NATIONAL BIODIVERSITY STRATEGY

AND

ACTION PLAN

LEBANON

NOVEMBER, 1998

Foreword

Lebanon signed the Convention on Biological Diversity in 1992 and ratified it in 1994. The country study on Biodiversity was conducted in 1995 and 1996, and specified the richness in plant and animal species.

The project entitled "National Biodiversity Strategy and Action Plan (NBSAP) and The Country Report to the Conference of Parties (COP)" is funded by GEF and executed by UNDP in close co-ordination with the Ministry of Environment. The main activities of the project included the establishment of a multi-sectorial national steering committee, a biodiversity assessment based on existing knowledge, the identification and analysis of options through extensive dialogue and consultation, and the elaboration of a National Biodiversity Strategy and Action Plan.

The International Union for Conservation of Nature (IUCN) and extensive local consultation provided technical backstopping. Dialogue with stakeholders and authorities was established through the first national and four provincial workshops and other public awareness means, such as newspapers, magazines, posters, pamphlets, T.V. and radio spots, as well as T.V. interviews and reports. Biodiversity was an important component in the activities of Capacity 21 project, which contributes to increasing public awareness and education regarding environmental issues.

The Ministry of Environment has launched a very active program to conserve nature. The Environment Code is being legislated. The protected areas system is very active and a sizeable project is under exploitation in three reserves: Arz-El-Chouf , Palm Islands and Ehden Forest . The Wetland Reserve of Ras-El-Ein was established in October, 1998, and negotiations continue to establish the reserves of Ammiq and Yammouni. The Lebanese government has allocated over 1600 Million US Dollars to execute projects related to the environment and Biodiversity aiming at reduced pollution, sewage treatment, building dams and improving irrigation.

The present Strategy and Action Plan reflect a full year of active work of national and international expertise. It includes the scientific approach and the stakeholders interests.

Furthermore, the success of the program aiming to enrich biological diversity in Lebanon, cannot be achieved by the mere expression of good intentions, or by simply expecting the compliance of people to its plan. It rather depends on imposing strict legal mandatory measures. This dictates the necessity to ordain some new law provisions that should (a) define "biological crime", (b) set a legal characterisation of biological crimes as misdemeanours or as felonies, (c) impose severe personal penalties as well as grave indemnities in money and in kind.

In addition, new laws related to taxation and aiming to encourage people to contribute effectively in the success of the program should be ordained, where:

- Unbuilt real estates will be exempted from taxes, if cultivated or covered by trees.
- Bare unbuilt real estates will be subject to a yearly progressive tax based of its areas.
- Buildings, as well as houses will benefit from large tax exemptions, if the unbuilt areas of the properties are converted into green spaces. On the other hand, the absence of such green areas will result in a progressive increase of the related tax.

We strongly need new legal provisions aiming to extend the role of the Ministry of Environment so this Ministry will have an obligatory binding opinion in all drafts of laws that may be of effect on biological diversity.

The protection of the environment is a must. It is greatly needed in this aspect to establish in the Ministry of Environment a department for the protection of the environment, covering the whole territory of Lebanon, similar to the department for the protection of the consumer, in the Ministry of Economy.

Finally, I wish to express my appreciation to all scientists, institutions, and individuals who contributed to the final form of the present Strategy to which I give my full support.

Akram Chehayeb
Minister of Environment

Executive Summary

Lebanon, like most developing countries, has adopted and signed most international conventions. To meet its obligations to the Convention on Biological Diversity (CBD) and fulfill the requirements of Articles 6 and 26, the government of Lebanon has requested financial and technical assistance from the United Nations Development Program (UNDP)/Global Environment Facility (GEF).

Article 6 calls for developing national strategies and action plans to conserve, study, and sustainably use biological diversity. Article 26, requires contracting parties (national governments) to submit reports on measures taken to implement provisions of the convention, and on their effectiveness to meet its objectives, to the Conference of Parties (CoP). This activity is funded by GEF and executed by UNDP (LEB /97 / G 31/ A / 1G /99).

