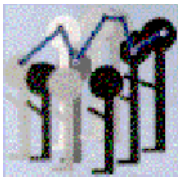

L. Preservation and Management of the Environment

1. Introduction

During the 1960s and until the mid-1970s, the standard of living and the quality of life were fulfilling to the majority of people in the country. The Lebanese nowadays, however, are very much preoccupied with the rapid degradation of their environment.

The civil war has had a severe and negative impact on the environment through: unplanned urbanization, land abandonment, degradation of terraced land, forest destruction and fires, destruction of fish spawning grounds, saline water intrusion into aquifers, dumping of solid and liquid wastes inland and in coastal waters, air and noise pollution from vehicles and privately-owned electricity generators, urban encroachment on coastal plains, dispersion of toxic elements into the environment as a result of chaotic utilization of chemicals in both industry and agriculture, and neglect of sites of cultural heritage and natural scenery.

However, there is a growing national consensus, including among policy makers, that only by respecting ecosystems it is possible to promote sustainable economic development. Only then can advantage be taken of new opportunities that arise from appropriately using and conserving the environment. Awareness is yet to be translated into commitment and effective implementation at the policy and programme levels.

A conceptual model to describe the interaction between human activity and the environment is set out in a recent World Bank report. The model is based on four parameters: source, sink, life support and impact on human welfare. For each of these parameters state, pressure and response are measured. Indicators to capture the parameters are used to identify the causes of and underlying reasons for the deterioration of the environment with a view to formulating remedial measures. The present assessment uses this approach.

At the outset, it should be noted that the major obstacle to assess the environmental situation in the country is the lack of measurements and data in most areas (air quality, surface and ground water quality, disease register, etc.).

2. Sources

a. Land resources. The quality and utilization of land resources, are used to assess this aspect of source. Data on land resources were mainly collected in the 1960s. The last evaluation of land use was carried out by the Food and Agriculture Organization of the United Nations (FAO) in 1980, mainly on the basis of the 1960s data (see Table III-45 below).

Table III-45: Land use in Lebanon

Land use/cover	Hectares	Percent
Arable land	260,000	25
Forest, more or less degraded (with cover of at least 10 percent)	70,000	7
Forests, sparse (less than 10 percent cover)	65,000	6

Abandoned lands, mostly old terraces	70,000	7
Rocky, non-cultivated lands, degraded range lands	515,000	52
Urban and constructed areas	27,000	3
Total area	1,017,000	100

Source: UNDP/FAO, Etude de reconstruction et de développement de l'agriculture au Liban, Volume I, report prepared for the Ministry of Agriculture, Beirut, 1980.

An assessment of the state of land was conducted recently; it shows terrain and soil conditions, ecosystems and agrosystems for different agro-climatic regions of North Lebanon and Central-South Lebanon transacts.

Pressure on land is evident from *desertification* resulting from rain and wind erosion, *salinization* from irrigation from wells, and *overgrazing* by livestock. Irreversible reduction of the vegetative cover, followed by the disappearance of top soil has led to desertification in many areas. The situation was also aggravated by unsustainable forms of land management; and socio-economic policy and institutional factors have not been helpful either. Highly calciferous ground water originating from limestone formations is excessively used for irrigation in the Bekaa. Coupled with high evapotranspiration, this practice has resulted in acute salinization of the soil. Excessive grazing has led to severe degradation in all rural areas of the country.

Land quality is adversely affected by *agricultural practices*, such as abuse of water resources, misuse of agrochemicals, etc. Use of irrigation water is inefficient as it is applied to most crops in a wasteful manner. Use of agrochemicals is highly unorganized and in many instances constitutes a health hazard. Banned chemicals continue to be used, while strict guidelines for pesticides management, whenever existing, are not enforced. The excessive use of fertilizers contaminates groundwater resources in certain areas. There is an urgent need to regulate the supply and management of pesticides at all stages of the supply chain, from importers through distributors and stores to end users.

