development of the Lebanese coastal zone. Basically, the project would complete the rehabilitation of the country's municipal solid waste collection and disposal systems as envisaged under the NERP and introduce a separate system for hospital waste (the needs for detection and disposal of industrial/hazardous/toxic wastes are to be studied by MOE under terms of reference agreed by the Bank (para. 4.12).

B. Project Description

2.2 The project would comprise the provision of: (i) refuse collection facilities - containers and compactor trucks; (ii) waste disposal facilities - sanitary landfills and compost plants; (iii) separate collection and disposal of hospital waste; and (iv) technical assistance and the preparation of a coastal zone management plan. It would meet the country's needs in solid waste management facilities, as foreseen in the NERP. It would strengthen the institutions responsible for SWM and encourage private sector participation, not only in the collection services but in the whole sector, including the investment of capital in SWM. It would also help develop a Coastal Zone Management (CZM) plan that would help serve as a tool for the protection of the Lebanese coast from further degradation.

C. Detailed Features

Collection Equipment

2.3 The collection equipment will consist of containers and compactor trucks. Two types of containers will be procured to maintain the standards adopted under the ERRP, namely: (i) 1100 liter, galvanized containers with covers for use in the urban centers of the coastline; and (ii) 1500 liter, painted steel, open containers for the rest of the country. The compactor trucks will be standardized at 10 cubic meters capacity, as these are suited to the narrow streets of the major cities and the winding, steep hills of the hinterland.

(a) **Containers**: These will be 5,200 in number, distributed across the country in accordance with the estimated population densities. Of this total, 1,600 will be

in galvanized steel and the remaining 3,600 in painted steel. Added to the 2,800 containers financed under the ERRP, the total number will be 8,000 (as estimated under the NERP).

(b) **Compactor Trucks**: The total number of new trucks will be 180, which, in addition to the 76 trucks financed under the NERP, will bring the total to the 256 trucks estimated as being required by the NERP. Again, distribution will be in accordance with estimated population.

(c) **Special Equipment**: Provision has been made in the project for the procurement of special equipment. These include separate containers and trucks for the collection and transport of hospital waste to the special incinerator, street sweeping and washing equipment for Beirut and trailer trucks for the purpose of transporting large quantities of waste.

Disposal Facilities

2.4 These will include 15 new landfills (in addition to the 13 financed under the ERRP) bringing the total number of landfills in the country to 28, so that each Caza will have its own landfill. Three compost plants will be built, one in Saida with a capacity of 200 tons of waste per day, one in Zahle, also with a capacity of 200 tons of raw waste per day, and a third one with a capacity of 240 tons a day to complement the existing incinerator in Beirut, which has a capacity of 240 tons per day (two furnaces, each capable of incinerating 5 tons per hour).

(a) **Sanitary Landfills**: Sites for landfills to be financed under the proposed project will be selected on the basis of environmental assessments agreed by the executing agency and the Bank. The landfills will be located at suitable distances from urban developments. The area will be sufficient to meet the needs of the Caza for 20 years. Each sanitary landfill will be enclosed with a suitable fence to prevent encroachment by scavengers and stray animals. A guardhouse and weighbridge will be located at the entrance to each site, enabling access to be controlled and the source of waste and its weight to be recorded. A suitable garage on site will house all the equipment belonging to the Caza and will provide routine maintenance services. An administration building will house the staff in charge of operating and maintaining both the landfill and the mobile equipment. Each site will be provided with the necessary earth-moving and compacting equipment. This will vary in quantity and size depending on the size of the landfill and the volume of incoming waste. Generally, each site will be provided with a mechanical shovel, a water tanker and a sheep's-foot type earth compactor.

(b) **Compost Plants**: The two compost plants in Saida and Zahle will be designed in accordance with appropriate technology. Before the waste enters the process

cycle, large, hard lumps of debris will be separated and sorted out. Then, as the waste is conveyed towards a shredding/homogenizing drum, recyclable materials - glass, plastics, paper, cloth, and bones - will be manually separated and dropped from special chutes to a compacting and baling unit for sale to manufacturing industries. Ferrous metals will be separated magnetically. The homogenized compost will be mechanically aerated and turned, then deposited in windrows until maturation. This will result in the production of homogeneous, high-quality compost which can be marketed easily to the farming community once its benefits are realized.

(c) **Amrousiyeh Complex**: The original design of the incinerator at Amrousiyeh had made provision for a third unit of 10 tons per hour incineration capacity. Experience with the existing furnaces has not been satisfactory because of the high moisture content and low calorific value of the waste. Fuel oil is now used to improve combustion and the air emissions consist of black smoke and other contaminants related to incomplete oxidation of the combustion gases. The Environmental Assessment (EA) report recommends that the incinerator capacity should not be expanded as originally designed, and that a compost plant, similar to that described above (see (b) Compost Plants) be constructed. During appraisal, it was agreed that part of the land adjacent to the incinerator would be used for the construction of a compost plant next to the incinerator. An environmental assessment for this compost plant has been undertaken (see para. 2.23). Refuse going into the combined facility would be separated - organic matter would be channeled to the compost plant while incinerable material would go to the incinerator. The calorific value of the waste being incinerated would be further improved by (i) selective collection of a minimum of 120 tons per day of waste from higher income neighborhoods and/or (ii) high calorific value sorted wastes from the compost plant. The project also provides for the rehabilitation of the emission system of the existing facility which, upon completion, will operate to improved environmental standards based on the European Union (then European Economic Community) Directive on Municipal Waste Incineration Plants (89/429/EEC - OJ L203, 15 July 1989). The selection of an appropriate design for the air pollution control system will be carried out during detailed engineering design.

(d) **Incinerator for Hospital Waste**: An appropriately designed incinerator will be constructed for the disposal of hospital waste from hospitals throughout Lebanon. Its precise location and capacity will be determined by feasibility and environmental studies to be undertaken during project implementation. Appropriate transport will be procured to transport hospital waste to the incinerator.

Table 2.1: Solid Waste/Environmental Management Project Summary Description of Disposal Facilities

GOVERNORATE CAZA	SITE SELECTION	LAND OWNERSHIP	LOAN FINANCING	DISPOSAL FACILITY
GREATER BEIRUT:				
Greater Beirut	yes	G/P	SW/EM	Amrousiyeh Complex
Greater Beirut	yes	G	ERRP	Karantina Compost Plant (Modernization)
Greater Beirut	no	-	ERRP	Landfill
Greater Beirut	yes	G	nil	Dora Landfil
Greater Beirut	yes	G	nil	Normandie Landfill
NORTH LEBANON:				
Akkar	no	P	ERRP	Landfill
Batroun	no	P	ERRP	Landfill
Bcharre	no	P	SW/EM	Landfill
Koura	no	P	ERRP	Landfill
Tripoli	yes	G	ERRP	Landfill
Zgharta	no	P	SW/EM	Landfill
MOUNT LEBANON:				
Aley	no	P	SW/EM	Landfill
Baabda	no	P	SW/EM	Landfill
Chouf 1	yes	P	ERRP	Landfill
Chouf 2	yes	G	SW/EM	Landfill
Jbeil 1	no	P	ERRP	Landfill
Jbeil 2	no	P	SW/EM	Landfill
Kesrouane	no	P	ERRP	Landfill
Metn	no	P	ERRP	Landfill
SOUTH LEBANON:				
Bent Jbeil	yes	P	SW/EM	Landfill
Hasybaya	no	P	SW/EM	Landfill
Jezzine	yes	P	SW/EM	Landfill
Marjayoun	no	P	SW/EM	Landfill
Nabatiye	no	P	SW/EM	Landfill
Saida	yes	P	ERRP and SW/EM	Landfill and Compost Plant
Sour (Tyre)	yes	G	ERRP	Landfill
BEKAA:				
Baalbeck 1	yes	P	ERRP	Landfill
Baalbeck 2	no	P	SW/EM	Landfill
Hermel	no	P	SW/EM	Landfill
Rachaya	no	P	SW/EM	Landfill
West Bekaa	no	P	SW/EM	Landfill
Zahle	yes	P	ERRP and SW/EM	Landfill and Compost Plant
Hospital Incinerator(s):	no	-	SW/EM	Hospital Incinerator

Notes:
- G = Government Land Ownership
- P = Private Land Ownership
- ERRP = Emergency Reconstruction and Rehabilitation Loan
- SW/EM = Solid Waste / Environmental Management Loan

2.5 Upon construction of the new landfills, the old uncontrolled dumps will be closed and rehabilitated. The rehabilitation of the old dumps will be carried out in accordance with internationally accepted standards. CDR will prepare a plan by September 30, 1996 to assess the impacts of, and develop cost effective measures for, closing the old dumps and, after exchanging views with the Bank, will start to implement this plan by March 31, 1997 (para. 6.1).

Technical Assistance

2.6 Technical assistance will comprise three major components, namely: (i) the preparation of a coastal zone management plan that would serve as a tool for the protection of the Lebanese coast from further degradation; (ii) engineering services for the design and supervision of construction (or implementation) of project components; and (iii) institutional development for CDR, MMRA, and the principal municipalities through the appointment of international experts, training of staff, and provision of computers and other modern equipment to help improve efficiency.

(a) **Coastal Zone Management Plan**: This component aims at creating the instruments and building the institutional capacities for the physical planning and monitoring of the coastal zone development, in order to improve environmental conditions and prevent further degradation. Its outputs would include: (i) preparing a regional environmental assessment which will identify the cumulative pressures and impacts of the coastal zone development under different investment scenarios (terms of reference available on file); (ii) establishing a GIS system for physical planning and monitoring of the coastal zone development for use by CDR, MMRA and the municipalities; (iii) preparing a coastal zone management plan to be approved and legally binding on all future developments on the coast; and (iv) initiating the implementation of emergency actions to protect and/or rehabilitate coastal resources. The coastal zone management plan will include: (a) a strategy for the allocation of coastal and marine resources, defining areas to be conserved and protected and policies for zoning and development of economic activities in the coast; (b) a regulatory needs assessment and preparation of draft guidelines, rules and regulations for control of activities on the coast; and (c) mechanisms for recurrent funding to support CZM activities and encourage public/private partnership.

(b) **Engineering Services**: The designs of compactor trucks, containers, and landfills have been completed, or are in the process of being completed, under the ERRP. Engineering services will be needed for assistance to CDR in bid evaluation, and supervision of construction. Full engineering services will be provided for the (i) design and construction supervision of the two compost plants in Saida and Zahle; (ii) design and construction of the air pollution control system and the

compost plant at the existing Amrousiyeh incinerator; and (iii) design and construction supervision of the incinerator for the disposal of hospital waste.

(c) **Technical Assistance and Training**: As both MOE and MMRA are newly established ministries, their staff requires training in the development and implementation of their responsibilities. MOE is already receiving technical assistance from UNDP for institutional development. In the short term, there is an immediate need to create capacity to review and manage environmental assessments at CDR, the project implementing agency. This agency will gradually take on responsibilities of decision making and loan administration for the environmental aspects of this loan, and this will be initiated with the recruitment of a senior environmental specialist experienced in environmental assessment to reinforce the PMU at CDR. This would be a permanent position, and eventually CDR may require a stronger environmental assessment unit composed of several environmental specialists to manage activities related to preparation and review of environmental assessments in all infrastructure sectors. As currently the institutional capacity for environmental management is in the formative stage in Lebanon, the Bank will closely supervise and approve all environmental assessments carried out by CDR, the implementing agency (para. 3.3). MMRA also requires strengthening of all departments. The project will recruit three international experts who will constitute the Project Coordination Unit (PCU) in MMRA and who will each serve for two years, coordinating project implementation and training MMRA staff. These will consist of a: (i) senior municipal engineer, with experience in solid waste and wastewater systems management; (ii) senior financial expert with experience in modern municipal financial management; and (iii) senior planner with experience with planning, zoning and urban transport. Upon the recommendations of these experts, the project would finance the procurement of computers and other office equipment to modernize the accounting and management systems at both MMRA and the principal municipalities, together with the necessary training in their use. Finally, the project would provide for the training abroad in municipal management of six technical staff from MMRA and one from each principal municipality.

D. Project Costs and Financing Plan

Project Costs

2.7 Total project cost is estimated to be about US$135.0 million of which about 41 percent will be financed by the proposed Bank loan of US$55.0 million. An exchange rate of US$1.0 = LL 1650 has been used. The cost estimates for the compactor trucks, containers and landfills, are based on the contracts awarded for identical works under the ERRP, adjusted for

inflation. The cost estimates for the incinerator for hospital waste, the compost plants at Saida and Zahle, and the compost plant and rehabilitation of the incinerator at Amrousiyeh are based on recent proposals received by CDR for similar projects. No physical or price contingencies have been allowed for the cost of land. Similarly, contingencies have not been allowed for the technical assistance components. A physical contingency of 10 percent has been included in the cost of the civil works only. Price contingencies for equipment and civil works have been included on the basis of the following annual inflation rate projections:

GOL's Fiscal Year	FY95	FY96	FY97	FY98	FY99	FY2000	FY2001
Costs in:							
US$	1.5	1.8	2.7	2.5	2.5	2.6	2.6
LL	8.0	6.0	5.0	4.0	2.5	2.5	2.4

A summary of cost estimates for the project is given in Table 2.2 below.

Table 2.2: Summary of Cost Estimates

Item No.	Subproject and Component	Local	LL (million) Foreign	Total	Local	US$ ('000) Foreign	Total	Percent Foreign	Percent of Base Cost
1.	CIVIL WORKS								
1.1	Land Acquisition	11,550.00	0.00	11,550.00	7,000.00	0.00	7,000.00	0.00	5.85
1.2	Development of New Sites	3,300.00	6,600.00	9,900.00	2,000.00	4,000.00	6,000.00	66.67	5.02
1.3	Closure of Old Dumps	4,950.00	11,550.00	16,500.00	3,000.00	7,000.00	10,000.00	70.00	8.36
1.4	Buildings and Workshops	1,650.00	1,650.00	3,300.00	1,000.00	1,000.00	2,000.00	50.00	1.67
	Sub-Total	21,450.00	19,800.00	41,250.00	13,000.00	12,000.00	25,000.00	48.00	20.90
2	GOODS AND EQUIPMENT								
2.1	Compactor Trucks	2,310.00	21,450.00	23,760.00	1,400.00	13,000.00	14,400.00	90.28	12.04
2.2	Containers	825.00	1,980.00	2,805.00	500.00	1,200.00	1,700.00	70.59	1.42
2.3	Landfill Equipment	825.00	7,425.00	8,250.00	500.00	4,500.00	5,000.00	90.00	4.18
2.4	Special Equipment	412.50	3,712.50	4,125.00	250.00	2,250.00	2,500.00	90.00	2.09
	Sub-Total	4,372.50	34,567.50	38,940.00	2,650.00	20,950.00	23,600.00	88.77	19.73
3	DISPOSAL PLANTS								
3.1	Compost Plant in Saida, 200T/day	3,960.00	22,440.00	26,400.00	2,400.00	13,600.00	16,000.00	85.00	13.38
3.2	Compost Plant in Zahle, 200T/day	3,960.00	22,440.00	26,400.00	2,400.00	13,600.00	16,000.00	85.00	13.38
3.3	Amrousiyeh Compost Plant	4,455.00	25,245.00	29,700.00	2,700.00	15,300.00	18,000.00	85.00	15.05
3.4	Hospital Waste Incinerator	1,650.00	14,850.00	16,500.00	1,000.00	9,000.00	10,000.00	90.00	8.36
	Sub-Total	14,025.00	84,975.00	99,000.00	8,500.00	51,500.00	60,000.00	85.83	50.17
4	TECHNICAL ASSISTANCE								
4.1	Coastal Zone Management	825.00	7,425.00	8,250.00	500.00	4,500.00	5,000.00	90.00	4.18
4.2	Engineering Services	660.00	5,940.00	6,600.00	400.00	3,600.00	4,000.00	90.00	3.34
4.3	Technical Assistance and Training	330.00	2,970.00	3,300.00	200.00	1,800.00	2,000.00	90.00	1.67
	Sub-Total	1,815.00	16,335.00	18,150.00	1,100.00	9,900.00	11,000.00	90.00	9.20
	Total Base Cost	41,662.50	155,677.50	197,340.00	25,250.00	94,350.00	119,600.00	78.89	100.00
5.	Contingencies								
5.1	Physical Contingencies	1,155.00	5,280.00	6,435.00	700.00	3,200.00	3,900.00	82.05	3.26
5.2	Price Contingencies	3,382.50	15,592.50	18,975.00	2,050.00	9,450.00	11,500.00	82.17	9.62
	Total Contingencies	4,537.50	20,872.50	25,410.00	2,750.00	12,650.00	15,400.00	82.14	12.88
	TOTAL COST	46,200.00	176,550.00	222,750.00	28,000.00	107,000.00	135,000.00	79.26	112.88

NOTE: US $1.0 = LL 1,650

E. Financing Plan

2.8 Financing of the project would be divided into two distinct, parallel parts: (i) components financed through Bank funds; and (ii) components financed through cofinancing. The Lebanese Government has requested the Japanese Government to cofinance the project in an amount equal to the Bank loan, and the initial reaction so far has not been negative. The Cofinancing funds would finance the disposal plants, i.e., the compost plant in Saida, the compost plant in Zahle, the compost plant at Amrousiyeh, and the incinerator for hospital waste. The remaining components would be financed with funds from the Bank loan. The financing plan is shown in Table 2.3 below. A cofinancing agreement for the equivalent of US$55 million will be signed with Japan or alternative financing will be found (para. 6.1).

Table 2.3: Financing Plan

Funding Agency	Local	Foreign	Total	% of Financing Plan
	---------- (US$ Million) ----------			
1. IBRD Loan	3.0	52.0	55.0	41.0
2. Government	25.0	-	25.0	18.0
3. Cofinanciers	-	55.0	55.0	41.0
TOTAL	28.0	107.0	135.0	100.0

F. Procurement

2.9 All Bank-financed civil works, equipment and materials, would be procured in accordance with the Bank's Procurement Guidelines. Procurement of consultant services and technical assistance would follow Bank's Guidelines for the Use of Consultants. Lebanese manufacturers competing for goods and equipment contracts under International Competitive Bidding (ICB) would receive a preference in bid evaluation of 15 percent of the CIF price or the prevailing custom duty applicable to non-exempt importers, whichever is less, provided the local value added to the product is not less than 20 percent of the ex-factory bid price.

2.10 Contracts for the supply of goods and equipment valued at US$250,000 or more would be awarded through ICB procedures. Contracts for the supply of goods would be grouped, as far as practicable, to attract international competition. Arrangements would be made for phased delivery of compactor trucks and containers to match the availability of landfill sites. Goods and equipment costing between US$50,000 and US$250,000 would be procured through international shopping, up to a limit of US$1.5 million, obtaining at least 3 quotations from suppliers in three different eligible countries, and those below US$50,000 would be procured through local shopping, up to a limit of US$500,000, by solicitation of at least three price quotations.

Table 2.4: Procurement Arrangements (US$ million)[1/]

	No. of Contracts	IBRD Procurement Methods ICB	LCB	Other	N.B.F	Total Cost
1. CIVIL WORKS						
1.1 Land Acquisition	-	-	-	-	7.0	7.0
1.2 Landfill Development	15	-	7.5	-	-	7.5
	-	-	(5.1)	-	-	(5.1)
1.3 Closure of Dumps	15	-	12.4	-	-	12.4
	-	-	(8.6)	-	-	(8.6)
1.4 Buildings & Workshops	15	-	2.5	-	-	2.5
	-	-	(1.3)	-	-	(1.3)
Sub-total	45	-	22.4	-	7.0	29.4
	-	-	(15.0)	-	-	(15.0)
2. GOODS AND EQUIPMENT						
2.1 Compactor Trucks	1	18.0	-	-	-	18.0
	-	(18.0)	-	-	-	(18.0)
2.2 Containers	1	2.0	-	-	-	2.0
	-	(1.3)	-	-	-	(1.3)
2.3 Landfill Equipment	1	6.5	-	-	-	6.5
	-	(6.5)	-	-	-	(6.5)
2.4 Special Equipment	10	1.2	-	2.0	-	3.2
	-	(1.2)	-	(2.0) [3/]	-	(3.2)
Sub-total	13	27.7	-	2.0	-	29.7
		(27.0)	-	(2.0)	-	(29.0)
3. DISPOSAL PLANTS (Financed by Cofinanciers)						
3.1 Saida Compost Plant	3	-	-	-	17.5	17.5
	-	-	-	-	-	-
3.2 Zahle Compost Plant	3	-	-	-	17.5	17.5
	-	-	-	-	-	-
3.3 Amrousiyeh Complex	3	-	-	-	19.5	19.5
	-	-	-	-	-	-
3.4 Hospital Waste Incinerator	3	-	-	-	10.4	10.4
	-	-	-	-	-	-
Sub-total	12	-	-	-	64.9	64.9
	-	-	-	-	-	-
4. TECHNICAL ASSISTANCE [2/]						
4.1 Coastal Zone Management	3	-	-	5.0	-	5.0
	-	-	-	(5.0)	-	(5.0)
4.2 Engineering	4	-	-	4.0	-	4.0
	-	-	-	(4.0)	-	(4.0)
4.3 TA & Training	-	-	-	2.0	-	2.0
	-	-	-	(2.0)	-	(2.0)
Sub-total	7	-	-	11.0	-	11.0
	-	-	-	(11.0)	-	(11.0)
TOTAL	77	27.7	22.4	13.0	71.9	135.0
	-	(27.0)	(15.0)	(13.0)	-	(55.0)

1/ Figures in brackets represent IBRD financing.
2/ Consultants will be recruited in accordance with Bank guidelines.
3/ International and Local Shopping

2.11 Contracts for civil works valued at US$500,000 or more would be awarded through ICB in accordance with Bank Guidelines. Civil works contracts under US$500,000, and civil works for the development of landfills or the rehabilitation of old dumps, which are in the range of US$100,000 to US$750,000, would be awarded through LCB open to foreign contractors. LCB procedures have been reviewed recently as part of a Country Procurement Assessment Report (CPAR) and the differences between Lebanese regulations and the Bank's Procurement Guidelines reviewed.

2.12 All bidding packages for works and goods estimated to cost US$250,000 equivalent or more, and consultant contracts over US$100,000 (US$50,000 for individuals), would be subject to the Bank's prior review. These limits would result in prior review of about 95 percent of total procurement financed by the loan. Other contracts for works and goods would be subject to the Bank's review after award of the contract. Where prequalification is used for major equipment contracts, procedures according to the Bank's Guidelines would be followed. Table 2.4 gives a breakdown of project components to be procured by ICB, LCB, and other procedures.

G. Disbursement and Special Account

2.13 Table 2.5 shows how the proposed Bank loan of US$55.0 million will be disbursed against the various project components.

Table 2.5: Disbursements

Category	Description	Amount US$ million	% of Expenditures To be Financed
1	Civil Works	12.0	70% of Expenditures (excluding cost of land)
2	Goods & Equipment	23.1	100% of foreign expenditures; 100% of local expenditures (ex-factory cost); and 80% of local expenditures for other items procured locally
3	Technical Assistance	11.0	100% of all Expenditures
4	Unallocated	8.9	
	TOTAL	55.0	

2.14 The estimated quarterly disbursement schedule is given in Annex 6. The disbursement schedule is based on the Bank's disbursement profile for the MENA Region but has been slightly modified for a 6-year implementation period instead of eight years. This is due to the fact that about 50 percent of the loan will be contracted during the first six months of effectiveness (see paras. 2.17-2.23). Disbursements are expected to be completed within six months after project completion. The closing date of the proposed loan will be December 31, 2001.

2.15 Out of the proposed loan, US$5.0 million (or 9 percent of total loan) will be used for advance procurement and retroactive financing, from the time of appraisal (December 1994), of (i) consulting services for institutional strengthening, for the CZM plan, for the proposed compost plants in Saida and Zahle, and for the incinerator for hospital waste; and (ii) the procurement of compactor trucks and containers. Such advance procurement is necessary for timely project implementation and to maintain the momentum started under the ERRP. However, all retroactive financing will be within the maximum period of twelve months prior to the expected date of loan signing.

2.16 In order to enable CDR to effectively implement the project and to ensure availability of foreign exchange to international contractors, CDR would maintain a Special Account at the Banque du Liban, the Lebanese central bank, for a maximum amount of US$2.0 million (US$0.5 million until US$4.0 million has been disbursed from the Loan Account), which is expected to cover the Bank's share of eligible expenditure over a four-month period. Payments from the Special Account would only be made for eligible expenditures indicated in the Loan Agreement. The account would be denominated in US dollars and replenished monthly, or whenever half the authorized allocation has been utilized, whichever comes first. All payments of less than 20 percent of the authorized allocations to the Special Accounts must be made through the Special Account; all other payments may be made using the direct payment or Special Commitment procedure. All disbursements for contracts under the procurement prior review limits will be submitted under Statements of Expenditures (SOE). Related supporting documents for SOE claims would be retained at CDR's headquarters and made available for inspection by Bank missions and project auditors. The Special Account and the SOEs will be audited in conjunction with the annual audit of CDR's accounts, the auditor providing separate opinions for the Special Account, the SOEs and CDR's accounts (para. 3.12).

