

**LEBANON ENVIRONMENTAL PROGRAM  
ASSESSMENT REPORT**

*Final Report*

**Prepared for**

**USAID/Lebanon**  
(Under Task Order No. LAG-I-00-99-00017-00)

**Prepared by**

**E C O D I T** ●



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## EXECUTIVE SUMMARY

The overall “State of the Environment” in Lebanon today offers niche opportunities for USAID/Lebanon to bring about significant environmental improvements through a combination of policy-oriented technical assistance and project investments. The report develops three technical assistance environmental program options for USAID’s consideration:

1. Implementing air pollution abatement policies;
2. Promoting sustainable waste management practices; and
3. Initiating long-term reforestation and ecosystem restoration.

Clearly, USAID/Lebanon cannot seize on all such opportunities, in particular due to budgetary limitations (about \$5 to \$6 million per year over three years). Hence the need to prioritize the program options for USAID/Lebanon’s consideration. The report presents a multi-criteria analysis of the three program options against the following evaluation criteria:

1. Interest in program and commitment to its success;
2. Long-lasting significant improvement in environmental quality;
3. Priority issue not currently being (adequately) addressed;
4. Support to other elements of USAID program in Lebanon;
5. Leveraging of other resources and activities; and
6. Potential for replication.

Based on this multi-criteria analysis, and on discussions with USAID/Lebanon, the report recommends a hybrid program combining certain aspects of the waste program (#2) and the reforestation program (#3). Such a program offers the highest “return on investment” by ensuring the sustainability of past investments and their widest possible replication building on lessons learned. The immediate, short-term objectives of this “hybrid brown/green” program would be to:

1. Leverage and rationalize USAID’s past investments in waste management and tree planting and reforestation (i.e., make sure the projects work in the long run);
2. Document the lessons learned from this recent experience by evaluating previously-funded pilot projects and producing lessons-learned reports; and
3. Strengthen municipal, local community and NGO capabilities to implement sustainable waste management and reforestation/ecosystem restoration practices through training and outreach (dissemination of guidance documents and manuals).

Bringing about national policy reforms and paradigm shifts in waste management and reforestation approaches would become a longer-term objective, say after one or two years, that the proposed hybrid program would set the stage to achieving.

At it proceeds with the proposed technical assistance program, USAID/Lebanon would continue to fund local waste management and reforestation/ecosystem restoration projects through qualified PVOs and NGOs. Such local projects would benefit from the lessons-learned and guidance to be documented/provided under the technical assistance program.

## LIST OF ACRONYMS

<i>ALMEE</i>	Agence Libanaise pour la Maîtrise de l'Energie et de l'Environnement
<i>CDR</i>	Council for Development and Reconstruction
<i>CHF</i>	Cooperate Housing Foundation
<i>CNEWA/PM</i>	Pontifical Mission
<i>DGUP</i>	Directorate General for Urban Planning
<i>EIB</i>	European Investment Bank
<i>ERG</i>	Energy Research Group
<i>FAO</i>	Food and Agricultural Organization
<i>GBA</i>	Greater Beirut Area
<i>GoL</i>	Government of Lebanon
<i>I/M</i>	Inspection and Maintenance
<i>IBRD</i>	International Bank for Reconstruction and Development
<i>IDB</i>	Islamic Development Bank
<i>IMF</i>	Independent Municipal Fund
<i>LEDO</i>	Lebanese Environment and Development Observatory
<i>LSES</i>	Lebanese Solar Energy Society
<i>MoE</i>	Ministry of Environment
<i>MoEW</i>	Ministry of Energy and Water
<i>MoIM</i>	Ministry of Interior and Municipalities
<i>MoPWT</i>	Ministry of Public Works and Transport
<i>NCSR</i>	National Council for Scientific Research
<i>ONF</i>	Office National des Forêts
<i>SWEMP</i>	Solid Waste Environmental Management Project
<i>SWM</i>	Solid Waste Management
<i>VAT</i>	Value Added Tax
<i>YMCA</i>	Young Men Christian Association

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## **1. INTRODUCTION**

### **1.1 Purpose**

The purpose of this environmental program assessment is to identify strategic opportunities for targeted environmental policy and technical assistance that USAID/Lebanon could undertake in the three-year period 2003-2005, without duplicating the efforts of other donors, and with potential to complement and add value to the Mission's other activities as well as those of others.

### **1.2 Background/USAID Strategy for Lebanon**

Back in 1997, USAID put in place a five-year strategy for Lebanon worth a total of US\$60 million. This strategy aimed at revitalizing and expanding economic opportunities in rural area, promoting democracy and good governance, and improving environmental practices. Over time, several other activities were added in response to emerging needs, such as a WTO accession program to encourage trade and investment; an industry-cluster program to identify and promote productive sectors for investment; a water resources management program to make agriculture more productive; and a landmine action program to increase awareness on suspected minefields and assist survivors in productive enterprises.

As its 1997-2002 strategy is coming to a close, USAID is preparing a new strategy for the period 2003-2005. USAID's intention over these next three years is to build on its successes, and meld elements of the existing strategy into one that will target value-added and growth-oriented sectors, and promote economic and political governance in ways that will enhance Lebanon's competitiveness as a regional and global player. Similar to the 1997-2002 strategy, this new strategy includes three major components:

1. Expanded economic opportunities;
2. Governance and democracy; and
3. Improved environmental practices.

USAID intends to provide approximately US\$35 million per year over the next three years.

On June 13, USAID issued a Request for Applications (Number Lebanon-02-010) from US organizations for funding a program for expanding economic opportunities. On May 24, 2002, USAID contracted ECODIT, through the Water IQC held by DAI, to conduct this environmental program assessment to assist the Mission in preparing the third strategic objective on improving environmental practices.

### **1.3 Methodology**

A three-member team with strong prior experience in the environmental situation in Lebanon carried out this Environmental Program Assessment (see team composition in Appendix A and Scope of Work in Appendix B). The team reviewed the most recent reports and documents on the environment in Lebanon, in particular the Lebanon 2001 State of the Environment Report.<sup>1</sup> Members of the team met with four US PVOs that have worked with USAID on its Community Cluster Program since 1997 (YMCA, CHF, Mercy Corps and Pontifical Mission), as well as with a selection of government officials and senior professionals (e.g., Ministry of Environment, Ministry of Transport, Council for Development and Reconstruction). Appendix C provides the list of meetings/contacts and select meeting notes.

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<sup>1</sup> Ministry of Environment, "Lebanon 2001 State of the Environment Report," Prepared by ECODIT Liban, December 2001

The team also conducted several field visits with the PVOs to a sample of USAID-funded environmental projects across the country. Projects visited include solid waste and wastewater treatment facilities, tree planting projects, biogas fermentation tanks, drainage canals, one olive mill, hill lakes, and a slaughterhouse (see Appendix D for the list of field visits and select field notes). While the team was already familiar with USAID's environmental program, the field visits provided an opportunity to meet some of the beneficiaries, including the local municipalities, NGOs and individuals, and to discuss some of the successes and lessons learned from the projects.

#### **1.4 Proposed Environmental Programs**

Based on its knowledge and analysis of the environmental situation, and building on the meetings and field visits, the team has outlined three environmental programs for USAID's consideration:

4. Implementing air pollution abatement policies;
5. Promoting sustainable waste management practices; and
6. Initiating long-term reforestation and ecosystem restoration.

The team initially had suggested a fourth environmental program option on "Enhancing and promoting natural and cultural heritage ("Lebanon Trails and Inns")." After meeting with USAID/Lebanon to discuss preliminary program options, it was agreed to drop this program option from further consideration here because it belonged more naturally to the strategic objective on economic growth opportunities.

The team considered program options to address other environmental issues but did not pursue them either because the GoL or other donors were already addressing those issues, or because the opportunities to bring about real environmental improvement were dim. For example, the Ministry of Environment has secured funding from the European Union's Life program to establish a Lebanese Cleaner Production Center, which would provide a platform for addressing industrial pollution concerns. Likewise, while there is a dire need to develop and implement sustainable coastal zone management plans and policies, achieving such objectives would be difficult under the existing political situation (previous attempts by CDR and the World Bank to develop an Integrated Coastal Zone Management Plan were thwarted by political interference in the late nineties).

#### **1.5 Report Organization**

This report is organized in five chapters as follows:

1. *Introduction* (this chapter);
2. *Implementing air pollution abatement policies* (Program 1);
3. *Promoting sustainable waste management practices* (Program 2);
4. *Initiating long-term reforestation and ecosystem restoration* (Program 3); and
5. *Summary and recommendations*.

Chapters 2 to 4 describe the three proposed environmental programs using the same outline:

- Background;
- Rationale for USAID Involvement;
- Program objectives;
- Program description; and
- Implementing organizations and beneficiaries.

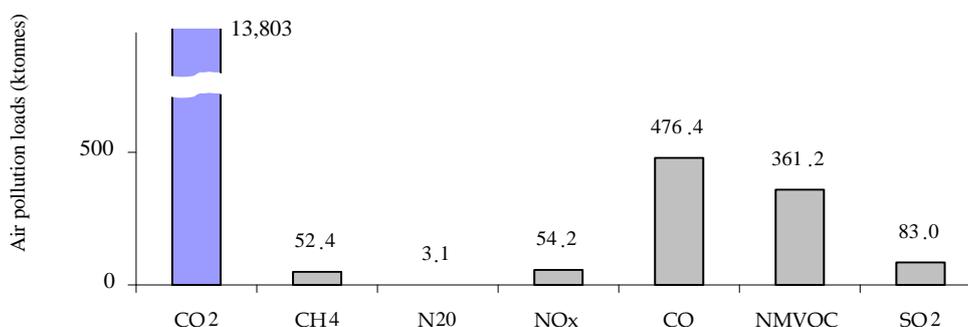
## 2. IMPLEMENTING AIR POLLUTION ABATEMENT POLICIES (PROGRAM 1)

### 2.1 Background

#### *Greenhouse gases*

In June 1992, Lebanon was among 155 countries that signed the United Nations Framework Convention on Climate Change (Rio de Janeiro, 1992). Following its ratification in 1994 and ensuing obligations, the Government of Lebanon (GoL) prepared the First National Communication on Climate Change (MoE-UNDP, 1999). The National Communication report estimated Greenhouse gases (GHG) loads for seven major gases: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), and non-methane volatile organic compounds (NMVOCs). A review of 1994 GHG emissions revealed that CO<sub>2</sub> is by far the most abundant GHG, with emissions in 1994 estimated at 13x10<sup>6</sup> tonnes (Figure 1). A breakdown of the emissions of each GHG is presented in Table 1.<sup>2</sup>

**Figure 1**  
**GHG Loads in Lebanon (1994) (MoE-UNDP, 1999)**



**Table 1**  
**Breakdown of Emission Sources for each Greenhouse Gas**

<i>Greenhouse gas</i>	<i>Emission sources</i>
Carbon dioxide (CO <sub>2</sub> )	The combustion of fossil fuels and wood is the primary source of CO <sub>2</sub> . The consumption of energy accounts for 85 percent of CO <sub>2</sub> emissions while industrial processes emit 14 percent of total CO <sub>2</sub> . Other sources are almost marginal, with land use and forestry contributing only one percent, in addition to negligible emissions from agriculture
Methane	The main source of methane is biogas production from organic waste decomposition (82 percent), followed by agricultural emissions and the energy sector
Nitrous Oxide (N <sub>2</sub> O)	It is a final product of the degradation of nitrogen fertilizers. Therefore, this greenhouse gas is primarily emitted by the agriculture sector. In 1994, 96 percent of nitrous oxide emissions were attributed to agriculture
Nitrogen Oxides (NO <sub>x</sub> )	This greenhouse gas comes from the combustion of fuel (energy and transport sector). Under high temperature conditions, nitrogen and oxygen react to produce nitrogen oxide
Carbon Monoxide (CO)	Carbon monoxide comes primarily from the incomplete combustion of fuels. Energy consumption by transport, industry, and thermal power plants accounted for more than 99.4 percent of all estimated CO emissions in 1994. Agriculture is responsible for most of the rest of CO emissions (0.5 percent).

<sup>2</sup> MoE is currently in the process of updating the GHG inventory for the year 1999

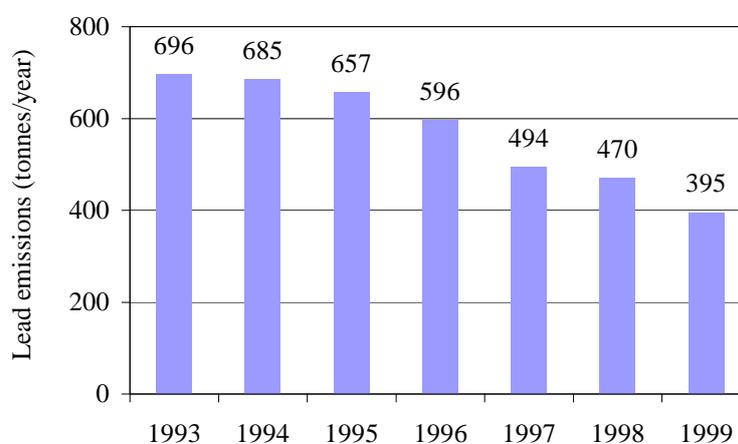
<i>Greenhouse gas</i>	<i>Emission sources</i>
Non-Methane Volatile Organic Compounds (NMVOC)	Industrial processes contribute to 76 percent of NMVOC emissions. Iron and steel production also contributes to NMVOC emissions (up to 1.25 percent of emissions from the industrial sector). The remainder of NMVOC emissions is related to the consumption of energy, primarily transport and the evaporation of fuel from the fuel tanks, fuel injectors, and crankcases.
Sulfur Dioxide (SO <sub>2</sub> )	Fuel combustion for energy production is responsible for 96 percent of SO <sub>2</sub> emissions, while industrial processes produce 4 percent of emissions

In addition to greenhouse gases, other pollutants (e.g., lead, particulate matter) are generated mainly by the industrial and transport sectors. The following section provides an indicative assessment of selected non-GHG pollutants.

### *Lead*

In terms of lead emissions, the most comprehensive study has been recently completed at the American University of Beirut (AUB)<sup>3</sup> and published in several forms (El-Fadel and Hashisho, 2000 and 2001; Hashisho and El-Fadel, 2001a and b; Hashisho, 2000). This study comprises several elements, including the measurement of lead levels in the air, socio-economic impacts of blood lead level reduction, and policy options for the phase out of leaded in gasoline in Lebanon. Figure 2 presents estimated annual lead emissions from the consumption of various gasoline grades, based on gasoline consumption and characteristics.

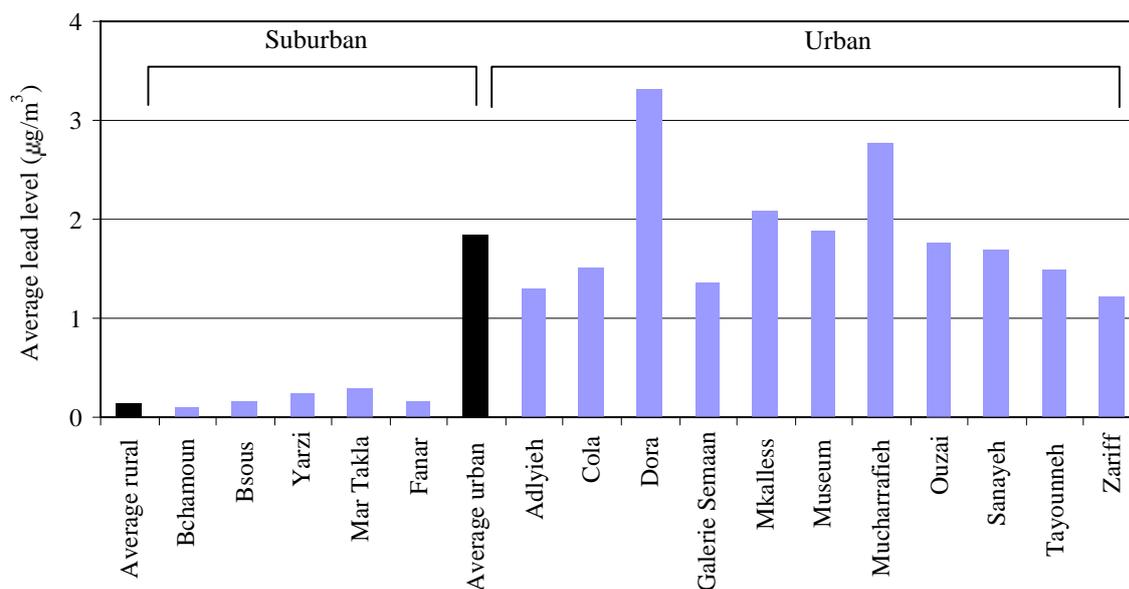
**Figure 2**  
**Estimated Annual Lead Emissions from all Gasoline Grades**



Limited measurements of lead in the air (Chaaban *et al.*, 2001; El Fadel *et al.*, 1999) indicated a range of 0.1 to 0.8 µg/m<sup>3</sup>. To investigate the degree of pollution resulting from the combustion of leaded gasoline, a sampling program was developed and implemented. For this purpose, 16 locations were selected in and around Beirut city, with 11 in urban areas at major road intersections and 5 in suburban areas. Lead concentrations at monitored urban locations varied from 0.17 to 4.64 µg/m<sup>3</sup> with an average value of 1.86 µg/m<sup>3</sup>. In suburban areas, atmospheric lead concentrations were much lower than those in the heavily traveled urban locations and ranged from 0.052 to 0.295 µg/m<sup>3</sup> with an average value of 0.147 µg/m<sup>3</sup>, which is about 12.7 times lower than the average measured in urban locations (Figure 3).

<sup>3</sup> Supported through funds from USAID/Lebanon to AUB

**Figure 3**  
**Average Air Lead Levels at Selected Locations in Beirut**



Law 341/2001, which aims to reduce air pollution from the transport sector, introduced a price differential of LBP 1,000 per 20 liters of unleaded gasoline, relative to leaded gasoline, effective immediately (June 2001). This price differential went up to LBP 2,000 effective January 1, 2002 and has resulted in a shift away from leaded gasoline in favor of unleaded gasoline (80 percent of total consumption today). There have been no measurements of lead levels in the air to assess the direct impact of this provision of Law 341.

#### *Particulate matter*

Measurements of particulate matter were conducted in both Tripoli and Beirut. In Tripoli, the Air Quality Laboratory of the Tripoli Development and Environment Observatory measured total suspended particulates (TSP) and suspended particulate matter (SPM). The results indicate that average daily values of TSP and SPM<sub>10</sub> (less than 10 microns or µ) exceeded the Lebanese standards of 120 and 80 µg/m<sup>3</sup> (MoE Decision 52/1 dated 1996) 32 and 56 percent of the time, respectively (Table 2 and Table 3). Measured average daily values of SPM<sub>2.5</sub> (less than 2.5 µ) exceeded the USEPA standard of 65 µg/m<sup>3</sup> 24 percent of the time (Lebanon has no air quality standard for SPM<sub>2.5</sub>).

**Table 2**  
**TSP Levels Measured in Tripoli in 2001**

<i>Month (Year 2001)</i>	<i>Number of Days Sampled</i>	<i>Average daily value (<math>\mu\text{g}/\text{m}^3</math>)</i>	<i>Number of Days Exceeding the Lebanese Standard (<math>120 \mu\text{g}/\text{m}^3</math>)</i>
January	17	85	5
February	12	117	7
March	12	139	8
April	-	-	-
May	-	-	-
June	11	127	5
July	-	-	-
August	10	122	8
September	10	141	7

Source: MoE/ECODIT, 2002

**Table 3**  
**SPM<sub>10</sub> Levels Measured in Tripoli in 2001**

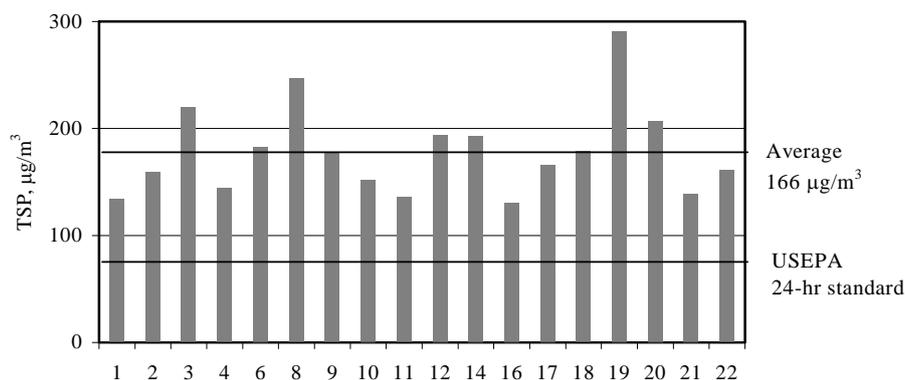
<i>Month (Year 2001)</i>	<i>Number of Days Sampled</i>	<i>Average daily value (<math>\mu\text{g}/\text{m}^3</math>)</i>	<i>Number of Days Exceeding the Lebanese Standard (<math>80 \mu\text{g}/\text{m}^3</math>)</i>
January	18	50	3
February	12	60	2
March	13	85	3
April	-	-	-
May	-	-	-
June	11	55	2
July	-	-	-
August	10	84	8
September	11	100	6

Source: MoE/ECODIT, 2002

In Beirut, the daily average concentration of TSP, measured in Bliss Street between March 1997 and May 1998, fluctuated around  $100 \mu\text{g}/\text{m}^3$  and peaked several times at levels above the Lebanese standard of  $120 \mu\text{g}/\text{m}^3$  (Chaaban *et al.*, 2001). These values are also higher than WHO standards ( $60\text{-}90 \mu\text{g}/\text{m}^3$  for urban regions). Air samples collected from many other locations in Beirut revealed that TSP levels ranged from  $102$  to  $291 \mu\text{g}/\text{m}^3$ , with an average value of  $166 \mu\text{g}/\text{m}^3$  (Figure 4) (El-Fadel *et al.*, 1999).