The main elements of the project included the establishment of a multi-sectorial National Steering Committee, the assessment of biodiversity based on existing knowledge, and the identification and analysis of options through extensive dialogue and consultation. The elaboration of a National Biodiversity Strategy and Action Plan, and the preparation and dissemination of a First National Report and submission of report to CoP are also required.

As a host to old civilisations, Lebanon experienced lots of use and sometimes over-use of its natural resources. The Cedars used to cover all high mountains, whereas their existence is presently restricted to few spots. The decrease in natural vegetation and animal wealth is noticeable and may be alarming.

At the time of Ottomans, nationals were considered citizens if they had trees around their houses. The absence of trees meant, at the time, a kind of nomadism, resulting in lower taxation and fewer duties towards the Sultan. Taxation on land used to be the practice, and many people gave their land to religious organisations that were tax exempt. Cedars, oaks, and other trees, as well as some animals and fish were, and still are, considered as natural heritage. Appreciative values are common within Lebanese sociological expressions.

In the sixties, houses with red-tiled roofs were highly appreciated in high, mountainous areas, and were exempted of municipal, and sometimes, state taxes. The town of Beit-Chabab was almost entirely exempted from such taxes, being very popular for tiled roofs. Some local municipalities even give money rewards to people growing certain types of trees in their house gardens. Farmers growing tobacco, sugar beet and wheat receive sizeable subsides as incentives to remain on their land and make best use of agricultural resources. Reward and punishment are becoming a norm in policy making.

A National Steering Committee representing a large number of institutions with direct or indirect interest in biological diversity was established under the authority of The Ministry of Environment. Four faculties of agriculture and four faculties of science represented the education system, while two umbrella unions represented Non-Government Organisations (NGO's). Representation from public institutions included the National Center for Scientific Research (CNRS), The Agricultural Research Institute (ARI), The Green Plan and The Urban Office. The Ministries of Information, Municipalities, Commerce, Transport, Hydro-Electric Resources, and Agriculture, were also represented. Over a thousand individuals, members of clubs, schools, teachers, NGO's, public and private institutions, scientists, administrators and international organisations were contacted. Contracts were also made with IUCN (International Union for Conservation of Nature) to provide technical backstopping, and fourteen national consultants to draft reports on biodiversity in terrestrial, marine, fresh water and agricultural habitats. Legal advisors and socio-economic inputs were also contracted.

Activities promoting public awareness were numerous and continuous. A project website was established within The Ministry of Environment (net:http//www.moe.gov.lb), and background information on Biodiversity planning was prepared by IUCN. A T. V. spot expressing the importance of plants and animals was shown on the local T. V. stations, and a poster representing the cycle of life with Arabic and English sub-titles was prepared (2000 copies). A pamphlet covering information on three plants and three animals was distributed to over 800 individuals who participated in various activities. Caps, pads, and folders carrying biodiversity identifications were distributed to participants in workshops that were held as follows:
1. First National Workshop: Feb 19, 1998. Marriott Hotel, 72 participants.
2. North Lebanon Workshop: June, 19, 1998. Balamand University, 74 participants.
3. Bekaa' Workshop: July, 8, 1998. Chtaura Park Hotel, 77 participants.
4. South Lebanon Workshop: July, 31, 1998. Chamber of Industry, Commerce and Agriculture, Saida, 85 participants.
5. Mount Lebanon Workshop: August 20, 1998. Kasr El-Mir Amin, Beit Eddine, 110 participants.

The Proceedings of the First National Workshop (110 English copies) and Provincial Workshops (400 Arabic copies) were disseminated to participants and interested individuals and institutions.

The major outcome of the process is the present strategy, which aims at satisfying the identified objectives. The objectives and action plan focus on conservation, sustainable use, and benefit sharing.