H. Project Status and Implementation

2.17 **Engineering Consultancy Services**: An international consulting firm was awarded a US$1.5 million contract, on the basis of an internationally competitive bidding process, for the design and supervision of the landfills for the 13 priority Cazas which formed part of the ERRP. Final engineering designs and bidding documents for the first five Cazas of Baalbeck, Chouf, Tripoli, Tyre and Zahle have been completed and invitations to bid will be launched in May, 1995. In view of the similarity of the work between the two phases and for reasons of economy

and efficiency, CDR, with the concurrence of the Bank, negotiated a US$500,000 extension to the contract to cover the engineering services of the second phase of 15 landfills (out of the 25 Cazas, three are large and will have two landfills each) to be financed out of the proceeds of the ERRP. The terms of reference require the consultants to carry out a complete EA for each site in accordance with the provisions of OD 4.01. It is expected that all the engineering design and bidding documents for the landfills will be completed by the end of June, 1996. EAs satisfactory to the Bank will be carried out and submitted to the Bank for approval prior to award of contracts for site development (para. 6.1).

2.18 CDR will be responsible for the execution of the CZM Plan, under the orientation of a technical steering committee. The Committee will include representatives of CDR, MOE, MMRA, main coastal municipalities, Departments of Urbanism and Transport (Ministry of Public Works), and the Executive Council for Major Projects. The technical assistance for the CZM Plan has commenced with the preparation of detailed terms of reference for the Regional Environmental Assessment (REA) of the coastal zone. A consultant will commence work on the REA in 1995, with retroactive financing under the project.

2.19 The bidding documents for the compactor trucks and containers have already been prepared, following the model used in the ERRP. CDR has started prequalification of the bidders and will issue the invitations for bids by June 1995, to be ready for the award and signature of the relevant contracts by the date of loan effectiveness.

2.20 CDR is bidding a contract for the detailed engineering design and bidding documents of the compost plant and air pollution control system in Amrousiyeh, in accordance with TORs approved by the Bank (the EA has already been completed and reviewed by the Bank). Bidding documents would be ready by May, 1995 and CDR expects to be able to award a contract by mid-1995. Consulting contracts for the detailed engineering design and bidding documents of the two compost plants at Saida and Zahle and the incinerator for the disposal of hospital waste will be awarded by international competition, with detailed engineering work starting in the summer of 1995 and to be completed early in 1996.

2.21 **Land Acquisition**: Land acquisition under the ERRP was initially slow as municipalities, most of which did not have the funds for the acquisition of privately owned land and doubted that the funds for acquisition and development were available, sought public land for landfill sites. However, many of these proved to be unsuitable. Several factors are expected to improve the situation very quickly: (i) construction will soon start in the first five Cazas mentioned in para. 2.17 above, serving as a model for the others; (ii) CDR will use funds allocated to land acquisition under the Government's reconstruction program to support municipalities that are not able to provide the necessary funds; and (iii) expropriation procedures will be used where necessary (a special expropriation unit has been set-up in CDR for this purpose).

2.22 The project requires the selection of environmentally and economically acceptable landfill sites, and to this end has developed a "Summary of General Site Selection Criteria for Controlled Sanitary Landfills" (Attachment 8 to Annex 10). These criteria will be used to select the landfill sites financed under the project. No sites will be acquired that would involve involuntary resettlement. In order to reinforce and accelerate the process of site selection of environmentally acceptable sites, a detailed schedule for land acquisition (Annex 9) was discussed during negotiations and the following agreements were reached: (i) environmental assessment (EA) reports will be prepared by the Borrower to recommend one or more environmentally acceptable sites for each Caza and the EA reports will be submitted to the Bank for review; (ii) negotiations should be initiated on one or more of the selected sites, and expropriation proceedings initiated as necessary; and (iii) no collection equipment will be allocated to municipalities until they have acquired the land for landfills (para. 6.1). These procedures should ensure that most landfill sites are acquired for the project by the end of 1995.

2.23 The two landfill sites in Saida and Zahle have been selected with a view to constructing the two compost plants on the same sites, and sufficient space is available for this purpose. This will both reduce the environmental impact of the two plants and place them within easy access of the landfill for the disposal of rejects. As mentioned under para. 2.4 (c), the Amrousiyeh incinerator was originally designed for future expansion and there is sufficient land available adjacent to the incinerator for construction of a compost plant. An Environmental Impact Assessment of the Amrousiyeh Complex has been reviewed by the Bank.

2.24 **Project Implementation Schedule**: Annex 3 shows the project implementation schedule in bar chart form. As the project is part of the NERP and is a continuation of the ERRP, many project components are linked and will overlap with ongoing projects.

I. Project Supervision

2.25 The implementation of the project is expected to take about six years. The Bank would supervise the project three times a year during the first two years of project implementation, and an average of twice a year during the last four years. The core team for the supervision missions would consist of a municipal engineer, a financial analyst, and an environmental expert. This core team would be supplemented by experts in the (i) production and marketing of compost and utilization of recycled material from the waste; and (ii) incineration of municipal solid waste and hospital waste. The project builds on the experience of the ERRP; the implementing agency, CDR, is both competent and familiar with Bank procedures. About 14 supervision missions are planned during project implementation and the supervision effort is estimated to require a total of 119 staffweeks (average of 17 staffweeks per year). The supervision effort is heavily front-loaded to ensure adequate performance in the critical early years of the project. The tentative supervision forecast is in Annex 4.

2.26 In addition to supervision missions, the project will be monitored through semi-annual progress reports which would be submitted by the CDR to the Bank within 30 days after the end of each semester during the entire project implementation period. These reports would focus on both the cumulative and specific progress achieved during the reporting period for: (a) the implementation of the agreed action plan to implement the sector development strategy, including its development impact; (b) preparation of environmental assessments for selection of disposal sites and status of site acquisition; (c) the bidding process for all major contracts for civil works and equipment to be procured; (d) the physical progress by contract of civil works and equipment delivery; (e) the status of technical assistance, studies, designs, programs, environmental monitoring, and staff training; (f) the status of Bank disbursements and projected disbursements for the next six months; (g) the status of covenants and accounts and audit; and (h) a summary of any issues raised by Bank missions and actions taken for their resolution. A brief summary would be added explaining the reasons for any delays or shortcomings in any of the above items and of actions taken to improve progress.

2.27 A mid-term review of all project activities would be conducted jointly by the CDR/MMRA and the Bank. To facilitate this review, CDR would prepare a detailed report covering all aspects of the project and submit it to the Bank by December 31, 1998 for a joint review in February 1999. The implementation completion report, including assessment of the project's development impact, would be prepared by CDR and submitted to the Bank not later than six months after the loan closing date.

J. Private Sector Involvement

2.28 So far, the involvement of the private sector has been limited to service contracts, using existing municipal collection equipment for transport to the dumps. Three relatively large contracts for collection and for operation and maintenance were awarded in Beirut to the private sector. These included: (i) the operation and maintenance of the Amrousiyeh incinerator, for an annual fee of US$1.35 million; (ii) the operation and maintenance of the Karantina compost plant, for an annual fee of US$1.75 million; and (iii) collection services for Greater Beirut, for an annual fee of US$3.65 million. The first year's operation on all three contracts is being funded out of the proceeds of the ERRP and performance is generally satisfactory. A similar contract has been awarded for the entire Chouf region. Some municipalities, like Zahle and the Association of North Metn had on-going contracts with the private sector, even before the ERRP. Municipalities will be required to enter into similar contracts under the proposed project before receiving collection equipment, unless they are able to demonstrate, as some can, that they are capable of performing the function with their own resources (para. 6.1).

K. Women in Development

2.29 Women, in general, are not directly involved in the collection and disposal of waste. In some communities (as in Jbeil), women's groups have formed associations for cleaning the environment. They have started an awareness campaign and have managed to collect contributions from businessmen and higher income groups to support the activities of their municipalities. However, women are quite active in local administrations both as professionals and support staff. The ratio of women in municipal organizations reaches up to twenty percent in the major urban areas and about ten percent in the rural communities.

L. Poverty Impact

2.30 The project has a high impact on poverty because of the difficulties faced by the poor to organize their own waste collection systems. The poor depend on the municipalities to collect their waste and are willing to pay a reasonable fee for the service. During periods of failure of the municipal institutions, the higher income areas are able to hire private entrepreneurs to collect the waste and take it to a dump while, not having the same resources, the largest piles of uncollected waste are found in the poorer areas, causing major health hazards. Children playing in these areas are particularly at risk. An additional benefit of the project for the poor will be the creation of additional employment opportunities in the collection and sorting of waste and recycling.

III. PROJECT EXECUTION AND MANAGEMENT

A. Background

3.1 While the ultimate beneficiaries of the project will be the people of Lebanon and visitors to the country, the intermediate beneficiaries will be the municipal organizations, which are under the tutelage of MMRA. The Council for Development and Reconstruction (CDR) will assume responsibility for implementation of the project, with the support of MMRA. CDR is adequately staffed with competent personnel; its procurement regulations, which are simpler than those of line ministries, work well and are acceptable to the Bank; and it has rapidly gained expertise in implementing Bank-financed projects. Within CDR, a Program Management Unit (PMU) consisting of a number of specialists is responsible both for planning and for coordination with the line ministries, through Sector Implementation Units (SIUs) located in the ministries. This arrangement was set up under the ERRP and found to work well. It is being financed under a grant from the European Union.

B. Organization and Management

3.2 CDR was established as an autonomous body with a Board of Directors chaired by a President and reports directly to the Council of Ministers. The Board of Directors is the supreme authority for setting policies concerning CDR's activities, for approval of CDR's work program and annual operating and capital budgets, and for awarding and supervising contracts. CDR also appoints consultants for the design and supervision of construction/implementation contracts.

3.3 The preparation of environmental assessment (EA) reports for each of the disposal facilities (Amrousiyeh complex, compost plants, landfills and hospital incinerator(s)) will be the responsibility of the implementing agency, CDR. A senior environmental specialist experienced in environmental assessments has been charged with the daily management of the EA work. This professional will participate in the forward planning for solid waste that will include: (i) preparing terms of reference for EAs for each disposal facility, to include recommendations for several environmentally acceptable sites; (ii) managing and monitoring the work of environmental consultants; (iii) reviewing EAs to ensure complying with the World Bank's Operational Directive 4.1 on the behalf of the Borrower; (iv) submittal of the final EA report to the World Bank for concurrence prior to final approval. The environmental specialist position within the PMU at CDR was filled on April 20, 1995, financed by the European Union. Terms of reference for the Senior Environmental Specialist are provided in Attachment 2 to Annex 10.

3.4 Monitoring of the consultants carrying out design and supervision is to be effected by the PCU for solid waste, which will be housed at MMRA. The PCU will be composed of three full-time professionals, one a solid waste management engineer, another a financial analyst, and the third a town planner. This team will be strengthened by short-term assignments by experts in various related fields, when necessary. A Technical Coordination Committee (TCC) made up of representatives of CDR, MMRA, PMU and PCU monitors progress, coordinates among the various organizations, and advises management regarding budgeting and decision - making. All participating municipalities will delegate a senior member of their staff to liaise with MMRA and the PCU for SWM.

C. Operation and Maintenance

3.5 Administratively, Lebanon is divided into six governorates and 25 Cazas (districts). Municipal services are provided by the municipalities, which are overseen by the Kaimakam (the administrative head of the Caza) and supervised by MMRA. Refuse collection is carried out either by municipal workers or contracted out to the private sector. In many Cazas, municipal organizations have formed associations and pooled their resources to attain an economy of scale. This arrangement has proven to be successful and will be extended to most Cazas. For example, in metropolitan Saida the municipal associations have the capacity to deliver an effective solid

waste management service. At a later stage during implementation, efforts will be made to create municipal associations covering a whole governorate in order to facilitate supporting activities. It will be a condition of allocation of collection equipment to municipalities that they either enter into a contract with a competent firm for collection and disposal or show that they are capable of performing the function themselves (para. 6.1).

3.6 After completion of each project component, a joint committee composed of representatives of CDR, MMRA, and the relevant municipal organization for the Caza would take over the work and then hand it over to the municipality concerned. Before the civil war, municipalities were sufficiently staffed and organized to provide adequate services to their inhabitants. Two municipal organizations that were not severely affected during the civil war have been taken as models and analyzed. Their organization charts and budgets for 1993 are shown in Annex 1. With the exception of a general lack of adequate disposal systems, these municipalities were able to raise the necessary revenues to provide adequate services.

D. Cost Recovery

3.7 In addition to solid waste collection and disposal, municipalities are responsible for street paving, sidewalks and parks, municipal police, stormwater drainage, abattoirs, etc., and wastewater collection and disposal until this last function is taken over during 1995-1996 by the Regional Water Supply and Sanitation Companies which are in process of being created. Not untypically, the revenues of the municipalities are rarely of the user charges type and remain fungible. In the absence of cost accounting, it is currently impossible to match costs with revenues. However, under the project, the cost of providing solid waste services has been estimated (Para. 3.9). Furthermore, with the modernization of the accounting systems of the municipalities (Para. 2.6 (c)), it will become easier to analyze costs and determine the need to adjust the various levies which make up the revenues of the municipalities. This should result in enhanced transparency.

3.8 Recently, the revenues of the municipalities have been substantially increased by revision of rental values and are expected to increase further as economic activity picks up and other tax bases grow (para. 1.4). The existing tax base would be sufficient to cover other municipal activities plus part of the cost of the solid waste management service. It has been agreed to create a cost recovery system, which would initially be set at the equivalent of about 25 percent of the estimated cost of the collection and disposal of solid waste, and to commence collection of charges within a year of starting the new solid waste service (para. 6.1). Supplementing the existing charging system will not only contribute to the financial viability of the municipalities but will also give the households a clearer price signal.

E. Affordability

3.9 The annual household cost of service has been calculated for five representative municipalities, taking into account, capital costs including engineering studies and construction supervision, O&M, replacement cost, and debt service. The actual cost of service varies with each municipality depending on the cost of land and other specific characteristics of each municipality as follows:

Average Annual Cost per Household (US$)

Baalbeck	42.80
Chouf 2	48.30
Saida	34.55
Tyre	55.20
Zahle	35.60

3.10 The above figures are for collection and landfill systems. The alternative using compost plants, is justified by the lack of available landfill sites and the value of the compost produced, which could be used for both agriculture and pisciculture. The proposed cost recovery scheme would ensure that charges for solid waste service are affordable by all households. Through a combination of direct and indirect charges, the poor would benefit from a cross-subsidy which would result from factors such as population concentration, relative affluence, and number of persons per household. There are some 690 municipalities in Lebanon, of which the largest 15 percent to 20 percent harbor roughly 80 percent to 85 percent of the total population. The economic affluence of the larger agglomerations is in dire contrast with that of the smaller ones where many of the poor live. Irrespective of location, however, affluent households contribute proportionately more to the Municipal Fund because their rental values and their consumption of services which form the bases for the revenues of the Municipal Fund are considerably higher than those of the poor. Furthermore, because of lack of scale even where they join force to provide service, small municipalities experience higher unit costs than large municipalities. Finally, the average number of persons per household is generally higher among the less affluent population.

3.11 At present, the taxes making up the bulk of the revenues of the Municipal Fund are assessed and collected once a year, creating an additional hardship for the poor. A new cost recovery system is being developed which will be implemented one year after commencement of waste management services provided under the project. Collection equipment would not be allocated to municipalities until a satisfactory cost recovery plan has been prepared (para. 6.1).

F. Accounting and Auditing

3.12 CDR will be the designated representative of the Borrower for withdrawing the proceeds of the World Bank loan. CDR will keep separate accounts for project expenditures in accordance with internationally acceptable accounting principles and practices. These accounts and the Special Account would be audited annually by an independent auditor acceptable to the Bank, and copies of the audited statements would be forwarded to the Bank within nine months of the end of the CDR's fiscal year. It has been agreed that: (a) CDR would maintain its overall accounts in an appropriate format; (b) that these accounts would be audited annually by independent and experienced auditors acceptable to the Bank; (c) that the auditors would, in addition to the overall audit report for the CDR, prepare and submit a separate opinion on the accuracy and appropriateness of the project accounts, SOEs and Special Account to be maintained by the CDR; and (d) that the annual audit report and the report on the project accounts would be submitted to the Bank within nine months of the end of each fiscal year.

G. Project Action Plan

3.13 Annex 7 gives the proposed Action Plan for the project. The two most critical aspects of the project are: (i) the timely acquisition of land for the sanitary landfills in the remaining Cazas; and (ii) implementation of the cost recovery system.

IV. ENVIRONMENTAL ASSESSMENT

4.1 Environmental Review Process. While the proposed project is expected to have positive environmental impacts by elimination of dumping of solid wastes at roadsides, at open seashore dumps, on vacant land and at uncontrolled dump sites, the possibility that some of its components could have negative impacts if mismanaged caused it to be subject to a category A environmental assessment according to World Bank Operational Directive 4.1. The impacts of these components and mitigation measures to be undertaken are described below.

Compost Plants at Saida and Zahle

4.2 Project Justification and Benefits. Composting plants were found to be the best technological and economic solutions to solid waste disposal problems for the Cazas of Saida and Zahle for the following reasons:

(a) the existence of close-by agricultural lands makes it economically and technically beneficial for compost to be used for soil improvement;

(b) the high proportion of humid (wet) organic matter (52 - 68%) enhances efficient compost production and makes incineration technically and economical not feasible;

(c) landfill volume requirements are greatly reduced (although the need for a landfill is not eliminated);

(d) the environment is safeguarded through the avoidance of nuisances such as odors, water table pollution, insect propagation, epidemic risks and aesthetic appearances; and

(e) the sorting of recuperable material, namely, plastic, metal, aluminum cans and glass, encourages the establishment of recycling industries.

4.3 Potential Environmental Impacts. Despite its advantages, the establishment of a composting plant may have negative impacts on the surroundings, including:

(a) the change in land use at the selected site from agricultural to a waste disposal site; and

(b) the nuisance to the local population, including noise from plant operations and truck traffic, generation of odors at the plant, dust and litter due to truck traffic and deterioration in roads due to heavy truck traffic. Environmental mitigation measures are presented in the Summary of Environmental Management Activities (Attachment 3 to Annex 10).

4.4 It is important to note that there are negligible effects of the composting plants on surface waters, groundwater, geological conditions at the site, fauna and flora, climate, tourist attractions and archeological sites. This is mainly due to the appropriateness of the site locations, which were selected on the basis of absence of impact on the aforementioned criteria as well as considerations of economy and efficiency and minimal nuisance to human settlements (see Attachment 8 of Annex 10).

4.5 Mitigation Measures. Mitigation measures to minimize the above-mentioned negative impacts were developed and a management plan for the application of these measures has been established. These measures are based on past experience both in Lebanon and abroad. Accordingly, all non-constructed areas will be covered with lawn, and the whole compost plant will be surrounded by trees. All circulation areas will have a high quality grade and sub-grade capable of withstanding the traffic of heavy trucks and will be paved with washable anti-sliding material. Odors will be controlled through a combination of efficient compost fermentation management, covering of fermentation area and odor control equipment. The storage, fermentation and maturation areas will be covered. These areas will be equipped with fire

extinguisher, fire hydrants and a basin for water storage. The noise pollution will be minimized by implementing strict regulations for noise control of equipment, for speed limitation of trucks arriving and departing, and by establishing fixed opening and closing hours for the operation of the plant. The odor and litter problems will be reduced by placing a reception facility below ground level. As for the wastewater generated from the daily use of water, it will be disposed of in a septic tank of appropriate capacity. The composting plants will be complemented by adjacent sanitary landfills, built according to international standards, capable of handling all the non-recyclable sorted refuse from the plants.

4.6 A summary of the proposed monitoring actions for the compost plants at Zahle and Saida is presented in Attachments 3 to 7 of Annex 10, with an identification of the responsible party and the associated costs. The primary responsibility for monitoring will be with the compost plant operator, especially as to monitoring of odors, groundwater, surface water and quality of the compost produced. Laboratory equipment for chemical analysis is included in the project, but external laboratory facilities may also be used. Monitoring costs, which will be confirmed during final design, are estimated to be of the order of US$40-80,000 per year of direct cost for each compost plant operator, mostly for chemical laboratory analysis. It should be noted that important measures would be undertaken to ensure that the operation of the compost plant meets the standards and objectives it was originally designed for, essentially the transformation of the municipal waste into a useful product that can be marketed and used in agriculture. This goal can be achieved by (i) ensuring a high quality compost that is suitable for use in the nearby agricultural lands; (ii) undertaking a successful marketing campaign to increase people's knowledge and awareness and to eliminate their reticence towards using a product generated from waste; and (iii) ensuring a good coordination between the various agencies concerned by the project, namely the Ministry of Municipal and Rural Affairs, the Ministry of the Environment, the Ministry of Agriculture, the municipalities involved, and other non-governmental organizations.

4.7 Environmental Management Activities. A summary of the major environmental impacts, and the agreed mitigation measures and monitoring actions, with approximate costs, is provided in Attachments 3 to 7 of Annex 10. The tender documents for the Saida and Zahle compost plants will require that bidders incorporate these measures into their proposals, including provision of sampling and laboratory equipment and estimates of annual monitoring costs.

Amrousiyeh Complex

4.8 Environmental Impacts. The EA of the Amrousiyeh Complex indicates that increasing the capacity of the existing incinerator is not an environmentally sustainable solution for waste disposal in the region of Western Beirut. As the organic (putrescible) materials represent 50-68 percent (wet weight basis) of the waste with a high water content (62-81%), the existing incinerator furnaces require addition of fuel oil to attempt to generate complete combustion. Emission stack testing shows that there is still incomplete combustion, even under the best

operating conditions with all parameters exceeding international norms. Black smoke, particulate matter and odors are common occurrences. The Amrousiyeh incinerator would not, therefore, be expanded.

4.9 Mitigation Measures. The proposed alternative to the incinerator expansion is the construction of a compost plant at the existing site and modernization of the existing furnaces at the incinerator, including an air pollution control system to meet international standards. Inefficient incineration of the wastes will be resolved by selective collection of wastes with higher calorific value wastes and by use of the high calorific value waste separated at the compost plant. This solution is an integrated solution that encourages reduction, reuse and recycling of waste materials and also makes efficient use of the existing facilities at the site. The EA for the complex is being prepared and will be completed prior to Board presentation. The mitigation measures will be similar to those described above for the composting plants for Saida and Zahle, with the addition of appropriate measures for the incinerator, and a similar division of environmental monitoring responsibilities (see Attachments 3 to 7 of Annex 10). The monitoring costs at the Amrousiyeh complex may exceed the monitoring costs estimated for the other compost plants, as the incinerator will require regular air quality testing, estimated at US$25,000 for each performance test, to ensure that the operator is in conformance with the European Union air regulations. Total costs for monitoring may exceed $100,000 per year, at least for the initial years, but are likely to diminish thereafter. The tender documents for the complex will require that bidders incorporate full environmental mitigation and monitoring measures into their proposals, including provision of sampling and laboratory equipment and estimates of annual monitoring costs. The environmental mitigation and monitoring measures for the Amrousiyeh Complex will be implemented by CDR.

4.10 **Guidelines for Selection and Design of Landfills.** The selection of sites for landfills in Lebanon is a difficult process due to the shortage of suitable sites in the rugged mountainous terrain, due to the disruption of effective municipal land use planning procedures during the civil war and due to opposition to landfill sites from those in their vicinity. The "not in my backyard" attitude to accepting landfills appears to be widespread among landowners and the public in Lebanon. A general set of criteria have been developed within the EA to: (a) assist in the selection of rational sites for landfills; and (b) define basic design principles for landfills. The criteria emphasize avoidance of sensitive environmental features, while taking into account the need for landfills to be located close to population centers so as to minimize transport distances. The criteria are summarized in Attachment 8 to Annex 10. Once the sites will be identified, and prior to their acquisition, a specific environmental assessment will be prepared for each site (TOR available on file). These will systematically analyze three main environmental aspects: (i) justification of site selection; (ii) results of the public consultation process; and (iii) site specific design criteria for environmental mitigation and protection. These EAs will be reviewed by CDR's environmental specialist and by the Bank to establish the adequacy of the proposed sites for use as landfills (see also paras. 2.17, 2.22 and 3.3). The costs of environmental monitoring, which would be born by the operators, are expected to be

similar to those for the compost plants. The tender documents for landfills will require that bidders incorporate full environmental mitigation and monitoring measures into their proposals, including provision of sampling and laboratory equipment and estimates of annual monitoring costs.