PM levels in urban areas may have decreased following the ban of diesel usage by taxis under Law 341/2001. A study is underway at AUB to evaluate the effects of this ban on air quality (lead and PM levels) in heavily traveled urban areas.

**Figure 4**  
Average particulates concentrations at various locations in Beirut



### *Other pollutants*

In the Chekka region, periodic air quality monitoring program indicated elevated levels of SO<sub>2</sub> and NO<sub>2</sub>, exceeding annual and 24-hour average USEPA ambient air quality standards at all sampled locations (Table 4).

**Table 4**  
Summary of the Air Quality Monitoring Results in Chekka (El-Fadel *et al.* 2001)

Constituent	Concentration range	USEPA ambient air quality standard <sup>a</sup>	
SO <sub>2</sub> (ppm)	0.45 - 0.7	0.14 (24-hour average)	0.03 (annual average)
NO <sub>2</sub> (ppm)	6.4 - 10.11 <sup>b</sup>	0.053 (annual average)	0.053 (annual average)
CO (ppm)	0.33	9 (8-hour average)	9 (8-hour average)
PM <sub>100</sub> (µg/m <sup>3</sup> )	67-316	150 (24-hour average) <sup>c</sup>	50 (annual average) <sup>c</sup>

<sup>a</sup> EPA, 1997

<sup>b</sup> Equipment calibration questionable

<sup>c</sup> Specified as PM<sub>10</sub>

A recent field monitoring survey was conducted at a total of 10 stations representing different areas of Tripoli (Table 5). Measurements were made at several intersections inside the busy streets of Tripoli and inside the old city. Results showed that CO, SO<sub>2</sub>, NO<sub>2</sub> and TSP concentrations exceed WHO standards at most locations during daytime, due to vehicle-induced emissions and construction activities, and generally decrease during night time. Consequently, air pollution is considered as a major environmental problem caused by traffic in the area.

**Table 5**  
**Average Day and Night Time Concentrations of CO, SO<sub>2</sub> and NO<sub>2</sub> and**  
**Daily Average Concentration of TSP in Tripoli (JICA, 2001)**

Sampling station	CO 1-hour WHO standard 9 ppm		SO <sub>2</sub> 1-hour WHO standard 0.134 ppm		NO <sub>2</sub> 1-hour WHO standard 0.21 ppm		TSP WHO standard 150 µg/m <sup>3</sup>
	Day	Night	Day	Night	Day	Night	Daily average
S1	10.3	5.1	1.8	1.6	0.17	0.15	190
S2	8.3	7.0	1.8	1.6	0.4	0.15	200
S3	16.0	11.9	1.7	1.5	0.2	0.1	230
S4	12.3	11.0	1.8	1.6	0.37	0.1	220
S5	8.9	2.3	1.8	1.5	0.5	0.3	80
S6	13.5	5.0	1.8	1.6	0.4	0.3	150
S7	16.4	2.6	1.7	1.5	0.4	0.3	50
S8	13.7	1.2	1.7	1.5	0.4	0.3	50
S9	11.8	3.4	1.7	1.5	0.4	0.3	230
S10	11.6	11.0	1.7	1.5	0.3	0.1	100

## 2.2 Rationale for USAID Involvement

The air quality management sector offers USAID/Lebanon unique opportunities to:

1. Leverage and rationalize USAID's investment in air quality management;
2. Remedy environmental and health risks posed by select air pollutants;
3. Promote technology-based renewable resources to reduce pollutant emissions; and
4. Promote local/national linkages in governance and democracy.

### **Leverage and rationalize USAID's investment in air quality management**

Historically, USAID's investment in air quality programs in Lebanon has been very limited, primarily due to the fact that USAID's programs have targeted community-based initiatives in rural areas where air quality management was not a priority concern to local stakeholders and communities. The only serious funding occurred at academic institutions, particularly at AUB where funds were provided to acquire field equipment that can assist in air quality characterization studies and defining the extent of air pollution in urban areas and near industrial facilities. Many of these studies (see background section above) were very beneficial in defining the needs for setting strategies and adopting policies for proper air quality management, particularly in urban areas and near industrial point-sources. In fact, results from these studies have contributed to shaping the most recent law on reducing air pollution from the transport sector (Law 341/2001) and raising the public awareness about the significance of potential adverse impacts associated with transport and industrial related emissions, and the need to adopt air pollution abatement measures.

The major limitation in funding air quality management initiatives is the long-term sustainability of these initiatives. For instance, at AUB, while USAID's funding level was highly beneficial with respect to the policies that it has helped to shape (Law 341/2001), the initiative has practically ended and needs additional funds to maintain its momentum. Today, the lack of continuous air quality monitoring poses a major impediment to further abatement of air pollution.

### **Assessment of air quality monitoring needs and capabilities**

Continuous air quality monitoring at the national level does not exist in Lebanon. Partial data are becoming available either from local continuous monitoring stations (Air Quality Laboratory of the Tripoli Development and Environment Observatory, Meteorological Services at Beirut International Airport) or from sporadic monitoring campaigns (AUB studies). Lebanon urgently needs a comprehensive air quality-monitoring plan. Such a monitoring plan is important in order to identify the magnitude of the problem of poor air quality, shed light on the ambient air quality trends in Lebanese urban and industrialized areas, and provide the basis for the development and implementation of air pollution control policies including ambient air quality standards and management plans. In addition, monitoring can be used to evaluate the effectiveness of policy measures targeting the reduction of air pollution. Monitoring data also provide a useful tool for raising public awareness and can be used as the basis for a public alert system. Such a system would rely on a monitoring network to alert the responsible authority when high background levels of pollution and unfavorable meteorological conditions are likely to give rise to serious health effects among asthma sufferers and other vulnerable groups.

### **Remedy environmental and health risks posed by select air pollutants**

Industrial and vehicle-induced emissions have long been known to be associated with various environmental and health impacts that ultimately translate into a socio-economic burden on society. Several studies have estimated this burden in terms of increased mortality and morbidity in Lebanese urban areas or near industrial zones. These studies suggest that the potential health and economic benefits of reducing PM, lead, and SO<sub>2</sub> concentration in the air can be significant. Therefore, the adoption of policies that can reduce pollutant emissions will result in significant socio-economic benefits. Such policies have been articulated in the recently approved Law 341/2001. Supporting the implementation of this law is essential in remedying environmental and health risks associated with vehicle-induced emissions in Lebanese urban areas.

### **Promote technology-based renewable resources to reduce pollutant emissions**

Preliminary surveys conducted at AUB on a random sample of 200 houses spread all over the country, indicate that 60 percent use electric boilers, 31 percent use diesel oil boilers, and 9 percent use natural gas, wood, and solar energy. The use of solar energy does not exceed 1 percent at best. At a typical household located 700 meters above sea level, the measurements of both total electricity consumption and electric boiler consumption show that the average consumption is 40 liters of hot water per person per day, and that electric boilers consume about 35 percent of total household electricity over a year. The study showed that solar water heaters (SWH) can cover the energy demand totally over seven months of the year and partially over the rest of the year. This demonstrates that SWH with a back-up electric resistance, for example, can successfully replace the electric water heating in Lebanon. A reduction in electricity bill of around 23 percent can be achieved and more savings can be attained as the number of family members increases. Therefore, relying on SWH not only would reduce pollutant emissions, but also would entail a significant economic benefit.

## **Promote local/national linkages in governance and democracy**

The proposed initiative to establish improve national air quality monitoring capabilities would bring together different organizations with varying interests, responsibilities and capabilities for air monitoring. The initiative would empower these organizations to work together under one program, share common strategic vision and objectives, and join their efforts, resources and know-how towards achieving it. These organizations would include both national-level government and research institutions, such as MoE, MoPWT and AUB, as well as local governments such as the Tripoli Observatory for Environment and Development (Federation of Municipalities of Al-Fayhaa/Tripoli).

All initiatives under the proposed air quality program would call on citizens to participate in one way or another in abating air pollution levels. By informing the population of ambient air quality levels in a real-time fashion, Initiative #1 would raise public awareness of air pollution levels and associated health impacts on a day-to-day basis, so that vulnerable individuals can avoid exposing themselves to high pollution levels and commuters can begin taking steps to reduce the use of private vehicles (e.g., car pooling). Initiative #2 would strengthen the sense of civic responsibility by requiring car owners to carry out effective inspection and emission tests. Finally, Initiative #3 would empower households to seek out and acquire less-expensive forms of water heating through targeted micro-credit facilities.

### **2.3 Program Objectives**

The proposed air quality management program has the following main objectives:

1. Reduce the health impacts and associated economic costs of air pollution;
2. Leverage and rationalize USAID's investment in *air quality* management by (a) ensuring the long-term success of previously funded USAID initiatives and (b) continuing to implement air quality management systems;
3. Promote sustainable development to reduce pollutant emissions by adopting renewable energy alternatives; and
4. Strengthen institutional capabilities in air quality management.

### **2.4 Program Description**

Based on information and data presented above, as well as the feedback and views of various stakeholders, three initiatives were defined for possible USAID funding:

1. Improve national air quality monitoring capabilities;
2. Provide technical and policy support in implementing Law 341 on reducing air pollution from the transport sector; and
3. Promote the use of solar water heating in Lebanon.

The remainder of this section provides background information and a conceptual framework for each of these initiatives.

#### **Initiative 1: Improve National Air Quality Monitoring Capabilities**

To improve national air quality monitoring capabilities, the program would undertake the formulation of a concerted air quality monitoring strategy (AQMS) and assist the stakeholders in implementing AQMS (i.e., investment, training, technical support and training, data compilation

and reporting). The ambient air quality monitoring program in Lebanon would include various tasks, namely proper siting of monitoring stations, determination of parameters to be monitored, data collection, analysis and reporting, and training of personnel.

### *Siting*

Proper siting of monitoring stations is one of the most important steps in the development of a monitoring plan. Preliminary surveys would need to be conducted in urban and industrial hot spots (i.e., areas suspected to be subject to high air pollution loads). The location of monitoring stations would take into account factors such as accessibility and limited disruption of traffic or other activities. In addition to potentially polluted areas, and for analysis purposes, other monitoring stations also would be positioned in regions with minimum emissions for background determination.

### *Installation*

Following the identification of proper sites for monitoring units, calibration and installation of the monitoring stations would be conducted. The parameters to be monitored at each station include various air quality indicators such as CO, NO<sub>x</sub>, HC, SO<sub>2</sub>, PM, O<sub>3</sub>, and lead) and meteorological indicators (temperature, barometric pressure, humidity, wind speed and direction, and rainfall).

### *Data collection and analysis*

Monitoring units would be connected to a central station for data collection and processing. A relational air quality and meteorological database, within a geographical information system (GIS) framework, could be developed for data synthesis and analysis. Monitoring data would help in establishing air quality and meteorological trends that would form the foundation for the development of a comprehensive air quality management plan to be implemented at the national level.

### *Data reporting/management*

Periodic environmental monitoring reports would be prepared to analyze the data collected and assess the adequacy of air pollution control measures. The contents of the reports would include original measurements, sampling locations, time of sampling, environmental quality assessment, and data analysis.

### *Training*

In an effort to strengthen institutional capacity and environmental awareness, training sessions would be offered to staff from MoE, concerned ministries and government agencies, and research institutions. Such training would include information on health impacts of the different pollutants, air pollution prevention, sampling techniques and monitoring, air pollution standards and regulations. In addition, technical assistance would be provided to the personnel responsible for the maintenance of monitoring stations and for data collection.

### *Involved parties*

Different parties would be involved in the implementation of air quality monitoring in Lebanon. The governmental bodies include MoE, NCSR, MoEW, and MoPWT.<sup>4</sup> Academic institutions are currently best equipped to assist in the implementation of monitoring activities.

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<sup>4</sup> Supervising authority over the National Meteorological Institute at Beirut International Airport

As such, the monitoring plan could be implemented in a collaborative effort between academic institutions and involved ministries and government agencies.

### **Initiative 2: Provide Technical and Policy Support in Implementing Law 341/2001 on Reducing Air Pollution from the Transport Sector**

The program would provide technical and policy support in implementing Law 341/2001 on reducing air pollution from the transport sector. Specifically, the program would assist in:

1. Designing and implementing a fuel quality improvement program (Law 341, Art. 4); and
2. Supporting a vehicle inspection & maintenance program (Law 341, Art. 5).

#### *1. Designing and implementing a fuel quality improvement program (Law 341, Art. 4)*

The main gasoline characteristics having an effect on engines and emissions include its knock resistance rating or octane number, volatility and chemical composition. Reducing volatility, increasing oxygen content, reducing aromatics and reducing lead content can reduce emissions from gasoline combustion. Reducing lead content is currently considered as the most popular strategy used worldwide for the improvement of gasoline quality.

In the case of diesel, the main parameters affecting pollutant emissions are sulfur content, cetane number, aromatic HC, and density. Improvements to conventional diesel fuel include using detergent additives or reducing the aromatic and sulfur content. Reducing sulfur content is currently considered as the main strategy used worldwide for the improvement of diesel quality.

Therefore, a national strategy for the improvement of fuel quality could target a complete lead phase-out in gasoline and the reduction of diesel sulfur content. In addition, the introduction of alternative fuels such as compressed natural gas (CNG) on high mileage vehicles could be explored.

#### a. Requirements for lead phase-out from gasoline

A country's complete lead elimination strategy includes a realistic time schedule that takes into account technical considerations, such as the local fleet characteristics, distribution system and capabilities of domestic petroleum refineries. Other factors such as law enforcement, cooperation of various agencies, economic incentives and public awareness are equally important in setting policies for the phase-out of leaded gasoline (Table 6).

In developing a strategy for the elimination of lead from gasoline in Lebanon, Hashisho and El-Fadel (2001a) analyzed different scenarios for lead phase-out in Lebanon, proposed supporting measures, and developed a phase-out action plan. As mentioned earlier, the economic incentives in favor of unleaded gasoline provided by Law 341/2001 has triggered the leaded gasoline phase-out process. Therefore, in the context of the present initiative, an update of the strategy for the elimination of lead from gasoline in Lebanon could be conducted taking into consideration the planned analysis of the effects of Law 341 on air quality in heavily traveled urban areas.

**Table 6**  
**Possible Measures to Enhance the Use of Unleaded Gasoline**

<i>Type of measure</i>	<i>Specific measures</i>	<i>Efficiency considerations</i>
Regulatory measures	Car exhaust emission limits	The limits can only be met by the use of catalytic converters. This measure should not be considered as an instrument for phasing out lead from petrol, but can have an important supportive role in this process. A dual distribution system and sufficient supplies of unleaded petrol are prerequisites for the efficiency of such schemes.
	Dual distribution system	The lack of a separate and controlled distribution of unleaded and leaded petrol can be a constraint to the phase-out of lead in petrol, as it is a prerequisite for the efficiency of economic measures and awareness building measures, and for the monitoring and control of petrol sales in general.
	Different sizes of pump nozzles	
Economic measures	Tax differentiation	Fiscal concerns may constitute a constraint to the use of tax differentiation schemes, unless they are designed to be fiscally neutral. Still, tax differentiation can be a highly effective measure to support lead phase-out, and may thus have a potential in many countries.
Awareness building	Information campaigns	Campaigns may aim to provide information on the health effects of lead, the applicability of unleaded petrol for different car makes and models, the possible availability of other lubricant additives than lead, and other supporting measures or initiatives taken.
Consensus building	Coordination and planning	Coordination of governmental agencies with interest groups such as oil refineries and car manufacturer and non-governmental organizations concerned about environmental issues can facilitate the transition to unleaded gasoline

b. Requirements for the reduction of diesel sulfur content

Currently the government is the main importer of diesel fuel used in both the transport and the industrial sectors. Standards for the sulfur content in automotive diesel do not exist in Lebanon since only the diesel used for industrial purposes is imported. The Lebanese standard defining the maximum permissible sulfur content in industrial diesel is 0.5 percent of sulfur by volume (as compared to less than 0.05 percent in the EU and the US). In the transport sector, before Law 341, around 20 percent of vehicles were running on imported diesel including the majority of taxi/services, pick-ups, trucks and buses. Under Law 341, and effective June 15, 2002, the government has implemented a total ban on the use of diesel by taxis/services and is planning to provide economic incentives for retrofitting such taxis/services with gasoline-burning engines. Absent sufficient incentives, the use of gasoline for high mileage vehicles is not economically feasible. Therefore, the introduction of a “cleaner” diesel would be an attractive alternative solution to banning diesel-powered vehicles altogether. Such a solution would require a national policy for the adoption of a “cleaner” diesel, which would incorporate regular inspection of vehicles, continuous monitoring of fuel quality at the port of entry, and renewal of old diesel engines. Therefore, in the context of the present initiative, the policy of adopting cleaner diesel will be evaluated with its corresponding economic implications.

c. Requirements for the introduction of compressed natural gas

Natural gas, which is 85 to 99 percent methane, has many desirable qualities as a fuel for spark-ignition engines. Clean burning and cheap, it already plays a significant role as a motor fuel in many parts of the world. In the context of the present initiative, the introduction of CNG

for high mileage vehicles in Lebanon can be explored. Factors such as cost of fuel supply, storage and compression and the costs of refueling stations would be evaluated. In addition, the size and weight of the CNG storage cylinder play an important role in the feasibility of CNG use in light-duty vehicles. Stringent safety standards would need to be examined in relation to the use of CNG storage cylinders, particularly with respect to construction specifications.

## 2. *Supporting a vehicle inspection & maintenance program (Law 341, Art. 5)*

Inspection and Maintenance (I/M) programs are an important part of motor vehicle emission control efforts since they are the best way to identify cars that need remedial maintenance or adjustment. Without effective I/M, compliance with emission standards is significantly weakened. Supporting an I/M program in Lebanon would include various tasks, namely reviewing sustainable transport policy approaches for mitigating traffic emissions, defining transport policies in Lebanon, defining a typical I/M program, developing exhaust emission standards for the I/M program, and identifying the parties involved in the program.

### a. Reviewing sustainable transport policy approaches for mitigating traffic emissions

The different types of policy options aiming at reducing traffic-induced emissions would be introduced along with the interdependence of the various strategies. The definition, evolution, and characteristics of a number of vehicles, fuel and transport management targeted policy options could be presented. Moreover, based on international experience, the benefits, limitations and future development of such measures would be assessed (Table 7).

**Table 7**  
**Policy Options to Be Reviewed**

<i>Type of measure</i>	<i>Command and control</i>	<i>Market-based</i>
Vehicle targeted	<input type="checkbox"/> Emission standards for used vehicles <input type="checkbox"/> Inspection and Maintenance <input type="checkbox"/> Emission restrictions on imported vehicles	<input type="checkbox"/> Emission related taxes <input type="checkbox"/> Differential registration fees and taxes <input type="checkbox"/> Vehicle retrofit programs
Fuel targeted	<input type="checkbox"/> Gasoline standards <input type="checkbox"/> Diesel standards <input type="checkbox"/> Alternative fuels	<input type="checkbox"/> Fuel taxes
Transport management	<input type="checkbox"/> Driving bans <input type="checkbox"/> Ride sharing <input type="checkbox"/> Staggered work hours <input type="checkbox"/> Parking management	<input type="checkbox"/> Road pricing

### b. Defining Transport Policies

The status of existing policies targeting vehicles, fuels and transport/traffic management measures in Lebanon would be presented, along with an evaluation of these measures with respect to the reduction of vehicle-induced emissions. This effort would be preceded by an overview of the existing transport sector status and the institutional framework with potential involvement in the implementation and enforcement of mitigation measures for transport-related air pollution. Finally, emission reductions reported in various studies targeted at predicting the decrease in transport-related pollutants after implementation of various policies would be presented.

### c. Defining a typical Inspection and Maintenance (I/M) program

In a typical I/M program, motorists are required to periodically take vehicles to an inspection station, where one or more tests of the emission control system are administered. Based on the results of the emission tests, a vehicle with malfunctioning emission controls or excessive exhaust pollution may or may not be repaired. In the case of repair, the vehicle is retested in order to determine the post-repair emission rate; in case the vehicle is not repaired the motorist pays an emission fee. Most I/M programs have waiver provisions, which excuse a vehicle from meeting the test requirements if the owner can demonstrate that he has made some minimum expenditure on emission repair. The inspection consists of several parts. One test that is almost always performed is a test of tailpipe emissions, which directly examines the emissions of the vehicle. Therefore, in the context of the present initiative, a Stated Preference approach can be adopted for analyzing people's responses towards the implementation of a new I/M program in Lebanon. For this purpose, a questionnaire-based survey would be developed and administered to a representative sample of interviewees. The issues encompassed in the questionnaire would include a scenario-based approach for the choice between centralized and decentralized inspection stations as well as between repair and payment of an emission fee. In addition, the general attitudes towards the proposed I/M program and towards air pollution in Beirut could be addressed. A binary-logit model would be adopted in order to predict people's responses towards the proposed I/M program.

### d. Developing exhaust emission standards for the I/M program

The results of exhaust emission measurements for a sample of gasoline-fueled private autos (PAs) would be conducted. The vehicle sample to be tested would be distributed across model years ranging between 1972 and 2002. The data provided would include tested vehicle characteristics (model year, number of engine cylinders, odometer reading, vehicle manufacturer and fuel type), testing information (date and time of test and test number) and test results (AFR, CO, CO<sub>2</sub>, HC, NO<sub>x</sub> and O<sub>2</sub>). Testing of vehicles would be conducted under idling conditions until concentrations stabilize, a technique commonly used in I/M programs worldwide. The vehicle emission measurements would provide the necessary data to set emission control standards for a feasible I/M program that takes country-specific characteristics into consideration.

### e. Identifying involved parties

Different parties would be involved in the implementation of the initiative providing technical and policy support in implementing law 341/2001 on reducing air pollution from the transport sector. In the context of an I/M program, the MoIM would be a key player since it is responsible for vehicle registration. In fact, the MoIM has recently issued solicitation for proposals for the installation of I/M facilities. Of course, coordination with MoE remains essential in setting emission standards. Academic institutions could assist in the measurements of exhaust emissions and setting standards. This initiative could be implemented in a collaborative effort among academic institutions and involved ministries and government agencies, with the participation of the private sector.