Protecting biodiversity through forest and range management with the expansion and management of protected areas are the main objectives at the terrestrial ecosystem level. In aquaculture, the activities are directed towards saving, using, and studying freshwater biodiversity. In the marine ecosystem, protection of the coast, and using resources sustainably were major considerations. Agrobiodiversity had four objectives: 1) protect the ecosystem and maintain native biodiversity, 2) adopt agricultural practices that minimise loss in genetic diversity, 3) establish a national database for documentation and monitoring, and 4) develop partnership with local communities.

Other objectives related to management, conservation and partnership included:

1. Protecting endemic species using urban and landscaping habitats.
2. Protecting indigenous genetic biodiversity from introduced (new or exotic) species.
3. Improving social understanding and scientific capacities to study, monitor and evaluate biodiversity.
4. Ensuring effective participation in conventions, agreements, and protocols.
5. Implementing the relevant Biodiversity Strategy and Action Plan.

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NATIONAL BIOLOGICAL DIVERSITY STRATEGY
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I- <u>THE CONVENTION ON BIOLOGICALDIVERSITY</u>

Lebanon was the excellent host for the oldest civilisation and the Lebanese have   found uses for renewable resources since the discovery of red-dye in shellfish (Murex) and used cedar wood to build boats and ships. The silk industry once perfected in Kartaba has moved west to Cordoba in Spain and farther west to Cordova in Argentina. Ancient activities, coupled to population pressures and inadequate planning, have resulted in the degradation of the environment and relatively worn out ecosystems.

Right after World War I, awareness of the value of genetic resources of plants was realised and some seed collections started since 1930. With the establishment of the Food and Agriculture Organisation (FAO), more focus was made on the productive values of commercial plants and animals. Lebanon was a major participant in the United Nations programs and in the FAO activities.

During the last few years, the Lebanese society has taken serious steps and given more attention to environmental issues that have a direct impact on the public such as industrial discharges, domestic waste and wastewater as well as air pollution. Lebanon has recently signed a number of international conventions dealing with nature conservation including the Convention on Biological Diversity.

The government and non-governmental organisations have been actively involved in resolving and developing better understanding to environmental problems through awareness campaigns, international conventions and legal approaches.

The conservation and sustainable use of natural resources are major objectives of both public institutions and private societies at the international, regional and national levels. Regional organisations are focusing on problems related to ecosystems rather than socio-political boundaries. Population growth is leading to an increased consumption of natural resources and excessive demand, which results in exhaustion, impoverishment or extinction of these resources whether they are of biological nature (renewable) or material (non-renewable). The earth is facing serious environmental problems including pollution, soil erosion, climate change and ozone layer depletion. These gross changes in the environment, combined with increased human pressures on natural resources have a global impact on the loss of biodiversity.

Humans have discovered, used and altered very few biotic resources to fit their needs through domestication and selection. They also have used wild species

very extensively in many societies. The domestication process is a continuous phenomenon of life.

Species diversity refers to variation within a region among species of taxonomic diversity or richness in number of species. Ecosystem diversity covers communities or associations of species in terms of their abundance, structure, pattern, and changes, and in terms of interacting processes of predation, parasitism and mutualism. The Lebanese ecosystems are small and tight, and their biotypes are definitely struggling against a changing environment.

Wildlife represents those biotypes whose commercial and social values are not yet exploited. However, the national ecosystem is very rich, 9119 species (identified 1996) of which 4633 are plants and 4486 belong to the animal kingdom.