4.11 **Hospital Wastes.** Inventories of hospital waste were carried out for the Cazas of Saida and Zahle, and for Western Beirut. These surveys are a first attempt to describe the types and quantities of hospital wastes generated in Lebanon. The survey results indicated that hospital wastes represent a minor proportion of the overall waste production: less than 1 percent of daily waste generation. Hospital wastes consist of mainly domestic wastes (from the kitchens, offices, general maintenance services), but infectious wastes (consisting of human tissue, blood and laboratory wastes) can, in some hospitals, represent up to 50 percent, as is common in western Europe. At two hospitals in Western Beirut, which are equipped with special incinerators, hazardous wastes are separated from domestic wastes through the use of colored plastic bags, but in other cases both types of hospital wastes are often co-mingled in collection and disposal with the other municipal wastes, although some municipalities use separate collection and disposal facilities. Under the project, a feasibility study and environmental assessment for the location and sizing of a central hospital wastes incinerator will be carried out and funding provided for the incinerator and the necessary collection vehicles. The EA will be reviewed by CDR's environmental specialist and by the Bank. As an interim measure, (i) systems similar to those in use in the Beirut hospitals described above will be established to separate potentially infectious wastes from domestic wastes, (ii) collection staff will be trained in separate collection of infectious wastes, and (iii) checks of incoming wastes at disposal areas will ensure that no infectious bio-medical wastes enter compost plants.

4.12 **Industrial Wastes.** Inventories of industrial waste were carried out for the Cazas of Saida and Zahle, and for Western Beirut. The inventories were compiled based on systematic interviews with owners and managers of local industries. Industries surveyed include slaughter houses, rendering plants, chicken and livestock production, tanneries, dye and textile mills, food transformation industries, vehicle repair garages and furniture plants. These surveys are a first attempt to describe the types and quantities of industrial wastes generated in Lebanon, and the results presented in the EAs show that: (i) the quantities are probably under-estimated; and (ii) existing disposal practices are basically haphazard, for example, disposal in rivers, on roadsides in uncontrolled dumps, mixture with all other plant wastes or burning of used tires. Further studies will be undertaken by MOE during project implementation to develop a plan to collect separately and dispose of separately the various categories of industrial wastes. As an interim measure, collection contractors will be required by municipalities to refuse to collect waste from industrial plants, or any other waste suspected of containing hazardous substances. Similarly, operators of waste disposal sites will inspect all incoming wastes for hazardous substances.

4.13 **Coastal Zone Management Plan.** The first step in the preparation of the coastal zone management plan (CZMP) will be a full assessment of the key coastal resources under threat by

development pressures. A regional environmental assessment (REA, terms of reference available on file) will provide a diagnostic of the present situation, and forecast the state of the coastal zone and its resources by the year 2010 under various investment scenarios. It will identify the main sources of environmental degradation, critical areas and emergency actions, in a study corridor up to 16 km wide. This REA will be used for the preparation of land-use policies, which can lead to environmentally sustainable patterns. The consultant will commence work in 1995.

V. PROJECT BENEFITS AND RISKS

A. Cost/Benefit Analysis

Project Benefits

5.1 The principal project benefits will be substantial improvement to the environment: cleaning up the accumulated refuse in urban areas and along the Mediterranean coast, improving the management of existing disposal sites, creating new ones, and adding composting plants, thereby eliminating unsanitary and improper piles of refuse from public areas. The actions to be undertaken under the project will benefit the health of all Lebanese, particularly the lower income groups. They will also eliminate one of the major impediments to attracting foreign business and tourism which are essential to the country's economic development. The beneficiaries include the entire population, many of which, for years, have been deprived of adequate solid waste collection and disposal or did not get service at all in spite of paying some of the cost of service through various taxes and assessments. Additionally, the principal municipalities will receive training and other technical assistance, including the modernization of their accounting and information systems (para. 2.6(c)), all of which will help to strengthen them as institutions. Private sector participation in the solid-waste management business will be encouraged through contracting to municipalities, which should increase efficiency by introducing an element of competition. Employment generation will also be enhanced through the opportunities offered by presorting and increased recycling, particularly for lower income groups.

Least-Cost Solution

5.2 During project preparation, consultants analyzed the various options for collecting, processing and disposing of solid waste. The collection aspect was a choice between door-to-door collection and the placing of containers at convenient locations; the latter was selected for reasons of efficiency and affordability. For disposal, various alternatives, including landfills, composting and incineration were carefully analyzed. Based on the topography, population concentration, and the availability of suitable land, the alternative selected in each of the areas represents the optimal and least-cost solution (see Annex 8, "Affordable Solid Waste Management Services").

Incremental Costs and Benefits

5.3 The incremental costs for the Project consist of the project costs, including land acquisition, buildings and workshops, compactor trucks, containers, landfill equipment, compost plants, incinerators, and engineering services; the cost of eventual equipment replacement over a designated time period; and the additional recurrent costs required to operate the new facilities and equipment. These have been satisfactorily established.

5.4 Incremental benefits consist mainly of the favorable impact of the project on the country's environment and the health of the population, particularly in protecting its rivers and coastal waters. Some of the waste material will be recovered and sold for recycling. Likewise, where composting proves feasible, the compost will be sold to interested farmers. Benefits also include the ability to service the country's entire urban population, and the virtual elimination of unhealthy piles of refuse from populated neighborhoods and beaches. Finally, appropriate collection and disposal of solid waste will enhance the aesthetic values of a country rich in touristic potential.

5.5 While incremental costs are known, incremental benefits cannot be quantified. Therefore, an economic internal rate of return has not been calculated for the project.

B. Project Risks

5.6 The main risks involved with the project are: (i) if suitable cost recovery mechanisms are not put in place, the projected levels of service for collection and disposal will not be maintained nor improve upon existing conditions; and (ii) scarcity of land for sanitary landfills could make it difficult to acquire sites and slow down project implementation.

5.7 An ongoing study is looking into the financial resources of the municipalities and will put forward recommendations for the improvement of the resource base of municipalities. The project provides for technical assistance to MMRA and the municipalities for modernization and staff training. A detailed time-bound schedule for land acquisition was be agreed at negotiations and a special fund for land acquisition has been activated by CDR to assist the municipalities in providing land. Authorities directly involved with waste management, MMRA and the municipalities, are convinced of the economic and environmental advantages of landfills.

VI. AGREEMENTS REACHED AND RECOMMENDATION

6.1 The following assurances were obtained at negotiations and recorded in the Loan documents:

(i) the rehabilitation plans of the old dumps will be reviewed by the Bank before implementation to ensure environmentally acceptable solutions (para. 2.5);

(ii) a cofinancing agreement for the equivalent to US$55 million shall be signed with Japan or alternative sources of funding found (para. 2.8);

(iii) the Special Account and SOEs will be audited and separate opinions provided for each in conjunction with the annual audit of CDR's accounts (para. 2.16);

(iv) the environmental mitigation and monitoring measures recommended for the compost plants at Saida and Zahle will be implemented by CDR (para. 4.7 and Attachments 3 to 7 of Annex 10);

(v) the environmental mitigation and monitoring measures recommended for the Amrousiyeh complex will be implemented by CDR (para. 4.9);

(vi) preparation of future environmental assessments for all landfills and the hospital incinerator will be the responsibility of CDR, the implementing agency; CDR will: (a) continue to employ a senior environmental specialist to manage EA activities; (b) obtain the Bank's no objection to each EA report prior to awards of contracts for site development; (c) acquire environmentally acceptable sites as recommended by each EA report and in accordance with the agreed timetable; (d) ensure that no sites will be acquired if involuntary resettlement is involved; and (e) ensure that the environmental mitigation and monitoring measures recommended in each EA are implemented by CDR (paras. 2.17, 2.22, 3.3, 4.9, 4.10 and 4.11);

(vii) Conditions of allocation of collection equipment to participating municipalities will be: (a) acquisition of environmentally acceptable land for all landfills and disposal plants and their transfer to the project (para. 2.22); (b) entering into a contract with a competent firm for collection and disposal or providing evidence of their own capability to perform the function (paras. 2.28 & 3.5); and (c) presentation of an acceptable cost recovery program (para. 3.11); in those cases where CDR has acquired the landfills on an exceptional basis, CDR shall enter into appropriate arrangements with private sector contractors and formulate cost recovery plans;

(viii) CDR would submit: (a) semi-annual progress reports within 30 days of the end of each semester; (b) the detailed report for the mid-term review by December 31, 1998; and (c) the project implementation report and a plan for future operation of the project within six months after loan closing (para. 2.27);

(ix) a cost recovery system acceptable to the Bank will commence within one year of starting the new solid waste management service (para. 3.8); and

(x) (a) CDR would maintain its overall accounts in an appropriate format; (b) that these accounts would be audited annually by independent and experienced auditors acceptable to the Bank; (c) that the auditors would, in addition to the overall audit report for the CDR, prepare and submit a separate opinion on the accuracy and appropriateness of the project accounts, SOEs and Special Account to be maintained by the CDR; and (d) that the annual audit report and the report on the project accounts would be submitted to the Bank within nine months of the end of each fiscal year (para. 3.12).

6.2 Given the understandings reached under para. 6.1, Items i - x above, the proposed project provides a suitable basis for a Bank loan of US$55.0 million to the Lebanese Republic at the IBRD standard variable rate, with 17-year maturity, including 5 years of grace.

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

LIST OF ANNEXES

ANNEX 1

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

IMPLEMENTING AGENCIES

1. **Council for Development and Reconstruction**
   - Operational Functions
   - Organization Chart
2. **Ministry of Municipal and Rural Affairs**
   - Operational Functions
   - Organization Chart
3. **Municipality of Zahle**
   - Organization Chart
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4. **Municipality of Jbeil**
   - Organization Chart
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LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION OPERATIONAL FUNCTIONS

Constitution

1. The Council for Development and Reconstruction (CDR) was established under the provisions of Legislative Decree No. 5 on December 31, 1977, later modified by the provisions of Law No. 117, dated December 7, 1991. It is a Public Institution with the status of a legal person, autonomous financially and administratively and attached directly to the Council of Ministers. In consultation and cooperation with the various Ministries, Public Institutions, and Municipalities.

Duties

2. CDR is responsible for all development and reconstruction projects and carries out the following duties:

Planning

(a) preparation of a general economic plan, follow-up plans and programs for Reconstruction and Development;

(b) preparation of a draft budget for the implementation of the general plan;

(c) preparation of draft laws related to development and reconstruction; and

(d) preparation of the guidelines for town and regional planning.

Advisory

(a) advising the Government on economic and financial cooperation with other countries and international agencies;

(b) communicating with other countries and international agencies regarding economic, technical, cultural and social assistance;

(c) preparing and publishing statistics on economic and social activity;

(d) carrying out research activities in the field of development;

(e) reviewing development and reconstruction programs prepared by the various ministries and public institutions;

(f) providing information to ministries and public institutions; and

(g) advising on the creation of financial institutions and mixed companies involved in development.

Executive

(a) preparing feasibility studies and designs for projects;

(b) carrying out the implementation of projects, superseding all ministries and public institutions, except the Council of Ministers;

(c) carrying out the reconstruction of areas damaged by military operations; and

(d) establishing holding companies or councils for the expropriation of land necessary for public projects.

Financial

(a) financing any projects or programs referred to it for implementation;

(b) granting of loans to public institutions, municipalities or the private sector; and

(c) taking up of equity in companies, or the divestment of such shares.

Supervisory

(a) supervising or inspecting all projects assigned to it;

(b) overseeing the channeling of foreign aid towards their objectives; and

(c) ensuring that loans are utilized towards their development and reconstruction objectives.

Resources and Revenues

3. The resources and revenues of CDR consist of:

(a) budgetary allocations under the General Budget;

(b) amounts transferred to it, or taxes and fees created in its favor;

(c) loans;

(d) revenues from investments;

(e) revenues provided under special legal provisions; and

(f) Treasury advances.

Board of Directors

4. The management of CDR is entrusted to a Board of Directors comprising, at most, 12 members, appointed by a decree of the Council of Ministers. Directors should be holders of duly recognized university degrees. The decree also nominates a President, two Vice-Presidents and a Secretary General, who become the Executive Directors. They shall be full-time officers of CDR.

5. Full-time members of the Board are nominated for periods of five years, while part-time members are appointed for three years. The services of part-time board members can be terminated at any time through a decision of the Council of Ministers. Full-time members of the Board can be terminated only through voluntary resignation, medical incapacity, incompetence, major error, or contravention of the legal provisions of the Decree establishing CDR.

6. The full-time members of the Board have no right to engage in any other activities except for serving on the committees appointed by the Government or representing Lebanon in international seminars and conferences.

General Provisions

7. CDR includes a Government Commission within it, appointed by a decree of the Council of Ministers, with terms of reference and organization structure decreed by the Council of Ministers.

8. CDR will be subject to audit by the Central Audit Department in accordance with provisions proposed by the CDR Board, discussed with the Audit Department and approved by the Council of Ministers.

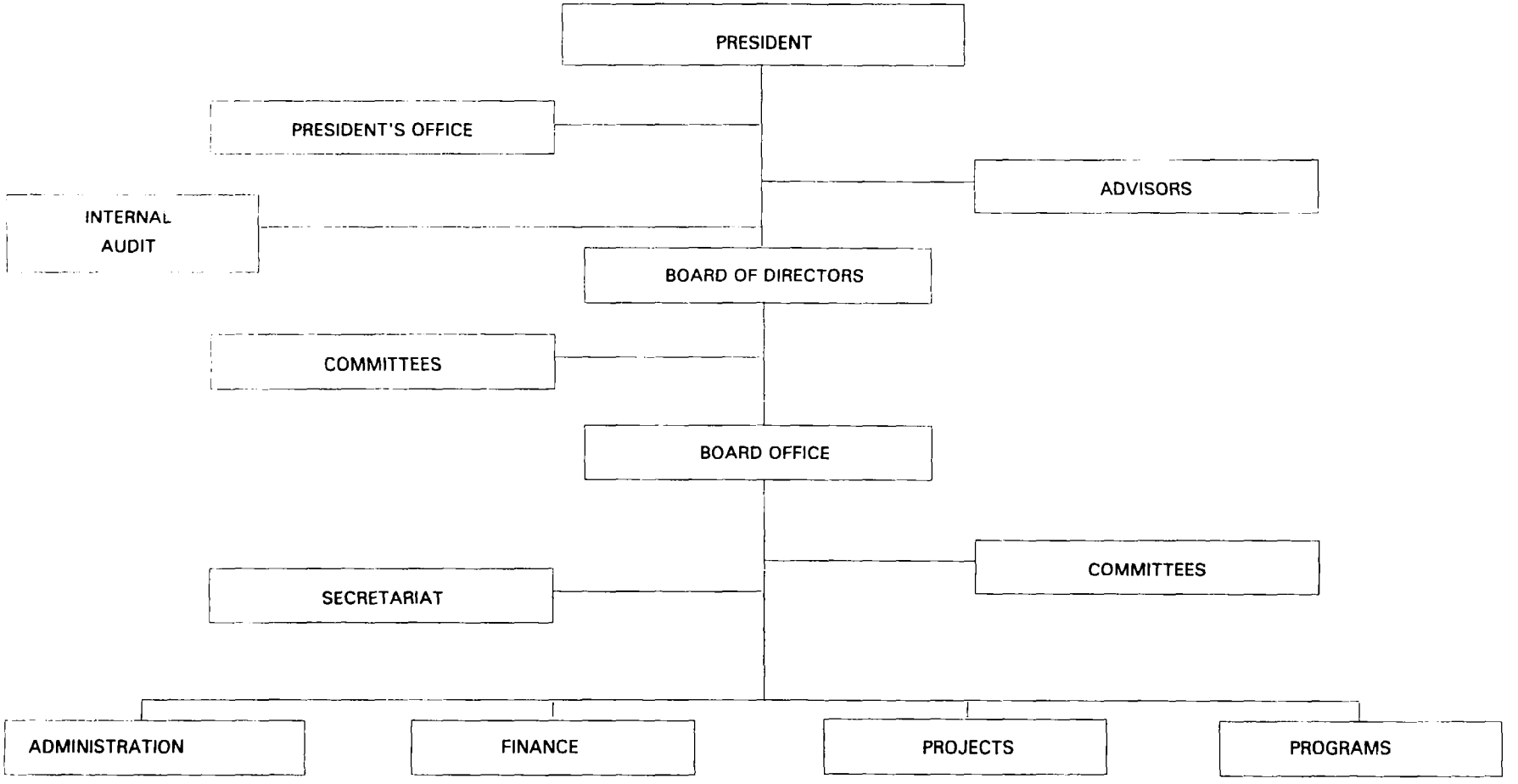
9. The internal bye-laws governing the operations of CDR, its organization structure, its cadres and the salaries and benefits of its staff as well as the powers and responsibilities of Board members are fixed by the Council of Ministers through decrees.

10. The internal operations of CDR and its various departments are fixed by the Board of Directors. The Board of Directors and the Officers of the Board can delegate some of their powers and responsibilities to subcommittees appointed by them for the purpose.

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL ENVIRONMENTAL PROJECT

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION - ORGANIZATION CHART



LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

MINISTRY OF MUNICIPAL AND RURAL AFFAIRS

Operational Functions

The Ministry was established under Law No. 197 dated February 18, 1993. The operational responsibilities of the various departments are shown below:

1. Responsibilities of the Ministry

1.1 Planning and carrying out studies aiming at the development of life in the local communities, increasing the involvement of citizens, and application of local laws and regulations with respect to municipalities, associations of municipalities, elders and councils of elders, especially with respect to:

(a) supervision of municipalities, associations of municipalities, and other local authorities subject to its administrative, financial and technical control; and review and approval of their decisions, in accordance with the existing rules and regulations; and

(b) ensuring of cooperation and cooperation of municipalities and associations of municipalities (i) among themselves; (ii) with all public administrations and institutions; and (iii) regional and international organizations and municipalities in other countries.

1.2 Cooperating with institutions responsible for the revitalization of life in the villages and the improvement of their standards.

1.3 Supervising the elders (Mukhtar) and councils of elders, and directing their work in accordance with the law of elders and associations of elders.

2. Responsibilities of Departments

2.1 Administration Department

The Administration Department is responsible for the following:

(a) Secretarial work, mail and correspondence;

(b) Personnel affairs of Regular Staff, Staff on Contract, and Staff on Daily Wages, administering their employment status and conditions of employment;

(c) Individual personnel files for all staff;

(d) Accounting;

(e) Legal and administrative reviews and rulings in legal matters, settlements and complaints;

(f) Periodic reports about the activities of the Ministry, in cooperation with other departments;

(g) Control of stocks, stores and furnishings; and

(h) Filing, archives, and administration and storage of papers and documents.

2.1.1 Administration Unit

(a) Secretarial work, mail and correspondence;

(b) Prepare subject files and transfer them to concerned departments in the ministry;

(c) Prepare personnel files for staff and process appointments, promotions, leave, termination and disciplinary action;

(d) Receive complaints from citizens and refer them to the relevant agency for review; and

(e) Maintain and keep stores and archives.

2.1.2 Accounting Unit

(a) Prepare annual budget based on proposals from individual departments;

(b) Prepare salaries, allowances, indemnities, rewards, and financial assistance, and payment to beneficiaries;

(c) Keep accounts and budget records; and

(d) Prepare studies and bidding documents related to stocks and furnishings required by the departments of the Ministry.

2.1.3 **Legal Unit**

(a) Express legal opinions where required;

(b) Review cases and complaints brought up against MMRA and prepare necessary replies;

(c) Express legal opinions in matters related to municipalities or elders brought to its attention;

(d) Express legal opinions in court cases against municipalities, associations of municipalities, or elders, referred to it;

(e) Represent MMRA in committees of a legal nature and in land expropriation committees when necessary; and

(f) Prepare draft laws and regulations related to the activities of municipalities and elders.

2.2 Municipal and Rural Affairs Department

The Department of Municipal and Rural Affairs is responsible for the application of laws and regulations related to municipalities, associations of municipalities, elders, and councils of elders, especially with respect to:

(a) Review of decisions made by local authorities which are subject to the control of MMRA, pending the issuing of appropriate decisions;

(b) Participate with other institutions and organizations for the revitalization of villages that do not have municipal councils; and

(c) Cooperation and coordination with governors and district commissioners (Kaimakams) to prepare studies for the revitalization of villages and development of rural areas.

2.2.1 Municipal Affairs Unit

(a) Examination and review of decisions and formalities prepared by municipalities or associations of municipalities that require approval by the Minister, to facilitate their legal process;

(b) Prepare necessary studies to improve and develop municipal activities; and

(c) Cooperate with official administrations, and local, regional and international organizations to improve municipal activities.

2.2.2 Rural Affairs Unit

(a) Supervision of elders and councils of elders;

(b) Develop activities of elders and councils of elders;

(c) Revitalize villages without municipal councils;

(d) Prepare studies to develop rural areas;

(e) Prepare projects for the distribution of Government assistance and contributions to villages and prepare works programs that could be implemented through the contributions and assistance; and

(f) Cooperate and coordinate with governorate councils on matters related to villages.

2.3 Municipal Project Department

The Municipal Projects Department is responsible for the following:

(a) Technical review of projects and works programs submitted by municipalities or associations of municipalities;

(b) Preparation of studies (designs) for construction projects requested by municipalities or associations of municipalities;

(c) Supervision of projects being implemented by municipalities or associations of municipalities, upon their request;

(d) Review of planning and expropriation proposals prepared by municipalities or associations of municipalities;

(e) Supervision of solid waste management, when requested; and

(f) preparation of studies for municipal facilities, when required.

2.3.1 **Design and Construction Unit**

(a) Design of construction projects upon the request of municipalities or associations of municipalities;

(b) Technical supervision of the various implementation phases of the projects mentioned in para. a above;

(c) Preparation of the General Conditions of Contract and particular bidding documents for the procurement of municipal works and materials; and

(d) Supervision construction of projects implemented by municipalities or associations of municipalities.

2.3.2 **Planning and Expropriation Unit**

(a) Preparation of master plans requested by municipalities or associations of municipalities;

(b) Review of expropriation proposals by municipalities or associations of municipalities, or preparation of expropriation files if requested;

(c) Planning of roads, public spaces, gardens or parks and preparation of relevant projects, upon the request of municipalities, associations of municipalities, or villages; and

(d) Review of proposals to remove land from public municipal property to private municipal property.

2.3.3 Stores and Furnishings Unit

(a) Preparation of bidding documents for the procurement of municipal equipment, tools and furnishings, upon request; and

(b) Supervision of the maintenance of municipal furnishings upon request.

2.4 Control and Guidance Department

The Control and Guidance Department is responsible for the following:

(a) Financial control of both legislative and executive bodies in the municipalities and associations of municipalities, as well as the activities of staff and workers;

(b) Supervision of the activities of financial controllers; and

(c) Municipal guidance activities.

2.4.1 Administration Unit

(a) Secretarial and registration work for the Control and Guidance Department; and

(b) Preparation of documents and distribution of mail addressed to the Department.

2.4.2 Financial Control Unit

(a) Review and control of all financial activities carried out by the municipalities and associations of municipalities;

(b) Supervision of the activities of financial controllers in carrying out their duties under the provisions of Chapter Three of Decree No. 5595 dated September 22, 1982 which defines the accounting procedures in municipalities and associations of municipalities; and

(c) Investigation of complaints of a financial nature submitted to MMRA.

2.4.3 Municipal Guidance Unit

(a) Cooperation with the municipal councils and the councils of associations of municipalities in the performance of their duties and rights;

(b) Guiding the administrations of municipalities and associations of municipalities in methods of improving performance and efficiency;

(c) Preparation of proposals to simplify municipal activities;

(d) Assisting municipalities and associations of municipalities in the organization or reorganization of their departments;

(e) Studying organization charts and lines of communication in municipalities and associations of municipalities; and

(f) Preparation of standard forms for municipal documents.

2.5 Information Department

The Information Department is directly attached to the Director General and is responsible for the following:

(a) Preparation of all statistical programs and studies for the Ministry;

(b) Carrying out of all analytical studies that aim at the development of the various departments of MMRA and their activities; and

(c) Preparation of all statistical studies as well as the storage, coordination, and adaptation of information related to municipal councils, the councils of associations of municipalities, elders, councils of elders, and their activities, especially with relation to budgets, financial transactions, advances, loans, projects, and whatever has any connection with social and economic conditions in towns and villages.

2.6 Independent Municipal Fund

The Independent Municipal Fund is attached to MMRA through the Director General. Its responsibilities are:

(a) Distribution of municipal funds in accordance with the stipulations of Decree No. 1917 dated April 6, 1979.