### **Initiative 3: Promote the Use of Solar Water Heating in Lebanon**

The use of solar energy instead of fossil fuel would reduce emissions of greenhouse gases and other pollutants. Promoting solar water heating in Lebanon could be a very effective strategy for improving air quality and reducing electricity consumption. To promote the use of solar water heating in Lebanon, the program would:

1. Conduct a detailed feasibility study of using solar heating in Lebanon;
2. Develop a strategy and a business plan for introducing solar heating;
3. Provide technical and policy support in disseminating solar heating use on a wide scale, beginning with the rural community clusters where PVOs are currently working;
4. Develop and disseminate technical guides and manuals on solar heating; and
5. Assist in putting in place economic incentives (e.g., credit facilities) to encourage households to invest in solar heaters

#### *Economic feasibility*

The initial step in introducing solar water heating in Lebanon would be to conduct a detailed economic feasibility study. Such a study would examine alternative technologies, vendors, and opportunities to manufacture solar heaters in Lebanon. It would estimate the contribution of electric water heating to household electricity bills and the payback period on investing in solar heaters based on savings in the electricity bill. Such a feasibility study would constitute the backbone of information campaigns aiming at encouraging households to shift from electric heating to solar heating.

#### *Awareness campaigns and training*

Large-scale introduction of solar water heating in Lebanon would require sustained awareness campaigns through the media, the distribution of brochures, etc. Such campaigns would focus on the economic and environmental benefits of using solar heating instead of other, non-renewable sources of energy. Training of importers or local manufacturers might be necessary as well.

#### *Economic incentives*

Different economic incentives for encouraging households to shift from electric to solar water heating would be investigated. Such incentives would include exemption from customs tax, free installation, or credit facilities with reduced interest rates.

#### *Pilot project*

The implementation of solar water heating would provide suitable, clean, reliable and cost-effective energy source. Currently, few efforts are being conducted into investigating solar water heating in Lebanon. A pilot project at a small rural community level could be implemented to explore the *in-situ* feasibility of solar water heating.

#### *Involved parties*

Several parties would need to be involved in the implementation of solar water heating in Lebanon, including MoEW, MoE, and academic and research institutions such as the Energy Research Group at AUB, ALME, and the Lebanese Solar Energy Society (LSES). In the context of this initiative, it is also essential to coordinate with existing energy-related programs recently

funded by the UNDP at the MoEW and the Directorate General for Urban Planning (DGUP). Private banks could play a key role in providing credit facilities.

## 2.5 Implementing Organizations and Beneficiaries

The potential stakeholders/agencies involved in controlling, monitoring, analyzing and assessing the sources of air pollution and improving air quality have been cited above for each of the initiatives/programs and they include the Ministry of Environment (MoE), Ministry of Public Works and Transport (MoPWT), Ministry of Energy and Water (MoEW), Ministry of Interior and Municipalities (MoIM), the National Council for Scientific Research (NCSR), academic institutions, municipalities, and non governmental organizations (NGOs). In the context of the present study, several meetings with representatives of various stakeholders have been conducted. In addition, the issue of air quality management in Lebanon has been the subject of several meetings recently conducted with several stakeholders by members of the team (2001-2002) in the context of an initiative by the NCSR and AUB to seek local funding from various ministries for a network of air quality monitoring that can assist in developing air quality policies similar to Initiative 1 proposed here. Table 8 summarizes the key meetings conducted under this study as well as within the context of the NCSR and AUB initiative. Based on these meetings, it appears that the three initiatives have the support of stakeholders and could be housed in various ministries as follows:

1. "Improving national air quality monitoring capabilities" could be housed at the MoE and/or the NCSR. Both have expressed strong interest in this initiative and have been in previous contact with AUB to promote and implement such an initiative. Close coordination with other line ministries (MoTPW [National Meteorological Institute at Beirut International Airport], MoEW, MoH) would be essential.
2. "Providing technical and policy support in implementing Law 341 on reducing air pollution from the transport sector" could be housed at the MoIM, especially considering that this ministry is responsible for vehicle registration and is in the process of establishing I/M centers for the purpose of exhaust emissions control. Close coordination with other line ministries (MoE, MoTPW, MoEW, MoH, MoId) and research institutions (NCSR, AUB) would be essential.
3. "Promoting the use of solar water heating in Lebanon" could be housed at MoEW, which hosts another large energy-related program funded by the UNDP. Housing this initiative at MoEW would ensure that duplication in efforts is avoided and only complementary activities are adopted. Similar to the other initiatives, close coordination with other line ministries (MoE, MoId) and research institutions (NCSR, AUB ERG, ALME, LSES) would be essential.

A committee representing the various ministries and research institutions could be formed to coordinate each initiative.

**Table 8**  
**Stakeholders and Air Quality Management in Lebanon**

<i>Stakeholder</i>	<i>Representative</i>	<i>Brief response</i>
MoE	HE Dr. Michel Moussa*	Supports initiatives related to air quality monitoring. Recommends a program hosted at MoE with the contribution of various ministries and government agencies
	DG Dr. Berj Hatjian*	Supports initiatives related to air quality monitoring. Recommends a program hosted at MoE with the contribution of various ministries and government agencies
	Dr. Naji Kodeih	Expressed interest particularly in initiatives related to air quality monitoring and supporting Law 341. Recommends a program hosted at MoE with the contribution of various ministries and government agencies
MoTPW	HE Mr. Najib Mikati*	Supports initiatives related to air quality monitoring for the purpose of developing policies for air quality management in Lebanon
	Dr. Abdo Bejjani	Expressed interest particularly in initiatives related to air quality monitoring and supporting Law 341. Recommends a program hosted at NCSR with the contribution of various ministries
	DG Mr. Abdelhafiz Kaysi*	Expressed interest in initiatives related to air quality monitoring and supporting Law 341
	Ms. Mathilda Khoury	Indicated that the “Capacity Building for the Adoption and Application of Energy Standards in Buildings” project is not directly related to solar water heaters or the other initiatives
MoEW	HE Mr. Abdel Hamid Baidoun*	Supports initiatives related to air quality monitoring. Expressed the possibility of a joint work with the energy-related program at the ministry that has been recently funded through the UNDP
	Dr. Adnan Jouni	Indicated that the Lebanese Center for Energy Conservation and Planning is interested in coordinating on Solar Energy related projects. Since this project is still at the inception phase, the scope of work is still not clear as to whether it will have a component related to a pilot scale project in the context of solar energy
NCSR	Dr. Mouin Hamzeh	Supports all initiatives particularly the one related to air quality monitoring. His position is that NCSR can assist at a research level in some tasks depending on NCSR's resources and that MoE could be the information dissemination entity where the programs could also be hosted
ALMEE	Mr. Tony Matar	Supports the air quality initiatives particularly those related to Law 341 and the solar water heating. ALMEE has similar EU funded projects and would be interested in carrying further work related to these two initiatives
AUB ERG	Dr. Nesreen Ghaddar Dr. Riad Chedid Dr. Farid Chaaban Dr. Mutasem El-Fadel	Support the initiatives and expressed interest in contributing to them. They recommended programs hosted at or in coordination with AUB due to the presence of the necessary equipment (mostly funded by previous USAID initiatives for air quality management) and expertise to implement these programs

\* Meetings recently conducted with several stakeholders by members of the team (2001-2002) in the context of an initiative by the NCSR and AUB to seek local funding from various ministries for a network of air quality monitoring that would assist in developing air quality policies similar to Initiative 1 proposed under the air program

### **3. PROMOTING SUSTAINABLE WASTE MANAGEMENT PRACTICES (PROGRAM 2)**

#### **3.1 Background**

With the exception of noteworthy but limited exceptions, municipal solid waste, construction debris and wastewater continue to be dumped or discharged directly into the environment across the country.

##### **Solid Waste Management**

Municipal solid waste management (MSWM) is at a major crossroads. Recently, the Council of Ministers asked the Ministry of Interior and Municipalities (MoIM) to prepare “Terms of Reference” for solid waste management in Lebanon. The MoIM contracted a Swiss company to prepare those ToR, which are currently reviewed by MoE and other concerned agencies before approval by the Council of Ministers.

Great investments in MSWM facilities have been made in GBA and are being made in other urban poles such as Tripoli, Zahle and Saida. Outside select urban poles and local communities, solid waste continues to be managed in a manner that is not protective of either human health and/or the environment. Even in the extended GBA, serious questions are raised about the cost-effectiveness, financial sustainability and replicability of the Emergency Plan for SWM implemented since 1997. Municipalities, large and small, are desperately looking for long-term SWM solutions. The GoL has yet to make serious policy commitments to promoting, and eventually requiring, sustainable and environmentally friendly SWM practices throughout the country and by all sectors (population, industry, agriculture, construction, tourism, energy).<sup>5</sup>

##### Inside the Greater Beirut Area

Municipal solid waste today is managed in accordance with the 1997 Emergency Plan for Solid Waste Management in the GBA. Under the Plan, an integrated MSW management system was established, including sorting of recoverable materials, composting for sorted organic material, land disposal of sorted and baled MSW (in theory inert materials) at the Naameh landfill (20 km south of Beirut), and land disposal of inert and bulky materials. While the Plan has laid the foundation for an integrated approach to SWM in the GBA, key SWM indicators remain well below target, especially with regard to recycling and composting. Lower levels of recycling and composting have drastically reduced the projected lifetime of the Naameh sanitary landfill built under the Plan. Moreover, the Plan has suffered from a number of deficiencies built in the service contracts (targets defined in quantity rather than percentage terms, targets based on inputs rather than outputs) and the failure to put in place incentives to promote the recycling of recovered materials or the use of compost in various land applications (e.g., agriculture, landscaping, forestation). For example, there were no specific incentives to promote the recycling of PET, PVC, and “dirty” recyclable materials and the recycling marketing study commissioned by CDR in 1998 has yet to come out. In the absence of recycling incentives, questions are raised about the cost-effectiveness of continuing to sort, bale, and wrap mixed waste for eventual disposal at the Naameh landfill, which is expected to reach saturation by mid 2003.

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<sup>5</sup> “Lebanon 2001 State of the Environment Report,” Ministry of Environment, Prepared with ECODIT, December 2001

### Outside the Greater Beirut Area

The Solid Waste Environmental Management Project (SWEMP), launched in 1996, was designed to provide solid waste management solutions outside GBA. SWEMP was supported by a loan secured by the GoL from the International Bank for Reconstruction and Development (IBRD). The loan agreement was initially worth US\$55 million for a three-year period; it envisioned the construction of about 15 sanitary landfills, the closure and rehabilitation of existing waste dumps, the construction of two composting plants (Saida and Zahle) and one incinerator for hospital waste. However, political turmoil, public opposition (NIMBY syndrome), poor public participation processes, and conflicting opinions about the most adequate treatment technology brought the project to an impasse and led to the suspension of SWEMP in December 1999. CDR and the World Bank have recently agreed to reduce the budget of SWEMP to about half of its original size and to focus on completing ongoing activities, such as rendering the Zahle landfill operational and rehabilitating the Hbaline dumpsite.

### Community-Based Initiatives for MSWM

Faced with no overall long-term strategy for waste management, mayors all over the country are being approached by private businesses that wish to market their own waste treatment technologies. While some of these technologies may be potentially suitable in small- to medium-sized communities, many proposals are poorly founded and unreliable. Even working proposals and technologies are facing operational problems (e.g., fate of by-products, market for recyclables, hygienic concerns), financial difficulties (i.e., how to sustain the projects after funding stops), and central government red tape. Several villages and municipalities have initiated their own waste management projects, with lead technical and financial support from USAID (including Kfarsir, Akkar el-Atika, Chakra and Mays el Jabal), followed by UNDP. In the past five years, USAID and UNDP/LIFE have allocated SWM grants worth over US\$1 million, excluding co-financing by local communities (see Tables 7 and 8).

**Table 7**  
**USAID Supported Community-Based Solid Waste Management Projects**

<i>US PVO</i>	<i>Cluster</i>	<i>Village</i>	<i>Amount Allocated (US\$)</i>	<i>Remarks</i>
YMCA	Kfarsyr	Kfarsyr	135,000	Includes public awareness campaigns
	Akkar el Atika	Akkar el Attika	116,000	
	Bint Jbeil	Mays el Jabal	100,000	
	Bint Jbeil	-	130,000	
	Tyre	Maarakeh	200,000	
CNEWA/PM	Tyre	Chakra	NA	
		Khirbet Silm	NA	
		Qabrikha	NA	
	Akkar	3 villages	NA	USDA 416(b) II grant
	Qlaiaa	Borj el Moulouk, Qlaiaa, Dier Mimas, Kfarkila, Oudayseh	NA	10 tons/day

Note: CHF and MCI have not implemented solid waste treatment projects

Source: Data provided to ECODIT by YMCA and CNEWA/PM

**Table 8**  
**EC-Life Supported Community-Based Solid Waste Management Projects**

Bsharre	<p><u>Council for Environmental Protection in Bsharre</u>. The NGO launched in 1996 a management project to sort MSW. Awareness programs encouraged local inhabitants (8,000 in winter and 15,000 in summer) to segregate household waste into two containers (wet and dry waste). Dry waste was then manually sorted. Wet (organic) waste is dumped from roadside (only a few kilometers from the Cedars). Main limitation the high cost of transporting sorted waste (mainly glass and plastics) to recycling factories (more than 100 km away). Municipality has shown little commitment to sustain the project.</p> <p><i>Total project cost: US\$ 90,000 (including 25,000 LIFE grant)</i></p>
Arab Salim	<p><u>Call of the Land Association</u>. The NGO launched in 1997 a MSW sorting and recycling project, including awareness programs. Plastics, glass and metals are recovered and shipped to recycling factories. Transportation costs are prohibitive. Recycling factories do not always buy the recovered materials.</p> <p><i>Total project cost: US\$ 28,500 (inc. 25,000 LIFE grant).</i></p>
Maghdoucheh	<p><u>Environnement Sans Limites</u>. In 1998, the NGO launched a MSW project. It included source separation, recycling and awareness campaigns. Difficulty includes transportation costs.</p> <p><i>Total project cost: US\$ 45,000 (inc. 24,000 LIFE grant).</i></p>
Nabatiyeh	<p><u>Environmental Protection Council</u>. The NGO launched in May 1997 a SWM project. Project includes management of solid waste through source separation, recycling and awareness campaigns. In all, 107 households, 14 schools, 30 institutions and 30 restaurants and shops took part. Difficulties include technical project management and transportation costs.</p> <p><i>Total project cost: US\$ 69,000 (inc. 25,000 LIFE grant)</i></p>

Source: MoE/ECODIT, 2002

### Construction debris management

Poor building and road construction practices have compromised the landscape and ecosystem integrity and visual amenity in several parts of the country. Most roads continue to be built with utter disregard for the environment, with contractors dumping excavated materials down ravines along the path of the road. Contractors for other types of construction projects (buildings, public works, etc.) typically dump their waste in ravines and alongside roads. Such reckless dumping creates horizontal and vertical “white trails” that become enduring eyesores in the natural landscape (e.g., unique rock formations disappear under the rubble) and exacerbates soil erosion and rainwater runoff problems. All those impacts could be avoided or mitigated if road projects underwent proper environmental impact assessment and construction permits required contractors to manage construction debris in an environmentally sound manner.

## **Wastewater management**

Lebanon's National Wastewater Management Program has divided the country into several regions to be sewerred and served by large regional wastewater treatment plants. For example, the plan calls for building a dozen major sewage treatment plants on or near the coast, with associated sewer networks and sea outfalls, to treat wastewater generated in the coastal zone, in some cases up to elevations of 1,000 meters and above (e.g., Kesrouane). While significant investments have been made in building sewer networks, few wastewater treatment plants have been constructed, primarily due to the lack of funds.

### In the Greater Beirut Area

Wastewater from Beirut and parts of the surrounding cazas will be collected and transported to two main coastal collectors: (1) the northern main collectors (17 km) converge on Dora, where a wastewater treatment plant (design capacity 891,000 people-equivalent) and associated outfall will need to be constructed, and (2) the southern collectors (9 km) converge on Ghadir, where a preliminary wastewater treatment plant (grit and scum removal only) has been rehabilitated (784,000 people equivalent). Although works on the northern coastal collectors were completed in 2001, the collectors are likely to remain idle for several years because no funding has been secured for the construction of the Dora plant. Meanwhile, the newly built collectors will require repair and routine maintenance works (e.g., flushing).

### Beyond the Greater Beirut Area

Although the GOL has reportedly secured funding for 25 wastewater treatment plants, at least 10 proposed plants remain without funding (see Table 9). Sources of funding for these large wastewater treatment plants are diverse and include the Italian Protocol, French Protocol, European Investment Bank (EIB), Japan, Islamic Development Bank (IDB), International Bank for Reconstruction and Development (IBRD), and the Government of Lebanon. All five wastewater plants financed under the French Protocol are currently under execution, in addition to one plant financed by the IBRD for Baalbeck.

**Table 9**  
**Current Status of Wastewater Treatment Plants**

<i>Caza</i>	<i>Location/Name</i>	<i>Source of Funding</i>	<i>Implementation Status</i>		
			Under Execution	Under Preparation	No Funding Secured
<b>Akkar</b>	Jebrayal	None so far			X
	Abdeh	None so far			X
	Michmich	Italian Protocol		X	
<b>Minieh-Dinnieh</b>	Bakhoun	Italian Protocol		X	
<b>Tripoli</b>	Tripoli	None so far		X	
<b>Becharre</b>	Becharre	None so far			X
	Hasroun	None so far			X
<b>Koura</b>	Amioun	None so far			X
<b>Batroun</b>	Chikka	French Protocol	X		
	Batroun	French Protocol	X		
<b>Jbeil</b>	Jbeil	French Protocol	X		
	Kartaba	Italian Protocol		X	
<b>Kesrouane</b>	Khanchara	None so far			X
	Harajel	Italian Protocol		X	
	Kesrouane/Tabarja	None so far			X
<b>Metn</b>	Dora	None so far			X
<b>Aley</b>	Ghadir	None so far			X
<b>Chouf</b>	Chouf coastal area	French Protocol	X		
	Mazraat el Chouf	French Protocol		X	
<b>South</b>	Saida	Japan	X		
	Sour	None so far			X
<b>Hermel</b>	Hermel	Italian Protocol		X	
<b>Baalbeck</b>	Laboue	IBRD		X	
	Yammouneh	Lebanon		X	
	Baalbeck	IBRD	X		
<b>Zahle</b>	Zahle	Italian Protocol		X	
	Aanjar/Marj	Italian Protocol		X	
<b>West Bekaa</b>	Jib Jinnine/Deir Tahnich	IDB		X	
	Qaroun	Italian Protocol		X	
	Sohmor/Yohmor	IDB		X	
<b>Hasbaya</b>	Hasbaya	Italian Protocol		X	
<b>Nabatiyeh</b>	Jbaa	Italian Protocol		X	
	Nabatiyeh	French Protocol	X		
<b>Bint Jbeil</b>	Shakra	Italian Protocol		X	
	Bint Jbeil	Italian Protocol		X	

Source: Adapted from CDR Progress Report, March 2001

### Community-based initiatives in wastewater management

Delays in wastewater works in several regions have prompted several municipalities (elected in 1998 after a 35-year hiatus) and local communities to make their own arrangements to improve wastewater collection and treatment, with lead technical and financial support from USAID's community cluster program. Some of these local wastewater treatment facilities coincide with the plans envisioned by the national program, such in Kobeyat. In other instances, local wastewater treatment projects were not consistent with existing regional wastewater management plans and were either stopped or implemented without central government approval/permit. All five PVOs have worked with local communities and community clusters to build more than 20 small wastewater collection and/or treatment systems since 1997 (see Table 10).

**Table 10**  
**Small-Scale Wastewater Treatment Plants Funded by USAID**

<i>NGO</i>	<i>Cluster</i>	<i>Village</i>	<i>Cost (US\$)</i>	<i>Beneficiaries</i>	
YMCA	Akkar	Akkar el Atika	65,000	NA	
	Akkar	Koss Akkar	145,000	NA	
	Rachaya-Hasbaya	Kfeir		293,000	NA
		Marj el Zouhour		132,000	NA
		Mymess		58,000	NA
		Yanta		307,000	NA
		Ain Harsha		120,000	NA
CNEWA/Pontifical Mission	Dennieh	Markibta	113,000	260 families	
	Akkar	Qobayat-Andket	195,000	NA	
	Baabda	Himmana (rehabilitation)	168,000	1,400 families	
		Kornayel	NA	NA	
	Jezzine	Barteh	NA	NA	
	Marjaayoun	Borj el Moulouk	185,000	NA	
	Qlaiaa	Qlaiaa	(USDA)	NA	
Creative Associates	Chouf	Bchetfine	350,000	240 families	
CHF	Fakiha	Jabbouleh	74,000	NA	
MCI	Akkar	Charbila	80,000	5,759 families	
	Wasat el Qaiteaa	Bqerzla	177,000	330 families	
		Hmaira	51,500	120 families	
	Hasbaya	Wazzani	45,600	35 families	
<b>Total</b>		<b>20 WWTPs</b>	<b>2,559,100</b>		

Note: Costs include USAID and local contribution

Source: YMCA, CNEWA/Pontifical Mission, Creative Associates, CHF and MCI, respectively

### 3.2 Rationale for USAID Involvement

The waste management sector offers USAID/Lebanon unique opportunities to:

1. Remove economic and policy/legal barriers to sound waste management;
2. Leverage and rationalize USAID's investment in local waste management solutions;
3. Remedy environmental risks posed by select special wastes; and
4. Promote local/national linkages in governance and democracy.