Construction requires sand and gravel, which are met through removal of sand from the coastal strip and through quarrying in the mountains. There is evidence of intensive coastal erosion and exposure of mountainous terrain to erosion and landslides. Dredging sand from the seabed also has negative effects on marine ecology, coastal morphology, beaches and fisheries.

Forested areas are estimated at roughly 5 percent of total land area (down from 8 percent in 1968). Losses in *forest cover* are the result of forest fires, which were sometimes intentional, cutting of trees, and urbanization. A reforestation program is ongoing, administered by the Ministry of Agriculture. The sustainability of the program depends on building local technical capacity, mobilizing adequate financial resources and commitment of local communities.

Deforestation, land abandonment and agricultural mismanagement have led to widespread *soil erosion*. The cost of *soil erosion* was estimated at US$ 10.3 million in 1995, as shown below.

Table III-46: Annual cost of soil erosion
(millions of US dollars)

Type of land	Area (ha)	Rate of soil loss (t/ha/year)[1]	Loss (US$ million)
Degraded terraces	36,000	200	2.5
Degraded range lands	210,000	100	7.4
Degraded forests	70,000	17	0.4
Total	316,000	317	10.3

Source: Ministry of Environment, Assessment of the State of the Environment, report prepared by Environment Resources Management/World Bank, 1995.
[1]For soil loss of 200 t/ha/year, the cost is US$ 200 and US$ 35 for losses of 100 t/ha/year and US$ 17 for losses of 17 t/ha/year, respectively.
Notes: t = Tons; ha = Hectare

b. Marine resources. A recent study on the state of marine resources and pollution revealed positive concentrations of mercury, copper, cadmium and PCBs along the Lebanese coast, due to the discharge of untreated industrial waste.

Fishing, using traditional methods, is an activity of limited economic importance, employing about 4,000 persons. During the past two decades, the catch per boat fell sharply, mainly due to over-exploitation of fish resources. Fish are caught indiscriminately, including the very young. Catches declined from 6,000 tons/year in 1974-1975 (1,000 fishing boats) to about 1,400 tons in 1994 (968 fishing boats). Presence of DDT was recently identified in fish tissues.

c. Water resources. Measurement of water flows was interrupted in 1982, and it is only in the past few years that a limited effort was made towards re-establishing a measurement network. A comprehensive inventory of water resources, particularly ground water, requires further research and studies. Available historical data permit to conclude that Lebanon is rather well-endowed with water resources which are, however, poorly distributed geographically and seasonally. More than 40 rivers, of which 17 are perennial, flow either into the Mediterranean or to neighboring countries. About 75 percent of the annual flow occurs between January and May. Some of the major rivers are located away from potentially irrigable lands and urban population centers. Much of the potentially irrigable land is in the Bekaa Valley, South Lebanon and the Akkar plain, whereas the majority of water resources are in Mount Lebanon and North Lebanon.

Annual surface flow is estimated at 2,280 million cubic meters (Mm3), of which 800 Mm3 only are available in the dry period. Resources of this magnitude can supply the needs of the country at least until the year 2010, provided that storage capacity is made available to supply water in the dry months (Table III-47).

Table III-47: Demand for Water in Lebanon
(Mm3/Year)

Type of use	1994	2000	2010
Domestic potable water	205	245	310
Industry	130	205	440
Agriculture-Irrigation	800-1,105	920	790

Total	1,135-1,440	1,370	1,540
Surplus	840-1,145	910	740

Source: Ministry of Environment, Assessment of the State of the Environment, report prepared by Environment Resources Management/World Bank, 1995.

About 65 percent of potable water is drawn from surface water. Over 200 springs contribute towards meeting the daily domestic needs.

d. Cultural and natural heritage. Lebanon is endowed with a rich cultural heritage, including several world-known historical sites, such as Baalbeck, Tyre, Byblos and Anjar, and more recently, the discoveries in downtown Beirut.

The country is also rich in natural scenery, such as the Deir El-Nourieh cliffs near Chekka, the Jurassic rock outcrops of Fakra (Kesrouan), and the Qadisha valley in the north of Lebanon, etc., which require urgent protection and careful management. The protected areas, namely the Palm Islands, the Ehden Forest and the Barouk Forest, are under pressure from human encroachment and economic development.