3. Regional Departments and Divisions

A Department of Municipal and Rural Affairs will be established in each Governorate (except Beirut Governorate), and in each Caza (except the center of the governorate).

3.1 Governorates

The Department of Municipal and Rural Affairs in the Governorate will be responsible for the following:

(a) Supervision of the activities of municipalities, associations of municipalities, elders and councils of elders, as well as the review of proposals for the revitalization of villages within the governorate;

(b) Receipt and review of decisions and documents of municipalities and elders and submission of recommendations to the governor for approval in accordance with the authority vested in him by the provisions of the Municipal Law No. 118 dated June 30, 1977;

(c) Submission of periodic reports to the Central Administration concerning municipal and rural activities in the governorate; and

(d) Coordination and cooperation with the municipal Control and Guidance authorities.

3.2 Caza (District)

The Department of Municipal and Rural Affairs in the Caza will be responsible for the following:

(a) Supervision of the activities of municipalities, associations of municipalities, elders and councils of elders, as well as the review of proposals for the revitalization of villages within the Caza;

(b) Receipt and review of decisions and documents of municipalities and elders and submission of recommendations to the Kaimakam for approval in accordance with the authority vested in him by the provisions of the Municipal Law No. 118 dated June 30, 1977;

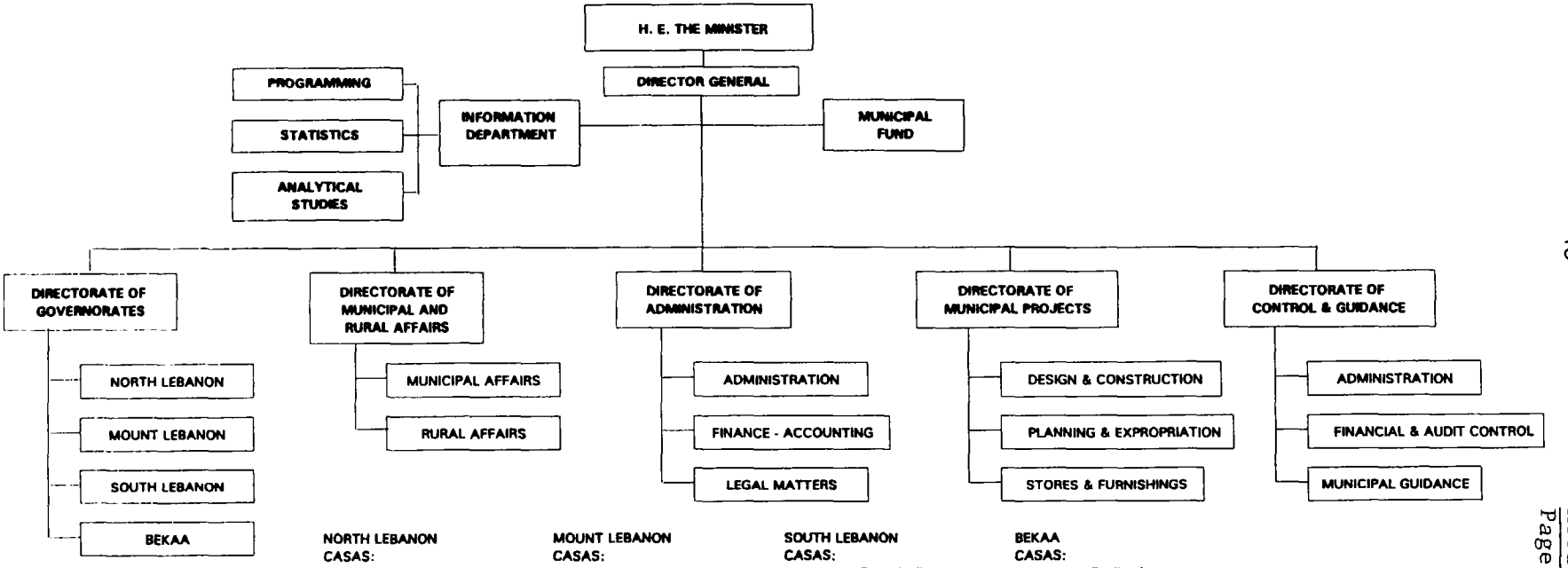
(c) Submission of periodic reports to the head of the Department in the governorate concerning municipal and rural activities in the Caza; and

(d) Coordination and cooperation with the municipal Control and Guidance authorities.

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

MINISTRY OF MUNICIPALITIES AND RURAL AFFAIRS - ORGANIZATION CHART



NORTH LEBANON CASAS:
Akkar
Batroun
Bcharre
Koura
Tripoli
Zgharta

MOUNT LEBANON CASAS:
Aley
Baabda
Chouf
Jbeil
Kesrouane
Metn

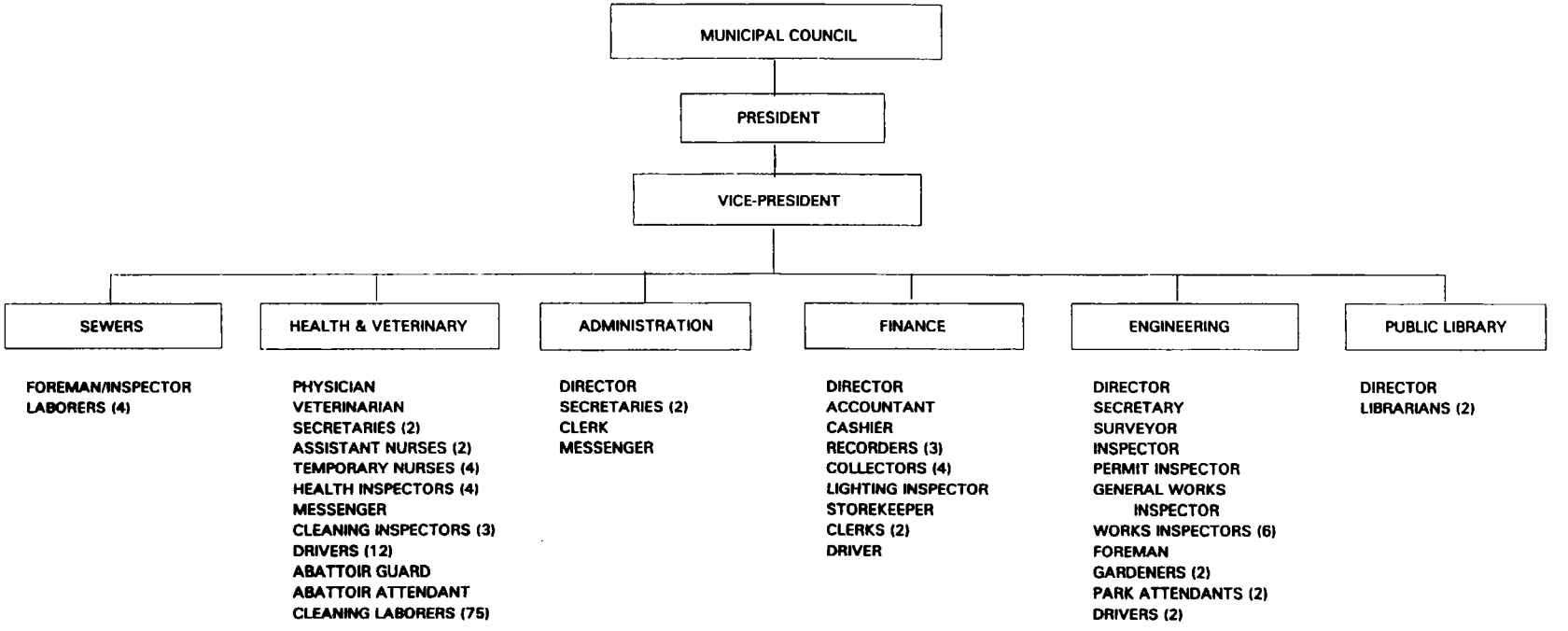
SOUTH LEBANON CASAS:
Bent Jbeil
Hasbaya
Jezzine
marjayoun
Nabatiye
Saida
Sour

BEKAA CASAS:
Baalbeck
Hermel
Rachaya
West Bekaa
Sahle

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

ZAHLE MUNICIPALITY - ORGANIZATION CHART



LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

ZAHLE MUNICIPALITY - 1993 ACTUAL REVENUES AND EXPENDITURES

(In thousands of Lebanese Pounds)

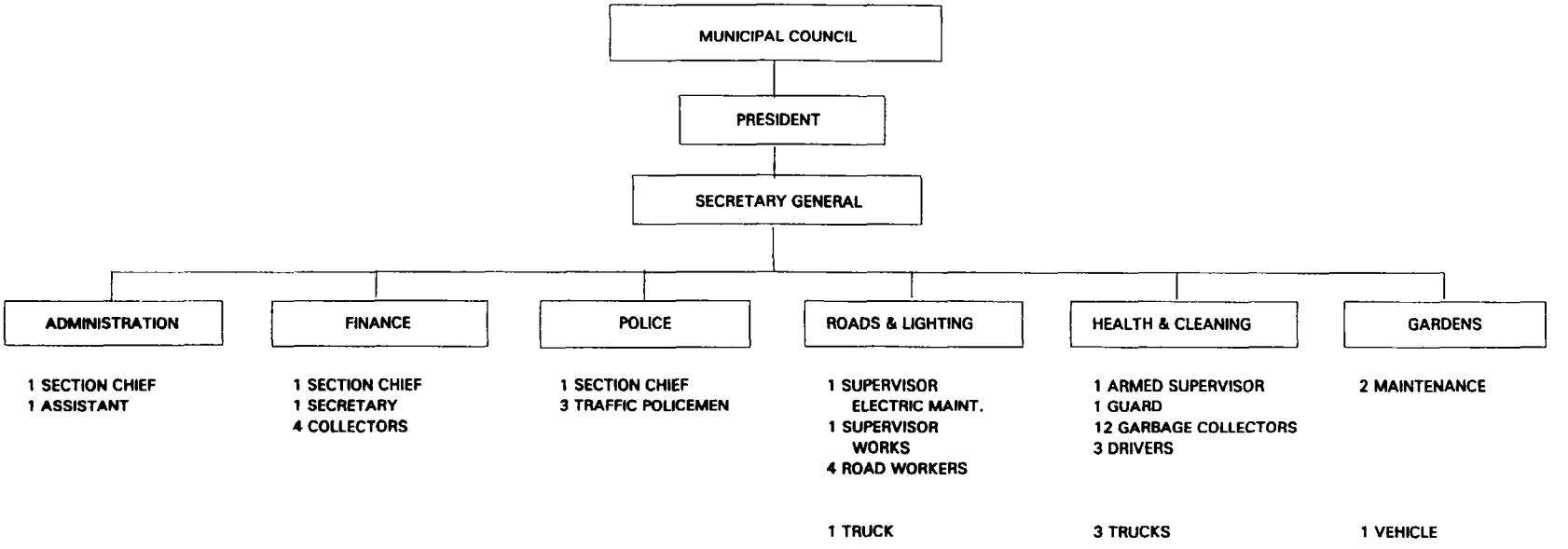
REVENUES	
FEES	
Building Permits	213,720
Exemption from Garage	28,250
Building Contraventions	59,966
Construction of Sewers and Sidewalks	5,043
Sub-Total	306,979
TAXES	
All	302,481
INVESTMENTS	
Interest on Bank Deposits	105,560
PERMITS	
Meeting Places	400
Advertizing	3,406
Public Places	230
Fuel Stores and Stations	100
Motors of Industries	190
Classified Establishments	240
Sub-Total	4,566
CENTRAL GOVERNMENT TRANSFERS	
Total	626,684
TOTAL REVENUES	1,346,269

EXPENDITURES	
ADMINISTRATIVE	
Salaries and Wages of Staff	187,980
Special Allowance to Admin Staff	8,316
Family Allowances	62,784
Transport and Travel	6,517
Medical Assistance to Staff	23,181
Educational Assistance to Staff	40,117
Overtime Pay	4,886
Entitlements to Employees	17,554
Social Assistance to employees	3,750
Scholarships to Outstanding Students	1,000
End of Service Indemnity	54,508
Uniforms for Workers	4,120
Allowances to Medical Committee	1,187
Allowances to Land Evaluation Committee	2,083
Sub-Total	417,981
PUBLIC WORKS EXPENDITURES	
Refuse Collection Contract	260,000
Public Sewers	120,000
Construction of roads and Retaining Walls	150,000
Miscellaneous Works	78,000
Sub-Total	608,000
SURPLUS	320,288
TOTAL EXPENDITURES & SURPLUS	1,346,269

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

JBEIL MUNICIPALITY - ORGANIZATION CHART



LEBANASE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

JBEIL MUNICIPALITY- 1992 ACTUAL REVENUES

(In Lebanese Pounds)

Les taxes perçues directement par la municipalite	Amounts
Taxe sur la valeur locative pour les immeubles d'habitation	29,574,293
Taxe sur la valeur locative pour les locaux commerciaux	22,293,983
Taxe sur les locaux de réunion et les clubs de paris	3,938,000
Taxes sur les annonces et sur occupation des biens publics	16,344,500
Taxes sur les commerces et les stations-services	910,000
Taxes sur les équipements des établissements industriels classés	480,000
Taxes sur les permis de construire	35,965,074
Taxes supplémentaires - caisse de retraite des ingenieurs	0
Taxes pour installation des égouts & trottoirs	7,980,275
Taxes sur les rapports & études techniques	895,000
Taxes sur l'abattage	6,900,000
Taxes sur les enchères	0
Taxes sur l'exercice des commerces ambulants	0
Taxes professionnelles	0
Taxes sur vente en gros & demi-gros	0
Taxes sur les entrées aux sites archéologiques	9,807,750
Taxes sur l'enregistrement des contrats de location	0
Taxes pour l'entretien des égouts et trottoirs	0
Taxes sur les abris	78,000
Taxe de reconstruction	0
Total Chapitre 1	135,166,875

Les taxes percues par l'Etat ou les offices autonomes ou les etablissements publics ou prives et versees directement a la municipalite	
Impôt sur plus-values	0
Suppléments sur communications et abonnements telephoniques	0
Supplément perçu sur la valeur de la consommation électrique	44,779,605
Part de la Municipalité de l'impôt sur les immeubles bâtis	8,500,000
Part de la Municipalité de la Caisse autonome de l'Habitat	0
Part de la Municipalité des recettes de l'office des eaux potables	7,911,166
Total du Chapitre 2	61,190,771

Les taxes perçues par l'Etat pour le compte de toutes les Municipalités (Caisse Municipale Autonome)	Amounts
Part de soutien au budget de la Municipalité	0
Part réservée aux projets de développement	0
Total du Chapitre 3	0

Les recettes diverses et exceptionnelles	
Aides, dons et legs	0
Contraventions & intérêts	3,223,642
Revenus des biens municipaux & biens indivis et vente de....	34,944,000
Surplus sur réalisation de travaux pour compte de tiers	0
Recettes sur exercices antérieurs	0
Prêts et avances du Trésor	0
Recettes non prévues	0
Retenues pour indemnités fin de service	0
Report à nouveau	26,118,743
Total du Chapitre 4	64,286,385

Sommaire:	
Chapitre 1	135,166,875
Chapitre 2	61,190,771
Chapitre 3	0
Chapitre 4	64,286,385
Total	260,644,031

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

JBEIL MUNICIPALITY- 1992 ACTUAL EXPENSES

(In Lebanese Pounds)

Chapitre premier: Charges administratives	Amounts
	500,000
Salaires & dérivés *	46,049,959
Fournitures, imprimés & journaux	929,885
Habillement & armement	996,000
Loyers, chauffage, eau & électricité	100,000
Gratifications, bonus, allocations diverses, y compris les les allocations médicales et scolaires	31,637,717
Annonces, timbres posteux, communications téléphoniques & télégraphiques	53,082
Frais de déplacement et de transport	1,486,000
Total du Chapitre 1	81,752,643
Chapitre deux: charges d'équipement, entretien & santé publique	
Achat & entretien d'ameublement	0
Achat & entretien des machines, camions, voitures, cycles	13,475,415
Achat & entretien d'équipement & machines diverses	396,750
Entretien des immeubles, cimetières publics & jardins	1,449,000
Nettoyage, lutte contre les insectes, y compris, déplacements & salaires des journaliers & besoins divers	17,317,830
Carburant	13,922,360
Entretien de l'éclairage public, & frais d'électricté	26,952,281
Entretien des routes, égouts, canaux, trottoirs & divers	15,817,900
Entretien du réseau de distribution d'eau & abonnement	0
Assurance des immeubles, équipements, employés & autres	1,618,200
Total du Chapitre 2	90,949,736
Chapitre trois: charges des projets de développement	
Construction d'immeuble	11,469,983
Installation d'un réseau d'éclairage public	0
Aménagement du réseau d'eau, des égouts, des trottoirs, des routes publiques et canaux	0
Aménagement de plages, jardins & autres	886,000
Construction d'un incinérateur d'ordures, d'un abattoir, d'un hopital, d'un marché public, centre culturel, centre sportif, dispensaire caserne pompiers,& autres projets divers	0
Coût des études	0
Indemnités d'expropriations, achats d'immeubles & bien-fonds	0
Total du Chapitre 3	12,355,983

Chapitre quatre: Charges des services & aides	
Charges sanitaires, aide aux nécessiteux, fondations charitables	100,000
Encouragement aux activités culturelles, éducatives, sanitaires syndicales, sportives & sociales	179,000
Bourses & primes scolaires, aide aux écoles & bibliothèques	0
Aides aux projets des directions générales & associations agréees	0
Total du Chapitre 4	279,000
Chapitre cinq: charges diverses	
Réceptions, festivités & festivals	2,417,200
Taxes & frais judiciaires, de procès, conciliations & honoraires d'avocats	0
Travaux pour compte de tiers	0
Ristournes	0
Remboursement de prêts & dettes& avance du Trésor et interets	0
Frais exercices précédents	0
Cotisation à la Caisse Nationale de Sécurité Sociale	0
Participation à l'Union des Municipalités	2,000,000
Charges exceptionnelles	2,662,100
Indemnites de fin de service	0
Total du Chapitre 5	7,079,300
Chapitre six: réserves	
Réserves	5,000,000
	0
Total du Chapitre 6	5,000,000

Sommaire:	
Chapitre 1	81,752,643
Chapitre 2	90,949,736
Chapitre 3	12,355,983
Chapitre 4	279,000
Chapitre 5	7,079,300
Chapitre 6	5,000,000
Total Expenditures	197,416,662
Surplus	63,227,369
Total	260,644,031

LEBANESE REPUBLIC
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

PROPOSED SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

February 3, 1995

GOVERNORATE	CAZA	COMPACT. TRUCKS NO. OF UNITS NERP EST.	COMPACT. TRUCKS NO. OF UNITS ERRP DIST.	COMPACT. TRUCKS NO. OF UNITS NEW PROJ.	CONTAINERS NO. OF UNITS NERP EST.	CONTAINERS NO. OF UNITS ERRP DIST.	CONTAINERS NO. OF UNITS NEW PROJ.	LANDFILL/DEVELOP. NO. OF UNITS NERP EST.	LANDFILL/DEVELOP. NO. OF UNITS ERRP DIST.	LANDFILL/DEVELOP. NO. OF UNITS NEW PROJ.	L/F BUILDINGS NO. OF UNITS NERP EST.	L/F BUILDINGS NO. OF UNITS ERRP DIST.	L/F BUILDINGS NO. OF UNITS NEW PROJ.	L/F COMPACTORS NO. OF UNITS NERP EST.	L/F COMPACTORS NO. OF UNITS ERRP DIST.	L/F COMPACTORS NO. OF UNITS NEW PROJ.
GREATER BEIRUT		45	8	37	2200	440	1760	1	1	0	1	1	0	1	1	0
	Greater Beirut	45	8	37	2200	440	1760	1	1	0	1	1	0	1	1	0
NORTH LEBANON		57	18	39	1620	660	960	6	4	2	6	4	2	5	4	1
	Akkar	13	4	9	420	200	220	1	1	0	1	1	0	1	1	0
	Batroun	6	2	4	160	80	80	1	1	0	1	1	0	1	1	0
	Bcharre	4	2	2	110	50	60	1	0	1	1	0	1	0	0	0
	Koura	5	2	3	110	50	60	1	1	0	1	1	0	1	1	0
	Tripoli	23	6	17	650	200	450	1	1	0	1	1	0	1	1	0
	Zgharta	6	2	4	170	80	90	1	0	1	1	0	1	1	0	1
MOUNT LEBANON		67	22	45	1720	710	1010	8	4	4	8	4	4	8	4	4
	Aley	8	3	5	215	100	115	1	0	1	1	0	1	1	0	1
	Baabda	7	3	4	130	60	70	1	0	1	1	0	1	1	0	1
	Chouf 1	6	2	4	215	100	115	1	1	0	1	1	0	1	1	0
	Chouf 2	4	2	2	140	60	80	1	0	1	1	0	1	1	0	1
	Jbeil 1	6	2	4	132	60	72	1	1	0	1	1	0	1	1	0
	Jbeil 2	2	1	1	48	20	28	1	0	1	1	0	1	1	0	1
	Kesrouane	24	6	18	700	250	450	1	1	0	1	1	0	1	1	0
	Metn	10	3	7	140	60	80	1	1	0	1	1	0	1	1	0
SOUTH LEBANON		49	17	32	1390	550	840	7	2	5	7	2	5	5	2	3
	Bent Jbeil	5	2	3	145	60	85	1	0	1	1	0	1	0	0	0
	Hasbaya	2	1	1	75	40	35	1	0	1	1	0	1	0	0	0
	Jezzine	5	2	3	145	60	85	1	0	1	1	0	1	1	0	1
	Marjayoun	4	2	2	83	40	43	1	0	1	1	0	1	1	0	1
	Nabatiye	8	3	5	240	100	140	1	0	1	1	0	1	1	0	1
	Saida	16	4	12	462	150	312	1	1	0	1	1	0	1	1	0
	Tyre	9	3	6	240	100	140	1	1	0	1	1	0	1	1	0
BEKAA		38	11	27	1070	440	630	6	2	4	6	2	4	6	2	4
	Baalbeck 1	3	1	2	100	40	60	1	1	0	1	1	0	1	1	0
	Baalbeck 2	10	2	8	290	120	170	1	0	1	1	0	1	1	0	1
	Hermel	2	1	1	60	30	30	1	0	1	1	0	1	1	0	1
	Rachaya	3	1	2	75	40	35	1	0	1	1	0	1	1	0	1
	West Bekaa	6	2	4	145	60	85	1	0	1	1	0	1	1	0	1
	Zahle	14	4	10	400	150	250	1	1	0	1	1	0	1	1	0
TOTAL		256	76	180	8000	2800	5200	28	13	15	28	13	15	25	13	12

LEBANESE REPUBLIC
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

PROPOSED SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

GOVERNORATE	CAZA	L/F BOWZERS NO. OF UNITS NERP EST.	L/F BOWZERS NO. OF UNITS ERRP DIST.	L/F BOWZERS NO. OF UNITS NEW PROJ.	L/F SITE TREATM. NO. OF UNITS NERP EST.	L/F SITE TREATM. NO. OF UNITS ERRP DIST.	L/F SITE TREATM. NO. OF UNITS NEW PROJ.	L/F WEIGHBRIDGES NO. OF UNITS NERP EST.	L/F WEIGHBRIDGES NO. OF UNITS ERRP DIST.	L/F WEIGHBRIDGES NO. OF UNITS NEW PROJ.	L/F CLOSE DUMPS NO. OF UNITS NERP EST.	L/F CLOSE DUMPS NO. OF UNITS ERRP DIST.	L/F CLOSE DUMPS NO. OF UNITS NEW PROJ.	ENGINEERING NO. OF UNITS NERP EST.	ENGINEERING NO. OF UNITS ERRP DIST.	ENGINEERING NO. OF UNITS NEW PROJ.
GREATER BEIRUT		4	2	2	1	1	0	1	1	0	1	1	0	1	1	0
	Greater Beirut	4	2	2	1	1	0	1	1	0	1	1	0	1	1	0
NORTH LEBANON		6	4	2	5	4	1	5	4	1	6	4	2	6	4	2
	Akkar	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
	Batroun	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
	Bcharre	1	0	1	0	0	0	0	0	0	1	0	1	1	0	1
	Koura	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
	Tripoli	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
	Zgharta	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
MOUNT LEBANON		8	4	4	7	4	3	7	4	3	8	4	4	8	4	4
	Aley	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
	Baabda	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
	Chouf 1	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
	Chouf 2	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
	Jbeil 1	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
	Jbeil 2	1	0	1	0	0	0	0	0	0	1	0	1	1	0	1
	Kesrouane	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
	Metn	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
SOUTH LEBANON		5	2	3	5	2	3	5	2	3	7	2	5	7	2	5
	Bent Jbeil	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1
	Hasbaya	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1
	Jezzine	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
	Marjayoun	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
	Nabatiye	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
	Saida	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
	Tyre	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
BEKAA		6	2	4	6	2	4	6	2	4	6	2	4	6	2	4
	Baalbeck 1	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
	Baalbeck 2	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
	Hermel	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
	Rachaya	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
	West Bekaa	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
	Zahle	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
TOTAL		29	14	15	24	13	11	24	13	11	28	13	15	28	13	15