#### **Remove economic and policy/legal barriers to sound waste management practices**

Key economic and policy barriers to sound waste management practices have included insufficient or ill-adapted laws and regulations. Removing such barriers would buttress ongoing efforts by the Ministry of Environment to require EIAs as part of project permitting. Key policy issues include the lack of solid waste service charges, counter-productive monopoly in the provision of municipal solid waste management services, and the lack of exclusive arrangements to manage certain special wastes.

### Providing revenue mechanisms to pay for solid waste services

CDR uses the Independent Municipal Fund (IMF) to pay the costs of the SWM system for GBA (estimated at \$85 per tonne). The MoIM then deducts those costs from the amounts owed by the Fund to various municipalities and federations of municipalities served by the SWM system. As a result, those municipalities and federations do not “feel the pain” of incurring the costs of the SWM system, since they do not “see” those costs on their budget ledgers. The law on municipalities did not explicitly allow municipalities to raise solid waste service fees. Moreover, funds owed by the IMF to municipalities and federations have not been disbursed for years. Municipal revenues will dwindle in the future due to the elimination of the 10 percent surcharges on electricity, telephone, and water bills, which were previously collected by the GoL on behalf of municipalities and owed to them. The GoL has replaced those surcharges with the Value Added Tax (VAT), which serves to replenish the GoL’s coffers, without compensating Municipalities with alternative sources of revenues.

### Avoiding monopoly situations in the provision of MSWM services

Government agencies can learn from the GBA experience as they tender for the provision of MSW collection and street sweeping services in the future. For example, would the service be contracted out to a single company, as in the past six years in GBA, or to two or three organizations, each serving a different geographic area? In the latter instance, the organizations selected to provide the service would be driven to compete to offer the best quality services at the lowest prices possible. At the same time, the oversight agency (CDR or MoIM) would be able to compare the quality and price of the services offered by different organizations. In fact, a public enterprise could provide the service in one of the sub-areas, which would provide a benchmark for comparison.

### Awarding exclusive arrangements for the management of special waste

Beyond municipal solid waste *per se*, the GoL needs to make important policy decisions to promote effective management of special wastes. Generally, it may be best to let two or more companies provide the same waste management service to encourage more competition, which would lead to better service at a lower cost in the long run. In some instances, however, it may be necessary to award exclusive rights to one or more select companies to collect and manage low-quantity special wastes. Due to its small size, Lebanon generates relatively small quantities of such special wastes as slaughterhouse waste/by-products, hospital/clinical waste, olive oil residues, used tires, and waste oils. Private companies are not willing to invest in treatment and/or recycling technologies to manage those wastes, without some sort of guarantee from the Government that the waste will be made available to them on an exclusive (or semi-exclusive) basis. Without guaranteeing the supply of raw materials, the return on investment may not be high enough to justify the investment by a private for-profit company. In fact, in some cases, the quantities of waste are so small that the GoL may need to offer additional financial incentives to justify the investment that these companies would need to make.

### **Leverage & rationalize USAID's investment in local waste management solutions**

As explained previously, USAID/Lebanon and its partners have implemented several solid waste and wastewater management systems for local communities/clusters around the country since 1997. All solid waste management systems have adopted the concept of dynamic composting, beginning with the first pilot project implemented by YMCA in Kfarsir. YMCA and other PVOs (Pontifical Mission, CHF) have since implemented or plan to implement similar systems in other communities around the country (see Table 11). Two contractors have developed a niche expertise in this field (Cedar Environmental and *Mutasem*). A 12-drum system imported from the Philippines is competing with the one-drum system first introduced by Cedar Environmental. In contrast, different PVOs are using different wastewater treatment technologies, ranging from low-cost low-tech approaches, such as anaerobic digestion and stabilization ponds (Mercy Corps, YMCA), to mechanical aeration systems (CHF, Pontifical Mission).

There is ample anecdotal evidence to suggest that most of these systems have helped to solve, at least temporarily, critical local environmental and public health risks posed by past waste dumping practices. For example, the participating municipalities are thrilled that they have built a solid waste management system that can handle their solid waste loads and eliminate scattered waste dumping. In Deir Jabboule, Sister Marguerite reiterated the many benefits of the wastewater treatment plant built by CHF: no more odors, no need to hire contractors frequently to pump septage from the old tanks and haul it away, reuse of the treated water to irrigate fruit tree fields.

At the same time, however, legitimate questions can be raised about the long-term sustainability (and environmental soundness) of those solutions, which appear to focus on investment and infrastructure aspects and may underestimate or neglect social dimensions and management requirements (operation and maintenance). For example, issues pertaining to the quality and marketability of recycled materials (compost, plastic, glass) have yet to be addressed. Likewise, the full-cycle costs of dynamic composting, including potentially high operation costs (electricity) and maintenance costs (wear and tear), and the municipalities' ability to pay for them through service fees and other charges, may not be well understood or taken into consideration. In Akkar Al-'Atiqa, population growth and a rapid increase in household connections to the sewer network have led to increased plant influent and underperformance of the plant, less than two years after starting operation. This has necessitated the installation of a makeshift aeration system whose efficiency remains to be tested. In Deir Jabboule, the Convent's Superintendent stressed that "we [the Convent] would not have participated in the project had we known the costs of operating and maintaining it." As a result of poor maintenance, the wastewater treatment plant is not treating the wastewater adequately.

Clearly the USAID program would benefit from ensuring the long-term sustainability of those sound waste management projects that it has funded previously. USAID and Lebanon also would benefit from drawing the lessons learned from the pilot activities implemented between 1997 and 2002. Lessons learned would include successes achieved and ways to replicate them, as well as difficulties encountered and ways to avoid or minimize them in the future. Analyzing and documenting such lessons learned would serve to guide future waste management interventions at the community or community cluster level. Such an analysis also would provide ground truthing to test alternative national and local waste management policies and to prepare adapted waste management guidance and outreach materials for dissemination to local communities and municipalities.

### **Remedy environmental risks posed by select industrial sectors**

Haphazard dumping of special wastes poses significant environmental and economic damage across the country. The primary special wastes of concern are construction debris, olive press residues, slaughterhouse waste and by-products, hospital and clinical waste, tannery effluents and used tires. The GoL and private sector companies have prepared feasibility studies and/or submitted proposals to manage these various waste types, except for construction debris (outside Beirut) and slaughterhouse waste. However, none of these feasibility studies and proposals has been implemented yet, as explained next:

- The EC SMAP program may fund a regional project to provide support to the olive oil industry in Lebanon, Syria, and Jordan, which may include policy proposals and small-scale (i.e., one or two olive presses) pilot activities to manage olive oil residues. UNDP Lebanon is currently negotiating the grant agreement (about \$2M) with the EC, which has raised several procedural objections to the way the proposal had been written. If those objections are not sorted to the satisfaction of the EC, the project may not be funded;
- In 1998, the MoE received a proposal from NAPA to build and operate a rendering plant for slaughterhouse waste -- as well as fresh hide cuttings and shavings from tanneries. NAPA would not proceed with its proposal until it received exclusive rights to the slaughterhouse by-products, but Council of Minister Decision 42 (dated 1/3/2000) scrapped those plans unilaterally;
- After an extensive and lengthy feasibility study of hospital waste management, the GoL has finally approved Decree 8006/2002, which defines the government's policy for the management of these wastes. The GoL will need to strengthen the Syndicate of Hospitals to assist in implementing the decree;
- The MoE has completed a pre-feasibility study for the relocation of tanneries in Lebanon. UNIDO is interested in conducting a detailed feasibility study building on the results of the pre-feasibility study but has not yet found the financial resources required for such a study; and
- One of the Chekka cement companies has applied for a permit to burn used tires as fuel and has submitted an EIA to the MoE, which has not been approved yet.

Construction debris offer perhaps the highest potential reward (on a per-dollar spent basis) from a well-targeted policy initiative aimed at curbing illegal dumping of those wastes in the environment. Slaughterhouse waste and by-products would require strong government policies and investments (perhaps under public-private partnerships) to ensure their sound management.

### **Promote local/national governance & democracy linkages**

Municipalities are responsible for solid waste and wastewater management within their jurisdiction, from planning to investment, operation and maintenance. However, most municipalities lack the human, technical and financial resources required to assume such responsibilities. Moreover, while the private sector may be able to undertake solid and liquid waste management services better and more efficiently, municipalities need technical guidance and legal advice on how to enter into public-private partnerships to provide such services (contract negotiation, monitoring and oversight). Finally, even when municipalities take the initiative to plan and implement local waste management solutions, they face insurmountable

bureaucracy and red tape, leading to significant delays in project approval and permitting by the Central Government and eventual withdrawal of private sector interest.

### 3.3 Program Objectives

The proposed waste management program has the following main objectives:

1. Remove economic and policy/legal barriers to sound waste management;
2. Leverage and rationalize USAID's investment in *local* waste management solutions by (a) ensuring the long-term success of sound local waste management solutions previously funded by USAID and (b) continuing to implement *sustainable* local waste management systems;
3. Remedy environmental risks posed by select special wastes sectors by implementing flagship *pilot regional* waste management systems; and
4. Strengthen municipal capabilities and promote public-private partnerships to implement sustainable waste management practices.

### 3.4 Program Description

To achieve the objectives above, the proposed waste management program would undertake the following four initiatives:

1. Formulate sustainable waste management policies;
2. Implement sustainable *local* waste management systems;
3. Implement flagship *pilot regional* waste management systems; and
4. Strengthen municipal capabilities and promote public-private partnerships to implement sustainable waste management practices

While some of these initiatives may be undertaken on a stand-alone basis (e.g., implement local WM solutions), they are all linked together and the program would achieve significant synergies from implementing most if not all of them, either jointly or sequentially as appropriate.

#### **Initiative 2.1: Formulate sustainable waste management policies**

As explained in Section 3.2, there are several economic and policy/legal gaps or barriers to implementing sustainable waste management practices. The program would assist the GoL in removing some of the major gaps/barriers, such as by providing revenue mechanisms to pay for solid waste services or drafting solid waste management legislation and standards. The Ministry of Environment would form a working group from its senior staff and other government agencies as appropriate (e.g., Ministry of Interior and Municipalities, Ministry of Finance, Council for Development and Reconstruction), which would oversee the following activities:

1. Prepare white papers for discussion on policy issues and options related to cost recovery, incentives for recycling, waste management standards (including for construction debris), etc.;
2. Conduct targeted workshops to discuss the policy issues and options proposed in the white papers;
3. Recommend specific policies to ensure cost recovery, promote recycling, control waste management practices, etc.; and
4. Draft laws, decrees and decisions, as appropriate, to implement the proposed policies.

### **Initiative 2.2: Implement sustainable *local* waste management systems**

Clearly, the USAID/Lebanon environmental program has been able to provoke a paradigm shift among policy and decision-makers at both the national and local levels. While not underestimating the potential weaknesses and threats offered by local solutions, some senior government staff now openly recognize that local solutions may be desirable, and perhaps unavoidable, in many instances. Dozens of mayors and local elected officials have visited many such facilities and started demanding similar solutions to the waste problems facing them. It would be essential to ensure that previous investments in local waste management solutions are sustained on a long-term basis, so that USAID's investment bears its fruits and these projects can showcase the strengths and opportunities offered by local waste management solutions. At the same time, USAID/Lebanon would continue to implement local waste management solutions, with more attention paid to long-term sustainability. Specific activities would include:

1. Evaluate the waste management experience of the USAID community cluster program and prepare lessons-learned reports (successes and ways to replicate them, as well as difficulties and ways to avoid or minimize them);
2. Design and implement approaches to ensure the long-term sustainability of local waste management solutions previously implemented by the five PVOs; and
3. Implement waste management projects in new communities/clusters, incorporating the lessons learned from past/ongoing projects.

### **Initiative 2.3: Implement flagship pilot *regional* waste management systems**

As explained in Section 3.2, special wastes are likely to continue to pose risks to human health and the environment, at least in the near to medium term. Under this initiative, USAID/Lebanon would assist in putting in place regional solutions for one or two select waste streams, using a mix of policies, technologies and investments. At this stage, implementing a regional solution to the problem of olive oil residues may offer the best opportunity for a significant improvement in environmental quality. Even if it were to get funded, the EC/SMAP project would implement a very localized treatment technology for olive oil residues generated by a couple of olive presses. It would not solve regional environmental problems posed by olive presses, which cause scattered soil and ground water pollution and render potable water undrinkable during the olive-pressing season (e.g., Tripoli Water Board).

A regional solution to the olive oil liquid residue problems may require building a regional treatment/disposal facility (e.g., for the Koura/North) and putting in place a tanker truck-based system to collect those wastes from individual olive presses and transport them to the regional treatment/disposal facility. Building and operating such a management system would require an elaborate public-private partnership between olive press owners, cooperatives of olive farmers, and the government. Under this partnership, olive press owners would commit to building on-site tanks to store liquid olive oil residues and to delivering such waste to the tanker truck on a routine basis and for a fee to ensure cost recovery, while the government would enforce compliance by all olive presses in the region and ensure cross-regional equity (e.g., by applying the same fee to other regions, even in the absence of a regional management system), etc. The partnership could construct and operate the system directly, or under a concession to a private sector company.

Specific activities would include:

1. Conduct/update technical feasibility studies of managing the select waste streams (e.g., olive oil liquid residue);
2. Conduct participatory workshops and consultation meetings to reach consensus on recommended policies, approaches, and regional actions;
3. Put in place the necessary institutional mechanisms and public-private partnership for regional project planning, design and implementation;
4. Assist the partnership in designing, implementing and operating the proposed pilot regional project(s); and
5. Prepare lessons-learned reports and strategy/materials for dissemination to other regions/special wastes.

#### **Initiative 2.4: Strengthen municipal capabilities and promote public-private partnerships to implement sustainable waste management practices**

As explained in Section 3.2, there is a strong need to strengthen municipal and local capabilities to plan and implement local waste management solutions, either directly or in partnership with the private sector. Better informed municipalities also will be better prepared to work with each other and to lobby the central government to implement badly needed policies and investments. This initiative would include the following key activities:

1. Develop, produce and disseminate targeted and adapted (to the Lebanese context) waste management guides and manuals for municipal and local decision-makers, covering technical, institutional/legal, and financial matters; and
2. Train local elected officials and senior professionals on best waste management practices and policies.

### **3.5 Implementing Organizations and Beneficiaries**

The Ministry of Environment (Minister, Director General) has expressed a strong interest in hosting a waste management program along the lines describes above, which would be consistent with its mandate to spearhead the development of waste policies and laws and to disseminate best management practices. The Council for Development and Reconstruction also seems interested in seeing such a program put in place. The EA team still needs to contact the Ministry of Municipal and Rural Affairs for feedback. The following institutions also would need to participate in the program: Ministry of Finance (cost recovery), Parliament (laws), Ministry of Water and Energy (wastewater), municipalities, and PVOs.

#### 4. INITIATING LONG-TERM REFORESTATION AND ECOSYSTEM RESTORATION (PROGRAM 3)

##### 4.1 Background

###### *Status of Forests*

Data on forest resources are old and outdated. The FAO and the Lebanese Army prepared the first set of national forest data in 1966. In 1991, FAO and Khatib & Alami updated these data based on 1987 Landsat images, but the resulting maps revealed significant errors. With technical and financial support from both the National Center for Remote Sensing and CERMOC, the Lebanese Environment and Development Observatory (LEDO) has sponsored the preparation of a new land cover map of Lebanon, which is due to be released by the end of the summer of 2002. This map will soon provide new and valuable information on forest cover.

Abusive felling, over-grazing, urban development, fires, and pests threaten Lebanese forests. The Juniper and several oak species are felled primarily for the production of coal. Overgrazing is further threatening dwindling juniper forests and endangering its regeneration. Hunting malpractices could also affect the natural regeneration of juniper seeds by reducing bird populations, especially the thrush (this bird species feeds on the fruits of juniper trees and releases the kernel together with its droppings, slightly braised and decomposed, ready for germination). Urban development and forest fires, such as in the cazas of Metn, Baabda and Kesrouane, are the major threats to pine forests. Forest fires rage in many parts of the country between August and early October. Data on the number and extent of forest fires were sketchy until recently. Today, more data are available from several sources (MoA, Civil Defense, Lebanese Army, local NGOs) but these data are not always mutually consistent. Between 1998 and 2000, approximately 35 km<sup>2</sup> of forests were recorded as affected by fires (i.e., charred or just superficially burnt), as indicated in Table 11.

**Table 11**  
**Forest Areas Affected by Fires by Mohafaza (in hectares)**

<i>Year</i>	<i>North Lebanon</i>	<i>South Lebanon</i>	<i>Bekaa</i>	<i>Beirut</i>	<i>Nabatiyeh</i>	<i>Mount Lebanon</i>	<i>Total</i>
1998	179	900	-	-	253	271	1,601
1999	165	134	5.0	-	51	1,133	1,486
2000	107	79	127	-	22	74.0	408
<b>Total</b>	<b>451</b>	<b>1,113</b>	<b>132</b>	<b>-</b>	<b>326</b>	<b>1,478</b>	<b>3,495</b>

Source: MoE/ECODIT, 2002

###### *Forest Management*

At the MoA, the Directorate of Rural Development and Natural Resources is responsible for staffing and operating a fire control unit. This unit has already recruited 221 forest guards who man 31 monitoring stations (25 are located within forests, see Table 12). Forest guards are responsible for enforcing forest protection laws and regulations (such as the National Forest Code –Law No. 558/1996) and apprehending offenders. Sixty forest guards received basic training (1997-2000) in forest management and fire control measures under a cooperation agreement with the French “Office National des Forêts” (ONF). Furthermore, the unit currently operates four

7,500-liter water trucks and 26 utility cars that can be equipped with 600-liter tanks, used for early intervention.

**Table 12**  
**Number and Distribution of Forest Monitoring Stations (May 2001)**

<i>Mohafaza</i>	<i>No. of stations</i>	<i>Location</i>
South Lebanon	3	Saida, Tyre, Jezzine
Mount Lebanon	6	El Tayouneh, Beit Eddine, Hammana, Jbail, el Metn, Kesrouan
North Lebanon	11	Batroun, Zgharta, Aaindakt, Nahr Moussa, Syr, Ain Yaacoub, Tannourine, Bnechaa, El Aabde, Ehden, Harrar
Bekaa	7	Soughbine, Chtoura, Deir el Ahmar, Rachaya el wadi, Hermel, Harbata
Nabatiyeh	4	Marjaayoun, Nabatiyeh, Bint Jbeil/Yater, Hasbaya

Source: MoE/ECODIT, 2002

The MoA is also planning the construction of 14 monitoring towers across the country to provide early warning and quick intervention to control forest fires. These towers will be strategically located in Akkar, el Danieh, Batroun, Zgharta, Jbeil, Kesrouan, Bologna, Beit Meiry, Sofar, Aghmid, Obay, Daraya and Lala. Due to lack of funds, no monitoring tower has yet been built.

Meanwhile, the Lebanese Air Force has been assuming a growing role in combating forest fires. Beginning in 1999, the Lebanese Army acquired 10 fire-fighting “buckets” which are mounted to helicopters and release 1,100 liters of water each. In 2002, the Lebanese Army acquired five more. The buckets are filled in the sea or inland water bodies (Qaroun lake) and can be released anywhere in the country within 30 minutes of notification. Airborne fire fighting has proved instrumental in containing forest fires when they are reported early, but less effective when the blaze has propagated. The fire-fighting unit of the Lebanese Air Force maintains direct contact with regional army stations and the civil defense. The construction and manning of forest fire monitoring towers would provide early warning of forest fire incidents. The MoE has provided financial support to build a monitoring tower in Kobeyyat.

#### *Reforestation and tree planting campaigns*

In the 1960s, the GoL put in place a “Project for the Improvement of the Lebanese Mountains”. This national project focused on three major activities: land reclamation (i.e., terracing and agricultural roads), irrigation (i.e., hill lakes and distribution networks), and reforestation. The Green Plan, a separate authority under the Ministry of Agriculture, was charged with implementing these activities. During the period 1960-1975, large-scale reforestation projects were initiated with the establishment of mixed stands, including conifers, and the creation of forest nurseries (Talhouk et al., 2001). For example, in the Chouf Mountains, vast reforestation around the cedar patches was undertaken (e.g., Maaser el Chouf, Barouk, and Ain el Zhalta). Unfortunately, planned forest thinning (the practice of removing small trees to allow better growth) and plot management were interrupted by the war. Today, the trees are densely aligned and stunted.

Over the past 10 years, several NGOs, working with government agencies and with the support of local and international donors, undertook many reforestation campaigns throughout Lebanon. While these efforts are significant socially, their impact on total forest cover has been rather negligible. Although there is no reliable information on the scale and impact of these campaigns, the survival rate for transplanted trees is believed to vary between 10 and 40 percent

at best. This low performance is due to harsh climate conditions and grazing, amplified by poor follow-up and maintenance. Reforestation in the highlands of Lebanon is difficult because:

- Conventional reforestation is labor intensive;
- Extensive grazing compromises survival rates;
- Irrigation water is usually scarce and must be hauled a long distance (this may be impossible in the absence of access roads); and
- Mountain soils are often too shallow to support trees (many soils are degraded beyond restoration).

In light of these shortcomings, several reforestation efforts are currently tackling the issue differently. For example, in Bsharre, homeland to the relic Cedars of The Lord, the “Committee for the Friends of the Cedars” launched in 1998 an 18-year reforestation project. The committee secured seed money from *Iles de France* and is currently managing a plant nursery, which can produce up to 25,000 saplings per year. The municipality donated 226 hectares of common lands (masha’a) for establishing a new cedar forest using saplings from the nursery. After planting, follow-up and maintenance is secured by a tree adoption program. Project sponsors and supporters pay up to US\$100 for every tree planted, and the money is used to finance maintenance over 18 years (watering, weeding, protection). In addition, the trees are name tagged after their sponsor who also receives a certificate.

#### *Government spending on reforestation*

Whereas national reforestation campaigns were previously the responsibility of MoA, the yearly government allocation of LBP5 billion (about US\$3.3 million) was transferred to the MoE in 2001 and for a period of five years. This budget allocation is significantly larger than MoE’s total budget in 2000 (US\$1.7 million).