The importance of tourism to Lebanon, and the regional role it aspires to play in this respect, adds to the urgency of action aimed at the protection, conservation and rehabilitation of the natural and cultural heritage.

3. Pollution

Combating pollution and the destructive exploitation of natural resources has lately received national attention, partly as a result of vocal campaigns by non-governmental organizations (NGOs). There is, however, still a long way to go towards the formulation and execution of needed policies and action programs.

a. Air pollution. Air pollution appears to be widespread. Its major source is the combustion of petroleum products, mainly for power generation and transport purposes.

Petroleum consumption by motor vehicles is expected to increase from 1.2 million tons per year in 1993 to 1.8 million tons in 2010. Motor vehicles are the principal source of Nitrogen Oxide (NOx), carbon monoxide (CO) and lead, particularly in the greater Beirut area; emissions of the latter pose serious health problems. The hourly emission of CO around heavily-used roads is about to approach or exceed WHO health norms. As shown in the table below, emission figures are estimated to more than double by 2010, compared to their 1993 levels.

Table III-48: Estimated emissions of selected air pollutants in Lebanon, 1993, 2010
(Tons per year)

Year	$CO2^1$	SOx^2	NOx^3
1993	2,286,025	64,090	83,880
2010	5,204,450	136,470	149,110

Source: Ministry of Environment, Assessment of the State of the Environment, report prepared by Environment Resources Management/World Bank, 1995.
Notes: [1] Carbon dioxide [2] Sulfur oxide [3] Nitrogen oxide

b. Water pollution. Excessive use of agrochemicals and pesticides, uncontrolled discharge of solid and industrial waste, sewage and waste oils result in grave effects on water quality. According to a national water quality control survey of 1990, about 70 percent of all water sources and piped water were exposed to bacteriological contamination. Also, sea water tests at selected beach sites showed high concentration of nitrates (N) and phosphates (P), as shown in Table III-49. High concentration levels of (P) and (N) can cause algae to bloom, which may eventually lead to the eutrophication of water bodies and thus make beaches unsafe for bathing.

Table III-49: Seawater tests at Kesrouan beaches

Sample	NH4+[1]	NH3[2]	P[3]
Sample 1	0.04	2	0.01
Sample 2	0.04	5	0.02
Sample 3	0.06	7	0.03
Sample 4	0.04	5	0.02
Jounieh raw sewage outfall	24.1	27.3	29.0

Source: Associated Consulting Engineers, Water and Wastewater Feasibility Study for Kesrouan Drainage Zone, 1994.
Notes: 1 Amonium; 2 Ammonia; 3 Potash

c. Noise pollution. Noise has yet to be recognized as a serious pollutant. Inhabitants of Lebanese cities often live and work under conditions in which noise attains disturbing levels. According to a 1995 study, noise at major roads in the Greater Beirut area was measured at levels which can cause some health problems. As an example, in Hamra street in Beirut, noise levels were found to be consistently above 90 decibels between 9 a.m and to 2 p.m. during week days.

d. Solid waste and wastewater. Toxicity from solid and hazardous waste is a good indicator of environmental pollution. Municipal solid waste is estimated at present at 5,000 tons per day for all of Lebanon, of which about half being generated in the greater Beirut area. The Beirut Normandy marine dumping site, which was operational throughout the war, was closed in 1992; it is at present undergoing an expensive transformation program which will extend over many years, as part of the development of the city centre. Subsequently, a marine dumping site was opened at Dora, north of Beirut, where at the end of 1995 the height of waste measured 40 meters. There is only one incinerator at Amroussieh (Beirut southern suburb), which is too small to take in the waste produced daily in Beirut and its suburbs. Outside the Greater Beirut area, solid waste is burned indiscriminately in open air or dumped along roadsides in vacant lots - often spilling into irrigation canals and polluting water and/or blocking irrigation systems. These practices may cause long-term soil contamination.