LEBANESE REPUBLIC

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

PROPOSED SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

SPECIAL EQUIPMENT

GOVERNORATE	CAZA	DESCRIPTION	NO. OF UNITS
GREATER BEIRUT			
	Greater Beirut		
		Bowzers	2
		Street Sweepers	4
		Mechanical Shovels	4
		Miscellaneous	2
NORTH LEBANON			
	Batroun	Trailer Trucks	2
		Miscellaneous	1
	Koura	Mechanical Shovels	1
	Tripoli	Mechanical Shovels	1
MOUNT LEBANON			
	Kesrouane	Mechanical Shovels	1
		Hospital Waste Trucks	2
	Jbeil 1	Miscellaneous	3
SOUTH LEBANON			
	Saida	Mechanical Shovels	1
TOTAL			24

ANNEX 2
Attachment 1

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

COST ESTIMATE
WORLD BANK FINANCED COMPONENTS

ITEM NO.	DESCRIPTION	NO. OF UNITS	(US$ '000) LOCAL	FOREIGN	TOTAL
1	CIVIL WORKS				
1.1	Land Acquisition	15	7,000.00	0.00	7,000.00
1.2	Development of New Sites	15	2,000.00	4,000.00	6,000.00
1.3	Closure of Old Dumps	15	3,000.00	7,000.00	10,000.00
1.4	Buildings and Workshops	15	1,000.00	1,000.00	2,000.00
	Sub-Total		13,000.00	12,000.00	25,000.00
2	GOODS AND EQUIPMENT				
2.1	Compactor Trucks	180	1,400.00	13,000.00	14,400.00
2.2	Containers	5,200	500.00	1,200.00	1,700.00
2.3	Landfill Equipment	15	500.00	4,500.00	5,000.00
2.4	Special Equipment	MISC.	250.00	2,250.00	2,500.00
	Sub-Total		2,650.00	20,950.00	23,600.00
3	TECHNICAL ASSISTANCE				
3.1	Coastal Zone Management	LUMP SUM	500.00	4,500.00	5,000.00
3.2	Engineering Services	MISC.	400.00	3,600.00	4,000.00
3.3	Technical Assistance & Training	MISC.	200.00	1,800.00	2,000.00
	Sub-Total		1,100.00	9,900.00	11,000.00
	TOTAL BASE COST		16,750.00	42,850.00	59,600.00
4	CONTINGENCIES				
4.1	Physical Contingencies		500.00	2,200.00	2,700.00
4.2	Price Contingencies		1,750.00	6,950.00	8,700.00
	Total Contingencies		2,250.00	9,150.00	11,400.00
	TOTAL COST		19,000.00	52,000.00	71,000.00

ANNEX 2
Attachment 2

LEBANESE REPUBLIC

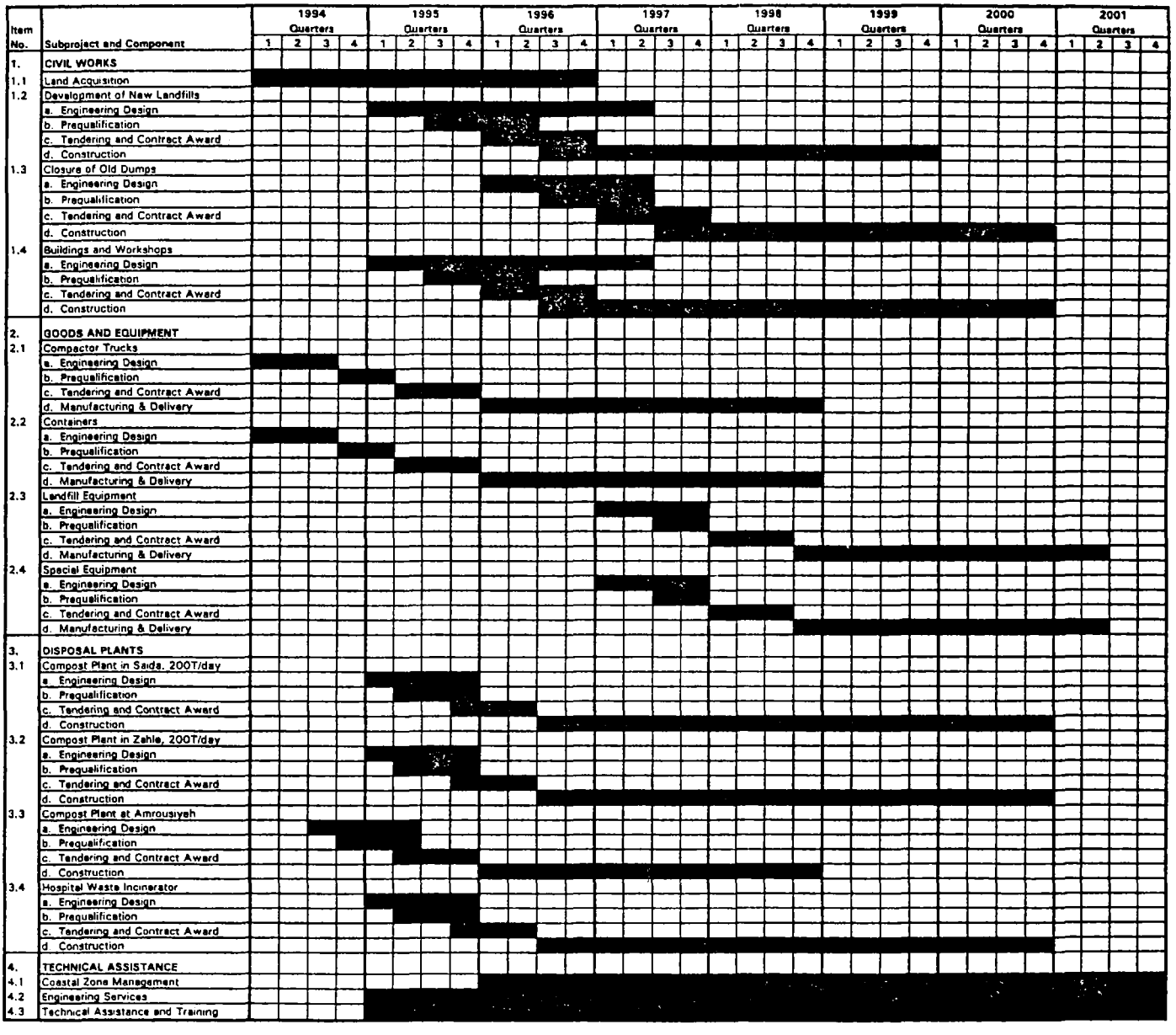
SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

COST ESTIMATE
COFINANCED COMPONENTS

ITEM NO.	DESCRIPTION	NO. OF UNITS	COST (US$ '000) LOCAL	FOREIGN	TOTAL
1	DISPOSAL PLANTS				
1.1	Saida Compost Plant 200T/d	1	2,400.00	13,600.00	16,000.00
1.2	Zahle Compost Plant 200T/d	1	2,400.00	13,600.00	16,000.00
1.3	Amrousiye Compost Plant 250T/d	1	2,700.00	15,300.00	18,000.00
1.4	Hospital Waste Incinerator	1	1,000.00	9,000.00	10,000.00
	TOTAL BASE COST		8,500.00	51,500.00	60,000.00
2	CONTINGENCIES				
	Physical Contingencies		200.00	1,000.00	1,200.00
	Price Contingencies		300.00	2,500.00	2,800.00
	Total Contingencies		500.00	3,500.00	4,000.00
	TOTAL COST		9,000.00	55,000.00	64,000.00

ANNEX 3

LEBANESE REPUBLIC
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION
SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT
IMPLEMENTATION SCHEDULE



ANNEX 4

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

Project Supervision Forecast

Project implementation would take place over six years - starting in the second half of FY1996 and completed in FY2002. The Bank would supervise the project three times a year in the first two years and an average of twice a year in the last four years. The table below gives the staffweeks estimated for the supervision effort and consists of staff/consultant inputs both in the field and at headquarters.

	Staffweeks in Fiscal Year							
Specialist	FY96	FY97	FY98	FY99	FY00	FY01	FY02	Total
Municipal Engineer	6	4	4	4	4	4	4	30
Financial Analyst	6	4	4	4	4	4	4	30
Environmental Expert	6	4	4	4	4	4	4	30
Composting Expert	3	3	3	4	4	-	2	19
Incineration Expert	4	4	2	-	-	-	-	10
TOTAL	25	19	17	16	16	12	14	119

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

Technical Assistance

1. As indicated under Para. 2.6 of the SAR, three experts in municipal management will each serve for a period of two years at MMRA to set up the various operational systems and train MMRA staff in SWM activities. In addition to their duties at MMRA, they will be responsible for the setting up of similar systems at the principal municipalities, which are the centers of their respective Cazas, and for training municipal staff in SWM. Their principal responsibilities will be to: (i) set up adequate collection and disposal systems in the Cazas, including the planning of collection routes, periodicity of collection, and maintenance and servicing of collection equipment; (ii) set up a modern accounting system both at MMRA and the municipalities, help computerize the accounting systems, and advise on achieving full cost recoverY; (iii) plan the location of collection bins, estimate the effect of waste collection on urban traffic, and maximize the utilization of the roads through proper scheduling of collection; (iv) introduce upstream sorting of the waste and advise on the possibilities of creating small industries based on recycled material; and (v) organize an educational campaign to teach citizens the benefits of proper SWM.

2. The following paragraphs give the profiles of the three experts who will provide technical assistance to MMRA. In addition to their duties at MMRA and the municipalities, the Technical Assistance Team (TAT) will coordinate project implementation with the PMU at CDR, which will also be strengthened under the project by the addition of a senior environmental specialist to assist in reviewing environmental assessments (see Annex 10.1 for TOR). Short term experts would be available as necessary, particularly to provide assistance to municipalities on their specific needs. The Table below shows an estimate of the cost of technical assistance.

Cost Estimate of Technical Assistance (US$)

Item No.	Description	Unit	Quantity	Rate $	Total
1.	Engineering Expert	M/M	24	10,000	240,000
2.	Financial Expert	M/M	24	10,000	240,000
3.	Planning Expert	M/M	24	10,000	240,000
4.	Training Municipality Staff	M/M	75	2,000	150,000
5.	Assistance to CDR	M/M	24	10,000	240,000
6.	Municipal Assistance	M/M	24	10.000	240,000
7.	Short-term Experts	M/M	24	10,000	240,000
8.	Equipment & Computers				200,000
9.	Contingency				210,000
	TOTAL				2,000,000

3. Profile/Terms of Reference for Engineering Expert

Job Title:	Municipal Engineering Expert
Qualifications/Experience:	University degree equivalent in Mechanical or Industrial Engineering. At least 10 years' experience in the management of municipal waste management, fleet operation and maintenance.
Languages:	Fluent in English and French - knowledge of Arabic desirable.
Duration of Contract:	Two years, with three months' trial period.
Position:	At MMRA, with visits to other Cazas.
Salary:	Relative to experience and qualifications.
Starting Date:	As shown in the Action Plan.

Responsibilities:

The Engineering Expert will be the TAT team leader and will report directly to the Director General of MMRA. He will set up the work programs of the team, supervise its activities, coordinate with the SIU at MOE and the TCC at CDR, and visit the various Cazas to estimate their needs and develop technical assistance programs for them. His tasks generally will include:

(a) reviewing and commenting on the engineering designs and bidding documents prepared by consultants for all components of the project;

(b) reviewing MMRA's and municipalities' systems for procurement, operation, maintenance, collection and disposal and suggesting improvements to those systems;

(c) reviewing the collection and routing plans of municipalities, as well as the deployment and utilization of equipment and suggesting improvements;

(d) monitoring productivity and efficiency and submitting proposals for their improvement to attain the agreed targets;

(e) advising on the number of staff required for operating both the collection and disposal systems;

(f) assisting in the on-the-job training of municipal and MMRA staff in SWM activities;

(g) participating in the development of a suitable and equitable cost recovery system for SWM;

(h) directing the preparation of a publicity campaign to educate the public in the benefits of proper SWM;

(i) collaborating with the municipal finance expert in the preparation of budgets and fiscal projections; and

(j) directing the preparation of monthly progress reports, quarterly achievement reports and six-monthly comprehensive reports showing the accomplishments TAT and its objectives for the next period.

4. Profile/Terms of Reference for Financial Expert

Job Title:	Municipal Finance Expert
Qualifications/Experience:	University degree equivalent in Business Administration, Municipal Accounting and Public Finance. At least 10 years' experience in the management of a municipal organization.
Languages:	Fluent in English and French - knowledge of Arabic desirable.
Duration of Contract:	Two years, with three months' trial period.
Position:	At MMRA, with visits to other Cazas.
Salary:	Relative to experience and qualifications.
Starting Date:	As shown in the Action Plan.

Responsibilities:

The municipal finance expert will be responsible for the modernization and computerization of the accounting systems at MMRA and the municipalities, within the framework of the Lebanese fiscal regulations.

His tasks generally will include:

(a) reviewing the financial resources of MMRA and the municipalities, studying the results of the recently commissioned study for long-term strategy in the sector (aimed at the establishment of cost recovery for services);

(b) establishing separate accounts at the municipalities for the expenses and revenues of the municipal waste collection and disposal systems;

(c) assisting in the preparation of the annual budget procedures of MMRA and the municipalities;

(d) reviewing existing salary structures and advising on their modification or improvement, within the framework of existing legislation;

(e) collaborating with the PMU, especially the Financial Expert within the PMU;

(f) assisting the Team Leader in carrying out his duties, especially the preparation of the financial portions of progress and periodic reports;

(g) assisting in the selection of office technological equipment and the training of staff at MMRA and the municipalities in their use and applications to the new accounting systems; and

(h) carrying out any duties that may be assigned to him by the Team Leader.

5. Profile/Terms of Reference for Planning Expert

Job Title:	Municipal Planning Expert
Qualifications/Experience:	University degree equivalent in City Planning and Urban Transport. At least 10 years' experience in the planning solid waste collection systems and urban transport in a municipal organization.
Languages:	Fluent in English and French - knowledge of Arabic desirable.
Duration of Contract:	Two years, with three months' trial period.
Position:	At MMRA, with visits to other Cazas.
Salary:	Relative to experience and qualifications.
Starting Date:	As shown in the Action Plan.

Responsibilities:

The municipal planning expert will be responsible for providing assistance for the planning of waste collection timetables, routes, traffic and street improvements to accommodate the improved waste collection systems.

His tasks generally will include:

(a) assisting in the selection of environmentally acceptable landfill sites for each caza/municipality and assisting in the review of the environmental assessment for each site;

(b) reviewing the collection routing systems proposed by various municipalities, within the framework of the traffic pattern of their cities, to advise on their suitability and necessary improvements;

(c) collaborating with the planning departments of MMRA and the municipalities with the aim of introducing improvements to street layouts and traffic patterns with the aim of accommodating the increased number of collection vehicles and containers;

(d) cooperating with municipalities in the location of containers and the construction of special niches or lay-byes for the placing of containers;

(e) assisting in the training of MMRA and municipal staff in matters related to city planning and urban transport;

(f) assisting the Team Leader and the Financial Expert in the preparation of monthly progress reports and periodic reports as required; and

(g) carrying out any duties that may be assigned to him by the Team Leader.

ANNEX 6

LEBANESE REPUBLIC
SOLID WASTE/ENVIRONMENT MANAGEMENT PROJECT

Loan Disbursement Schedule
(US$ Million)

Bank Fiscal Year Quarter Ending	Quarterly Disbursements	Cumulative Disbursements	Disbursement as % of Total
FY 1996			
December 31, 1995	1.0	1.0	1.8
March 31, 1996	0.8	1.8	3.3
June 30, 1996	0.8	2.6	4.7
FY 1997			
September 30, 1996	1.1	3.7	6.7
December 31, 1996	1.1	4.8	8.7
March 31, 1997	2.2	7.0	12.7
June 30, 1997	2.2	9.2	16.7
FY 1998			
September 30, 1997	3.6	12.8	23.3
December 31, 1997	3.6	16.4	29.8
March 31, 1998	4.2	20.6	37.5
June 30, 1998	4.2	24.8	45.1
FY 1999			
September 30, 1998	4.2	29.0	52.7
December 31, 1998	4.2	33.2	60.4
March 31, 1999	2.5	35.7	64.9
June 30, 1999	2.5	38.2	69.5
FY 2000			
September 30, 1999	3.0	41.2	74.9
December 31, 1999	3.0	44.2	80.4
March 31, 2000	2.5	46.7	84.9
June 30, 2000	2.5	49.2	89.5
FY 2001			
September 30, 2000	1.2	50.4	91.6
December 31, 2000	1.2	51.6	93.8
March 31, 2001	0.9	52.5	95.5
June 30, 2001	0.9	53.4	97.1
FY 2002			
September 30, 2001	0.8	54.2	98.5
December 31, 2001	0.8	55.0	100.0

LEBANESE REPUBLIC
SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

Project Action Plan

Environmental Impact Assessments

1.	Sign consultancy contract for carrying out EAs for the Saida and Zahle compost plants and the Amrousiyeh incinerator	August 15, 1994 (done)
2.	Submit summaries of EAs to the Bank	October 10, 1994 (done)
3.	Circulate summaries of EAs to the Board	October 26, 1994 (done)
4.	Recruit a Senior Environmental Specialist	April 20, 1995 (done)

Study on Long-term Strategy

5.	Sign contract for carrying out a study on long-term strategy, including cost recovery	October 15, 1994 (done)
6.	Submit draft recommendations of the study to the Government and the Bank for review	March 31, 1995 (done)
7.	Submit final report for cost recovery to the Government and the Bank for review	April 3, 1995 (done)

Engineering Consultancies

8.	Appoint consultants for the engineering design and bidding documents for the Amrousiyeh compost plant	June 30, 1995
9.	Appoint consultants for the finalization of the bidding documents for the compactor trucks and containers	December 31, 1994 (done)
10.	Sign the consultancy contract for the engineering design of the second phase of landfill developments	October 31, 1994 (done)

11.	Complete engineering design of landfills	June 30, 1996
Physical Implementation		
12.	Complete land acquisition for Phase I	March 30, 1995 (done)
13.	Complete land acquisition for Phase II	December 31, 1995
14.	Complete prequalification of bidders for the compactor trucks and containers	March 15, 1995 (done)
15.	Complete prequalification of bidders, receive bids and award contracts for the compost plants and hospital waste incinerator	December 31, 1995
16.	Award construction contracts for all landfills (through LCB)	December 31, 1995
Institutional Aspects		
17.	Reach agreement with Government on the principles of cost recovery	December 31, 1994 (done)
18.	Reach agreement with Government on detailed timetable for achievement of full cost recovery	March 31, 1995 (done)
Technical Assistance		
19.	Appoint the three experts at MMRA	June 30, 1995
20.	Agree on the TORs for the preparation of a Regional Environmental Assessment (REA) as the first phase of the Coastal Zone Management (CZM) Plan	December 15, 1994 (done)
21.	Appoint consultants for REA and start work on the Plan	June 30, 1995
22.	Complete preparation of the REA	December 31, 1995

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

DEVELOPMENT IMPACT MONITORING INDICATORS

The development impact monitoring indicators presented below provide an overview of criteria to measure the progress in project implementation and progress towards meeting the major project objectives. The indicators are presented for each of the project's main components, and are intended to guide supervision missions on major milestones and targets to be chronologically achieved in meeting the major project objectives outlined in the Staff Appraisal Report. These development impact monitoring indicators will have to be continuously updated during project implementation. The indicators are applicable to the SW\EM facilities which will complete waste management facilities and institutional development for all 25 cazas, including Greater Beirut. Indicators are presented for the following project components:

- Solid Waste Collection (24 cazas and Greater Beirut);
- Solid Waste Disposal Facilities (15 landfills, 2 compost plants, 1 Amrousiyeh Complex for a total of 18 disposal facilities);
- Hospital Waste Collection and Disposal System (1 system);
- Closure of Old Dumpsites (Landfills) (15 old dumpsites);
- Coastal Zone Management Plan (1 plan);
- Cost Recovery (24 cazas and Greater Beirut); and
- Institutional Development (MMRA, CDR, MOE and Cazas/Municipalities for a total of 4 major institutional units).

Attachment to ANNEX 7
Page 2 of 5

Project Component	Unit	1995	1996	1997	1998	1999	2000
I. Solid Waste Collection							
i. Engineering design and bid documents preparation:							
(a) containers	Containers		1700	3400	5200	5200	5200/5200
(b) compactor trucks	Trucks		60	120	180	180	180/180
(c) bowzers	Bowzers			5	10	15	15/15
(d) compactors	Compactors			4	8	12	12/12
ii. Fulfillment of allocation conditions by caza:							
(a) disposal site acquisition	Site	10	18	18	18	18	18/18
(b) bid for private contractor or show ability to operate by Caza/Municipality	Caza		5	10	15	20	25/25
(c) cost recovery plan	Caza		5	10	20	25	25/25
iii. Implementation Reports	Caza				15	25	25/25
iv. Elimination of all stockpiles of solid waste in vacant lots, in streets, along highways and rural roads, and general improvement in litter control in each Caza	Caza		2	5	10	15	25/25
II. Disposal Facilities							
i. Preparation of an environmental assessment report recommending one or more environmentally acceptable sites for approval by CDR and the Bank	Caza	13	18	18	18	18	18/18
ii. Acquisition or expropriation of disposal sites	Caza	10	18	18	18	18	18/18
iii. Preparation of detailed engineering design for each disposal facility, and of bid documents	Caza		10	18	18	18	18/18
iv. Award of a construction contract for each disposal facility, and supervision of the construction work to ensure compliance to construction specifications and environmental mitigation measures	Caza		8	13	18	18	18/18
v. Preparation of bid documents for operation by private contractor or training program for municipal employees	Caza		5	13	18	18	18/18
vi. Selection of an operator for each disposal facility by a private contractor or specialized training for municipal employees, if operated by the municipality	Caza		5	13	18	18	18/18
vii. Commencement of operations for the landfill or compost plant	Caza			8	13	18	18/18

Project Component	Unit	1995	1996	1997	1998	1999	2000
viii. Adequacy of operations by assurance of daily cover for landfills, high quality compost for compost plants, lack of odor problems for both, minimal machinery maintenance and costs at both, and conformity to environmental monitoring plan	Caza			8	13	18	18/18
The overall goal is to achieve a disposal facility with few or no adverse impacts on health or the environment, that is sustainable with minimum operational deficiencies due to proper maintenance and operational practices	Caza						
III. Hospital Waste Collection and Disposal System							
i. Preparation of an environmental assessment (EA) report and feasibility study	EA Feasibility Report		1	1	1	1	1/1
ii. Disposal site acquisition or expropriation	Site		1	1	1	1	1/1
iii. Preparation of preliminary engineering for collection and disposal	Report			1	1	1	1/1
iv. Final engineering and tender documents	Tender			1	1	1	1/1
v. Construction contract	Contract			1	1	1	1/1
vi. Report on operations including environmental monitoring results	Report					1	1/1
IV. Closure of Old Dump (Landfill) Sites							
i. Preparation of preliminary engineering and environmental permanent closure plan for all dump sites in each Caza for review by CDR and the Bank; a key issue is to assure the absence of toxic and hazardous waste materials mixed with the municipal solid wastes	Caza		15	15	15	15	15/15
ii. Preparation of detailed engineering design for each disposal facility, and of bid documents	Caza			5	10	15	15/15
iii. Temporary closure of old dump sites	Caza			5	10	15	15/15
iv. Award of a construction contract for each Caza for permanent closure of all sites, and supervision of the construction work to ensure compliance to construction specifications and environmental mitigation measures	Caza			5	10	15	15/15
v. Post construction inspection reports annually to ensure lack of odor, gas and groundwater effects through implementation of an environmental monitoring plan	Caza				5	10	15/15
The overall goal is to achieve permanent closure of each old dumpsite with no impacts on health or the environment	Caza						

Project Component	Unit	1995	1996	1997	1998	1999	2000
V. Coastal Zone Management Plan							
i. Award of regional environmental assessment (EA) contract	EA Contract	1	1	1	1	1	1/1
ii. Workshop and/or mid-contract report with recommendations for a CZM Strategy	CZM Strategy		1	1	1	1	1/1
iii. Preliminary discussions with CDR, MOE and MMRA for a CZM implementation plan	Implementation Plan		1	1	1	1	1/1
iv. Final regional FA report	Final EA		1	1	1	1	1/1
v. Implementation of legal and institutional structures for Coastal Zone Management Plan	CZM Plan				1	1	1/1
VI. Cost Recovery							
i. Formula for cost recovery agreed	Caza		5	10	20	25	25/25
ii. Administrative and legal procedures set up in each Caza	Caza		5	10	20	25	25/25
iii. Training of personnel and necessary computer hardware and software purchased	Caza		5	10	20	25	25/25
iv. Costs and budgets for solid waste management established for a 3-5 year horizon in each Caza with provision for expansion of landfill sites and satisfactory maintenance practices	Caza		5	10	20	25	25/25
v. Household invoice rate established and approved by each Caza Government and MMRA	Caza		5	10	20	25	25/25
vi. Invoices sent to households, and payments received over first fiscal year	Caza			5	10	20	25/25
vii. Achievement of full cost recovery within three fiscal years after distribution of collection vehicles in each Caza	Caza					5	10/25
VII. Institutional Development							
i. Recruitment of technical assistance experts to MMRA and CDR	Experts	4	4	4	4	4	4/4
ii. Submission of progress reports specified in TORs for each expert	Reports		4	4	4	4	4/4
iii. Completion of long-term strategy for Solid Waste Management and implementation of its recommendations	Strategy	1	1	1	1	1	1/1

Project Component	Unit	1995	1996	1997	1998	1999	2000
iv. Demonstration of capacity to plan for continued improvements in collection service and for additional landfill capacity (new cells)	Caza			5	8	20	25/25
v. Preparation of a second solid waste/environmental management project to emphasizes the 3R's (Reduce, Reuse, Recycle), hazardous waste management, clean-up of toxic and hazardous sites, implementation of coastal zone improvement projects	2nd Project					1	1/1
vi. Institutional development will take place at CDR, MMRA, MOE and at the Caza (municipal) level. The overall goal of the institutional development is to achieve an effective management of solid waste throughout the Lebanese Republic in the short-term (3-5) years, and to develop human resources who can plan and manage for continued long-term effectiveness of the collection and disposal of solid waste	Evaluation Plan					1	1/1

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

Affordable Solid Waste Management Services

INTRODUCTION

1. Income levels in Lebanon are significantly lower than they were before the outbreak of war - probably about one third of what they used to be in real terms (current estimates are of average household incomes of US$400 per month based on a minimum wage of US$225 per month). Yet, in many cases, expectations of service standards remain high, influenced by the pre-war standards. The objective of the project is to provide a level of service that is affordable to the majority of the population, so that households will be willing and able to pay for the service provided, and hence ensure the sustainability of the project. The analysis that follows sets out the rationale behind the proposed service levels and systems of collection and disposal.