Recognizing the importance and complexity of reforestation, MoE has developed an annual project implementation plan for the five years to come. In the short term (years 1 to 5), MoE will target 18,000 hectares of disused (abandoned?) lands and hopes to put in place a framework for subsequent efforts, to ultimately achieve a forest cover of 200,000 hectares (20 percent of Lebanon’s surface area) over the next 30 to 40 years. To implement the short-term objective, MoE has defined a set of guidelines to improve production, planting and after-care. Although the Ministry is resolved to perform better than its predecessor (the Ministry of Agriculture), reforestation may prove to be an undertaking too big for the Ministry.

## **4.2 Rationale for USAID Involvement**

Reforestation and ecosystem restoration (RER) offer USAID/Lebanon interesting opportunities to:

1. Leverage and rationalize USAID’s investment in grassroots tree planting and reforestation programs;
2. Promote improved tree planting and reforestation practices that will result in higher survival rates;
3. Demonstrate cost effective opportunities for reusing abandoned quarries; and
4. Strengthen municipal and local community capabilities to implement long term RER programs.

### Leverage USAID's investment in grassroots tree planting & reforestation programs

A review of USAID supported environmental projects show that significant resources have been allocated to reforestation (see Table 13). MCI alone has implemented land reclamation and rehabilitation projects covering more than 120 hectares at a total cost of approximately US\$198,700. The Pontifical Mission has provided well over 90,000 seedlings to villages inside its clusters and CHF has been very actively supporting local municipalities in implementing large-scale tree planting projects such as along both sides of the entrance roads to remote villages. Because each NGO reports its projects differently, it is impossible to estimate the total land area affected by either reforestation or land reclamation projects, or estimate the total number of trees planted. Nevertheless, it is safe to conclude that US PVOs have allocated significant resources to reforestation projects between 1997-2002.

**Table 13**  
**USAID Supported Reforestation and Land Rehabilitation projects**

<i>PVO</i>	<i>Cluster</i>	<i>Activity and Description</i>	<i>Amount (US\$)</i>
MCI	Bebnine	Restoration of green cover (Bebnine, 15 hectares)	2,000
	Wasat el Qaiteaa	Land reclamation (Bajaa, 13.3 hectares)	24,600
		Land reclamation (Bajaa, 6 hectares)	12,000
		Land reclamation (Mbarakieh, 10 hectares)	15,000
	Hasbaiya	Land reclamation (Kfarchouba, 12.4 hectares)	25,000
	Rachaiya	Land reclamation (kaoukaba Abu Arab, 12 ha.)	24,000
		Afforestation (Kfar Mechki, 9 hectares)	10,800
		Land reclamation (Libbaya, 13 hectares)	25,000
		Land reclamation (Libbaya, 13 hectares)	25,000
		Land reclamation (Mhaidse, 12.4 hectares)	24,800
	Land reclamation (Qnaabe, 5.5 hectares)	10,500	
YMCA	Akkar	Reforestation (1,000 trees)	1,000
	Bint Jbeil	Reforestation (1,700 trees)	2,175
	Kfeir	Rehabilitation and protection of pine forest	5,000
CNEWA/PM	Akkar	Provision of seedlings (Andket, 3811 seedlings)	NA
		Provision of 3,000 seedlings (Aydamoun)	NA
		Provision of 3,630 seedlings (Chadra)	NA
		Reforestation of natural reservation (Kobayat)	NA
		Provision of 4,385 forestry trees (Kobayat)	NA
		Provision of 13,305 seedlings (Kobayat)	NA
	Aley	Provision of 2,799 seedlings (Baissour)	NA
	Baabda	Provision of 6,360 seedlings (Jouar el Haouz)	NA
	Harf	Provision of 4,930 seedlings (Fouara)	NA
		Provision of 10,838 seedlings (Kfarnis)	NA
		Provision of 8,825 seedlings (Wadi es Sit)	NA
		Provision of 12,995 seedlings (Deir Dourit)	NA
	Dinniyeh	Provision of seedlings (Korhaya, Markibata)	NA
Lebaa	Provision of 15,358 seedlings (Abra, Barteh, Kfar Jarra, Lebaa, Mrah el Hbas, Saidoun, Sfaray)	NA	
CHF	Baalbeck	Regional reforestation	NA
	Hermel	Regional reforestation	NA
	Hermel	Regional reforestation	NA

Source: Data supplied by MCI, YMCA, CNEWA/PM and CHF, respectively

### **Promote improved tree planting and reforestation practices**

While great efforts are being dispensed across the country to implement reforestation projects, little is known on the rates of survival. Many factors potentially decrease survival rates - the most notable ones are excessive grazing and inadequate watering. In addition to improving tree-planting techniques, other considerations are equally important to ensuring successful and environmentally sound reforestation programs. For example, many forest seedlings are imported from Syria through donations. These seedlings are either sold or distributed haphazardly to municipalities and NGOs. The absence of disease free certifications and quarantine regulations could have potentially severe repercussions on biodiversity and forest ecosystems. Hence there is an urgent need to regulate the import of seedlings, and develop a mechanism for certifying the origin of forestry seeds. Also, municipalities and NGOs need guidance about where to implement reforestation projects and which species to select. The types of information and guidelines contained in the Ministry of Environment's reforestation strategy should be disseminated to municipalities and NGOs. Technical assistance should be provided to local communities to encourage RER activities that conserve indigenous ecosystems. Local communities must also be informed that different guidelines apply to RER activities inside nature reserves and protected forests.

### **Demonstrate cost effective opportunities for reusing abandoned quarries**

Years of unregulated quarrying have left hundreds of abandoned quarries across Lebanon (In 1996, Dar Al Handasah surveyed at total of 710 quarries). Although quarry operators are required by law to excavate rock by terracing and implement basic site rehabilitation at the end of the quarry's service period, most quarries today represent enduring eyesores and are a potential danger to public health. Many municipalities in Lebanon complain that abandoned quarries degrade their environment. In recent years, applied research has increasingly focused on the issue of how to rehabilitate abandoned quarries and reconstitute some utility to the site (such as parks, recreational areas, landfills, etc.). Contrary to most opinions, quarry rehabilitation is not necessarily an expensive operation. Some of the techniques are potentially very interesting to Lebanon and could be implemented cost effectively. Emphasis today is on implementing simple, low-cost activities to assist the natural regeneration of native plants in and around the quarry. Also, abandoned quarries could offer a repository for the disposal of inert construction and demolition waste. These types of waste are currently dumped along roadsides, down ravines, or along the coast. Quarries potentially also provide a usable floor area that could be suitable for the construction and operation of solid waste treatment plants.

### **Strengthen municipal and local community capabilities to implement long-term RER activities**

In order to sustain long-term RER activities, it is essential to strengthen municipal and local community capabilities. Municipalities around the country are eager to reforest their lands and welcome every opportunity to do so. Unfortunately, some municipalities lack the technical and financial resources to implement ecologically sound reforestation programs and ensure adequate maintenance. Therefore, there is a need to document on-going grassroots reforestation activities and prepare lessons learned reports. Field visits, exchange tours with neighboring countries, and training workshops are essential to support municipal capabilities to implement long-term RER activities.

### 4.3 Program Objectives

The objectives of reforestation and ecosystem restoration must be long term by necessity. For the upcoming three-year strategy of USAID/Lebanon, we propose a three-year program that would set the stage for an ambitious, longer-term national reforestation and ecosystem restoration program (which one could refer to as “The Lebanon Tree Project”). The proposed reforestation and ecosystem restoration program would seek to:

1. Leverage and rationalize USAID/Lebanon’s investment in tree planting and reforestation projects;
2. Promote best management practices in tree planting and reforestation programs;
3. Demonstrate new and cost-effective techniques to restore ecosystems (e.g., assisted natural regeneration and rangeland rehabilitation); and
4. Strengthen municipal and local community capabilities and promote public-private partnerships to implement sustainable reforestation and ecosystem restoration practices.

### 4.4 Program Description

To achieve the objectives above, the proposed reforestation and ecosystem restoration (RER) program would undertake the following three initiatives:

1. Formulate policies and approaches for a long-term grassroots reforestation and ecosystem restoration (RER) program;
2. Test and refine policy issues and options through pilot RER activities in target areas; and
3. Strengthen municipal and local community capabilities to implement long term RER programs.

#### **Initiative 3.1: Formulate policies and approaches for a long-term grassroots reforestation and ecosystem restoration (RER) program**

As explained in Section 4.2, there are many obstacles to sustainable long-term reforestation and ecosystem restoration programs. USAID would assist the Ministry of Environment and other key stakeholders in formulating policies and mechanisms to facilitate, improve and sustain reforestation programs. While the Ministry of Environment has already drafted a five-year reforestation strategy, it has not been able to date to select a contractor for implementation (too few bidders, insufficient credentials of the bidders, etc.). At the rate it is going, MoE will have difficulty in spending the allocated LBP 5 billion per year effectively and efficiently. USAID could assist the Ministry of Environment in reviewing and refining its reforestation strategy and could leverage financial resources to ensure the highest return on investment in reforestation activities. The program could suggest alternative approaches to reforestation such as assisted natural regeneration (for example controlling grazing) and rangeland rehabilitation. It could also provide support to establish new community level tree nurseries that would be equipped and capable to respond to the Ministry of Environment when it issues requests for quotations. At the same time, USAID would continue to implement local reforestation and land reclamation projects. Specific activities under Initiative 3.1 would include:

1. Strengthen the national reforestation strategy;
2. Formulate environmental guidelines and best management practices for reforestation activities;
3. Formulate and discuss national and local policies to support RER activities; and

4. Recommend environmental legislation to sustain RER activities

**Initiative 3.2: Test and refine policy issues and options through pilot RER activities in target areas**

As explained in Section 4.2, USAID/Lebanon and its partners have implemented many reforestation and tree planting projects under its community cluster program. While these projects have supported community-based reforestation, it is important to assess how much has been accomplished and explore ways to improve RER activities. USAID/Lebanon could then replicate these experiences on a larger scale. It could also provide assistance to the GoL on how to establish a national center for forestry seeds. Such a center would systematically collect, label and store seeds from major forest species and from various geographic areas and ecosystems in Lebanon. This center would certify the origin of the seeds and provide a sufficient seed stock to meet the needs of local tree nurseries around the country. USAID also could support the establishment of new tree nurseries and seed collection programs in select target areas.

Specific activities under Initiative 3.2 would include:

1. Examine a selection of reforestation and land reclamation projects implemented by USAID/Lebanon's partners and other stakeholders and prepare lessons-learned reports (successes and ways to replicate them, as well as difficulties and ways to avoid or minimize them);
2. Provide assistance for the establishment of a center for forestry seeds;
3. Select areas for long-term large-scale RER activities;
4. Assist in building and operating tree and plant nurseries in each area; and
5. Assist in developing partnerships between municipalities, NGOs and local communities to implement long-term RER activities in the select areas.

**Initiative 3.3: Strengthen municipal and local community capabilities to implement long term RER programs**

As explained in Section 4.2, there is a strong need to strengthen municipal and local capabilities to implement and monitor RER activities either directly or in partnership with the private sector and NGOs. Better informed municipalities also will be more willing to piloting new approaches to reforestation and ecosystem restoration, such as assisted natural regeneration. They would also be better prepared to work with each other and to control and monitor the grazing sector in a more rational way.

Specific activities under Initiative 3.2 would include:

1. Develop, produce and disseminate targeted and adapted (to the Lebanese context) RER guides and manuals for municipalities and NGOs, covering technical, ecological and financial matters;
2. Train local municipalities and NGOs on sound RER activities and practices.

#### 4.5 Implementing Organizations and Beneficiaries

Successful reforestation calls for a collaborative participation of both public and private sector stakeholders. Within the public sector, the Ministries of Agriculture and Environment are the principal partners. Other partners may include the Lebanese Army and the Green Plan. Qualified private sector companies could operate large-scale forestry nurseries and NGOs are needed to secure local participation in reforestation and ecosystem restoration. Table 14 lists potential stakeholders in long-term reforestation and ecosystem restoration programs in Lebanon.

**Table 14**  
**Potential Implementing Organization and Beneficiaries**

<i>Institution</i>	<i>Remarks</i>
Ministry of Environment	The GoL has entrusted MoE with implementing a five-year reforestation program worth LBP 5 billion per year
Ministry of Agriculture	MoA employs forest guards and runs forest monitoring stations
Green Plan	In the 1960s, the Green Plan was responsible for large scale reforestation programs, including by aerial seeding
Lebanese Army	The Army has refurbished its own helicopters with fire fighting equipment (buckets) and uses them to assist in fire fighting
Association for Forest Development and Conservation (AFDC)	AFDC has a proven track record in forestry-related projects, including combating forest fires
Greenline Association (GLA)	GLA has a proven track record in environmental education across 100 schools in Lebanon on good tree planting practices
Private tree nurseries	Select companies could set up and operate large-scale tree nursery operations cost-effectively
Universities	Universities can provide technical support in relation to disease control, certification of seed origin and conservation of indigenous ecosystems

## 5. SUMMARY AND RECOMMENDATIONS

The overall “State of the Environment” in Lebanon today offers niche opportunities for USAID/Lebanon to bring about significant environmental improvements through a combination of policy-oriented technical assistance and project investments. Clearly, USAID/Lebanon cannot seize on all such opportunities, in particular due to budgetary limitations (about \$5 to \$6 million per year over three years). Also the Government of Lebanon would not be able or willing to push through simultaneous multiple policy reforms on various fronts. Hence the need to prioritize the program options for USAID/Lebanon’s consideration. This chapter presents a multi-criteria analysis of the three program options described in this report and concludes with the team’s recommendations concerning the best possible course of action.

### 5.1 Multi-criteria analysis

To summarize the pros and cons of various program options, the team has conducted a multi-criteria analysis of the three program options using the following six evaluation criteria:

7. Interest in program and commitment to its success;
8. Long-lasting significant improvement in environmental quality;
9. Priority issue not currently being (adequately) addressed;
10. Support to other elements of USAID program in Lebanon;
11. Leveraging of other resources and activities; and
12. Potential for replication.

Table 15 provides a summary of the proposed programs and initiatives under each program. Table 16 provides a summary of the multi-criteria analysis, which is detailed next.

#### 1. Interest in program and commitment to its success

*What is the level of interest in the program among government officials, senior professionals, NGOs, academia, etc.? Is there a consensual political commitment to proceeding with the proposed program? Where would the program be hosted to maximize cost-effectiveness and results?*

1. While the GoL has recently shown an unprecedented resolve to enforce the ban on diesel taxis effective June 15, 2002, as required by Law 341/2001, more efforts are needed to implement the remaining provisions of the law. Generally, no government agency has specific legal jurisdiction and oversight over air pollution control, which leaves the door wide open to the MoE to lead the way in terms of developing air quality strategies and standards and in monitoring air emissions. But the need for inter-agency coordination remains strong: e.g., with (1) MoIM, which issues license plates and has jurisdiction over car safety inspection, (2) Directorate General of Urban Planning (building permits), under the initiative to promote solar water heaters, (3) NCSR which has expressed strong interest in air quality management and has been funding various studies in this regards, and (4) academic institutions which are currently best equipped in terms of equipment and expertise to carry out certain components of the programs.
2. In contrast, various government agencies have vied in the past few years for control and oversight of the solid waste management sector. However, consensus seems to have emerged within the government today that the Ministry of Interior and Municipalities would take the lead in setting an overall strategy for Municipal Solid

Waste Management (i.e., *vision* on technologies, such as recycling/composting and landfill disposal, public participation, cost recovery, etc.) while the Ministry of Environment would assume the lead in setting policies and standards and in public awareness and education. Of course, MoE also would continue to assume its role in environmental approval of SWM projects through the EIA process. Likewise, after years of wrangling on the topic of wastewater management, MoIM appears to have all but abandoned prior attempts to control the sector to the MoEW. Here too, however, MoE has lead responsibility and jurisdiction over wastewater management policies and standards (water quality, effluent standards, reuse standards) as well as public awareness and outreach. Similar to SWM, MoE also would continue to assume its role in environmental approval of wastewater management projects through the EIA process. Any work on cost recovery for either solid or liquid waste services would need the active participation and support of the Ministry of Finance, MoIM, MoEW and Parliament.

3. The GoL's decision to re-allocate LBP5 billion per year earmarked for reforestation away from the Ministry of Agriculture to MoE has baffled many political observers. Clearly, MoA could not demonstrate increased forest areas as a result of spending this budget allocation in the past. Over time, however, MoE has not been able to move forcefully to spending the new budget allocation in a cost-effective manner, leaving many environmental NGOs quite disenchanted. As a result, the budget allocation has been reduced to LBP2 billion for FY 2002 and there is a risk that it would shrink even further if MoE does not act forcefully on a feasible strategy for reforestation. Although MoE would be the agency of choice to host the proposed reforestation program, the program would need the active cooperation and support of MoA to achieve its objectives fully: e.g., coordination with MoA's forest monitoring stations units and with the Green Plan, which funds land rehabilitation (terracing) and agricultural roads.

## **2. Long-lasting significant improvement in environmental quality**

*Would the proposed program result in long-lasting and significant improvement in environmental quality? How quickly would these results be achieved?*

1. Recent/ongoing government measures to ban diesel fuel in taxis/vans and phase out leaded gasoline undoubtedly have produced/will produce significant improvements in air quality (particulate matter, lead) in urban centers and along the narrow coast. The proposed program would help achieve additional, perhaps equally significant improvements in air quality by introducing cleaner fuels (lower SO<sub>2</sub> emissions due to lower sulfur content) and instituting effective car inspection and emission testing (e.g., lower emission of Products of Incomplete Combustion, which are at the origin of smog). Some may argue, however, that the GoL has already adopted Law 341, which calls for these measures, and hence will proceed with implementing them as it has already by banning the use of diesel fuel by taxis/vans. As for the solar heaters initiative, it would open up a rather virgin territory in Lebanon and help achieve potentially significant improvements in air quality, both at the local level (for households using boilers to heat water) as well as near power plants (by reducing demand on electricity from households previously using electric heaters). Introducing solar heaters also would create new jobs and income opportunities (manufacturing and installing solar heaters) and reduce the oil bill of the country paid from its dwindling hard currency reserves.

2. The proposed waste management program would ensure that previous investments in local waste management solutions (continue to) improve the environmental situation in the host communities. It would provide needed adjustments in the operation and maintenance of the pilot solid/liquid waste management systems previously implemented to ensure their long-term sustainability and environmental soundness. For example, dynamic composting as it is currently practiced may not produce compost of high enough quality for application onto agricultural fields (e.g., high contents of undesirable elements such as plastics and glass). The proposed program would provide overall guidance on source separation of organic waste from other materials and would put in place pilot separation programs in the host communities. The program also would seek to ensure the long-term sustainability of local waste management systems by helping put in place regional and national incentives for recycling and effective cost recovery mechanisms. In addition, the program would improve waste management practices beyond the previous community clusters, either directly by implementing new local waste management solutions or indirectly by strengthening the capabilities of municipalities and communities to implement sound systems. Last and not least, the program would remedy serious environmental and health risks posed by haphazard dumping of certain special wastes. For example, it would provide a landmark solution to the recurrent environmental problem of olive oil residues generated by hundreds of olive oil mills scattered throughout the country, some of which were built with donor money including USAID's (e.g., Kobeyate).
3. The proposed program would set the stage for a sustained long-term reforestation and ecosystem restoration (RER) in Lebanon. As with any reforestation program, the environmental benefits of this program would not be achieved in the short term. The program would invest in sustained long-term RER activities in pilot areas of the country, where increased forest cover and biodiversity would be observed in the mid to long terms. The proposed center for forestry seeds will ensure a reliable supply of certified seeds, without which the reforestation of Lebanon may not conserve the country's endemic biodiversity. Strengthening municipal and NGO capabilities also would increase the efficiency, cost-effectiveness and environmental quality of future RER activities.

### **3. Priority issue not currently being (adequately) addressed**

*Does the proposed program address a priority issue that is not currently being addressed? If the issue is already being addressed, is it not being addressed adequately and what would be the proposed program's added value?*

1. While the GoL has implemented in a timely fashion certain provisions of Law 341/2002 on reducing air pollution from the transport sector (e.g., ban on the use of diesel in taxis and vans), it has fallen behind on other statutory deadlines such as for banning the use of leaded gasoline in all vehicles (July 1, 2002), setting permissible fuel standards (gasoline and diesel) and banning the use of all other (non-compliant) fuel standards (December 9, 2001), and requiring annual compulsory, road worthiness tests on all gasoline powered vehicles that are older than three years (January 1, 2002). The proposed air program thus would assist the GoL to meet its obligations pursuant to Law 341/2001. The program also would fill a vacuum in air quality data monitoring and reporting, which is an important component of any air quality improvement strategy. Finally, the proposed solar heater initiative would address a

priority issue that is barely being addressed at the moment, save for limited paper research, advocacy, and localized implementation.

2. At the national level, the solid waste sector has been in an utter state of lethargy for years, amidst inter-agency wrangling and several failed attempts to locate and build sanitary landfills under the World Bank-funded SWEMP. The proposed program would seize on an important window of opportunity offered by recent GoL advances in preparing so-called Terms of Reference (ToRs) for MSWM, which appear to have dropped previous misguided “fantasies” about using non-proven technologies, such as plasma, and re-drawn the national SWM strategy on the basis of proven technologies (recycling/composting, landfilling), public participation and cost recovery. As little, if any, is done to promote public participation, cost recovery and recycling incentives, the proposed program would assist the GoL in moving effectively in these areas, consistent with its own SWM TORs. In the area of wastewater, the program would facilitate the paradigm shift away from regional sewerage and centralized treatment works, on which government officials and senior professionals across the board seem to be converging. As for the question of special wastes, current plans to address risks associated with them appear limited at best. For example, the EC/SMAP grant, if awarded, would address the olive sector overall in three countries (Lebanon, Syria, Jordan) and could not have the type of impact envisioned by the proposed collection and treatment/disposal system for the Koura/North Lebanon olive oil residues.
3. MoE has only recently started to develop a national reforestation strategy and would need to strengthen this strategy and implement it. For example, the draft strategy appears to over-emphasize the role of the private sector --in establishing tree nurseries and planting trees and caring for them, to the detriment of local community groups, NGOs and municipalities. The proposed program would seek to establish a more balanced public-private approach to reforestation and ecosystem restoration to ensure that such activities meet their long-term objectives. It would build the capacity of local groups to plan, implement and maintain RER activities, in partnership with the private sector as needed.