Lebanon has established legal commitments to participate in regional and international activities related to conservation and use of environment resources. These commitments include the Arab Center for Studies in Arid Regions (ACSAD), International Center for Agricultural Research in Dry Areas (ICARDA), Arab Organisation for Agricultural Development (AOAD), International Fund for Agricultural Development (IFAD), Mediterranean Higher Education (CIHEAM) and International Plant Genetic Resources Institute (IPGRI). Lebanon has also ratified or signed all international conventions related to global resources management and having direct or indirect impacts on biodiversity, such as The Basle Convention, The Montreal Protocol, The Convention to combat Desertification, Climate Change, Cultural and Natural Heritage (Paris 1972), Wetlands and the Convention on Biodiversity. At the United Nations Conference on Environment and Development (UNCED), held on June 5, 1992 at Rio de Janeiro, Lebanon was among the 156 nations who signed the convention. On December 14, 1994, Lebanon ratified the convention and complied with its objectives to study, save, use and share benefits resulting from biodiversity. To satisfy Article 7 of the Convention , the Country Study on Biodiversity was carried out during 1995-1996 with assistance from GEF/UNEP-UNDP in co-operation with the Ministry of Agriculture. Ongoing projects related to international conventions and receiving GEF assistance are Climate Change, Protected Areas (P.A), Ozone Office, Sustainable Development and Networking (SDNP), Capacity Building (C 21) and Biodiversity Enabling Activity.

II- STATUS OF BIODIVERSITY IN LEBANON

2.0- Overview

Lebanon is a highly mountainous country (3090 m highest peak) with extreme variability in climatic conditions, soils, and socio-economic status. With its long coastal strip becoming urbanised, it is certain that natural and commercial vegetation are under over-exploitation. The largest area in Lebanon is that covered by mountains, sparse grassland and desert areas ~ 31%. Agricultural and annual crops cover over one fifth of the country and it is reported that a high proportion of the population (30-50 %) is involved in agriculture or related activities.

Grazing areas with grassland and forbs add up to 15 % of the total area and barren rocks cover an area similar to forest land ~ 7%. Fruit trees are famous, popular and satisfy local needs with some export potential. The total area covered by these trees is over 5% and includes vineyards, deciduous fruit trees, citrus and bananas. Olives continue to constitute a major old, durable crop and are most abundant in North and Mount Lebanon areas. Vegetables are grown in winter and summer and provide a continuous market supply. The Mount Lebanon area used for vegetable production is the largest, being close to city market facilities.

Lebanon, being a small country, is a favourite area for the study and conservation of various flora and fauna. For each geographical region characterised by its own sociological features, there is a group of special plants and animals that reflect certain particular ecological conditions. However, this variability and the favourable climatic conditions are the direct cause for human overpopulation (400 inhabitants/km^2) which exercises severe destructive pressures on the environment, and endangers the biodiversity state. In Lebanon, over 9119 species of plants and animals were identified (20% estimate) and a higher number (43500) remains to be identified. Plant species count is 4633 and the animal kingdom species are 4486 .

2.1-Terrestrial Biodiversity

Regarding the terrestrial flora in Lebanon, half of the wild species of fodder plants are endangered due to uncontrolled urban development, over-grazing, and land reclamation which constitute a great threat to the habitat. Other types of plants are estimated to have a higher endemism and are not at a great risk of extinction. However, ferns face a 45.2 % risk, endemic plants 41.3 % and medicinal plants 6.8 %.

The destruction of the vegetation cover by various factors has disturbed the overall terrestrial fauna. A wide variety of vertebrates, of which birds are the most

abundant, are nowadays at a lower risk of extinction, specially after the decision of the government and the Ministry of Environment about banning hunting activities. Invertebrates, particularly insects, form the most abundant and widespread group of land fauna. Spiders are highly vulnerable and 21.8 % are endangered.

Many wild animals were already extinct by the beginning of the 20th century, like the Syrian brown bear, the Asian leopard, the Persian lynx, the deer, the Arabian gazelle and the golden hamster, in addition to the lion which had disappeared in the 16th century. Other species close to extinction include the wolf, the wild cat, the mongoose and the squirrel, whereas the rare species include three shrews, eleven bats, the weasel and the spiny mouse. Still exists a variety of vulnerable species like the four species of batsand, the common field mouse. The reptiles stand at 16.3 % risk, birds at 11% and mammals at 6.9 %.