COMPOSITION OF SOLID WASTE

2. Analysis of solid waste in Beirut and Tripoli carried out over the past two years shows it to have a high organic content, 60-70 percent, and hence a high moisture content which renders it on the whole unsuitable for incineration, but more suitable for composting. This is confirmed by the difficulties encountered in operation of the incinerator at Amrousiyeh during the past year, where combustion has frequently been incomplete, with consequent pollution of the atmosphere. On many occasions it has been necessary to add fuel oil to achieve combustion. The solution proposed in the project to overcome these technical difficulties at Amrousiyeh is to construct a composting plant beside the incinerator and to sort the incoming waste, directing it to the most appropriate disposal system and so raising the calorific value of the waste diverted to the incinerator.

ALTERNATIVE COLLECTION SYSTEMS

3. During preparation of the ERRP, consideration was given to the choice between house-to-house collection and the placing of containers at convenient locations throughout urban areas. The latter proved to be the more cost effective procedure, being considerably more rapid and hence involving less capital and operating costs (US$25 per ton). Nevertheless it required the cooperation of the public to carry their garbage over a normally short distance to the container. The implementation of this system has proved effective in Beirut under the ERRP and its extension to other urban areas is proposed under the project.

SOLID WASTE COMPOSITION

CONSTITUENTS:	TRIPOLI-1994	BEIRUT-1994	
	COMPOSITION %	COMPOSITION %	MOISTURE CONTENT 1/ %
Vegetable and Putrescible	58	53	76
Paper and Cardboard	12	18	49
Plastic	11	11	35
Glass/China	1	9	3
Metal	3	3	7
Fabric	6	3	43
Miscellaneous	10	3	11
TOTAL/AVERAGE	100	100	55

1/ Moisture content is available for Beirut only.

4. Another choice that is becoming increasingly widespread in many countries is the sorting of waste at the household level, primarily to assist recycling of waste for reuse and environmental protection purposes. This system requires more complex collection and disposal procedures and a high degree of public participation. While it may become possible to introduce such a system in Lebanon in the future, it will take time to develop public awareness of the advantages of such a system and establish the facilities needed for its implementation. In the meantime, the priority is to establish a workable system throughout the country as rapidly as possible. An exception is hospital waste which for obvious reasons needs to be separated at source and for which separate facilities will be provided under the project.

5. Industrial and hazardous wastes from large plants are excluded from collection in this project, but it is acknowledged that there is still considerable mixing of household and industrial wastes in most small and medium sized industries. Strengthening of the legal framework and of enforcement capabilities is required to ensure full separation of industrial and hazardous

wastes. Separate specialized collection and disposal facilities will have to be developed under a separate project, as these are much more expensive facilities to build and to operate.

ALTERNATIVE DISPOSAL SYSTEMS

6. Three alternative systems of disposal were analyzed during project preparation:

* sanitary landfills;
* composting; and
* incineration.

7. Each system of disposal has certain advantages and disadvantages in the context of Lebanon. Sanitary landfills, while cheap to construct and operate, suffer from scarcity of appropriate sites - the mountainous terrain and high population density make it difficult to find low cost sites adjacent to urban areas. Composting has acquired a bad reputation amongst the farmer end users due to poor quality compost produced in the past, although better sorting and production control, already introduced at the Karantina compost plant under the ERRP, should eliminate this problem in future. Studies indicate that there is sufficient demand for composting to be viable. Incineration appeared to be a possible option initially due to the availability of industrial sites for what is regarded as an industrial process, but its high investment and operating costs make it unaffordable and hence unsustainable at this stage, apart from environmental problems associated with air emissions and disposal of hazardous fly ash.

8. A further major constraint in Lebanon is the unwillingness of any caza to accept the refuse of another caza. This means that separate facilities have to be provided in each caza within its constraints, thus reducing choices and scope for economies of scale. For example, in Beirut land scarcity has resulted in disposal systems based on composting and incineration; in Tripoli, the existing sanitary landfill will be rehabilitated, while the future choice between landfills, composting and incineration, or a combination, is analyzed and debated, despite available capacity at landfills in adjoining cazas.

9. Estimates of the costs of alternative disposal systems are summarized in the table below - they are based on recent consultants' reports for sanitary landfills (in Tripoli, Saida, Zahle, Tyre and Baalbek), composting plants (in Beirut, Tripoli, Saida and Zahle), and incineration (in Beirut and Tripoli). Although these estimates are indicative of orders of magnitude only, they are consistent with data available from other countries in the region (see, for example, "Municipal Solid Waste Management Study for the Mediterranean Region", a study prepared for METAP by Cowiconsult in September, 1992).

COMPARATIVE DISPOSAL COSTS

	LANDFILL	COMPOSTING	INCINERATION
CAPACITY (tons per day)	100	300	400
ANNUAL THROUGHPUT at 90% capacity (tons per year)	32850	98550	131400
TOTAL INVESTMENT COST ($Mn)	1.5-3.0	16	45
Annual Costs: Amortization @ 10%/20yrs (US$ per ton)	5-10	20	40
Operation and Maintenance (US$ per ton)	10-15	15-20	25-35
Total Annual Amortization and Operating Costs (US$ per ton)	15-25	35-40	65-75

10. **Sanitary Landfill** costs will vary according to the price of land and the extent of preparation needed for the site. For example, in most of the proposed landfills a double layer of impermeabilization (impermeable geomembrane and impermeable clay layer) is proposed to ensure effective protection against possible contamination of water resources; on coastal landfill sites, a dyke would be built to ensure against spilling of refuse into the sea; land prices are significantly lower in the Bekaa Valley than on the coastal zone. Overall costs of collection and disposal would amount to US$40-50 per household per year, less than 1% of average household income.

11. **Composting** represents a viable alternative method to landfill, particularly in agricultural areas where there is potential demand from farmers, as in the Bekaa (Zahle), in the southern coastal area (Saida and Tyre) and in the northern Akkar region (Tripoli). The costs shown in the table take no account of revenue from sales (manure is currently priced at about US$30 per

ton. Even so, the combined costs of collection and disposal would be affordable at about US$60 per household per year.

12. **Incineration** is a significantly more costly process, particularly in Lebanon, where the high technology is new and the high moisture content of the garbage makes it difficult to burn. For incineration to work in these circumstances, it would need to be combined with other disposal systems - composting and/or sanitary landfills - that can dispose of high moisture refuse. Incineration would in any event require complementary landfill facilities to dispose of residues, which can represent up to 30% of total waste incinerated. In the future the relative disadvantages of incineration may change, as the technology becomes absorbed, income levels rise, the composition of the solid-waste changes and it becomes possible to reduce the costs by selling surplus power generated to the national grid. Then its use may become attractive on a selective basis to extend the life of scarce landfill volume capacity, despite its relatively high capital and operating costs.

ANNEX 9

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

Timetable for Landfills EAs and Site Acquisition

Activity	Date First 2 Cazas	Date Next 5 Cazas	Date Next 5 Cazas	Date Last 3 Cazas
A. Submission of draft EAs for review by CDR and the Bank	Done	31-July-95	31-Dec-95	31-March-96
B. Finalize land acquisition	Done	30-Nov-95	30-April-96	31-July-96

LEBANESE REPUBLIC
SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

ENVIRONMENTAL ASSESSMENT SUMMARY

1.00 Background

1.01 Lebanon, a prosperous upper middle-income country in the mid-70s, has been devastated by 15 years of turmoil as a result of violent civil strife and military occupation. The civil war had a severe impact on the socio-economic conditions in the country. Lebanon's per capita income, about US$1,900 in 1993, in real terms was only about half of the 1975 level, and income inequalities have been accentuated. The total damage to physical assets during the war period was estimated by the United Nations at US$25 billion. Damage is both a direct result of the war, as well as the accumulated effects of a near total disruption in capital investment and maintenance.

1.02 Against this background, the Government of Lebanon has prepared a three-year National Emergency Reconstruction Program (NERP) which has recently been extended to the ten-year Horizon 2000 program. The first five years of the Horizon 2000 include the NERP and total approximately US$5 billion (in constant 1992 prices).

The Solid Waste Management Sector

1.03 Solid waste collection and disposal services deteriorated greatly during the civil war. Refuse collection trucks and containers, often used as barricades during the fighting, were destroyed. The remaining equipment has either lived beyond its effective life or prematurely damaged because of lack of maintenance. Thus, refuse collection services deteriorated to the point where refuse collection became almost non-existent and solid waste was dumped on the streets, vacant lots and the coastline, with frequent intermingling of hospital and other hazardous wastes.

1.04 Although Lebanon's physical features sometimes make it difficult to find sites for sanitary landfills with suitably large capacity for refuse disposal, this is still the least cost and simplest method of disposal. Composting is also considered an appropriate technology for the disposal of large volumes of waste, particularly where there is a potential market for the product, as market studies (available on file) indicate for agricultural areas. Incineration is rarely a viable option in Lebanon due to the substantial investment cost, high ratio of organic matter in the refuse, and the extremely high operating costs.

1.05 Refuse collection and disposal have always been the responsibility of the municipal authorities. The service is funded, along with other municipal services, from the fungible revenues of the municipalities. These consist of: (i) a municipal tax equivalent to 11 percent of the imputed rental value of property, and the proceeds from land sales and construction permits, all of which are collected directly by the municipalities; and (ii) a share of certain revenues, such as a 10 percent surcharge on telephone, electricity and water bills, and duties on imports, liquor and fuel, collected by the Central Government and distributed to the municipalities on the basis of population and the size of the previous budget, Beirut being limited to 60 percent of the total under the existing formula. In the past, municipalities were capable of providing adequate refuse collection services, although the development of sound disposal systems had only just started when the civil war broke out. With time, the resource base of the municipalities was eroded because: (i) the Lebanese Pound has slid to about one-thousandth of its value in 1975; (ii) Lebanon, until July 1992, practiced absolute rent control, leaving revenues from the municipal tax frozen in terms of Lebanese Pounds; recently, however, rental values have increased between 15- and 80- fold, according to the age of the property; (iii) there has been a drop in the revenues from electricity, water and telephones; however, the revenues from surcharges on these services are expected to increase substantially as the major service bottlenecks are removed with the help of the NERP, and follow-on projects; and (iv) because of Central Government budgetary constraints, the share of the municipalities has not been paid from the Municipal Fund although transfers are expected to resume in the not too distant future. Pending resumption of transfers from the Municipal Fund, the municipalities have to rely in part on ad-hoc advances from the Central Government to meet priority needs. Government has recently undertaken a study (funded by the Bank) for the development of a long-term strategy for solid-waste management, anchored on the achievement of full cost recovery in the sector through the introduction of direct user charges.

Environmental Management

1.06 One of the results of the civil war in Lebanon was the deterioration of public services, particularly water supply, waste water disposal, solid waste collection, power supply, and public transport. The deterioration of solid waste services has created a severe risk to public health and the environment due to: pollution of water sources and distribution systems; discharge of waste directly into the sea and into irrigation canals; scattered piles of solid waste throughout the country; mixing of hospital waste with domestic waste; and air pollution caused by burning of solid-waste. The situation has been further exacerbated by the lack of a country-wide land use system which has led to haphazard expansion of dwellings on the sea coast, on fertile agricultural land and on sensitive natural ecosystems; pollution of surface waters and underground aquifers caused by uncontrolled pumping to provide the new communities with running water; pouring of sewage into disused wells; widespread deforestation; destruction of the cultural heritage; and degradation of marine and coastal areas.

1.07 The coastal zone has been particularly affected by these impacts, and is suffering severe environmental degradation. The destruction of the Central Business District (CBD) of Beirut and the separation of communities during 15 years of strife, led to the development of major commercial and industrial centers along the sea coast, which themselves triggered the construction of large housing settlements for employees. The sea coast from Tripoli in the North to Tyre in the South has become a continuous stretch of densely populated urban settlements, many of which are lacking in services. In several areas along the coastline, solid waste dumps and outfalls of untreated sewage pollute the sea, while emissions from traffic, power stations, cement plants and other industries, mostly using fuel of doubtful cleanliness, contribute to the atmospheric pollution.

1.08 Lebanon is in the process of preparing a comprehensive national framework for environmental protection. Recently, there have been several initiatives towards strengthening the recently created Ministry of Environment (MOE) to enable it to carry out its role of setting, monitoring and enforcing environmental standards. Assistance is being provided by the Mediterranean Environment Technical Assistance Program (METAP) for the preparation of a national environmental strategy, which will identify the priorities for action and the policy, institutional and investment tools for their implementation. This will contribute to the definition of the MOE long-term program and provide inputs to establish the broad institutional framework for environmental management. The United Nations Development Programme (UNDP) is providing a complementary program of technical assistance and training to MOE for the review and consolidation of environmental laws and regulations, institutional development, capacity building for environmental assessment, and creation of public awareness and participation mechanisms. Although the enforcement of environmental regulations is feasible under the existing legal framework, it is expected that actions will be accelerated when the revised framework is approved by Parliament later in 1995. MOE has recently moved into new premises, which will permit an expansion of staff from the present level of approximately 20 people to the planned level of about 150 people.

1.09 The Council for Development and Reconstruction (CDR), which has the overall responsibility for planning and coordination of investment programs, also needs strengthening in its environmental review functions. In view of the need to integrate environmental considerations at the earliest stage of the planning process, CDR will use the services of the European Union (EU) funded Program Management Unit (PMU) to provide a senior environmental expert to train CDR staff and to coordinate environmental review activities. The expert, who will be in post by March 31, 1995, will also coordinate the inclusion of environmental mitigation and monitoring actions into the construction and operation of disposal sites.

2.00 Project Description

2.01 **Project Objectives.** The main objectives of the project are to: (i) eliminate hazardous and unsightly dumping of solid-waste; (ii) improve methods of waste collection and disposal; (iii) improve cost recovery and modernize municipal accounting systems; (iv) improve the quality and marketability of compost, through the introduction of sorting of the waste at the entrance to the compost plant; (v) increase the involvement of the private sector in solid waste management; (vi) strengthen CDR and MMRA and the principal municipalities; and (vii) create instruments for the more orderly planning and development of the Lebanese coastal zone. Basically, the project would complete the rehabilitation of the country's municipal solid-waste collection and disposal systems as envisaged under the NERP and introduce a separate system for hospital waste.

2.02 **Major Project Components.** The project has four main components: (i) collection equipment; (ii) landfill civil works; (iii) waste disposal facilities; (iv) technical assistance including a coastal zone management plan.

2.03 **Collection Equipment Component:**

(a) Containers: These will be 5,200 in number, distributed across the country in accordance with the estimated population densities. Of this total, 1,600 will be in galvanized steel of 1100 liters with covers for use in urban centers along the coastline. The remaining 3,600 containers will be in painted steel of 1500 liter capacity.

(b) Compactor Trucks: The compactor trucks will be standardized at 10 cubic meters capacity, as these are suited to the narrow streets of the major cities and winding, steep hills typically found in Lebanon. The project will finance 180 new compactor trucks, and distribution will be in accordance with estimated population.

(c) Special Equipment: Where necessary, provision has been made in the project for the procurement of special equipment. These include street sweeping and washing equipment for Beirut and trailer trucks for the purpose of transporting large quantities of waste from transfer stations that will be built in cazas where it is practically impossible to find land for a sanitary landfill.

2.04 **Landfill Civil Works Component:**

(a) Sanitary Landfills: The 15 landfills are being selected in accordance with approved site selection criteria. Of the 13 landfills being financed under the ERRP, the land has been acquired for 6 Cazas; the rest are still in the selection

and evaluation process. Sites for landfills to be financed under the proposed project will be selected on the basis of environmental assessments agreed by the executing agency and the Bank. The landfills will be located at suitable distances from urban developments. The area will be sufficient to meet the needs of the Caza for 20 years. Each sanitary landfill will be enclosed with a suitable fence to prevent encroachment by scavengers and stray animals. A guardhouse and weighbridge will be located at the entrance to each site, enabling access to be controlled and the source of waste and its weight to be recorded. A suitable garage on site will house all the equipment belonging to the Caza and will provide routine maintenance services. An administration building will house the staff in charge of operating and maintaining both the landfill and the mobile equipment. Each site will be provided with the necessary earth-moving and compacting equipment. This will vary in quantity and size depending on the size of the landfill and the volume of incoming waste. Generally, each site will be provided with a mechanical shovel, a water tanker and a sheep's-foot type earth compactor.

(b) Closure and Rehabilitation of Old Uncontrolled Dumps: The old uncontrolled dumps in each of these cazas will be closed and rehabilitated. The rehabilitation will be carried out in accordance with cost effective standards, and the design concepts will be reviewed by the Bank.

2.05 **Waste Disposal Facilities Component:**

(a) Compost Plants: Two compost plants will be constructed; with one in Saida (200 tons per day), and one in Zahle (200 tons per day). Before the waste enters the process cycle, large, hard lumps of debris will be separated and sorted out. Then, as the waste is conveyed towards a shredding/homogenizing drum, recyclable materials - glass, plastics, paper, cloth, and bones - will be manually separated and dropped from special chutes to a compacting and baling unit for sale to manufacturing industries. Ferrous metals will be separated magnetically. The homogenized compost will be mechanically aerated and turned, then deposited in windrows until maturation. This will result in the production of homogeneous, high-quality compost which can be marketed primarily to the farming community.

(b) Amrousiyeh Complex: The original design of the incinerator at Amrousiyeh had made provision for a third furnace of 10 tons per hour incineration capacity. Experience with the existing furnaces has not been satisfactory because of the high moisture content of the waste. Fuel oil is now used to improve combustion and the air emissions consist of black smoke and other contaminants related to

incomplete oxidation of the combustion gases. The Environmental Assessment (EA) report, now under preparation, has made preliminary recommendations that the incinerator capacity should not be expanded, and that a compost plant, similar to that described above (see (a) Compost Plants) be constructed. The alternative project concept, which has been adopted for this project, consists of a compost plant and use of the existing incinerator. The incinerator will be modernized to improve the combustion process by (i) improved califoric value in the waste feed by selective collection of a minimum of 120 tones (metric) per day of waste from higher income neighborhoods, (ii) high calorific value sorted wastes from the compost plant, and (iii) improved mechanical and control equipment. The objective is to meet the European Union Directive on Municipal Waste Incineration Plants (89/429/EEC - OJ L203, 15 July 1989).

(c) Incinerator for Hospital Waste: An appropriately designed incinerator will be constructed for the disposal of hospital waste from hospitals throughout Lebanon. Its precise location and capacity will be determined by feasibility and environmental studies to be undertaken during project implementation Appropriate transport will be procured to transport hospital waste to the incinerator.

2.06 **Technical Assistance Component:**

(a) Coastal Zone Management (CZM) Plan: This component aims at creating the instruments and building the institutional capacities for the physical planning and monitoring of the coastal zone development, in order to improve environmental conditions and prevent further degradation. Its outputs would include: (i) preparing a regional environmental assessment which will identify the cumulative pressures and impacts of the coastal zone development under different investment scenarios; (ii) establishing a GIS system for physical planning and monitoring of the coastal zone development for use by CDR, MMRA and the municipalities; (iii) preparing a coastal zone management plan to be approved and legally binding on all future developments on the coast; and (iv) initiating the implementation of emergency actions to protect and/or rehabilitate coastal resources. The coastal zone management plan will include: a) a strategy for the allocation of coastal and marine resources, defining areas to be conserved and protected and policies for zoning and development of economic activities in the coast; b) a regulatory needs assessment and preparation of draft guidelines, rules and regulations for control of activities on the coast; and c) mechanisms for recurrent funding to support CZM activities and encourage public/private partnership.

(b) Engineering Services: The designs of compactor trucks, containers, and landfills have been completed, or are in the process of being completed, under the ERRP.

Engineering services will be needed for assistance to CDR in bid evaluation, and supervision of construction. Full engineering services will be provided for the (i) design and construction supervision of the two compost plants in Saida and Zahle; (ii) design and construction of the Amrousiyeh Complex, and (iii) design and construction supervision for the collection and incineration of hospital waste.

(c) Institutional Technical Assistance and Training: As CDR, MOE and MMRA are newly established institutions, their staff requires training in the development and implementation of their responsibilities. MOE is already receiving technical assistance from UNDP for institutional development over the mid to long term. In the short term CDR will receive immediate strengthening to review and manage environmental assessments for the project components of landfills, hospital waste incinerator and the Amrousiyeh Complex. As the implementing agency, CDR will be responsible for these environmental assessments (EAs), and the Bank will review all EA reports. The terms of reference for a senior environmental specialist are presented in Annex 2. The project will provide supplementary assistance to MMRA, by recruiting three international experts who will each serve for two years, providing technical assistance and on-the-job training of MMRA staff on solid waste and municipal management. Finally, the project would provide for the training of technical staff from MMRA and the municipalities.

3.00 Environmental Aspects

3.01 **Environmental Review Process:** While the proposed project is expected to have positive environmental impacts by elimination of indiscriminate dumping of solid wastes at roadsides, at open seashore dumps, on vacant land and at uncontrolled dump sites, the possibility that some of its components could have negative impacts if mismanaged caused it to be subject to a category A environmental assessment according to World Bank Operational Directive 4.01. The impacts of these components and mitigation measures to be undertaken are described below.

Compost Plants at Saida and Zahle

3.02 **Project Justification and Benefits:** Composting plants were found to be the best technological and economic solutions to solid waste disposal problems fore the Cazas of Saida and Zahle for the following reasons:

(a) the existence of close-by agricultural lands makes it economically and technically beneficial for compost to be used for soil improvement;

(b) the high proportion of humid (wet) organic matter (52% - 68%) enhances efficient compost production and makes incineration technically and economical not feasible;

(c) landfill volume requirements are greatly reduced (although the need for a landfill is not eliminated);

(d) the environment is safeguarded through the avoidance of nuisances such as odors, water table pollution, insect propagation, epidemic risks and aesthetic appearances; and

(e) the sorting of recuperable material namely plastic, metal, aluminum cans and glass encourages the establishment of recycling industries.

3.03 **Potential Environmental Impacts:** Despite its advantages, the establishment of a composting plant may have negative impacts on the surroundings, including:

(a) the change in land use at the selected site from agricultural to a waste disposal site; and

(b) the nuisance to the local population, including noise from plant operations and truck traffic, generation of odors at the plant, dust and litter due to truck traffic and deterioration in roads due to heavy truck traffic.