#### **4. Support to other elements of USAID program in Lebanon**

*Does the proposed program support or overlap with other elements of the USAID program in Lebanon, especially those pertaining to strengthened economic opportunities and governance & democracy? Does it build on previous USAID-funded activities?*

1. Developing air quality monitoring capabilities, as proposed under the air program, would build on USAID/Lebanon’s previous investments in laboratory analysis capabilities, especially the Air Monitoring Lab and Core Environmental Lab of AUB. While these labs have been providing services to public and private sector clients, and participating in limited research and study programs, they have yet to be fully utilized and self-sustained. These labs would take their deserved place in the web of air quality monitoring stations envisioned under the air program. In addition, providing air quality data to the public on real-time and routine bases would help meet the basic “right-to-know” of citizens in any democratic state. More importantly, monitoring can be used to evaluate the effectiveness of policy measures targeting the reduction of air pollution. In this context, monitoring data provide a useful tool for raising public awareness and can be used as the basis for a public alert system. Such a system would rely on a monitoring network to alert the responsible authority when high

background levels of pollution and unfavorable meteorological conditions are likely to give rise to serious health effects in asthma sufferers or other vulnerable groups. Overall, the proposed air quality program would produce significant health benefits and associated economic impacts (reduced mortality and morbidity, improved productivity, etc.). In addition, the first two initiatives envisioned under the program would create new economic opportunities that would benefit only a few directly (air monitoring, centralized vehicle inspection and testing). In contrast, the third initiative (introducing solar heating) could snowball into a business worth tens of millions of dollars per year and employing hundreds of professionals and skilled workers nationwide.

2. The proposed waste program has strong links to the other two strategic objectives of the upcoming USAID/Lebanon strategy for 2003-2005. It would enhance economic opportunities for recycling and create jobs related to waste management (consulting, engineering design, equipment, construction, operation and maintenance, monitoring). Strengthening municipal and local capabilities to plan, design and implement local waste management solutions would build on and extend ongoing efforts by USAID/Lebanon to improve the administrative capabilities of municipalities (SUNY) and to promote transparency and governance (by empowering municipalities and local communities to “take charge of their own destiny” and cut central red tape and bureaucracy). Also, the program would build on previous USAID-funded pilot waste management systems in the community clusters: it would draw the lessons to be learned from them and at the same time provide support to the host communities to ensure the long-term sustainability of these pilot projects.
3. The proposed commercial tree nurseries would expand economic opportunities for farmers and nursery owners/operators. The program also would strengthen local capacity to plan, design and implement sustainable local reforestation and ecosystem restoration activities. By empowering NGOs, local community groups and municipalities to engage in RER activities, it would build on and complement USAID/Lebanon’s governance and democracy program. Incidentally, the proposed program would aim to replicate or set the stage for other similar projects like the Tree Project of USAID/Armenia, and would need to heed the lessons learned from those projects.

##### **5. Leveraging of other, non-USAID resources and activities**

*Would the proposed program leverage (or complement) other, non-USAID resources and/or activities currently undertaken or planned? If so, to what extent?*

1. The proposed initiative to develop air quality monitoring capabilities provides much-needed support to ongoing attempts by various stakeholders (MoE, NCSR, MoPW, MoIM) to build such capabilities. Likewise, providing support to the GoL in introducing cleaner fuels and instituting effective car inspection and emission testing would assist GoL in meeting its obligations under Law 341/2002. Finally, promoting solar heaters would complement/leverage plans, under a US\$500,000 two-year GEF grant (implemented by UNDP Lebanon), to promote energy-efficient buildings and integrate “thermal building” guidelines into the national Building Codes (working with the Directorate for Urban Planning – no work on solar heaters envisioned). The proposed initiative could also leverage activities of the Lebanese Center for Energy

Conservation and Planning, which was recently created at the MoEW under a US\$4.4 million, five-year grant from GEF/UNDP.

2. The proposed waste program would learn, if not leverage, from past and ongoing efforts by the GoL to develop centralized waste management systems. As explained previously, it would seize on the opportunity offered by the “ToRs” for MSWM, expected to be approved by GoL in the near future, which have reportedly laid out a workable vision for MSWM, which USAID/Lebanon can assist in flushing out and implementing. In particular, the proposed program would help push forward the issues of recycling incentives and cost recovery mechanisms, after years of either passivity or inconclusive efforts (e.g., study on the marketability of recovered materials commissioned by CDR since 1998 and not out yet).
3. The proposed RER program has the potential to offer the highest direct leveraging effect, as it would help MoE spend judiciously its new allocation of 5LBP billion per year over five years on reforestation activities. If MoE does not spend this budget allocation quickly and wisely, it risks losing it altogether, especially given the tight budgetary constraints facing the GoL.

## **6. Potential for replication**

*Are there any opportunities for replication of the proposed activities, in the future or in other parts of the country? What is the magnitude of the replication or multiplier effect?*

1. No significant opportunities for replication, except perhaps that developing air quality monitoring capabilities, if successful, could be replicated to develop water quality monitoring capabilities.
2. The program would showcase successful pilot projects to other local communities. Using the manuals, guides and lessons-learned reports prepared under the proposed program, these other communities in turn would be able to implement similar projects, with little or no direct assistance from the program. Removing policy and economic barriers to recycling and cost recovery also would facilitate replication. Solving the problem of olive oil residues in one region (e.g., Koura/North Lebanon) would pave the way to implementing similar approaches and solutions in other regions (e.g., Hasbaya, Chouf) or for other special wastes (e.g., slaughterhouse waste and by-products).
3. The proposed RER program would implement pilot RER activities in select areas of Lebanon and showcase these projects to other local communities and NGOs. Using the manuals, guides and lessons-learned reports prepared under the proposed program, these other communities in turn would be able to implement similar projects, with little or no direct assistance from the program, using saplings from the tree nurseries established under the program or launching their own tree nurseries.

## 5.2 Recommendations

Table 17 presents a multi-criteria scoring of the three program options based on the analysis presented above. For each criterion, the table has assigned a score of +, ++, or +++ to each program option in increasing order of attractiveness. For example, for the criterion “Support to other elements of USAID program in Lebanon,” the air program gets a low score of “+,” the RER program “++”, and the waste program “+++.” This scoring reflects the finding that the waste program offers perhaps the strongest support to the other elements of the USAID program in Lebanon (economic opportunities and governance and democracy), including building on the past achievements of the program over the period 1997-2002, followed closely by the RER program. Adding up the number of “+s” assigned to each program option over all criteria yields a total of 9 “+s” for the air program, 13 “+s” for the waste program, and 11 “+s” for the RER program.

Clearly the multi-criteria scoring of Table 17 has no scientific basis and remains rather subjective. For example, who is to say that the RER program is “twice” as attractive as the air program (two “+s” compared to only one “+”) when it comes to supporting other elements of the USAID program in Lebanon? Similarly, there is no basis for adding up the scores obtained across all criteria for each individual program option. For example, “interest in the program and commitment to its success” may be twice as important a criterion as “potential for replication,” in which case it would need to carry a double weight (weighted summation). Nevertheless, as subjective as this scoring may be, it provides meaningful insights into the relative ranking of the three program options. In particular, the analysis suggests that the waste program is more attractive than the other two programs on at least two counts --priority issue not being (adequately) addressed and support to other elements of USAID program in Lebanon-- while it more or less ties with the air program on counts of “interest in program and commitment to its success” and “long-lasting significant improvement in environmental quality” and with the RER program with regard to “potential for replication.”

Based on this multi-criteria analysis, the waste program appears as the most attractive program option for USAID/Lebanon’s consideration. Of course, program adjustments and shifts in focus may be needed to minimize risks. In any case, USAID would need to secure the GoL commitment and inter-agency memoranda of understanding necessary to a full implementation of the program as outlined. If such a commitment were not secured, and to avoid getting caught into any residual wrangling between ministries over jurisdiction and prerogatives, USAID might want to focus on implementing those “technical” initiatives related to learning from past pilot projects (lessons-learned reports, manuals, guides, training) and supporting them, in addition to any and all non solid waste-related initiatives. Over time, say within one year, after the program has established enough credentials and goodwill, it could seek to extend into “non-technical” solid waste activities (cost recovery, public-private partnerships) if inter-agency cooperation and support is forthcoming. If not, USAID could decide then to drop the solid waste “policy” initiatives altogether and branch out the environmental program into the RER initiatives of the third program option. The USAID/Lebanon environmental program then would become focused on pilot activities, supplemented by sustained education and outreach, in both brown (waste management) and green (reforestation and ecosystem restoration) aspects of environmental management.

Therefore, and to ensure the highest “return on investment” while minimizing program risks, the team recommends a hybrid program combining certain aspects of the waste program (#2) and the reforestation program (#3). The immediate, short-term objectives of this “hybrid brown/green” program would be to:

1. Leverage and rationalize USAID’s past investments in waste management and tree planting and reforestation (i.e., make sure the projects work in the long run);
2. Document the lessons learned from this recent experience by evaluating previously-funded pilot projects and producing lessons-learned reports; and
3. Strengthen municipal, local community and NGO capabilities to implement sustainable waste management and reforestation/ecosystem restoration practices through training and outreach (dissemination of guidance documents and manuals).

Bringing about national policy reforms and paradigm shifts in waste management and reforestation approaches would become a longer-term objective, say after one or two years, that the proposed hybrid program would set the stage to achieving.

At it proceeds with the proposed technical assistance program, USAID/Lebanon would continue to fund local waste management and reforestation/ecosystem restoration projects through qualified PVOs and NGOs. Such local projects would benefit from the lessons-learned and guidance to be documented/provided under the technical assistance program.

**Table 15**  
**Summary of Proposed Environmental Programs and Initiatives**

<b>Program 1: Implementing Air Pollution Abatement Policies</b>		
<i>Initiative</i>	<i>Tentative Scope</i>	<i>Key Implementation Partners</i>
1.1 Improve national air quality monitoring capabilities	Assess air quality monitoring needs and capabilities Formulate a concerted air quality monitoring strategy AQMS Assist partners in implementing AQMS (i.e., investment, training, technical support, data compilation and reporting)	<ul style="list-style-type: none"> <li>▪ Ministry of Environment</li> <li>▪ National Council for Scientific Research</li> <li>▪ National Meteorological Institute at Beirut International Airport (MoPWT)</li> <li>▪ AUB</li> <li>▪ Tripoli Air Quality Lab</li> </ul>
1.2 Provide technical and policy support in implementing Law 341 on reducing air pollution from the transport sector	Designing and implementing a fuel quality improvement program (Law 341, Art.4) Supporting a vehicle inspection & maintenance program (Law 341, Art. 5)	<ul style="list-style-type: none"> <li>▪ Ministry of Interior (MoI)</li> <li>▪ Ministry of Environment (MoE)</li> <li>▪ Ministry of Industry (Directorate of Petroleum)</li> <li>▪ AUB</li> </ul>
1.3 Promote the use of solar water heating in Lebanon	Conduct a detailed feasibility study of using solar heating in Lebanon Develop strategy and business plan for introducing solar heating Provide technical and policy support in disseminating solar heating use on a wide scale, beginning with the rural community clusters where PVOs are currently working Develop and disseminate technical guides and manuals on solar heating Put in place financial incentives (e.g., credit facilities) to encourage households to invest in solar heaters	<ul style="list-style-type: none"> <li>▪ Lebanese Solar Energy Society</li> <li>▪ AUB's Energy Research Group</li> <li>▪ ALMEE</li> <li>▪ Ministry of Energy and Water</li> </ul>

<b>Program 2: Promoting sustainable waste management practices</b>		
<i>Initiatives</i>	<i>Tentative Scope</i>	<i>Key Implementation Partners</i>
2.1 Formulate sustainable waste management policies	<p>Prepare white papers for discussion on select policy issues and options</p> <p>Conduct targeted workshops to discuss the policy issues and options proposed in the white papers</p> <p>Recommend policies to ensure cost recovery, promote recycling, control waste management practices, etc.</p> <p>Draft laws, decrees and decisions, as appropriate, to implement the proposed policies</p>	<p>Ministry of Environment</p> <p>Ministry of Interior and Municipalities</p> <p>Ministry of Energy and Water</p> <p>Council for Development &amp; Reconstruction</p>
2.2 Implement sustainable <i>local</i> waste management solutions	<p>Evaluate the waste management experience of the USAID community cluster program and prepare lessons-learned reports</p> <p>Design and implement approaches to ensure the long-term sustainability of local waste management solutions previously implemented by the five PVOs</p> <p>Implement waste management projects in new communities/clusters incorporating lessons-learned</p>	<p>Municipalities</p> <p>PVOs</p> <p>Local communities</p>
2.3 Implement flagship pilot <i>regional</i> waste management systems	<p>Conduct/update technical feasibility studies of managing the select waste streams (e.g., olive oil liquid residue)</p> <p>Conduct participatory workshops and consultation meetings to reach consensus on recommended policies, approaches, and regional actions</p> <p>Put in place the necessary institutional mechanisms and public-private partnership for regional project planning, design and implementation</p> <p>Assist the partnership in designing, implementing and operating the proposed pilot regional project</p> <p>Prepare lessons-learned reports and dissemination strategy and materials</p>	<p>Olive press owners/operators</p> <p>Municipalities</p> <p>Ministry of Environment</p> <p>Ministry of Energy and water</p>
2.4 Strengthen municipal capabilities and promote public-private partnerships to implement sustainable waste management practices	<p>Develop, produce and disseminate targeted and adapted waste management guides and manuals for municipal/regional decision-makers</p> <p>Train local elected officials and senior professionals on best waste management practices/policies</p>	<p>Municipalities</p> <p>PVOs</p> <p>Local communities</p>

<b>Program 3: Long-term reforestation and ecosystem restoration</b>		
<i>Initiatives</i>	<i>Tentative Scope</i>	<i>Key Implementation Partners</i>
3.1 Formulate policies for a long-term grassroots reforestation and ecosystem restoration (RER) program	<p>Strengthen the national reforestation strategy</p> <p>Formulate environmental guidelines and best management practices for reforestation activities</p> <p>Formulate and discuss national and local policies to support RER activities</p> <p>Recommend environmental legislation to sustain RER activities</p>	<p>Ministry of Environment</p> <p>Ministry of Agriculture</p> <p>National Council for Scientific Research</p> <p>Select NGOs</p> <p>Select Municipalities</p>
3.2 Test and refine policy issues and options through pilot RER activities	<p>Examine a selection of reforestation and land reclamation projects implemented by USAID/Lebanon partners</p> <p>Provide assistance for the establishment of a center for forestry seeds</p> <p>Select areas for long-term sustained RER activities</p> <p>Assist in building and operating tree and plant nursery for each target area</p> <p>Set up partnerships between municipalities, NGOs and local communities</p> <p>The Lebanon Tree Project</p>	<p>Select NGOs and local community groups</p> <p>Select municipalities</p> <p>Private sector tree nurseries</p>
3.3 Strengthen municipal and local community capabilities to implement long term RER activities	<p>Develop, produce and disseminate targeted and adapted RER guides and manuals for NGOs, local community groups, and municipalities on RER: rangeland rehabilitation, nursery development, sustainable use of medicinal plants, reforestation techniques, quality assurance, etc.</p> <p>Train local municipalities and NGOs on sound RER activities and practices</p>	<p>Ministry of Environment</p> <p>Select municipalities</p> <p>Select NGOs (AFDC, GLA)</p>

**Table 16**  
**Summary Evaluation of Environmental Program Opportunities**

<b>Evaluation Criterion</b>	<b>Program 1: Implementing Air Pollution Abatement Policies</b>	<b>Program 2: Promoting Sustainable Waste Management Practices</b>	<b>Program 3: Long-Term Reforestation and Ecosystem Restoration</b>
1. Interest in program and commitment to its success	Door open to MoE to lead in developing air quality strategies/ standards and monitoring air emissions. But strong need for inter-agency coordination	MoE has expressed genuine interest in and commitment to the program, and is ready to host it. Support of CDR, MoIM needs to be ascertained further	HE Michel Moussa (MoE) considers reforestation as one of the Ministry's top priority and welcomes any outside assistance
2. Long-lasting significant improvement in environmental quality	Additional improvements in air quality by introducing cleaner fuels (lower SO <sub>2</sub> ) and instituting effective car inspection and emission testing	Definite immediate improvement in pilot activities at the local and regional levels. Multiplier effect of national policies and guidance/outreach	Implementation of RER activities will increase forest cover. Results enhanced if emphasis is placed on assisted natural regeneration
3. Priority issue not currently being (adequately) addressed	Assist GoL to meet its obligations under Law 341/2002. Fill a vacuum in air quality data monitoring and reporting. Introduce solar heating, a priority issue barely addressed at the moment	Fills a persistent gap at the policy and guidance/outreach levels, including the need for a framework SWM law as well as policy and economic incentives	Addresses several key policy gaps related to reforestation, including need to formulate and enforce environmental guidelines (e.g., seed origin, conservation of indigenous ecosystems)
4. Support to other elements of USAID program in Lebanon	Build on USAID's previous investments in lab capabilities such as AUB's Air Monitoring Lab and Core Environmental Lab	Strong linkage with G&D elements of USAID/Lebanon program. Encourages municipalities and private-public partnerships to implement sound waste management practices	Provides increased economic opportunities by establishing and operating commercial tree nurseries. Also empowers local communities, NGOs and municipalities (link to G&D)
5. Leveraging of other, non-USAID resources and activities	Provides much needed support to stakeholders attempting to develop air quality monitoring capabilities. May leverage or duplicate energy conservation plans under two GEF/UNDP grants	Complements recent GoL efforts in promoting sound waste management (e.g., clinical waste decree, hazardous waste study, etc.)	Complements MoE's recent five-year reforestation strategy
6. Potential for replication	No significant potential for replication, except perhaps to develop water quality monitoring capabilities	Provides sound bases and incentives for effective replication of sustainable waste management initiatives through Lebanon	Interested local communities can implement successful RER activities using manuals and lessons-learned reports prepared under program

**Table 17**  
**Multi-Criteria Scoring of Environmental Program Opportunities**

<b>Evaluation Criterion</b>	<b>Program 1: Implementing Air Pollution Abatement Policies</b>	<b>Program 2: Promoting Sustainable Waste Management Practices</b>	<b>Program 3: Long-Term Reforestation and Ecosystem Restoration</b>
1. Interest in program and commitment to its success	++	++	+
2. Long-lasting significant improvement in environmental quality	++	++	+
3. Priority issue not currently being (adequately) addressed	+	+++	++
4. Support to other elements of USAID program in Lebanon	+	+++	++
5. Leveraging of other, non-USAID resources and activities	++	+	+++
6. Potential for replication	+	++	++
<b>TOTAL</b>	<b>10 +</b>	<b>13+</b>	<b>11+</b>

## **APPENDIX A**

### **ENVIRONMENTAL PROGRAM ASSESSMENT TEAM**

**Joseph Karam**

Team Leader

Waste Management Specialist

**Karim El-Jisr**

Ecosystem Management Specialist

**Mutasem El Fadel**

Air Pollution Specialist

## **APPENDIX B**

### **SCOPE OF WORK**

#### **LEBANON ENVIRONMENTAL PROGRAM ASSESSMENT**

##### **BACKGROUND AND OBJECTIVE**

As part of developing its 1997-2002 strategy for Lebanon, USAID/Lebanon conducted an Environmental Policy Assessment that identified and recommended a range of policy options to strengthen environmental management in Lebanon (November 1997). The Assessment attempted to find out who was doing what about the different environmental priorities and which priorities had not been addressed or adequately addressed at the time. It also outlined individual options for specific medium-term and long-term policy reforms and institutional strengthening.

As it prepares its new strategy for Lebanon, USAID/Lebanon needs to conduct a targeted update of the previous Environmental Policy Assessment to take into account developments and activities that have taken place in the country since 1997. The new assessment needs to recognize and build on the environmental achievements of the ongoing AID program in Lebanon. It also needs to be consistent with the anticipated scope of USAID/Lebanon's development assistance program in Lebanon for the next few years.

##### **STATEMENT OF WORK**

The Government of Lebanon must plan and implement a broad range of policies and programs to effectively address deeply embedded institutional and technical issues covering a wide range of environmental areas. While the GOL has made progress in addressing some of those issues (e.g., protected areas, industrial pollution standards), with the assistance of its donors, several key issues continue to be not addressed satisfactorily, such as waste management, air pollution, reforestation, etc. A wide range of policy and institutional changes are required to overcome inappropriate economic policies, weak institutional settings, unenforceable laws and regulations, outdated technologies, and insufficient capital resources for the environment. Improving environmental management and protection in Lebanon entails a strategic focus on systemic, policy, regulatory, and institutional constraints. Redirection of GOL and donor resources toward overcoming these constraints is the key to most expeditiously and effectively improving environmental conditions.

The purpose of this environmental program assessment is to identify strategic opportunities for targeted policy and technical assistance that USAID/Lebanon could undertake, without duplicating the efforts of other donors, and with potential to complement and add value to the Mission's own activities as well as those of others.

##### **Tasks**

The Team shall undertake the following tasks:

1. Review the 1997 Environmental Policy Assessment;
2. Review the USAID/Lebanon environmental program and related activities;
3. Identify a range of environmental activities in consultation with USAID/Lebanon;

4. Analyze the opportunities and challenges offered by each possible environmental activity;
5. Organize a workshop to present the range of environmental activities; and
6. Prepare Environmental Program Assessment Report.