A national program of solid waste and waste water management constitutes an important component of the Horizon 2000 Plan. However, there have been delays in

implementation, due mainly to financial constraints. With respect to the solid waste component, there has been a debate as to the type of technology to be used which has been proven difficult to identify and develop adequate sites for controlled dumping in different areas (due to opposition of local communities).

Present waste water collection networks serve only half the population, with the other half adopting rudimentary methods of disposal. Conditions are unsatisfactory in both cases. Raw sewage is discharged directly into the sea as well as into rivers, streams and valleys. Disease outbreaks have been linked to pollution from wastewater. As indicated above, a major public works program in this area was initiated a few years ago; it is expected to take a decade to adequately cover all urban communities.

Lebanese industry, of which about 80 percent is located in the coastal zone clustered in and around Beirut and other cities, generates various types of waste contributing to air, water and soil pollution. A recent study, however, indicated that industrial waste in Lebanon can be classified as non-hazardous. The only waste that may be considered hazardous is that from tanneries because of the high sulfur content.

4. Life support

Ecosystems provide essential life-support services ranging from maintaining bio-diversity to decomposing organic waste. The expansion of human activity and its encroachment on ecosystems reduces the inability to provide such services. The quality of life-support services is measured by the extent of bio-diversity and the existence and state of protected areas. A survey and strategy on bio-diversity wwas undertaken by the Ministry of Agriculture with support from the United Nations Environment Programme UNEP and completed in mid-1996.

As of September 1996, three areas were protected by law, namely the Palms Islands of Tripoli, Ehden Forest and the Barouk Forest. These protected areas are already under great pressure from human activities, which threaten their survival. Several other sites are also in need of protection; the Ministry of Agriculture has taken initiatives in this respect. To organize and develop central and local management capacity of these areas, the Ministry of Environment received support from the Global Environment Fund (GEF) through the United Nations Development Programme (UNDP). Increased political commitment to preserve the natural heritage and life-support systems would favourably influence environmental conditions and the quality of life.

Certain types of land use practices, particularly the encroachment of residential development on forested mountain slopes, and the uncontrolled and chaotic transformation of the coastal strip for different economic uses, put pressure on life-support services. Urban encroachment on the coastal areas and on the western foothills of Mount Lebanon impose great pressure on land and other natural resources, and greatly affect living conditions. Coastal settlements, whether in Greater Beirut or in other cities, are subject to rapid urban growth characterized by high density of housing and economic activities; and suburban developments often lack infrastructure, urban services and housing of adequate standards.

5. Impact on human welfare

Environmental conditions affecting human health and welfare are closely related to social conditions, and thus to success or failure in sustainable human development. Important factors in this regard are population growth, urbanization and rural

developmental activities, which have a strong impact on natural resources and the environment.

a. Environment and population. Population growth is projected at a moderate and declining rate of less than 2 percent per year for the next twenty years. The Lebanese population is forecast to increase from its current level of 3.1 million to 5.8 million in the year 2015.

Rapid urbanization (85 percent of the population in 1995) has been a major factor affecting living conditions and the environment. Before 1975, economic development was mainly concentrated in Beirut and its suburbs, Mount Lebanon and the Zahleh area, and to a lesser extent in the coastal cities of Tripoli and Saida. The rest of the country lagged behind in infrastructure, economic and social development and, as a result, had a lower overall standard of living. This disparity caused rural-urban migration, mainly to Beirut and its suburbs, where more than 50 percent of the population and 65 percent of economic activity are concentrated.

The pattern of urbanization changed during the war period which caused a rapid expansion of the peripheral areas around Beirut, Zahleh, Tripoli and Saida. In a way, the war led to a more even demographic and economic activity patterns around a number of urban centres.