2.2-Fresh water Biodiversity

Many disturbances affecting sources and rivers weaken fresh water communities. This results in the elimination of the ecologically weak species, specially those sensitive to pollution, and an increase in the number of taxa with high ecological valence. Drainage, pollution and human interference have drastically changed the fresh water ecosystem, and resulted in a high proportion of endangered species.

Quarries and sand removal activities had for a long time a major impact on both the flora and fauna and the surrounding environment. However decisions to plan these activities are relatively helping in conserving the remaining areas. The risk of extinction on fresh water fauna is very high for Plecoptera (81 %), Coleptera (11.4 %) and Ephemenoptera (8.7 %). Crustaceans are 8.2 % at risk, fish 4 % and molluscs 3.0 %.

2.3-Marine Biodiversity

The marine and coastal flora and fauna in Lebanon are considered to be Mediterranean with some sub-tropical elements. Phytoplankton, which includes all microphytic algae, constitute the basis of the food chain in the sea through their primary productivity. The micro and macrophytic benthic algae are highly affected by coastal pollution.

In addition, macro-zooplanktons are highly abundant in the Lebanese water and of various types, including crustaceans, which are prevalent, as well as fish species which are disturbed by early fishing and unsafe fishing methods. Savage urbanisation, industry, domestic wastes, garbage and illegal fishing methods are stressing and damaging local biodiversity. Because of the coastal sand and pebble extraction and urbanisation, the sighting of turtles and Mediterranean

monk seals is a rare phenomenon, even though there is a recent unconfirmed report of sighting of monk seals in North Lebanon. The sea horse is also severely threatened by loss of habitat. Of particular significance is the loss of local terraces which are rich in biodiversity and unique to this part of the Mediterranean.

2.4-Agro-Biodiversity

The construction of touristic resorts and other different projects had lead to the destruction of large sensitive zones where biodiversity is strongly endangered. The Introduction of new, more profitable crop varieties in place of traditional ones is exerting pressure on landraces and wildlife in the area. One shouldn't ignore the effect of overgrazing and natural hazards in destroying the natural habitat of many wild plants and animals.

Livestock biodiversity includes the wild types and local breeds which are quickly disappearing from the rural areas, in addition to other domesticated species that are not economically significant anymore. Furthermore, wild relatives are threatened by extinction due to excessive hunting or change in habitat and the local breeds are gradually being replaced as a result of their poor competence. Farmers who still have interest in landraces and local breeds are becoming fewer with time as they all belong to the elder generation.

Monoculture and imported technologies overwhelm the agricultural system and make the local germplasm highly incompetent in comparison to the economic quality and production of potential of the new systems .

III - <u>Current Capacities for Biodiversity Management</u>

The free economical system and the democratic regime allow for a multi-organizational system to exist in terms of higher education, agricultural research, environmental science and related training. Biodiversity education is still at infant age, though environmental awareness is expanding at a rapid rate and new curricula include environment education at elementary and secondary education levels. University education is trying to satisfy socio-economic requirements. Faculties are being developed to cater for applied sciences and technological subjects.

There are surpluses of graduates in many fields and a definite shortage of specialists in Biodiversity. Instruction courses are being added to curricula in some faculties, and germplasm research started few years ago with international and bilateral support. The present situation of Lebanese institutions involved in research and training is highly encouraging. Lebanon hosts over fifteen higher education institutions involved with general aspects of student training, but very few universities have programs directly related to biodiversity issues.

The faculties of agriculture and sciences at the Lebanese University (LU), the American University of Beirut (AUB), Saint Joseph (USJ) and the Holy Spirit University (USEK) have programs focussing on environment and Biodiversity .

Many institutions are young and depend on part-time specialists, specially the Faculties of Agriculture at Saint Joseph and SaintEsprit universities. It is evident that the institutional analysis carried out in 1997 indicated some kind of specialised interest in each involved institution. Saint-Joseph University has recently started a program on eco-tourism which sounds attractive to the Lebanese society.