### **1. Review the 1997 Environmental Policy Assessment**

Prior to its departure to Lebanon, the Team will consult with appropriate USAID staff and review the 1997 Environmental Policy Assessment prepared for USAID/Lebanon.

### **2. Review the USAID/Lebanon environmental program and related activities**

Shortly after its arrival in Lebanon, the Team will conduct a kickoff meeting with USAID/Lebanon to discuss the scope and objectives of the Assignment and prepare a tentative schedule of meetings and visits. The Team then shall review the environmental program activities of USAID/Lebanon, including the environmental support to AUB and LAU as well as the environmental components (e.g., solid waste, water/wastewater, reforestation, etc.) of the community cluster program implemented by five PVOs. The Team will review project documents (mission reports, project reviews and summaries, etc.) and meet with representatives of AUB, LAU, and the five PVOs and visit a representative selection of environmental projects implemented by the PVOs (e.g., solid waste composting in Kfarsyr, domestic wastewater treatment in Hammana, etc.).

The purpose of this review is not to evaluate the program but rather to familiarize the Team with the successes and difficulties of past and ongoing environmental activities of USAID/Lebanon program. The Team then would aim to build on the successes and avoid or minimize the difficulties as it identifies and evaluates the range of environmental activities available to USAID/Lebanon in the coming years.

### **3. Identify a range of possible environmental activities in consultation with USAID/Lebanon**

The 1997 environmental policy assessment conducted an across-the-board analysis of environmental policy/institutional issues and opportunities for USAID/Lebanon. Such an across-the-board (cross-sectoral and cross-media) analysis is not warranted at this point because USAID/Lebanon has a better sense today of the general issues and opportunities for environmental activities in the country. Also, the opportunities for policy reform and institutional strengthening outlined in the 1997 report remain essentially valid but would need to be fine-tuned and updated.

Therefore, the Team will conduct a targeted update of the 1997 assessment. Building on the lessons-learned from the ongoing USAID/Lebanon environmental program and the Team's own familiarity with the environmental situation in Lebanon, the Team will identify, on a preliminary basis, four to six possible environmental program activities. These interventions may include policy reform, institutional strengthening and technical assistance to the GOL, municipalities, private sector groups, and/or NGOs/PVOs to achieve such environmental objectives as:

- Develop long-term awareness campaign and training program;
- Promote sustainable waste management at the rural community-cluster level;
- Promote industrial pollution prevention and control nationwide;

- Reduce air pollution levels in urban areas and human exposure to high pollution levels;
- Improve water quality and quantity in Lebanon, using one major watershed as a model; and
- Restore existing forest ecosystems and increase the forest cover of Lebanon.

USAID/Lebanon is keen on continuing and eventually expanding its ongoing environmental program with the AUB, LAU, and the five PVOs working in different community clusters. At the same time, USAID/Lebanon is interested in exploring opportunities for creating synergies with the existing program (e.g., using the environmental monitoring laboratory capabilities), expanding this program to other environmental media or sectors, and eventually taking it from the strictly local level to the regional or national level.

The Team shall meet with USAID/Lebanon to brainstorm over the pros and cons of each possible environmental activity. Based on this meeting, the Team shall develop a better sense of the types of activities in which USAID/Lebanon is interested and the conditions under which USAID could fund such activities.

#### **4. Analyze the opportunities and challenges offered by each possible environmental activity**

The Team shall meet with select representatives of government agencies, private sector groups, donors, and NGOs to solicit feedback and comments on the range of environmental activities identified. In particular, the Team shall meet with senior professionals and officials at the following organizations:

- Ministry of Environment;
- Council for Development and Reconstruction;
- Ministry of Agriculture and Green Plan;
- Universities (AUB and LAU) and research institutes (e.g., National Council for Scientific Research);
- PVOs and NGOs (e.g., Greenline, LEF, AFDC); and
- Select donors (World Bank mission in Beirut, UNDP, select bi-lateral donors, etc.).

The Team shall use these meetings to identify what, if anything, different stakeholders have done, are doing or plan to do in relation to each of the proposed program interventions. The Team shall identify and review pertinent environmental programs, reports, and documents prepared by or for these different stakeholders. The Team shall gauge and discuss the potential strengths, weaknesses, opportunities, and threats to each possible environmental activity. For each possible activity, the Team shall analyze and describe the following:

- Environmental, human health, and economic benefits of the proposed activity (in qualitative terms);
- Policy, regulatory, and institutional constraints that the activity would attempt to eliminate or reduce;
- Synergies with other related activities of USAID/Lebanon; and
- Gaps and redundancies with ongoing or planned activities of the GOL and other donors.

## 5. Organize a workshop to present the range of environmental activities

The Team then shall organize a one-day workshop with about 25 key stakeholders (private and public sectors) to present and discuss the range of environmental activities, suggest priorities, and identify near and medium-term actions needed. The workshop shall alternate presentations and discussions in plenary session with brainstorming discussions in small groups.

## 6. Prepare Environmental Program Assessment Report

The Team shall prepare an Environmental Program Assessment report that presents the methodology and findings of the assessment. In particular, the report shall present and describe four to six feasible environmental program activities for USAID/Lebanon consideration and explain the strengths, weaknesses, opportunities, and threats (SWOT) to each of those activities. As part of this SWOT analysis, the report shall describe, for each proposed initiative, the activity objectives, the constraints that the activity would work to eliminate or reduce, as well as related ongoing or planned activities by different stakeholders. The report shall also identify clearly the institutions that would be responsible for program implementation as well as the assumptions, schedule, and budget required for each proposed program initiative.

## REPORTS/DELIVERABLES

1. Summary meeting notes for all meetings conducted with individuals or groups who are not Mission staff and any formal meetings with Mission staff, and a list of individuals met during the course of this assessment (with addresses and telephone/fax numbers).
2. A summary draft report of the Team's findings and recommendations will be presented to the Mission prior to departure. This report is anticipated to be about 30 pages, excluding the annexes, with a 3-5 page Executive Summary. Five copies of the draft report are to be distributed by the Contractor for review, as decided by USAID/Lebanon. Within 10 business days, all comments will be sent to the Mission, which will pass appropriate comments from the Mission and USAID/W to the assessment team for incorporation into the final draft. Ten copies of the final report will be due within 10 days after receipt of comments from the Mission. Two copies of the Final Report (one to USAID/Lebanon and the other to ANE/MEA) will also be provided on diskette in MS Word 7 format.
3. Briefing for ANE and Global Bureau Environment Center Staff on the findings and recommendations outlined in the final report no later than **xxx**.

## TEAM

Two U.S. consultants and one local consultant:

**Team Leader/Environmental Specialist:** At least 15 years of experience in environmental policy and planning and proven environmental consulting experience in Lebanon and the Middle East. Specific experience in providing policy and planning support to waste management, industrial pollution control and water resource protection. Knowledge of Arabic or French a definite plus.

**Air Pollution Abatement Specialist:** At least 15 years of experience in designing, developing, and implementing policies and programs for air pollution abatement, in particular in urban areas

due to transport, and for raising environmental awareness (NGO participation, etc.). Experience in the Middle East and knowledge of Arabic or French a plus.

**Local Environmental Specialist:** Proven experience in improving ecosystem management in Lebanon and strong familiarity with the institutional and policy environmental framework in the country. Fluency in Arabic and English is a must. Knowledge of French a plus.

#### **LEVEL OF EFFORT**

Total LOE of 63 working days.

**APPENDIX C****LIST OF MEETINGS AND SELECT MEETING NOTES****Table C-1  
List of Meetings**

June 3, 2002	Ministry of Environment	Dr. Najj Kodeih
June 4, 2002	Beirut International Airport Meteorological Services	Dr. Abdo Bejjani
June 7, 2002	YMCA	Mr. Ghassan Sayah Ms. Leila Moubayed
	Mercy Corps International	Ms. Nora Bazzi Mr. Souheil Qorbani
June 13, 2002	Cooperate Housing Foundation	Mr. Talal Hajj Dib Mr. Ayman Abdallah Ms. Nada Nassar
	CNEWA/Pontifical Mission	Mr. Rabih Saba Ms. Marie Gabriel el Qorm Mr. Michel Constantine
June 17, 2002	Balamand University	DG Berj Hatjian, Ministry of Environment
June 25, 2002	Balamand University	DG Berj Hatjian, Ministry of Environment
June 27, 2002	Council for Development and Reconstruction	Ms. Wafa Charafeddine
July 3, 2002	Ministry of Environment	HE Michel Moussa
July 24, 2002	National Council for Scientific Research	Dr. Mouin Hamzeh
Aug. 1, 2002	Ministry of Energy and Water	Dr. Adnan Jouni, Lebanese Center for Energy Conservation and Planning
Aug. 1, 2002	Ministry of Public Works and Transport	Ms. Mathilda Khoury Project Manger

**Ministry of Environment**

Dr. Naji Kodeih, Head of Department of Environment and Technology  
With Dr. Mutasem El-Fadel  
June 3, 2002

Dr. Kodeih expressed interest particularly in initiatives related to air quality monitoring and supporting law 341. He recommended a program hosted at the MoE with the contribution of various ministries and government agencies. He also expressed strong interest to get employees at the ministry to be involved in various activities of the initiatives.

**Ministry of Transport and Public Works**

Dr. Abdo Bejjani, Director of Meteorological Services at Beirut International Airport  
With Dr. Mutasem El-Fadel  
July 4, 2002

Dr. Bejjani expressed interest particularly in initiatives related to air quality monitoring and supporting law 341/2001. He recommended a program hosted at the NCSR with the contribution of various ministries. He also supports programs hosted at the MoE. He expressed strong interest in getting the employees of the Directorate of Meteorological Services to be involved in various activities of the initiatives and readiness to share the network system at the airport to provide for a wider monitoring network.

**YMCA**

Ghassan Sayah, Chief Executive Officer  
Leila Moubayed, Environmental Program Manager  
June 7, 2002  
On: YMCA's environmental activities

Joseph Karam explained the purpose of ECODIT's assignment with USAID/Lebanon. Ghassan suggested that USAID/Lebanon's environmental program should cover the coastal zone and the beaches. He believes that YMCA's solid and liquid waste management activities have started to affect national policies. For example, the WB has asked for technical support from YMCA before approving/funding a WWTP project in Jezzine. Also, several WB consultants and staff visited the Kfarsyr dynamic composting plant and were impressed with its ability to solve a persistent problem for a cluster of 3-4 villages.

According to Ghassan, YMCA has come a long way since the first SW plant was installed and has made significant technological improvements to the design. The success of these local projects is forcing a paradigm shift from large-scale all-to-the landfill approaches in favor of more grassroots waste management and recycling systems. YMCA is also planning to upgrade the waste management facility by providing recycling on site (e.g., using recovered plastics to manufacture secondary products such as fire shields and isolation boards on site). YMCA believes that there are no obstacles to recycling in Akkar, where small entrepreneurs are competing for the recovered materials. YMCA did a survey of recyclers in Lebanon & Syria, where recyclers in the cities of Aleppo, Homs and Hama are shredding, melting and manufacturing PET water bottles into new products. YMCA and ECODIT agreed that there was a need for policies that would encourage recycling industries (i.e., import policies, tax exemption).

Following the Kfarsyr experience with Cedar Environmental (Ziad Abi Chaker), YMCA is currently developing a similar but improved facility in Akkar el Atika with Mutasem Ghandour. YMCA is also exploring variations to dynamic composting systems, such as a 12-drum system currently adopted in the Philippines, to be implemented in Mayss el Jabal. YMCA did not look into cost recovery issues yet; however, Ghassan indicated that their solid waste systems would/should cost about \$30/tonne overall (from collection to treatment).

YMCA is also developing a complete environmental awareness program. The program includes the preparation and distribution of an environmental awareness kit for schools and has signed a related protocol with the Minister of Education, HE Abdel Rahim Mrad. YMCA is seeking funds to produce and disseminate the kit to trainers and teachers in all public schools throughout Lebanon.

### **Mercy Corps International**

Nora Bazzi, Regional MCI Coordinator

Souheil Qorbani, National Program Coordinator

June 7, 2002

On: MCI's environmental activities

Agricultural and access roads are the top priority for communities served by MCI. MCI only approves such requests after examining the site. To be approved, proposed agricultural roads should provide access to "good" agricultural lands. These requests however do not undergo any formal environmental assessment. Nora agreed that NGOs and committee villages alike could benefit greatly from environmental assessment training workshops. MCI leaves it to the local community to prepare all legal documents and procedures for designating, approving and excavating new access/agricultural roads. MCI then finances the laying of treated "base coarse" on these roads. This technique has proved quite successful so far and more resistant to the wear-and-tear of heavy trucks.

Wastewater management activities are also demand-driven. Like with road projects, securing the land needed to implement wastewater projects is the responsibility of the municipality or local community.

MCI plans to construct a liquid olive residue (*zibar*) processing facility in Hasbaya. The system would work on enzymatic decomposition of olive residues. MCI is collaborating with LAU to identify the appropriate enzymes for breaking down liquid olive oil residues.

MCI currently does not support SWM activities.

MCI has financed projects to generate electricity and/or provide heating from biogas. Opportunities for solar heating have increased – but have not been tapped yet -- since the total subsidy on electricity use in the South has been completely removed. Nora suggested the Lebanese Solar Energy Society for potential contacts.

MCI is supporting the operation of small-scale several nurseries for fruit trees and reforestation. MCI also grouped sample activities into two "Integrated Training and Demonstration Parks" in Bibine and Hasbaya. These parks are also equipped to provide training facilities.

**Cooperative Housing Foundation**

Talal Hajj Dib, Project Manager

Ayman Abdallah, Chief Executive Officer

Nada Nassar, Project Administration

June 13, 2002

On: CHF's environmental activities

CHF works in several clusters in Baalbeck and South Lebanon. CHF recently built a slaughterhouse in Hermel. The slaughterhouse can receive up to 10 cows and 40 sheep per day (cost US\$140,000). The plant will soon be inaugurated but no solution has yet been found for the treatment of blood waste. Ayman hopes that the Ministry of Environment and the private sector will address this problem more seriously. We discussed the need to develop policies for collecting blood waste from all slaughterhouses and sending them to treatment facilities.

In the Baalbeck-Hermel region, CHF supported large-scale tree planting projects. Close to 30,000 trees were planted along both sides of the road leading to the village of Hermel. The local municipality is responsible for irrigating the trees (irrigation water comes from the Assi river). CHF bought the seedlings, prepared the holes, and provided all the tools. The Lebanese Army, local schools and the municipality helped during planting. Ayman emphasized the importance of securing project commitment from the local municipality as it will have to protect and water the trees for at least 2-3 years. We discussed the need to develop agreements between local NGOs and municipalities in order to provide the best possible after care and to share tree-planting experiences. There is a need to produce and disseminate technical guides on tree planting and after care. In some cases, where resources are limited, it is better to reduce the number of trees planted and increase resources allocated for maintenance.

CHF assisted the Réne Moawad Foundation in establishing a plant nursery in Zgharta. The nursery produces 40% forest trees (mainly distributed to local municipalities) and 60% fruit trees (mainly sold to farmers). The nursery includes new fruit varieties. Total production is estimated at 23,000 to 30,000 seedlings per year.

In Deir Jabboulé (population 500), CHF supported the construction of an extended aeration wastewater treatment plant. The plant receives up to 80m<sup>3</sup>/day and cost US\$40,000. It provides tertiary treatment using air blowers, clarifiers and chlorination using a dosing pump. Treated water is being reused for irrigating fruit trees. Selection of the wastewater treatment plant was based on a bidding process. CHF evaluated the bids as follows: 50% on cost, 30% on ease of operation and maintenance, and 20% on the technical performance of the plant. According to Ayman, similar wastewater treatment units are already installed in most beachfront resorts. Operational costs include electricity, chlorine and workers. Although there is a real potential for reusing treated wastewater, local villagers are still reluctant to use it when available. USAID could support exchange tours among various communities who are operating different wastewater treatment technologies. These exchange tours could also help overcome psychological barriers to reusing treated wastewater.

**CNEWA/Pontifical Mission**

Rabih Saba, Projects Manager

Marie Gabriel el Korm &amp; Michel Constantine

June 13, 2002

On: Pontifical Mission's environmental activities

The Pontifical Mission (PM) has supported projects related to wastewater treatment, solid waste management and reforestation. PM contracted Ziad Abu Chaker to build a composting plant in Chakra (population 15,000). The plant receives up to 10 tonnes of pre-sorted municipal waste per day. Similar composting plants are also being set up in Kherbit silim (cluster of 3 villages), Andket (Akkar), and Borj el moulouk (Marjaayoun). In all cases, the municipality provided the land. In some cases, the municipality also co-financed the plant (in cash). The contractor is responsible for monitoring the operation of the plant during the first year. He receives a set percentage of the revenues generated from the recyclables and the compost. The municipality covers the cost of the diesel and the workers. All other inputs and costs are the responsibility of the contractor.

Capital cost for the construction of a 10-tonne/day facility is approximately US\$220-230,000. This includes the cost of land leveling and the generator. These composting facilities are also equipped with concrete sheds for the storage of recovered recyclables.

According to PM's experience, setting up a composting plant is a long and complicated administrative procedure involving the Mohafez and the Ministries of Interior and Environment. In some cases, other public administrations may also get involved (such as Majles al Janoub in South Lebanon). The PM suggested that there is a need to improve the quality of the compost in order to render it more marketable. For example, the compost produced from those plants could be shipped to a centralized facility for polishing, bagging and marketing the finished product.

The PM supported the construction of several wastewater treatment plants (such as in Al-Kobayat, Kornayal and Barteh) and the rehabilitation of an old treatment plant in Himmana. EIA were conducted for some of them. The Himmana treatment plant uses a standard aeration system (two compartments) and was rehabilitated by EBD. *Aquarius* constructed the treatment plants in Barteh and Al Qobayat. These treatment plants have a design capacity ranging from 1,200 to 9,000 people.

We agreed that there was a real need to prepare lessons-learned reports from these projects and to share those experiences among the various NGOs. Municipalities could also benefit from exchange tours (the mayor of Qobayat is organizing a field visit for his municipal council to see the dynamic composting plant in Chakra).

PM is also involved in scattered tree planting campaigns. In Qobayat, PM helped upgrade a forest fire-monitoring tower. Tree nurseries are also planned in the area, with local support from NGOs and the local agricultural cooperative.

### **Director General of Environment**

Dr. Berj Hatjian

June 17, 2002

With Joseph Karam and Karim El-Jisr

On: opportunities for USAID environmental assistance

We discussed the need to disseminate the 2001 State of the Environment Report, using targeted approaches to reach out to different stakeholder groups (e.g., universities, NGOs, policy makers, bankers). According to Dr. Berj, the Ministry "intends to brew" the SOER, build on it to design an awareness strategy and prepare a National Environmental Action Plan (NEAP). The Ministry would explore potential funding from the European Community, USAID and GTZ to prepare the NEAP.

Berj believes that policy support may build on the outcome and decisions of the upcoming earth summit on Sustainable Development in Johannesburg 2002 (August 26 – September 4). According to Berj, this summit would set the stage for future international funding programs and guide development organizations on how to tackle environmental challenges and sustainable development issues. We informed Berj that USAID/Lebanon is in the process of finalizing their strategy for the period 2003-2005 (i.e., irrespective of what happens in Johannesburg).

We discussed the need to address the root causes of environmental degradation. Referring obliquely to the pilot waste management systems implemented by USAID, Berj expressed his concern that these short-term solutions could become long-term problems. The DG emphasized the need to reconcile small-scale solutions with national strategies and plans. He envisions centralized approaches supplemented by local solutions where they are needed most (“hot spots”).

Dr. Berj referred to the recent medical waste decree (Decree 8006/2002), which provides the first and most comprehensive legal framework for managing medical waste in Lebanon ever. The draft decree was reviewed and edited by seasoned judges who provided the necessary legal wording and jargon to facilitate the understanding and endorsement of the decree. It is therefore important to use the services of professionals with profound understanding and experience in the Lebanese legal system to support the development of environmental legislation. The Ministry of Environment is now seeking financial support to implement Decree 8006/02, for example to strengthen the Order of Hospitals’ capacity to promote good medical waste management practices.

Pursuant to Law 341/2001, the Ministry of Environment has already drafted vehicle emission standards and fuel quality standards. The Ministry of Interior and Municipalities has prepared Terms of Reference for vehicle monitoring by private contractors.

Berj believes strongly in the Ministry’s lead role in “mainstreaming the environment.” Mainstreaming the environment means ensuring that environmental concerns are taken into account by decision- and policy-makers, both in government and in the private sector. The Ministry of Environment has already made significant strides in mainstreaming the environment: the Ministry is represented on various influential committees, will be present in the mohafazas under the pending new law reorganizing the Ministry, etc. It is actively seeking to participate in other committees (e.g., with CDR). For example, Berj considers that the \$500K GEF project on thermal building guidelines is an effective way to instill environmental consciousness at the Directorate General for Urban Planning (project host) and the Orders of Engineers. He would welcome all support to the Ministry in “mainstreaming the environment.”

Berj also considers the environment as a lever for good governance and expanded economic opportunities. He views “the environment as an economic pole.”

Berj believes that Lebanon needs to develop solid waste legislation. MoE would take the lead in drafting such legislation, which would need to address issues such as cost recovery (e.g., service fees), compost quality standards, etc. Lebanon also needs a framework or guidelines for public-private partnerships in the waste sector. For example, the public sector could retain 51 percent ownership as well as control and oversight of the private sector, which would operate the service for a fee.

We agreed to hold a second brainstorming meeting on June 25.

**Director General of Environment**

Dr. Berj Hatjian

June 25, 2002

With Joseph Karam and Karim El-Jisr

On: Environmental opportunities concerning a waste program

We discussed the problem of poor road construction practices in Lebanon. Dr. Berj informed us that a new road has been built next to the Bental Nature Reserve in the Caza of Jbeil, despite fierce opposition from local groups and without the required government permits and approvals. Many road projects appear to be motivated strictly by narrow private interests (e.g., real estate speculation) and do not follow basic environmental guidelines or EIA procedures.