These trends were reversed, however, at the end of the war as real estate development once again concentrated mainly in and around Beirut and in Mount Lebanon. To meet pent-up demand, there was a frenzy of activities in the early 1990s with serious effects on the environment. As rehabilitation proceeds and developmental activities progress, the capital and the area surrounding it are again becoming a pole of attraction. As economic activity picked up in the capital, considerable traffic congestion developed, due to the fact that many families either elected to reside in the suburbs during the war or were forced out of the city because of high real estate prices. The trends of recent years are expected to continue into the next century, with population increasing in Greater Beirut at the expense of other regions.

b. Poverty and environmental degradation . There exists a strong relationship between environmental degradation and poverty. The poor typically live on marginal, erosion-prone land or in urban slums, close to polluting activities and without adequate access to clean water and sanitation. Children are particularly at risk because of polluted water supply. The struggle for survival by the poor, in and around the capital and other main cities, will meet with rising incidence of diseases through pollution and malnutrition. It will also bring about increased demand on public services.

c. Environmental practices in the country have caused a number of health risks*, including:*

- Excessive use of nitrates in agriculture has affected groundwater. In the Bekaa valley, levels as high as 49 mg/l have been observed in the early 1980s (the norm in the European Union is 20 mg/l). Such levels constitute a potential health risk, particularly to babies and small children.
- Discharge of untreated industrial effluent led to increased concentrations of mercury, copper, cadmium and PCB in sea water samples.
- Uncontrolled disposal of solid waste resulted in contamination of ground and surface waters with various contaminants including ammonia.
- Pollution of water resources (discussed above).

- The mortality rate of children under the age of one year associated with diarrhea was 3 percent in 1990. Each child under five is exposed, on average, to 3.5 incidents of diarrhea each year, causing the death of 750 children per year. Children under five years account for 50 percent of the cases and 90 percent of mortality (with 41 percent of the cases in the South, the North and the Bekaa). The main cause is water pollution resulting from limited access to safe drinking water, inadequate wastewater and solid waste disposal and treatment.
- Air pollution from electric power plants, quarries and major industrial plants, including manufacturing of cement, chemicals, etc., is severe, and constitutes a rising concern of the Ministry of Environment and among other concerned authorities. Electricity of Lebanon has plans to bring air pollution from electric power generation to within international norms, subject to mobilizing necessary financing. The regulation and management of quarries, including their restoration, to meet minimum environmental objectives, are still inadequate, despite international and national technical assistance and legislative action. However, the Government was expected to promulgate legislation governing the activities of quarries by the end of 1996.
- The intensive use of motor vehicles in urban centers, with an estimated one vehicle per three persons, on a dense road network with many "go slows", leads to high concentration of pollutants. A 1995 study found out that lead levels in Beirut streets, ranged from 5.5 to 20 micrograms per cubic meter (mg/m3) compared to the EPA standard of 1.5 (mg/m3).

The case of air pollution, specifically from vehicles, is a typical example of a lost opportunity to successfully manage a national environmental issue affecting human welfare. At the end of the war period, there was an opportunity to deal with air pollution from vehicles in a comprehensive manner. Policy measures and action could have been shaped to address different aspects with minimal cost and effort of subsequent corrective measures and maximum opportunity for adequate environmental management development. The different aspects to be addressed include air quality, traffic, gasoline quality, vehicle and gasoline taxes, health costs/health benefits and management of institutional aspects. Such approach could have saved the cost and effort of subsequent corrective measures.

6. National approach to environmental management

Environmental management is a relatively new topic on the national agenda. Building institutional capacity within a sustainable human development approach is an emerging policy concern.

An obstacle to the adoption of sound environmental practices has been the meaning to be attached to the term *environment*. Until recently, *environment* was presented as an obligation of people towards nature rather than one which people have towards each other and towards posterity. There has been a marked change in perception in recent years, however, as a result of increased awareness on the part of government and the public in general.

The institutional capacity for environmental management is still at an embryonic stage. This constrains the potential range of policy options available for environmental management. There exists a large body of *environmental laws*, but it is in need of updating and consolidation. Law enforcement is generally weak due to the lack of a clear distribution of roles and responsibilities.

A major initiative in this respect was the creation of a Ministry of Environment in 1994, which set out the institutional framework for the design and implementation

of environmental strategies, policies and programmes. Budgetary constraints, however, have been the major obstacle to the development of environmental management, including monitoring and enforcement. Staffing levels and operational resources of the Ministry remain very limited. In addition, the mandate of the Ministry of Environment overlaps with that of a number of other public entities. There is an urgent need for streamlining roles and functions, and for consolidating the institutional framework for environmental management. There would also be merit in taking advantage of the enthusiasm and potential of civil society by associating representative institutions in environmental management. Increased involvement of the private sector in environmental management would also be a welcome initiative as well.