The National Council for Scientific Research and particularly the National Centre for Marine Sciences have the necessary minimum of manpower and facilities, and are involved in serious environment and biodiversity assessment programmes. Interdepartmental programs (AUB) are being implemented to cover sustainable development and conserve nature. These programs help in the establishment of centres of excellence for research and training in specified fields.

Various reports have indicated the need for taxonomists, and some even consider that taxonomists are not only endangered but are on the way of becoming extinct. In Lebanon, over 9119 species of plants and animals were identified (20% estimate) and a higher number (43500) remains to be identified. Non-governmental organisations are expanding in size, number (35), and efficiency in raising environmental issues to top priorities of mass media,

resulting in the involvement of the public and its contribution to more logical decisions. A sizeable number of NGO's focuses on Biodiversity with evident interest in the plant kingdom, notably, trees. Many NGOs are young and consequently need to build their own capacities. Research to identify, study, conserve and use these species is needed. Institutions have to be strengthened to carry out these activities. Training is badly needed in the fields of taxonomy, genetic resources, conservation (in-situ, ex-situ), ecology, resource management, forestry, planning and data processing.

Conservation of Biodiversity is a new venture to the Lebanese public institutions. There was formal awareness about environmental management and conservation long ago. The summary of activities in terms of legislation and biodiversity value to the decision makers, shows that in the past few years a sizeable number of habitats was declared and legalised as protected areas (a total of 10). The Ministry of Agriculture and the Ministry of Environment are joining hands to encourage the political system to take decisions for the benefit of biodiversity conservation and richness in Lebanon. The ten-year development plan, started in 1993, did not include any direct budget allocation to biodiversity conservation. However, health and environment received 7 % of the total budget, and wastewater projects received 13 %. Irrigation and agriculture received $360 M from the plan. These have direct and indirect relationships with the status of biodiversity. Bilateral and international support are directly related to biodiversity issues and the three protected areas declared by law (Horsh Ehden, Palm Island and Arz-El-Chouf) are temporarily totally managed and operated via international financial resources. All other protected areas decreed by law and statutory order receive formal support in either administrative, legal or financial forms. Very recent legislation (October 1998) established the wetland reserve of Tyre beach, south of Tyre, as a natural habitat for marine and fresh water biodiversity.

Lebanon started management of resources since 1921 (Fishing), 1925 (Water pollution), 1939 (Protected Areas), 1949 (Forest code), 1952 (Hunting), 1974 (Hunting council) and legislative activities continued slowly in the eighties and speeded up in the nineties. Adoption, ratification and implementation of international conventions -- directly or indirectly related to natural resource management, conservation and sustainable use of Biodiversity -- were major objectives and rushed activities of the Lebanese Government recently.

Public awareness and participation thrive in fertile grounds in Lebanon. There are seven local television stations, which provide free access in educational issues. A major proportion of the Lebanese society has access to Internet and satellite information. The press media coverage is enormous; the number of daily newspapers exceeds 15, weekly and monthly magazines exceeds 20, and pamphlets, posters, guides, and other publications are countless. Some of these publications are issued in French and English. Of notable value to Biodiversity are two magazines: Environment and Development (published privately) and

Environment (published by MOE). Both consistently cover biodiversity issues. Activities on biodiversity are very frequent and receive full support from all media. Beirut also publishes more books than all the countries of the region. Apparently, Lebanon seems to be overqualified in terms of educational institutions and awareness media.