Berj reiterated the policy pillars of the Ministry's actions, which are founded on a string of commitments ranging from: the UN Charter on Human Rights, the Lebanese Constitution, the President's inaugural speech [a democratic society should provide jobs, promote literacy, improve public health, and punish environmental crime], the Council of Ministers' program declaration and the Ministry of Environment's strategy. Note: Based on the 2001 SOER, the Ministry has set out the following strategic objectives:

1. Strengthen decentralization in environmental management;
2. Reinvigorate the environmental legislative process at the national, regional and international levels;
3. Adopt scientific and practical guidelines in developing environmental policies, strategies, plans, and programs;
4. Develop specialized human resources in both the public and private sectors, and particularly at the MoE;
5. Establish a partnership with the public and private sectors, in particular educational institutions, media, civil society, and international organizations;
6. Promote institutional approaches to public administration activities;
7. Provide environmental guidance through extension and awareness raising, civil society empowerment, and the media; and
8. Plan and program for pro-active environmental management.

Berj regrets that the Ministry is not kept aware of the extent of local waste management practices implemented under the USAID program. He explained that the Minister of Environment has on many occasions applauded efforts by municipalities to implement local waste solutions to protect the environment. Berj reiterated his earlier remark (June 17) that local solutions need to be consistent with larger regional or national plans, lest they become a problem in the long term. He favors the idea of empowering municipalities to make sound environmental management decisions, and to band together and pressure the government to implement effective centralized solutions when needed. We agreed that providing technical assistance to municipalities, NGOs and local community groups on both brown and green environmental management issues would be at the heart of "mainstreaming the environment." Dr. Berj would welcome USAID/Lebanon's support in this area.

On solid waste in particular, Dr. Berj believes that we are "on the edge of the cliff" and that Lebanon cannot afford to wait any longer and needs to regulate the sector by developing proper solid waste legislation. He seemed to welcome the ToRs recently drafted by MoIM, and soon to be approved by GoL, which are generally in sync with MoE's views on technologies, policies and approaches to MSWM. In particular, Berj agrees on the need to look seriously at revenue generation and cost recovery issues (municipal fees, pricing) as well as public-private partnership

opportunities to ensure long-term sustainability. He suggested that there might be a niche for IDAL (Investment Development Authority of Lebanon) to promote investments in recycling industries. Berj thinks that the proposed IPP Solid Waste program (EC funding) is in a “dead place” and probably would not see the day of light.

### **Council for Development and Reconstruction**

Wafa Charafeddine, Program Planner

June 27, 2002

Ms. Charafeddine believes that there are excellent opportunities to bring about real differences in solid waste and wastewater management by implementing workable and sustainable local solutions. The USAID community cluster program has demonstrated that local solutions are feasible. The PVOs faced tremendous difficulties with the Ministry of Water and Energy when the local wastewater solutions that they wanted to implement were not in sync with the large-scheme plans of the Ministry. In reality, most plans for large-scheme treatment and disposal systems have bogged down due to the lack of funding and/or political and public opposition to the siting of large treatment and disposal facilities (e.g., along the coast). More than ever, municipalities need help in understanding the alternatives available to them and in making and implementing the right choices, including coming together to plan and implement joint waste management solutions.

In contrast to waste management, combating air pollution requires policy decisions at the national level.

### **Minister of Environment**

HE Michel Moussa

July 3, 2002

With Sana Saliba, Robert Mowbray, Elsa Sattout and Karim El-Jisr

On: Minister's views on USAID assistance

The Ministry of Environment is working on two fronts: (1) confronting the legacy of environmental problems (including declining forests, waste, quarries, and industrial effluents) and (2) enhancing the role and capabilities of the Ministry (human resources, staffing requirements, and environmental regulation). The Minister gave as an example the case of medical waste, which has for 50 years been dumped haphazardly in nature causing severe environmental impacts. The Ministry drafted a decree on the handling and treatment of medical waste – it was recently passed (MoE decree 8006/2002). The ministry is currently working with several large hospitals to assist them in complying with these new waste regulations. After a certain transitional period, the ministry intends to start fining non-compliant hospitals.

The Minister mentioned the urgency of enacting the Environmental Framework Law (he hopes that the cabinet will discuss this issue during their next session) and the draft EIA decree.

The Ministry of Environment is determined to resolving the following national issues (in descending order of priorities): illegal and widespread use of diesel engines, quarries, solid waste and problems related to the industrial sector (location, zoning, emissions, effluents).

### On Solid Waste Management

According to HE, solid waste issues remain a priority issue for the Ministry. The Council of Ministers asked the Ministry of Interior and Municipalities to prepare a set of ToR for solid waste management in Lebanon. The Ministry contracted a Swiss company to prepare those ToR. A couple of days ago, the Ministry of Environment received a copy of the ToRs (according to the Minister, not a “MSW strategy”), which call for the construction of regional landfills and composting facilities. The Minister did not define “regional” or mention anything about incinerators. The Ministry is currently reviewing these ToR before sending them to the Council of Ministers. HE believes that the implementation and operation of these SWM facilities (landfills and composting) should remain centralized. He does not believe that municipalities are capable of running such operations, much less financing them. He believes that the Independent Municipal Fund (IMF) should pay for such services. Additional sources of revenues could include the sale of recyclables and compost and revenues generated from a municipal “waste fee.” The Minister does not endorse scattered local initiatives to manage municipal solid waste because donor support usually only benefits a couple of municipalities by a process of selection: donors favor working with “good” municipalities, and tend to avoid working directly with less effective ones.

### On Wastewater Management

According to HE, wastewater management is also a top priority. He believes that USAID type support should continue because national wastewater management plans do not (or cannot) solve wastewater issues in all of Lebanon. He gave several examples to illustrate the point that geographic and/or topographic considerations preclude some villages from centralized wastewater plans. Hence, there will always be a need to provide local wastewater management solutions for isolated villages.

### On Reforestation and Tree Planting

HE explained that the GoL is allocating yearly funds to the Ministry of Environment for reforestation. The Ministry received LL5 billion in 2001 and only LL2 billion in 2002. The annual budget allocation may decrease further if the economic recession persists. The Ministry has prepared a national strategy for reforestation and identified target areas using GIS analysis of base maps (desertification, land cover, etc.). The Minister welcomes any support in implementing this strategy, whether inside or outside the areas identified for reforestation. Reforestation programs should integrate all the steps (production of seedlings, transplanting, maintenance and protection) into one entity that would be responsible for the whole reforestation process for a period of at least 2 years. The Ministry has already issued two requests for quotations that were not conclusive (not enough bidders, insufficient competencies), but a third one is underway and is expected to be successful. The minister thinks favorably of implementing reforestation programs around existing forests as well as nature reserves, although we should not spend too many resources on protected areas because they “should stand on their own”. The ministry is supporting the management of these reserves already (in kind and in cash). The minister emphasized that reforestation should not mean tree planting around roads, or municipal landscaping.

**National Council for Scientific Research**

Dr. Mouin Hamzeh, General Director

With Dr. Mutasem El-Fadel

July 24, 2002

Dr. Hamzeh supported all initiatives particularly the one related to air quality monitoring. His position is that NCSR can assist at a research level in some tasks depending on the NCSR's resources and that MoE could be the information dissemination entity where the programs could also be hosted. He is not in favor of decision-making committees that include various ministries. He felt that MoE could take the lead and coordinate as appropriate with others, at least for the monitoring initiative. Others could be brought on board by getting them directly involved in certain tasks.

**Ministry of Energy and Water**

Dr. Adnan Jouni, Project Manager, Lebanese Center for Energy Conservation and Planning

With Dr. Mutasem El-Fadel

August 1, 2002

Dr. Jouni indicated that the Center is interested in coordinating on Solar Energy related projects. Since his projects is still at the inception phase, the scope of work is still not clear as to whether it will have a component related to a pilot scale project in the context of solar energy. He proposed a continuous follow up in the near future once the scope is well defined. The scope will be disseminated in a future workshop in October.

**ALMEE**

Mr. Toni Matar, Technical Consultant, Mechanical Engineer

With Dr. Mutasem El-Fadel

August 1, 2002

Mr. Matar expressed his support for the air quality initiatives particularly those related to law 341 and the solar water heating. He indicated that ALMEE has been active in this context with a couple of EU-funded projects and would be interested in carrying further work related to these two initiatives. The work that ALMEE has been doing with regards to solar water heating complements the proposed initiative in the sense that it focused on several site buildings rather than a whole community.

**Ministry of Transport and Public Works**

Ms. Mathilda Khoury, Project Manager, Capacity Building for the Adoption and Application of Energy Standards in Buildings

August 1, 2002

Ms. Khoury indicated that her project is not directly related to solar water heaters or the other initiatives.

**Energy Research Group, American University of Beirut**

Dr. Nesreen Ghaddar, Energy Research Group

Dr. Riad Chedid, Energy Research Group

Dr. Farid Chaaban, Energy Research Group

Dr. Mutasem El-Fadel, Energy Research Group

July 2, 2002

All supported the initiatives and expressed interest in contributing to them. They recommended programs hosted at or in coordination with AUB due to the presence of the necessary equipment (mostly funded by previous USAID initiatives for air quality management) and expertise to implement these programs.

## APPENDIX D

### LIST OF FIELD VISITS AND SELECT FIELD VISIT NOTES

**Table D-1**  
**List of Field Visits**

June 8, 2002	Mercy Corps International South Lebanon clusters	With Said Zaher: Hasbaya, Hibbarieh, Wazzani
June 14, 2002	YMCA and Pontifical Mission Akkar Clusters	With Joseph Kassab: Koss Akkar, Akkar el Atika With Imad Abu Jawdeh: Qobayat
June 18, 2002	Cooperate Housing Foundation Baalbeck-Hermel Cluster	With Bilal Kanaan: Hermel (slaughterhouse and Aamouh lake project), Deir Jabboule (WWTP)
June 22, 2002	Opportunities for ecosystem restoration in the highlands of Mount Lebanon	With Elie Gebrael and Sami Matta

#### **Field Trip to the South with Mercy Corps**

Saturday, June 8, 2002

Saeed Zaher (Mercy Corps) with Joseph Karam and Karim El-Jisr

Livelihood Park: The hydroponic green fodder production unit (one old, another one coming online) seems to be producing quality barley that is improving milk productivity by the Hoilsten cows, while at the same time reducing production costs (less industrial feedstock and hay, less diseases). According to Saeed, the USDA-offered cows are not well adapted to the climate conditions of South Lebanon (and perhaps of Lebanon overall). The anaerobic digester of the cow waste produces biogas that meets the internal water heating needs of the park (no electricity generation). The park contains an informal, small-scale nursery for various trees and plants (berries, Damascus roses, sumac, forest trees) as well as experimental hatcheries for pheasants and partridges. It is not clear to what extent professionals have been involved in running this experimental wild bird hatchery program.

Dardara spring: Mercy Corps has cleaned the spring area and built a concrete wall around it to contain the spring water and store it in a neatly formed lake, from where it flows by gravity in two irrigation canals leading to the Qlaiaa or Khyiam agricultural fields. The Water Users Association (or water allocation committee) has not been established yet. People have broken into the specially built chambers at the two main lake outlets and broken the valves that control water delivery. As a result, water flows continuously from the lake. It will be interesting to observe the spring flow (and the water level in the lake) later in the summer and early fall. Mercy Corps also rehabilitated the main irrigation canals and the nearby spring of Ruqayqa.

Drainage ditches and water storage lake: Mercy Corps has also rehabilitated and built ditches cutting through portions of the Marjayoun/Kyiam plain in a North to South direction. The purpose of these ditches was not immediately clear: are they intended to receive the residual waters of the Dardara and Ruqayqa springs, after all the fields have been irrigated, and/or are they designed to drain the water-logged soils (if any) of the plain? Or perhaps are they intended to channel unused waters further south to the area where a water storage lake will be built in the future? It was not clear if Mercy Corps had conducted a feasibility study and EA for this rather significant project. Potential impacts would include water loss through evaporation, disposal of excavation materials, import of basalt stone to line the canal sides, growth of reeds and other weeds that could slow drainage, ditch maintenance, etc.

Wazzani Village: Mercy Corps built a sewer network and a wastewater treatment plant for the small village of Wazzani (35 families). By evacuating sewage away from houses, the project has definitely improved sanitation conditions in the village. But there appeared to be no maintenance or monitoring of the treatment plant itself to ensure that it is working properly. During the visit, effluents were not flowing from the second to the third basin, which suggests that either the second basin is leaking or water loss through evaporation and evapo-transpiration exceeded water addition from the first basin. Also, no water appeared to be leaving the third basin.

Wazzani and Hasbani Rivers: The Rivers provide habitat for a local variety of freshwater fish, which swim upstream in the winter to spawn at higher altitudes. After spawning, the small fish travel downstream and across the border all the way to the Houle Lake in Israel. Local environmental groups have observed that the small dams built long ago by the Government of Lebanon on the Hasbani river act as a potential barrier to this migration and are demanding that fish ladders be built on these dams to re-enable easy migration of the fish upstream. Mercy Corps has funded one such project on one of those dams. At the same time, it appears that fish – generally small size (10-15 cm)-- continue to be taken illegally by electrocution of the river waters.

Agricultural roads: Mercy Corps has built around 40 km of agricultural roads improving access of farmers to agricultural fields (olive orchards) and of firefighters to fire-prone forest areas. Mercy Corps leaves it up to the landowners to delineate the exact routing of the roads and to excavate the contours of the road using bulldozers. While this approach lets local landowners negotiate the best routing among themselves, it may not produce the optimal routing from an environmental perspective (e.g., avoiding wooded areas or high-slope areas prone to erosion). Also, excavation contractors need guidance and specific requirements on best practices for building a road. Mercy Corps intervenes to lay the base course of the road. Recently, Mercy Corps has experimented with the use of treated base course (gravel mixed with low doses of cement and water) with apparently successful results.

Al-Hebbariyyeh: Mercy Corps has designed and built a wastewater treatment plant for the village of Hebbariyyeh (2,000 people today). The plant contains the following components in series: anaerobic basins, trickling filters, and sand/cobble filters. Effluents are released into the wadi directly after the sand/cobble filters. Biogas is generated in the anaerobic basin and channeled to a gas storage chamber. There are no headwork facilities such as storm water overflow, grit and sand removal, or flow gauge. Mercy Corps intends to conduct effluent sampling and testing later this summer, which would determine the plant's treatment performance .

Jezzine stream: Immediately following the Israeli withdrawal, Mercy Corps provided assistance to the Municipality of Jezzine in cleaning up the stream that runs through it and lining it with concrete. This project came as a showcase of the strong commitment of USAID to the liberated

south in the aftermath of the withdrawal. It is not clear if alternatives to the concrete lining of the stream were considered. (We did not visit the Jezzine area)

### **Field trip to Akkar with YMCA**

Friday, June 14, 2002

Joseph Kassab (YMCA) and Imad Abu Jawdeh (Pontifical Mission) with JK and KJ

Met Hassan Nather, Director of Secondary School in Ouyoun, and YMCA representative in Akkar region.

Dynamic composting in Akkar el Atika: The plant has been operational for six months. The design of the plant includes two levels. The upper level is the waste reception area and includes storage areas for recovered materials. The lower level consists of two rotating drums in parallel configuration. The drums (capacity of 5 tonnes/day) are sheltered under a naturally ventilated steel structure. Incoming waste is unloaded in the upper level and manually sorted to remove recyclable materials and other non-organic waste residues. Sorted waste items including metals, aluminum cans, glass and plastics are stored in nearby concrete enclosures. Nylon bags are a major problem and must be systematically removed before entering the composting line. The waste is then fed into a shredding machine mainly to reduce the size of incoming waste (i.e., peels of lemon and citrus) and thereby increase the contact area of the waste and the speed of decomposition. The shredded waste is then fed into the drum through a funnel structure. The drum is about 15 meters long and slightly inclined (1 percent) to facilitate the movement of waste and leachate inside the drum. The residence time inside the drum is three days. Composted waste then exists at the end of the drum into a conveyor belt that carries the waste to a trommel unit where foreign objects and large non-composted organic residues are screened and discarded.

The finished compost is then cured in open air. The compost piled on site during our visit contained a relatively large fraction of non-organic residues, such as small pieces of plastics and glass. In the absence of source separation or more effective segregation of commingled waste at the inlet (waste unloading platform), dynamic composting is unlikely to result in better quality compost.

Wastewater treatment plant in Koss Akkar: The plant is located at the bottom of a steep valley and the road leading to it is in poor condition. The plant consists of two sludge retention tanks and three open basins. The residence time for incoming wastewater is approximately 10 days, subject to the volume/rate of incoming wastewater. In response to higher-than-expected incoming flow rates (due to increased household connections), the plant could no longer treat incoming waste and was retrofitted with air diffusers powered by two electrical generators. It will be interesting to see if this makeshift upgrade will improve the plant's treatment performance.

Wastewater treatment plant in Qobayat (with Imad Abu Jawdeh/Pontifical Mission): The plant is located about 3 km from the village on a leveled land. The Pontifical Mission and the municipality helped finance the sewage network. The plant location and sewage network were originally part of GoL's wastewater program for North Lebanon. It uses extended aeration to reduce BOD and coliform. Residence time is 12 days and the plant can serve up to 9,000 people at the rate of 150 l/c/d (about 1,300m<sup>3</sup>/day). The plant consists of a grit removal compartment at the inlet, a sludge retention tank, and three extended aeration pits each equipped with 128 diffusers, in addition to a settling tank and a chlorination unit before final disposal. The Pontifical Mission hopes to complete all the works and inaugurate the plant this summer. An on-site diesel generator will supply power.

Olive mill in Qobayat (with Pontifical Mission): The mill is located about 2 km from the village. It was inaugurated just two weeks before the end of last year's olive pressing season but is expected to be fully operational this year. The plant is run by a local cooperative. It consists of an olive cleaning unit, a rotating stone mill, an olive sludge feeding pan, two mechanical presses. The oil is then pumped into an elevated reservoir and fed into the centrifuge for separating the oil from other liquid residues "zibar", which are discharged directly into the environment outside the plant. The plant is covered, spacious and appears to function well. The Cooperative hopes to install a bottling line in order to complete the process.

### **Field trip to Baalback/Hermel with CHF**

Tuesday, June 18, 2002

Bilal Kanaan and Ahmad Singer (CHF) with JK and KJ

Trees in Hermel: CHF has planted several rows of trees (cypress, pine, others) on each side of the road leading to the Qamou' obelisk and the entrance road to Hermel. The Municipality of Hermel is taking good care of the trees by watering them. If this maintenance and care continue for a few more years, the CHF project will have succeeded in greening the entrances to the Qamou' site and the town of Hermel, not a minor feat in this very arid part of the country (about 200 mm of rainfall per year).

Lake near the Qamou' Obelisk: CHF has also built a plastic-lined earth reservoir (capacity 19,000 m<sup>3</sup>) on a gently sloping site not far from the obelisk (less than 200 meters) and a transmission line to haul water from the Assi River (about 300 meters away) to the reservoir. The transmission line has not been connected to the reservoir yet. Once filled with water, the lake would serve to water the trees that have been planted alongside the road leading to the site, as well as any future tree planting projects around the obelisk. The Municipality also intends to transform the site into a tourist attraction by encouraging entrepreneurs to set up restaurants and souvenir shops around the obelisk and lake. While the Qamou' obelisk is today a neglected tourism landmark, unplanned development of the site in the future could have significant environmental impacts. No plan or environmental examination of site development has been prepared to date.

Hermel Slaughterhouse: Mr. Hisham Iskandar (Municipal council member) and Ali Ehmez (Municipal employee) took us on a tour of the new slaughterhouse facility built by CHF on land provided by the Municipality. In addition to the slaughterhouse, the Municipality built a concrete enclosure (small ranch) to house a cattle market and dug a well in the vicinity of the slaughterhouse. The Municipality will need to equip the slaughterhouse. The Municipality also intends to contract the slaughterhouse operation to the private sector, but it probably would need assistance in preparing the contract specifications (hygiene, by-products and waste management, quarantine procedures, etc.). The facility certainly would help to improve the current situation posed by butcher operations scattered in the area. Had an Environmental Assessment of this facility been undertaken, a number of design and future operational pitfalls could have been avoided. For example, the water well is located within a couple of meters from the cattle ranch and a dozen meters from the slaughterhouse and its liquid waste management tank system, which suggests a very high risk of aquifer contamination. On their way to the slaughterhouse, cows and sheep will have to go through a door with a standard threshold and are likely to trip over it. The two quarantine rooms (one for cows and one for sheep) have a full concrete floor with a small household-type drain in one corner, complicating the disposal of animal waste and wash water from this room. At the operational level, the flows of live animal, cut fresh meat, by-products, blood, and other waste are not readily obvious.

Deir Jabbouleh wastewater treatment plant: The wastewater treatment plant does not appear to be working: water in the last storage tank emitted a stench odor, was not clear, and had a yellowish to brown color. During the visit, the blowers were not on, but it was not clear if the convent superintendent had simply short-circuited the mechanical aeration system altogether, or the treatment plant was not working properly anymore. Mother Sister Eugénie explained that the maintenance contract proposed by the contractor (Watermaster) was too expensive and that it was written in English. Therefore she has refused to sign it. As a result, the contractor has stopped doing any maintenance on the system. Sister Eugénie also explained that the operation costs of the plant (around \$5,000 per year) were rather prohibitive. She stressed that “we [the Convent] would not have participated in the project had we known the costs of operating and maintaining it.” Bilal explained the importance of maintenance and offered to mediate with the Contractor to reach a mutually agreeable maintenance contract between them and the Convent. Sister Eugénie appeared willing to accept a maintenance contract at a lower cost. Sister Marguerite reiterated the many benefits of the treatment plant built by CHF (no more odors, no need to hire contractors to pump septage from the old tanks and haul it away, reuse of the treated water to irrigate fruit tree fields); she asked for help from CHF to alleviate the high costs of plant maintenance.