It is important to note that there are negligible effects of the composting plants on surface waters, groundwater, geological conditions at the site, fauna and flora, climate, tourist attractions and archeological sites. This is mainly due to the appropriateness of the site locations.

3.04 **Mitigation Measures.** Mitigation measures to minimize the above mentioned negative impacts were developed and a management plan for the application of these measures has been established. These measures are based on past experience both in Lebanon and abroad. Accordingly, all non constructed areas will be covered with lawn, and the whole compost plant will be surrounded by trees. All circulation areas will have a high quality grade and sub-grade capable of withstanding the traffic of heavy trucks and will be paved with washable anti-sliding material. The storage, fermentation and maturation areas will be covered. These areas will be equipped with fire extinguishers, fire hydrants and a basin for water storage. The noise pollution will be minimized by implementing strict regulations for noise control of equipment, for speed limitation of trucks arriving and departing, and by establishing fixed opening and closing hours for the operation of the plant. The odor and litter problems will be reduced by placing a reception facility below ground level. As for the wastewater generated from the daily use of water, it will be treated in a septic tank of appropriate capacity. The composting plants

will be complemented by adjacent sanitary landfills, built according to international standards, capable of handling all the non-recyclable sorted refuse from the plants. It should be noted that important measures would be undertaken to ensure that the operation of the compost plant meets the standards and objectives it was originally designed for, essentially the transformation of the municipal waste into a useful product that can be marketed and used in agriculture. This goal can be achieved by (i) ensuring a high quality compost that is suitable for use in the nearby agricultural lands; (ii) undertaking a successful marketing campaign to increase people's knowledge and awareness and to eliminate their reticence towards using a product generated from waste; and (iii) ensuring a good coordination between the various agencies concerned by the project, namely the Ministry of the Environment, the Ministry of Agriculture, the Green Plan, the municipalities involved, and other non-governmental organizations.

Amrousiyeh Complex

3.05 **Environmental Impacts.** Increasing the capacity of the existing Amrousiyeh incinerator is not an environmentally sustainable solution for waste disposal in the region of western Beirut. As the organic (putrescible) materials represent 50-68% (wet weight basis) of the waste with a high water content (62-81%), the existing incinerator oven requires addition of fuel oil to assist in combustion. Emission stack testing shows that there is still incomplete combustion, and black smoke, particulate matter and odors are common occurrences. The Amrousiyeh incinerator would not, therefore, be expanded.

3.06 **Mitigation Measures.** The proposed alternative for the incinerator expansion is the construction of a compost plant at the existing site and modernization of the existing ovens at the incinerator, so as to meet European Union standards. Inefficient incineration of the wastes will be resolved by selective collection of wastes with higher calorific value, by use of the high calorific value sorted waste generated by the compost plant and\or by use of compost from the composting plant. This solution is an integrated solution that encourages reduction, reuse and recycling of waste materials and also makes efficient use of the existing facilities at the site. The mitigation measures to be implemented for the composting plant will be similar to those described above for the composting plants at Saida and Zahle.

3.07 **General Site Selection Criteria for Landfills.** The selection of sites for landfills in Lebanon is a difficult process due to the lack of suitable sites in the rugged mountainous terrain, due to the disruption of effective municipal land use planning procedures during the civil war and due to opposition to landfill sites from those in their vicinity. The "not in my backyard" attitude to accepting landfills appears to be widespread among landowners and the public in Lebanon. A general set of criteria have been developed to: a) assist in the selection of rational sites for landfills and b) define basic design principles for landfills. The criteria emphasize avoidance of sensitive environmental features, while taking into account the need for landfills located close to all population centers to minimize transport distances, and are summarized in Attachment 8. An environmental assessment (EA) report recommending one or several

environmentally acceptable sites will be prepared for each caza by CDR, and the EA report will be reviewed by the Bank. The EAs will systematically analyze three main environmental aspects: (i) justification of site selection; (ii) results of the public consultation process; (iii) site specific design criteria for environmental mitigation and protection.

3.08 **Hospital Wastes.** Inventories of hospital waste were carried out for the cazas of Saida and Zahle, and for western Beirut. These surveys are a first attempt to describe the types and quantities of hospital wastes generated in Lebanon. The survey results indicated that hospital wastes represent a minor proportion of the overall waste production: less than 1% of daily waste generation. The hospitals wastes consist of mainly domestic wastes (from the kitchens, offices, general maintenance services) but infectious wastes (consisting of human tissue, blood and laboratory wastes) can represent up to 50%, as is common in western Europe. Presently both these types of hospital wastes are co-mingled in collection and disposal with the other municipal wastes. The only exception occurs at two hospitals in western Beirut which are equipped with special incinerators. Under the project, a feasibility study and environmental assessment for the location and sizing of a central hospital wastes incinerator will be carried out and funding provided for the incinerator and the necessary collection vehicles.

3.09 **Industrial Wastes.** Inventories of industrial waste were carried out for the cazas of Saida and Zahle, and for western Beirut. The inventories were compiled based on systematic interviews with owners and managers of local industries. Industries surveyed include slaughter houses, rendering plants, chicken and livestock production, tanneries, dye and textile mills, food transformation industries, vehicle repair garages and furniture plants. These surveys are a first attempt to describe the types and quantities of industrial wastes generated in Lebanon, and the results presented in the EAs show that: i) the quantities are probably underestimated; ii) existing disposal practices are basically haphazard, for example disposal in rivers, on roadside in uncontrolled dumps, mixture with all other plant wastes or burning of used tires. Further work will be undertaken to develop a plan, to be financed by the ERRP, so as to separately collect and to separately dispose of the various categories of industrial wastes.

3.10 **Coastal Zone Management Plan.** The first step in the preparation of the coastal zone management (CZM) plan will be a full assessment of the key coastal resources under threat by development pressures. A regional environmental assessment (REA) will provide a diagnostic of the present situation, and forecast the state of the coastal zone and its resources by the year 2010 under various investment scenarios. It will identify the main sources of environmental degradation, critical areas and emergency actions, in a study corridor 16 km wide. This REA will be used for the preparation of land-use policies which can lead to environmentally sustainable patterns. The consultant will commence work early in 1995.

Attachment 1 to ANNEX 10

LEBANESE REPUBLIC
SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

Summary Description of Disposal Facilities

GOVERNORATE / CAZA	SITE SELECTION	LAND OWNERSHIP	LOAN FINANCING	DISPOSAL FACILITY
GREATER BEIRUT:				
Greater Beirut	yes	G/P	SW/EM	Amrousiyeh Complex
Greater Beirut	yes	G	ERRP	Karantina Compost Plant (Modernization)
Greater Beirut	no	-	ERRP	Landfill
Greater Beirut	yes	G	nil	Dora Landfil
Greater Beirut	yes	G	nil	Normandie Landfill
NORTH LEBANON:				
Akkar	no	P	ERRP	Landfill
Batroun	no	P	ERRP	Landfill
Bcharre	no	P	SW/EM	Landfill
Koura	no	P	ERRP	Landfill
Tripoli	yes	G	ERRP	Landfill
Zgharta	no	P	SW/EM	Landfill
MOUNT LEBANON:				
Aley	no	P	SW/EM	Landfill
Baabda	no	P	SW/EM	Landfill
Chouf 1	yes	P	ERRP	Landfill
Chouf 2	yes	G	SW/EM	Landfill
Jbeil 1	no	P	ERRP	Landfill
Jbeil 2	no	P	SW/EM	Landfill
Kesrouane	no	P	ERRP	Landfill
Metn	no	P	ERRP	Landfill
SOUTH LEBANON:				
Bent Jbeil	yes	P	SW/EM	Landfill
Hasybaya	no	P	SW/EM	Landfill
Jezzine	yes	P	SW/EM	Landfill
Marjayoun	no	P	SW/EM	Landfill
Nabatiye	no	P	SW/EM	Landfill
Saida	yes	P	ERRP and SW/EM	Landfill and Compost Plant
Sour (Tyre)	yes	G	ERRP	Landfill
BEKAA:				
Baalbeck 1	yes	P	ERRP	Landfill
Baalbeck 2	no	P	SW/EM	Landfill
Hermel	no	P	SW/EM	Landfill
Rachaya	no	P	SW/EM	Landfill
West Bekaa	no	P	SW/EM	Landfill
Zahle	yes	P	ERRP and SW/EM	Landfill and Compost Plant
Hospital Incinerator(s):	no	-	SW/EM	Hospital Incinerator

Notes:
- G = Government Land Ownership
- P = Private Land Ownership
- ERRP = Emergency Reconstruction and Rehabilitation Loan
- SW/EM = Solid Waste / Environmental Management Loan

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

Terms of Reference for Senior Environmental Specialist

Job Title:	Senior Environmental Specialist
Qualifications/Experience:	University Degree in Natural, Environmental or Applied Sciences with specialization in Environmental Planning and/or Environmental Assessment preferably at the Masters level. At least 10 years experience in planning and design of infrastructure projects, with project management experience of coordination of environmental and engineering consultants, and liaison work with the public, municipalities, government agencies and international financial institutions.
Languages:	Fluent in French or English, with good working knowledge of the other (knowledge of Arabic also an advantage).
Duration of Contract:	Variable; as this is to become a permanent position a short term contract (6 months) may be acceptable to initiate the work, followed by a 18-24 month duration contract by same or different person (latter would involve a 3 month trial period).
Salary:	Relative to experience and qualifications
Starting Date:	Prior to April 20, 1995

Responsibilities:

The Senior Environmental Specialist will work initially as part of the forward planning for the selection of solid waste disposal sites for a solid waste/compost incinerator complex, approximately 20 landfills, and hospital waste incinerator. He will work within the Project Management Unit (PMU) at the Council for Redevelopment and Construction (CDR) of the

Government of Lebanon, and will coordinate with staff at other government agencies, such as the Ministry of Municipal and Rural Affairs, at Municipalities, Ministry of Agriculture, Ministry of the Environment and other relevant agencies.

His tasks will include:

1. Preparing terms of reference for Environmental Assessment (EA) report for disposal facilities (where this has not already been done), and ensuring that one or more environmentally acceptable sites are recommended by the EA report.

2. Managing and monitoring the quality and administrative matters related to preparation of EA reports by environmental consultants, and assisting in identification of one or more environmentally acceptable sites.

3. Reviewing EA reports to ensure compliance with the World Bank's Operational Directive 4.01 on the behalf of the Borrower (Government of Lebanon).

4. Submittal of the final EA report to the World Bank for concurrence prior to final approval.

5. Ensuring that the mitigation recommendations are incorporated into the detailed engineering design documents, into construction plans and into bidding documents.

6. Supervision and inspection of the construction contractor to ensure that mitigation measures are implemented, with frequent reports (minimum monthly) to CDR.

7. Advising the groups responsible for environmental monitoring on the appropriate means to monitor the effects of the compost plant during construction and operations.

8. Prepare monthly and quarterly achievement reports.

9. Collaborate with the SIU for solid waste management and the three experts in municipal management working at MMRA.

10. Assist in the on- the -job training for the new counterpart professional(s) who will permanently fill the position at CDR.

11. Advise CDR on the review, management, staffing and budgets of environment assessment reports for other infrastructure projects, as time permits.

LEBANESE REPUBLIC

Compost Plants at Zahle and Saida
Summary of Environmental Management Activities

IMPACT	MITIGATION				MONITORING		
Activities: Origin of Impacts	**Mitigation Actions**	**Project Phase**	**Responsible Implementation Group**	**Mitigation Cost US$**	**Monitoring Criteria**	**Responsible Monitoring Group**	**Monitoring Cost US$**
Dust along roadways used by refuse collection vehicles	Paving selected circulation and access roads	Detailed design and construction	Consulting engineer and construction contractor	Included in construction cost	Maximum ambient suspended particles 120 $\mu g/m^3$ (24 hr average)	Compost plant operator	Included in O & M costs for compost plant
Dust from unloading incoming refuse to the plant	Planning of the circulation, fermentation, maturation and storage areas	Detailed design and construction	Consulting engineer and construction contractor	Included in construction cost	Maximum ambient suspended particles 120 $\mu g/m^3$ (24 hr average)	Compost plant operator	Included in O & M costs for compost plant
	Excellent quality paving capable of withstanding frequent truck traffic	Detailed design and construction	Consulting engineer and construction contractor	Included in construction cost	Maximum ambient suspended particles 120 $\mu g/m^3$ (24 hr average)	Compost plant operator	Included in O & M costs for compost plant
	Water spray the working areas to suppress dust as deemed necessary	Operations	Compost plant operator	Included in O&M cost	Maximum ambient suspended particles 120 $\mu g/m^3$ (24 hr average)	Compost plant operator	Included in O & M costs for compost plant

IMPACT	MITIGATION				MONITORING		
Activities: Origin of Impacts	**Mitigation Actions**	**Project Phase**	**Responsible Implementation Group**	**Mitigation Cost US$**	**Monitoring Criteria**	**Responsible Monitoring Group**	**Monitoring Cost US$**
Litter along roadways used by refuse collection vehicles	Provide enclosed refuse collection vehicles or cloth traps to cover open vehicles	Operations	Waste collection personnel or collection contractor	Included in cost of waste collection	Weekly visual inspection	Municipality	Included in municipal budget
Odor: propagation at trucks arrival	Locating the storage pit in a depression with maximum 3 days capacity	Detailed design and construction	Consulting engineer and construction contractor	Included in construction cost	Maximum 3 days storage	Compost plant operator	Included in O & M costs for compost plant
	Well organized waste collection to avoid waste fermentation in streets	Operations	Waste collection personnel or collection contractor	Included in cost of waste collection	Complaints of unacceptable odors (see Attachment 4 to Annex 10)	Municipality and odor committee	Included in municipal budget
Odor: propagation during fermentation and maturation of compost	Maintaining aerobic conditions during fermentation by controlling the air flow rate	Operations	Personnel in charge of the fermentation unit and compost plant manager	Included in O&M costs for compost plant	Complaints of unacceptable odors (see Attachment 4 to Annex 10)	Municipality and odor committee	Included in municipal budget

IMPACT	MITIGATION				MONITORING		
Activities: Origin of Impacts	**Mitigation Actions**	**Project Phase**	**Responsible Implementation Group**	**Mitigation Cost US$**	**Monitoring Criteria**	**Responsible Monitoring Group**	**Monitoring Cost US$**
Odor: propagation during fermentation and maturation of compost (con'd)	Obtaining a sufficient velocity for the rise in temperature in order to attain fermentation in a few days	Operations	Personnel in charge of the fermentation unit and compost plant manager	Included in O&M cost	Complaints of unacceptable odors (see Attachment 4 to Annex 10)	Municipality and odor committee	Included in municipal budget
	Maintaining a 40 to 50% humidity in the fermenting mass in order to destroy the spores and pathogenic germs	Operations	Personnel in charge of the fermentation unit and compost plant manager	Included in O&M cost	Complaints of unacceptable odors (see Attachment 4 to Annex 10)	Municipality and odor committee	Included in municipal budget
Excessive odor propagation (complaints of neighboring communities)	Installation of an odor control unit	Detailed design and construction	Consulting engineer and construction contractor	US$600,000	Complaints of unacceptable odors (see Attachment 4 to Annex 10)	Municipality and odor committee	US$20,000-50,000/annual
Noise pollution: due to truck traffic	Planning of the schedules and itineraries of the waste collection vehicles	Operations	Compost plant manager and waste collection contractor	Included in O&M cost	40-60 dBA	Compost plant operator	Included in O & M costs for compost plant
	Imposition of a speed limit for the trucks on site	Operations	Truck drivers and compost plant manager	Included in O&M cost	40-60 dBA	Compost plant operator	Included in O & M costs for compost plant

IMPACT	MITIGATION				MONITORING		
Activities: Origin of Impacts	**Mitigation Actions**	**Project Phase**	**Responsible Implementation Group**	**Mitigation Cost US$**	**Monitoring Criteria**	**Responsible Monitoring Group**	**Monitoring Cost US$**
Noise pollution: due to the engines and equipment in the physical treatment unit	Ensuring that equipment specifications are in conformity with the regulations relative to the sound-proofing of site engines	Detailed design and bidding	Consulting engineer and CDR	Included in capital costs for construction	40-60 dB at fence line; workplace noise levels less than 85 dBA	Municipality and CDR	Included in municipal budget
	Regular maintenance of the engines	Operations	Compost plant manager	Included in O&M costs	40-60 dB at fence line; workplace noise levels less than 85 dBA	Municipality	Included in municipal budget
	Specifying the business hours from 6 a.m. to 6 p.m.	Operations	Compost plant manager	Included in O&M costs	Weekly site inspections	Municipality	Included in municipal budget
Contamination of ground and/ or surface water	Impermeable floor structure (10^{-7} cm/sec), leacheate collection system, stormwater management and construction of perimeter groundwater monitoring wells (minimum of 3)	Detailed design and construction	Consulting engineer and contractor	Cannot be addressed until detailed design	Establish background quality in groundwater monitoring wells, and sample groundwater at least monthly during operations and extending to ten years after plant closure (for parameters to monitor, see Attachment 5 to Annex 10)	Compost plant operator	To be determined by the environmental monitoring implementation plan

IMPACT	MITIGATION				MONITORING		
Activities: Origin of Impacts	**Mitigation Actions**	**Project Phase**	**Responsible Implementation Group**	**Mitigation Cost US$**	**Monitoring Criteria**	**Responsible Monitoring Group**	**Monitoring Cost US$**
Contamination of ground and/or surface water (con'd)	Provide a wastewater treatment unit of small capacity for the evacuation and treatment of the wastewater and leacheate incoming from the administrative buildings receiving pit, fermentation and maturation areas	Detailed design and construction	Consulting engineer and construction contractor	Included in capital costs for construction	Weekly monitoring of effluent as indicated in Attachment 6 to Annex 10; similar monitoring in receiving water body if pollutant loading is heavy in relation to dispersion capacity	Compost plant operator	Included in O & M costs for compost plant; detailed costing to be provided in the environmental monitoring implementation plan
	Stormwater management of the runoff water through proper planning of a drainage system in order to avoid all contact with the waste and the compost in the fermentation and maturation units	Detailed design, construction and operations	Consulting engineer and construction contractor	Included in capital costs for construction	Weekly site visual inspections	CDR and municipality	Included in construction supervision and municipal budget

IMPACT	MITIGATION				MONITORING		
Activities: Origin of Impacts	**Mitigation Actions**	**Project Phase**	**Responsible Implementation Group**	**Mitigation Cost US$**	**Monitoring Criteria**	**Responsible Monitoring Group**	**Monitoring Cost US$**
Contamination of soil and potential biological uptake of toxic chemicals (e.g. heavy metals) from application of compost	Based on crops planned to receive land application of compost and chemical concentrations they can tolerate Determine which contaminants limit application rates Then, based on concentrations of these constituents in compost, determine the total concentration which can be applied before phytotoxic levels are reached From this, determine amount of compost which can be applied	Operations	Compost plant operator	To be determined	See guidelines in Attachment 7 in Annex 10; baseline sampling of agricultural soils is also required; compost sampling should be frequent (at least weekly) at the beginning of operations: if compost quality does not meet guidelines, disposal in landfill or use as a daily cover should be carried out	Operator of compost plant	To be determined, but included in O & M costs of compost plant; detailed costing to be provided in the environmental monitoring implementation plan

IMPACT	MITIGATION				MONITORING		
Activities: Origin of Impacts	**Mitigation Actions**	**Project Phase**	**Responsible Implementation Group**	**Mitigation Cost US$**	**Monitoring Criteria**	**Responsible Monitoring Group**	**Monitoring Cost US$**
Fauna and flora	Adequate layout of the different units and buildings of the plant in order to integrate the plant within its surrounding	Detailed design and construction	Consulting Engineer and contractor	Included in capital costs for construction	Review of design drawings	CDR	Included in design supervision
	Maximum preservation of green spaces	Detailed design and construction	Consulting Engineer and Contractor	Included in capital costs for construction	Review of design drawings	CDR	Included in design supervision
	Maintenance of green spaces	Operations	Maintenance personnel	Included in O&M	Weekly site visual inspections	Municipality	Included in municipal annual budget
	Periodic control in order to prevent rat proliferation	Operations	Maintenance personnel	Included in O&M	Weekly site visual inspections	Municipality	Included in municipal annual budget
Uncontrolled access to the site; disposition of refuse and attraction of animals	Provide for proper fencing (at a height of 3m) around the whole site	Detailed design and construction	Consulting engineer and construction contractor	Included in capital costs for construction	Weekly site visual inspections	CDR	Included in construction supervision

IMPACT	MITIGATION				MONITORING		
Activities: Origin of Impacts	**Mitigation Actions**	**Project Phase**	**Responsible Implementation Group**	**Mitigation Cost US$**	**Monitoring Criteria**	**Responsible Monitoring Group**	**Monitoring Cost US$**
Utilization of the compost	Ensure a good quality compost by:		CDR and compost plant manager to ensure coordination between the various official and non-official organizations concerned, such as the Ministries of Agriculture, and Public Health, the Green Plan, and the farmers; sampling to determine compost composition and concentrations of glass, metals and heavy metals	Included in O & M costs for compost plant	See guidelines in Attachment 7 to Annex 10; preparation of an operations manual by plant operator compost	Compost plant operator, with verification by the Municipality and/or Ministry of Agriculture and/or Ministry of Environment	To be determined in the environmental monitoring implementation plan to be submitted by compost plant operator
	Supervision of the proper functioning of the plant	Operations	Compost plant manager	Included in O&M	Weekly site inspections	Municipality	Included in municipal budget
	Supervision of the manual and automatic sorting of materials	Operations	Compost plant manager	Included in O&M	Weekly site inspections	Municipality	Included in municipal budget

IMPACT	MITIGATION				MONITORING		
Activities: Origin of Impacts	**Mitigation Actions**	**Project Phase**	**Responsible Implementation Group**	**Mitigation Cost US$**	**Monitoring Criteria**	**Responsible Monitoring Group**	**Monitoring Cost US$**
Lack of resident cooperation with waste collection and treatment systems (such as separation at source)	Survey residents for social and cultural behavior; informing and educating the residents in regard to solid waste problem; and necessary legislation; and educational programs, conferences, etc.	Operations	Coordination between the compost plant manager, municipality, MMRA, and the media	To be determined; but base cost included in annual budget of municipality	Inability to meet compost quality guidelines in Attachment 7 to Annex 10 due to contamination of waste collected due to industrial wastes or other separation problems	Municipality, MMRA and the Ministry of Environment	To be determined
Lack of separation of infectious hospital waste from domestic wastes in hospitals	Visual inspection by collection contractor and by compost plant personnel. Refusal of trucks containing infectious bio-medical wastes	Operations	Compost plant operator with assistance from collection contractor, municipality, and Ministry of Health	Included in O & M costs for compost plant	Inability to meet compost quality guidelines in Attachment 7 to Annex 10. Additional monitoring criteria to be specified by Ministry of Health as necessary	Compost plant operator with assistance of Ministry of Health	Included in O & M costs for compost plant; detailed costing to be provided in the environmental monitoring implementation plan

IMPACT	MITIGATION				MONITORING		
Activities: Origin of Impacts	**Mitigation Actions**	**Project Phase**	**Responsible Implementation Group**	**Mitigation Cost US$**	**Monitoring Criteria**	**Responsible Monitoring Group**	**Monitoring Cost US$**
Lack of separation of hazardous and industrial waste from domestic wastes	Visual inspection by collection contractor and by compost plant personnel. Refusal of trucks containing chemical, hazardous, toxic or industrial waste	Operations	Compost plant operator with assistance from collection contractor, municipality, and Ministry of Environment	Included in O & M costs for compost plant	Inability to meet compost quality guidelines in Attachment 7 to Annex 10 Additional monitoring criteria to be specified by Ministry of Environment as necessary	Compost plant operator with assistance of Ministry of Environment	Included in O & M costs for compost plant; detailed costing to be provided in the environmental monitoring implementation plan
Lack of public services	Stormwater management	Detailed design and construction	Consulting engineer and construction contractor	Included in capital costs for construction	Review design drawings	CDR	Included in design and construction supervision
	Installing a heating unit and a water heater	Operations	Consulting engineer and construction contractor	Included in capital costs for construction	Review design drawings	CDR	Included in design and construction supervision
	Installing new electric lines and electrical generator of sufficient capacity	Detailed design and construction	Consulting engineer and construction contractor	Included in capital costs for construction	Review design drawings	CDR	Included in design and construction supervision
	Installing telephone lines	Detailed design and construction	Consulting engineer and construction contractor	Included in capital costs for construction	Review design drawings	CDR	Included in design and construction supervision

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

ODOR MONITORING APPROACH FOR MUNICIPAL SOLID WASTE COMPOST PLANTS

A. Background to Odor Regulations and Standards

1. The goal of setting uniform legal regulations and standards for odors is to define a level of odor that causes intolerable annoyance to the general population, to identify the source of the annoying odor and to take action to reduce the odor to an acceptable or unobjectionable level. As many odors are difficult to detect using modern analytical chemical techniques, the human nose still remains the most sensitive practical measuring instrument for odors.