IV - <u>Purpose</u>

The overall purpose of this National Strategy and Action Plan is to provide a framework for the protection, restoration, sustainable use, monitoring and benefit sharing with stakeholders of all biodiversity in Lebanon. This would be accomplished through:

a. establishing a National Biodiversity Unit (authority)

b. launching a major National Public awareness campaign

c. establishing a National BD information system

d. increasing resources devoted to BD conservation

e. expanding the protected areas system

f. establishing ex-situ conservation practices

g. utilising modern technologies for conserving endangered and rare endemic species

h. modernising harvesting technologies towards sustainable use.

i. developing and implementing legislation for the extension of legal protection to species and habitats

V- Guiding Principles

The Lebanese recognise that:

- Biodiversity is a key component of our cultural heritage; Lebanon is famous for its cedars.
- Our ancestors used biotechnology to extract red-dye from shellfish; figs saved lives in times of food shortage.

We are proud to live in Lebanon, where:

- Snow and water skiing are possible in the same day.
- Definite winter rains and dry warm summers are a must.
- Temperate plants give excellent fruits and subtropical crops are as delicious.
- Highly variable ecosystems allow for all forms of life to exist and flourish.
- Clean air and healthy fresh water are the norm.

We acknowledge and appreciate that:

- Biological diversity conservation is a moral responsibility that should be nourished to flourish with individuals, institutions, and public authorities.
- Biodiversity values (known and yet unknown) are to be acknowledged on the social, economic, and national levels.
- Users of BD components sustainably may be compensated or rewarded. Polluters or degraders should be taxed.
- Development programs should be ecologically sound and their impact on the environment and BD very keenly examined.

We are very keen to:

- Carefully study and cautiously handle exotic germplasm.
- Monitor the spread and competitiveness of introduced biological material.

VI - <u>Management and Conservation of Biodiversity</u>

6.1- <u>Terrestrial Ecosystems and Natural Habitats</u>

Goal

To protect Lebanon's terrestrial biodiversity from degradation and ascertain their availability for environmental and economic benefits.

Objective 1

Provide stability for the ecosystems to permit the establishment of ecological equilibrium.

Analysis (Rationale)

The absence of well-established data sets hinders us from getting a precise idea about both qualitative and quantitative distribution of Lebanese terrestrial ecosystems. Depending on the source, the means of evaluation and the definition of the different natural habitats, the area covered by these ecological units varies between 58 % and 63 % of the total surface of the country.

Rough estimates also apply for the distinction between forests, shrub lands and grasslands whereas, in some cases, the term rangelands regroups the two latter categories as they are evenly grazed. However, the majority of expert judgements agree that forests surfaces reach approximately 7 % only.

Based on these estimates, trends indicate a decrease in forest surface (134,703 ha in 1965 v/s 119,774 ha in 1997) and an significant increase in cultivated areas (132,743 ha in 1961 v/s 296,554 ha in 1997). We are far from the 20 % forest coverage that Lebanon should have.

It is only fair to mention that the MOE and MOA give more and more consideration to this issue. While MOE deals with the problem of "protected areas" and the "law of environment", MOA has elaborated in 1987 a short term plan to boost terracing, reforestation, fire fighting, forest management, as well as other practices.

The problems affecting the biodiversity of Lebanese natural habitats can be divided in two major categories, according to their origin: natural or man-made.

The first group includes all the events that are due to extreme climatic phenomena e.g. excessive snowing, flooding, drought, global warming, fire

hazards occurring from lightning or from an exceptional elevation in temperatures during the drought season.

The second category results from uncontrolled and/or abusive anthropogenic activities such as:

- Deforestation: either for clearing more space vowed to urban purposes, or to create new agricultural areas.
- Quarries tapping: which is the most drastic form of natural resources exploitation. Their impact is not limited only to their location (where the concerned ecosystems are completely eradicated) but extends also to the neighbouring and downhill habitats.
- Logging in view of firewood and charcoal production, as well as for wood industries.
- Fire: originating from arson (for the same reasons as pursued by deforestation) or accidentally induced (by the carelessness of pick-nickers, and the unaware behaviour of occasional visitors)
- Overgrazing: mainly in the rangelands and, due to their present state of accentuated degradation, the extension of this practice to nearby forests.
- Hunting: practised on a large scale and throughout the year, despite the present legislation that forbids hunting totally. It aggravates the dangers that already threatens the Lebanese avi-fauna (intoxication by pesticides) and the negative impacts on the equilibrium of the eco-systems (increase of pest populations)
- Pollution: by uncontrolled dumping, disposal and discharge of all kinds of waste (domestic, agricultural, urban, industrial) into these ecosystems.
- Urban development: correlated to anarchistic housing projects and urban centers, construction of new roads and highways without taking into account the environment with all its components.