Strategies, initiatives and programmes dealing with the environment are viewed as the domain of central government. Environmental management, however, would be more effective if all parties concerned are involved. Effective action against environmental degradation results from the ability of people to protect their immediate environment from their own actions and from the actions of outsiders. Decentralization is needed to realize the local potential. It is at the local level that innovative social experiments can be undertaken.

NGOs, academics, mass media and business and professional leaders and entities participate in the national debate on environment. However, their contribution has remained very limited. The revitalization of civil society through enlisting its participation in decision making and implementation of environmental policies and programmes merits close attention.

Several NGOs are active in raising awareness about sustainable development. They are also increasingly involved in local action programs dealing with afforestation, solid waste management, urban management, etc. However, NGOs have not yet taken any coordinated position nor launched specific initiatives regarding their involvement in environmental management at the national level.

There is yet to be a debate at the national level on *environmental strategy and priorities* - a good basis for which exists as a result of the state of the environment report, prepared for the Ministry of Environment by the World Bank. As indicated above, the Horizon 2000 Plan allocates considerable resources for waste water and solid waste management programmes. Other national priorities are yet to be decided.

In this connexion, a subject which is to be addressed is the environmental implications of macro-economic and sectoral policies. This would involve, among others, the study of the feasibility and approach for the implementation of clean and resource-efficient technology; *green taxes* and pollution charges, taxes on gasoline additives such as lead versus removing taxes on unleaded gasoline and public transportation. This will require the involvement of several public institutions at the initiative of the Ministry of Environment.

In a recent report (see above), the World Bank estimated the partial *cost of environmental degradation* in the country to be US$ 315 million annually, or roughly 3 percent of GDP, of which US$ 230 million are costs in terms of human health due to lack of safe water and sanitation, air pollution and overcrowding. Another US$ 85 million is attributed to the degradation of natural resources related to the loss of forests and bio-diversity, soil degradation and its impact on agricultural productivity, reservoir filtration and water quality, coastal pollution and its impact on marine resources and tourism. There is thus a strong case for

protection of natural resources and efficient environmental management.

With current trends in management and consumption patterns, environmental degradation is worsening in the country, mainly due to the small natural resource base, increasing population and inefficient urban management. *Environmental sustainability* issues need to be addressed soonest for two reasons. First, environmental degradation poses a threat to economic growth, and to human well-being, especially the poor. Second, failure to act now will greatly compound the cost and complexity of remedial action later.

The issue of *irreversibility* warrants close attention by policy makers. Above all, strong *political will* is required to effectively and radically deal with environmental issues. Well-conceived efforts of *research and planning* are also required, in addition to *public information and education*. A plan to raise public awareness of the need for water, energy and soil conservation, to change consumption patterns, to prepare grassroot environmental action plans, is needed; it is to be prepared and implemented in cooperation with the private sector and non-governmental organizations.

A basic goal of sustainable human development is *social capital building*, namely institutions for collective decision-making, involving the public sector, NGOs, local government and civil society in general. Particular attention must be paid to foster and support institutions concerned with policy making within and outside government and at both central and local levels.

Policy options should be oriented towards preventive action to ensure environmentally sound development at low cost for society, the enforcement of environmental laws and regulations for the protection of public health, and action to prevent further degradation of natural and cultural assets. Among the *priority areas* suggested to be addressed urgently are: control and management of air quality in urban centres; management of toxic and hazardous waste; urbanization and land use planning; water resources potential and management; soil erosion; and consumption patterns that are detrimental to the environment.

Building institutional capacity within a decentralized framework and enhanced cross-sectoral coordination and planning mechanisms, involving an active role for the private sector and NGOs, is a key issue in environmental management in the country. *Dissemination of information* to raise awareness and build commitment is another key issue which needs to be addressed in a creative manner.