2. A simple description of modern odor measurement involves: (i) collection of odorous air in tedlar or tevlar plastic bags; (ii) metering precise diluted amounts of the collected odorous air through an olfactometer to human noses belonging to a group of people with normal sensitivities to odors (referred to as an odor panel); and (iii) determining the odor level after dilution of samples at which 50 percent of the panel can correctly detect the odorous sample so as to obtain an objective quantitative measure (referred to as a dilution factor). The ideal goal for a compost facility would be to have an undetectable odor level at the property line as measured by the odor panel or alternatively a buffer zone specifying minimum distances to the nearest occupied residences.

3. As this method of measuring odors requires: (i) a high degree of quality control (for example less than 4 hours storage of odorous samples, availability of 5-7 qualified odor panelists on the day of odor testing, high purity non-odorous bottled air, odor free room, precise dilution metering, trained personnel, etc.,); (ii) does not take into account varying meteorological conditions; and (iii) is not directly related the degree of annoyance an odor will have in a community due to wide individual tolerance levels, neither the United States EPA (Environmental Protection Agency) nor the European Union have adopted uniform odor standards. The approach to controlling odors varies in each state in the United States and in each European country. Still the basis for regulatory involvement in all jurisdictions are complaints by the general public.

B. Odor Monitoring Approach for World Bank Financed Compost Plants In Lebanon

4. The purpose of the odor monitoring program is to establish if there is a recognizable odor problem in the community, as complaints from a limited number of people, or numerous complaints from the same people may not represent the feelings of the community as a whole. As chronic complainers may be justified in their perception of odors as objectionable, the goal is how:

(i) to establish that there is genuine odor problem in the community; and
(ii) to prove that spontaneous complainers are not just trouble makers.

5. The steps in the odor monitoring approach are as follows:

(i) all odor complaints reported to the compost plant or government officials, must be immediately forwarded to the municipal engineer;

(ii) The municipal engineer or a trained investigator should immediately contact the complainant to ascertain the current situation, based on the following pertinent information:

(a) is the problem currently occurring;

(b) a description of the odor which includes the nature, intensity and duration (for intensity description see table 1);

(c) the suspected source; and

(d) any physical effects incurred by the complainant.

(iii) if a complainant identifies a suspected source, the investigator should quickly visit the source and record an arrival time;

(iv) the investigator proceeds to conduct a 360 degree odor survey of the suspected source (for example at a compost plant from the receiving pit, the fermentation area, the maturation area, or the odor control unit); when an odor is detected the investigator records the following information: (a) the characteristics of the odor and weather conditions including wind speed and direction, (b) any physical effects on the investigator should be noted, and (c) the intensity of the odor should be evaluated (as per table 1); and

(v) the manager of the compost plant is requested by the municipal engineer to undertake corrective action to resolve the source of the odor.

6. Table 1 is an aid to used by the inspector in combination with the duration of an odor to decide if there is interference with a complainant's enjoyment of life and property.

7. The compost plant should be equipped with a simple meteorological station to provide information, preferably on a continuous basis, on wind speeds and directions, daily temperatures and precipitation. This data is essential to properly resolve any odor complaints.

8. In addition the municipal engineer should form an odor committee composed of approximately 5 citizens from within the caza and in the area close to the compost plant, which would be active when there are repeated complaints from the same people. Under such circumstances the municipal engineer would call upon the odor committee for assistance in jointly investigating odor complaints, as described in item 5.

9. If the above approach to odor monitoring is not successful in identifying if a community odor problem exists, then an international odor evaluation laboratory should be contracted to define the odor situation, to locate its sources and to recommend measures to reduce odors to an acceptable level. An odor evaluation of this scope is estimated to cost in the order of US$ 100,000, which would be managed by the municipality on a cost reimbursable basis paid for by the compost plant operator.

Table 1: Odor Intensity Scale	
SCALE/DESCRIPTION	ODOR INTENSITY DESCRIPTION
0	Odor not detectable
1 - Very Light	Odorant present in the air which activates the sense of smell but the characteristics may not be distinguishable
2 - Light	Odorant present in the air which activates the sense of smell and is distinguishable and definite but not necessarily objectionable in short durations. (Recognition Threshold)
3 - Moderate	Odorant present in the air which easily activates the sense of smell, is very distinct and clearly distinguishable and /or irritating.
4 - Strong	Odorant present in the air which would be objectionable and cause a person to attempt to avoid it completely, could indicate a tendency to possibly produce physiological effects during prolonged exposure.
5 - Very Strong	Odorant present which is so strong it is overpowering and intolerable for any length of time and could tend to easily produce some physiological effects.

Adapted from "New Jersey's Approach to Odor Problems" in Recent Developments and Current Practices in Odor Regulations, Controls and Technology, A & WMA Transaction Series, ISSN 1040-8177; No. 18, Pittsburgh, PA. 1991. p 25-35.

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

GUIDELINES FOR GROUNDWATER MONITORING CRITERIA

(Based on potable water quality standards as in decree passed on November 2, 1994 by the Ministry of Environment of Lebanon)

General Parameters			
Color	15mg/l; scale	Pt/Co	
Turbidity	2 Jackson units		
Odor	0 (at 12°C) Dilution factor:2		
	0 (at 25°C) Dilution factor:3		
Taste	0 (at 12°C) Dilution factor:2		
	0 (at 25°C) Dilution factor:3		
Temperature	25°C		
pH	6.5 - 9		
Chlorides (cl)	200	mg/l	
Sulphates (SO_4)	250	mg/l	
Sodium (Na)	150	mg/l	
Potassium (K)	12	mg/l	
Aluminum total (Al)	0.2	mg/l	
Dry residues	1500	mg/l	after drying at 180°C
Nitrates (NO_3)	50	mg/l	
Nitrates (NO_2)	0.1	mg/l	
Ammonium (NH_4)	0.5	mg/l	
Nitrogen Kjeldahl (N of NO_2 and of NO_3 excluded)	1	mg/l	
Oxygenation (or KM O_4 in acidic solution)	5	mg/l	
Sulphated Hydrogen	not detectable		(organoleptically)
Dissolved or emulsified hydrocarbons	0.01	mg/l	
Phenols (phenol index)	0.01	mg/l	
Surface agent (reaction to blue methylene)	0.2	mg/l	(lauryle-sulfate)

Metals

Iron (Fe)	0.2	mg/l
Managanese (Mn)	0.05	mg/l
Copper (Cu)	1.0	mg/l
Zinc (Zn)	5.0	mg/l
Phosphorous ($P_2 0_5$)	5.0	mg/l
Fluoride (F)	0.7 to 1.5	mg/l
Silver (Ag)	0.01	mg/l
Arsenic (As)	50.0	mg/l
Cadmium (Cd)	50.0	mg/l
Cyanides (Cn)	50.0	mg/l
Chrome (Cr)	50.0	mg/l
Mercury (Hg)	1.0	mg/l
Nickel (Ni)	50.0	mg/l
Lead (Pb)	50.0	mg/l
Antimony (Sb)	10.0	mg/l
Selenium (Se)	10.0	mg/l

Polycyclic Aromatic Hydrocarbons (PAH)

- Fluoranthene	0.2	μg/l	(Total of 6 compounds)
- Benzo (3,4) fluoranthene			
- Benzo (11,12) fluoranthene			
- Benzo (3,4) pyrene			
- Benzo (1,12) perylene			
- Indeno (1,2,3,cd) pyrene			
Benzo (3,4) pyrene	0.01	μg/l	

Microbiological Parameters

Coliforms total per	100 ml	0
Coliforms thermotolerant per	100 ml	0
Fecal streptococci per	100 ml	0
Bacteria sulfur reducing per	20 ml	1
Salmonella per	5 liters	0
Staphylcocci phathogenes per	100 ml	0
Fecal bacteriophages per	50 ml	0
Enterovirus per	10 liters	0

Pesticides and Other Contaminants

Insecticides, herbicides, fungicides, PCBs, PCTs:	0.1	mg/l for each compound or
	0.5	mg/l for total of all compounds measured.
Aldrine	0.03	mg/l
Dielddrine	0.03	mg/l
Hexachlorabenzene	0.01	mg/l

Attachment 6 to ANNEX 10

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

GUIDELINES FOR WASTEWATER EFFLUENT MONITORING CRITERIA

(Based on wastewater quality standards as in decree passed on November 2, 1994 by the Ministry of Environment of Lebanon)

Temperature	30°C	
pH	6.5 - 8.5	
COD (chemical oxygen demand)	150	mg/l
BOD (biological oxygen demand)	50	mg/l
Suspended solids	30	mg/l
Detergents anionic	3	mg/l
Hydrocarbons	5.0	mg/l
Phenols	0.5	mg/l
Cyanides	0.1	mg/l
Sulfates	250.0	mg/l
Nitrates	45.0	mg/l
Sulfides	1.0	mg/l
Fluorides	15.0	mg/l
Nitrites	10.0	mg/l
Heavy metals total:	15.0	mg/l
- chrome	0.1	mg/l
- cadmium	0.2	mg/l
- lead	1.0	mg/l
- mercury	0.05	mg/l
Arsenic	0.5	mg/l
Zinc	15.0	mg/l
Silver	0.1	mg/l
Tin	0.1	mg/l
Aluminum	10.0	mg/l

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SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

GUIDELINES FOR GENERAL USE COMPOST QUALITY FOR THE PROTECTION OF PUBLIC HEALTH, SAFETY AND THE ENVIRONMENT[7]

Parameter	Parameter Limit for General Compost only (all limits apply to product leaving compost plant site)
Stability:	mature compost based on a respirometry limit of O_2 consumed[1]
Soluble salts: electrical conductivity (maximum)	0.5 - 4.5 mmhos/cm[1]
Pathogens:	PFRP[2]
(either) fecal coliform	< 1000 MPN/g[3]
(or) salmonella	< 3 MPN/4g[4]
pH: (range)	5.5 - 8.5

Regulated chemical pollutant concentrations (per USEPA "Alternate Pollutant Limit" (APL) at 5.5 - 8.5 pH:

Arsenic (As)	41 - 54 mg/kg dry wt.
Cadmium (Cd)	21 - 39 mg/kg dry wt.
Chromium (Cr)	1200 mg/kg dry wt.
Copper (Cu)	1500 mg/kg dry wt.
Lead (Pb)	300 mg/kg dry wt.
Mercury (Hg)	17 mg/kg dry wt.
Molybdenum (Mo)	18 - 54 mg/kg dry wt.
Nickel (Ni)	420 mg/kg dry wt.
Selenium (Se)	28 - 36 mg/kg dry wt.
Zinc (Zn)	2800 mg/kg dry wt.

Foreign matter content:	2% - 10% by dry weight
Glass shards, metal fragments and man-made inerts (maximum) >4 mm:	Non-injurious

Film plastic >4 mm:	so as not to pose an ingestion threat to small animals
Sharps (Steel sewing needles, straight pins, stainless steel hypodermic needles):	removal by processing[5]
Particle size of organic matter content:	fine, medium or coarse[6]

Notes:

Note 1: VS (Volatile Solids) assumes man-made inert content does not exceed the product marketing standard of 1.5% dry weight >4 mm, <13 mm size.

Note: 2: PFRP (process to further reduce pathogens) is accepted by USEPA for windrow composting if aerobic conditions are maintained and there is a minimum of 5 turnings over 15 consecutive days maintaining a temperature not less than 55°C.

Note 3: Standard Methods 9221E: Fecal Coliform Procedure; or 9222 D: Fecal Coliform Membrane Filter Procedure

Note 4: Standard Methods 9260 D: Quantitative Salmonella Procedures

Note 5: This processing standard can be achieved by processing feedstock through water flotation; by passing product by magnetic separation devices to remove ferrous items; by sifting through an air flotation fluidized bed separator (destoner) equipped with a punched 2.5± mm round deck screen; or by passing product through an eddy current device.

Note 6: Fine ≤ 10 mm and an organic matter content of ≥ 25%
medium ≤ 15 mm and an organic matter content of ≥ 30%
course ≤ 25 mm and an organic matter content of ≥ 35%

Note 7: These guidelines are based on "Organic Waste Composting, Model State Regulations" published by the Composting Council, Alexandria, Virginia and on Florida State regulation (1989) "Criteria for the Production and Use of Compost made from Solid Waste."

Attachment 8 to ANNEX 10

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

SUMMARY OF GENERAL SITE SELECTION CRITERIA FOR CONTROLLED SANITARY LANDFILLS

The criteria below present in summary manner a 20 page text that describes in detail the technical, environmental and economic factors to be considered for selection of an appropriate landfill site.

1. Distances of landfill site to collection areas within each caza.
2. Existing access roads and minimum distance to an access road.
3. Surface land area available at landfill sites to determine site capacity and years of service.
4. Slope and stability of soils and surficial geology.
5. Permeability of deeper soils and geological structures.
6. Use of surface waters and selection of discharge point for leacheate collected at landfill site.
7. Hydrogeological conditions at the site.
8. Climatic conditions.
9. Availability of daily cover soils and granular materials.
10. Feasibility of perimeter drainage ditches.
11. Alignment and location of public utilities (electric lines, water distribution lines, sewers, etc.)
12. Sensitive wildlife and flora in immediate vicinity.
13. Distance to closest homes, villages, and other habitation.
14. Distance to beaches.
15. Distance to forests and wooded areas.
16. Compatibility (integration into) the landscape.
17. Neighboring tourist facilities.
18. Conformity to existing land use zoning designations.
19. Avoidance of known cultural and historic sites.
20. Socio-economic conditions and public acceptance of neighboring communities.
21. Ownership of the site (government owned or privately owned).
22. Land costs.
23. Capital investment costs; and operation and maintenance costs for the future landfill.

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

SECTOR DEVELOPMENT POLICY STATEMENT

Background

1. Refuse collection and disposal in Lebanon has always been the responsibility of the municipalities, which operate under the tutelage of the newly-created Ministry of Municipal and Rural Affairs (MMRA). Law No. 118 of 1977, the Municipal Law, gives municipalities the power to organize solid waste collection and disposal. Various government institutions, including the Ministries of Environment, Interior, Public Health and Social Affairs, have responsibility for functions related to Solid Waste Management (SWM), such as environmental protection, transport (traffic), public health and labor.

2. Several problems have been affecting the provision of adequate SWM services. In particular, solid waste collection services have been provided by financially weak municipal institutions with a limited resource base, largely dependent on central government budgetary transfers for their revenues. Also, Lebanon has few sites readily available for appropriate disposal of solid waste, particularly sanitary landfills. The topography of the country, divided between steep mountains, dense urban development and scarce agricultural soil, leaves very little choice of land available for waste disposal within close reach of cities. It has been found easier to dump the refuse at the nearest vacant stretch of the sea coast. The results are all too plain - pollution of the beaches, environmental degradation and possible breakout of epidemics.

Government Action

3. The Lebanese Government has embarked on a solid waste management program with the following objectives: (i) providing SWM services to all the urban communities of Lebanon in an environmentally sound manner; (ii) preventing further environmental degradation resulting from uncontrolled dumping of wastes, and initiating a program to address the environmental problems associated with existing dump sites; (iii) replacing damaged and antiquated collection equipment and extending waste collection services to new communities; (iv) repairing and rehabilitating existing disposal facilities; (v) establishing and operating suitable sanitary landfills in all Cazas; (vi) utilizing the private sector in rendering waste collection and disposal services; and (vii) ensuring sustainability of services through cost recovery.

Policy Statement

4. It is the stated policy of the Government to improve solid waste collection and disposal services in Lebanon and prevent further environmental degradation. To implement this policy, it is the Government's intention to attain gradually full cost recovery for solid waste services. Firstly, wherever the population mass warrants it, consideration will be given to the construction of additional compost plants and/or sanitary landfills. The method of composting will be modified in several ways: (i) compost plants will be provided with pre-sorting facilities for potential recycling; (ii) the quality of compost will be improved and a powerful campaign will be launched with the farmers to market the compost; and (iii) a special effort will be made to create small industries based on the utilization of recycled materials. Where it is not possible to find adequate land for sanitary landfills and composting does not prove to be a viable option, consideration would be given to the construction of incinerators with upstream sorting of the wastes. Secondly, to supplement municipal revenues, which have recently been increased through a rise in rental values, a gradual system of cost recovery will be initiated. The fee will initially cover about 25% of the cost of service. Thirdly, based on the experience gained under the ongoing projects in utilizing the private sector in SWM operations, the role of the private sector will be expanded to cover comprehensive systems. Existing municipal workers would be employed in such activities as street cleaning, development of parks, etc. Fourthly, a special effort would be made to introduce an economy of scale into the sector through the grouping of several municipalities (or even Cazas) into associations that would pool their resources together in providing SWM services. Successful examples of these already exist in the country.

Long-Term Strategy

5. In order to implement its policy, the Government has undertaken a study to help provide it with the tools necessary to realize its long-term objectives. The objectives of the study are to carry out an overview of the SWM sector and submit recommendations for the achievement of full cost recovery. Its findings and recommendations will help the Government take appropriate decisions for the reorganization of the sector in the future. The study looks into all aspects of the sector and, inter alia, covers the following topics:

- the method of solid waste collection and the possibility of increasing efficiency;
- the methods of disposal - landfill, composting, incineration - and the most suitable method for each area or region;
- the method of collection of municipal fees and the computerization of accounts;
- the possibilities of improving the quality and marketability of compost, manual pre-sorting of the waste, and establishment of industries based on recycled waste;

- the utilization of the capabilities of the private sector through operation and maintenance contracts of appropriate size;

- the restructuring of the sector in order to benefit from the economies of scale; and

- the achievement of full cost recovery in the sector.

6. The study is nearing completion and recommendations are being reviewed.

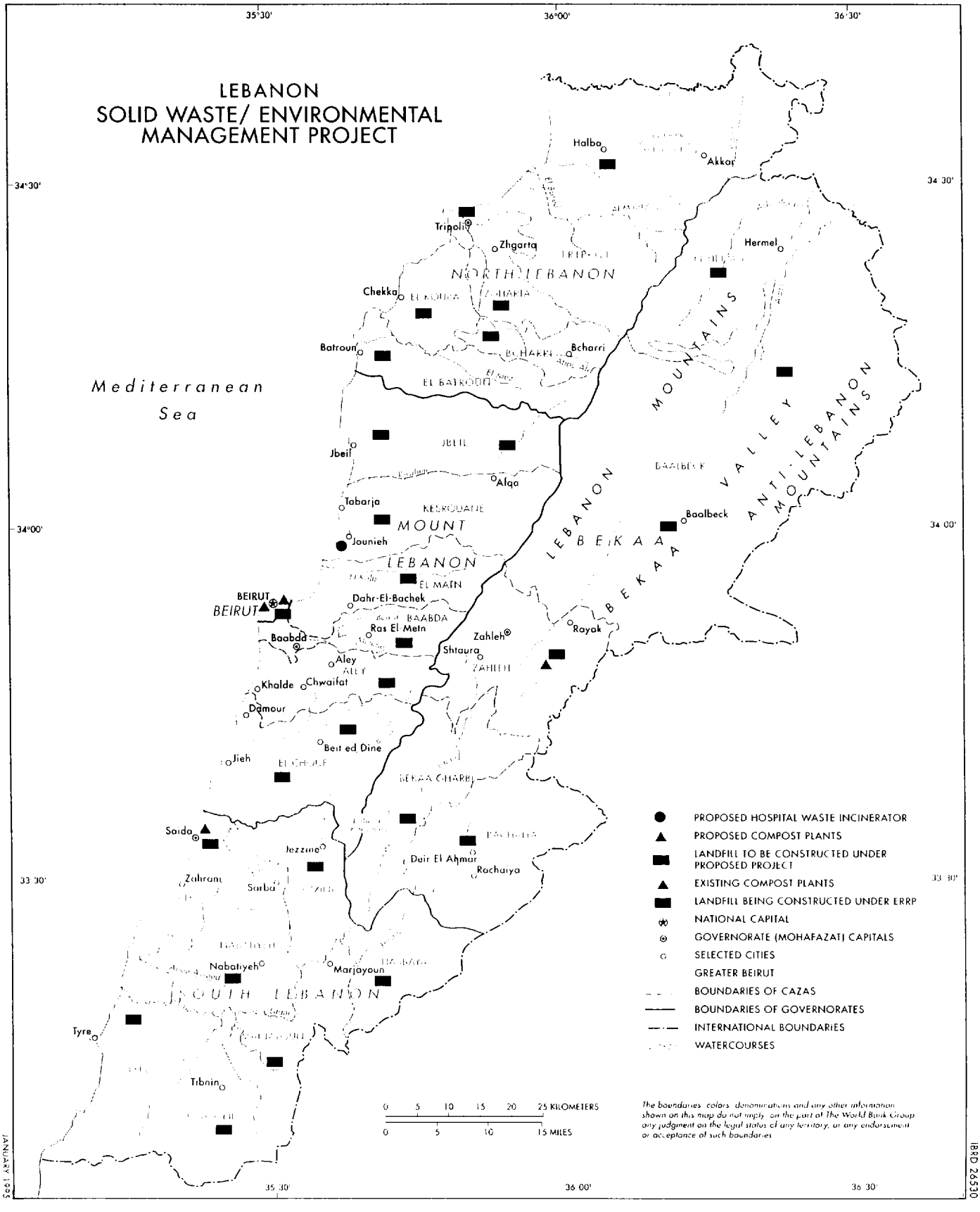
ANNEX 12

LEBANESE REPUBLIC

SOLID WASTE/ENVIRONMENTAL MANAGEMENT PROJECT

Staff Working Papers

1. CDR: Legislative decree No.5 for creation of the Council for Development and Reconstruction
2. MMRA: Operational function (Arabic version of Annex 1 - SAR)
3. Municipalities of Zahle: Budgets (in Arabic)
4. Municipalities of Jbeil: Budgets (in Arabic)
5. Municipalities of Tripoli: Technical assistance needs (in French)
6. Les Ordures Leur Ramassage (Tripoli)
7. La Fermeture Et L'Amenagement De La Decharge Actuelle (Tripoli)
8. Amenagement D'Une Decharge Controlee Sur Un Terrain Gagne Sur La Mer (Tripoli)
9. L'Incineration Etude Pour La Communaute D'Al Fayhaa (Tripoli)
10. Le Marche Potentiel Du Compost (North Lebanon)
11. Rapport Intermediaire Et Evalution Du Choix Du Systeme D'Elimination D'Ordures Menageres De La Communaute D'Al Fayaah (Tripoli)
12. Sanitary Landfills, Final Report, November 1994, CREED/LIBANCONSULT
13. Land Expropriation Laws (in Arabic)


LEBANON
SOLID WASTE/ ENVIRONMENTAL MANAGEMENT PROJECT
35°30'
36°00'
36°30'
34°30'
34°00'
33°30'
Mediterranean Sea
Halba
Akkar
Tripoli
Zhgarta
Hermel
NORTH LEBANON
Chekka
Batroun
Bcharri
EL BATROUN
Jbeil
JBEIL
Afqa
Tabarja
KESROUANE
MOUNT LEBANON
Jounieh
EL METN
BEIRUT
Dahr-El-Bachek
BAABDA
Ras El Metn
Baabda
Aley
ALEY
Khalde
Chwaifat
Damour
Beit ed Dine
Jieh
EL CHOUF
BEKAA CHARBI
Saida
Jezzine
Zahrani
Sarba
Dair El Ahmar
Rachaiya
Nabatiyeh
Marjayoun
SOUTH LEBANON
Tyre
Tibnin
LEBANON MOUNTAINS
BEKAA VALLEY
ANTI-LEBANON MOUNTAINS
BAALBECK
Baalbeck
Rayak
Zahleh
Shtaura
ZAHLEH
PROPOSED HOSPITAL WASTE INCINERATOR
PROPOSED COMPOST PLANTS
LANDFILL TO BE CONSTRUCTED UNDER PROPOSED PROJECT
EXISTING COMPOST PLANTS
LANDFILL BEING CONSTRUCTED UNDER ERRP
NATIONAL CAPITAL
GOVERNORATE (MOHAFAZAT) CAPITALS
SELECTED CITIES
GREATER BEIRUT
BOUNDARIES OF CAZAS
BOUNDARIES OF GOVERNORATES
INTERNATIONAL BOUNDARIES
WATERCOURSES
0 5 10 15 20 25 KILOMETERS
0 5 10 15 MILES
The boundaries colors denominations and any other information shown on this map do not imply on the part of The World Bank Group any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries
JANUARY 1995
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IMAGING

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