The consequences are as much alarming as they are numerous and widespread, especially when some of them reach an irreversible stage. It is well known that alteration and, a fortiori, disappearance of the vegetation cover modify the flow of matter and energy through the ecosystems.

The four provincial workshops held previously highlighted the major impacts on the Lebanese natural habitats. They are mainly:

- Loss of habitat (for both flora and fauna, affecting particularly endemic species) and therefore loss of genetic resources and variability.
- Decrease of under ground water surfaces and capacities, as a consequence of the increase in runoff water along the slopes. Many regions face problems of water availability either for drinking or for irrigation.
- Relative increase in the river flows and, in such cases, the risk of flooding. The impacts would be directly observed on the riverbank vegetation and ecosystems (Ripisylves).

- Total imbalance in the constitution (species composition) and the spatial distribution of the Lebanese terrestrial ecosystems.
- Regression of many climatic formations into their degradation stages, whilst those that were already in a delicate situation have disappeared.

Strategic Response

The Ministry of Agriculture is planning to:
1. build terraces with an average of 1,500 ha per year, and cultivate them with seeds and wood transplants,
2. produce 3,5, and 9 million wood transplants in the first , second and third year, respectively,
3. increase the number of forestry nurseries from 9 to 15 nurseries, distributed on all Lebanese territory during the same period, and protect and monitor against natural hazards (e.g. forest fire and pest attacks) through the:
- provision of 26 fire-engines for the different forest areas in Lebanon
- construction of water reservoirs in areas exposed to fire incidence
- creation of control centers
- purchase of three fire helicopters
- application of Integrated Pest Management in forests

On another hand, the Ministry of Environment is facing a lot of problems for undertaking necessary actions to conserve and to protect the environment. This is mainly due to the shortage in qualified human resources and the reluctant collaboration of the institutions involved in the same process.

The Ministry of Environment is planning to:
1. identify clearly the causes of loss in Lebanon's biodiversity.
2. Insure the implementation of adequate measures in order to establish and fulfill the sustainable development concept for the generations to come.

Action Agenda

Immediate term (short) 1-3 years

1. Preventing and combating forest fires.
2. Regulating hunting, including obligatory tests for acquiring necessary permits.
3. Establishing ecological tourism associated with public awareness and environmental education.
4. Legislate to eliminate the conflict of interests between the governmental institutions.

5. Identification of the potentialities of the Lebanese natural habitats and terrestrial ecosystems.
6. Creating land-zoning maps.
7. Protection of remarkable natural habitats , characterised by their ecology
8. (endemic species, uniqueness…) , their historical and /or socio-cultural and background (cedar forests , the valley of Qannoubine called "the valley of the Saints" , Aammiq wetlands ..)

Medium term 3-5 years

1. Develop, finalise and monitor an exhaustive database. Regular updating of this data bank would ensure a preventive approach towards the moderation of the impacts of natural hazards as well as a quick response to anthropogenic environmental changes.
2. Rehabilitation of abandoned or degraded zones.
3. Reforestation, along with related issues as forest management, plant nurseries , choice of species to be used in this process.

Long term 5-10 years

1. Encouraging and supporting research projects (fundamental as well as applied) related to the specific goals set for the development of terrestrial ecosystems.
2. Providing qualified staff to carry out efficiently the identified measures, on condition that necessary funds are to be ensured properly.
3. Solving the problem of overgrazing: identification and promotion of adequate fodder plants and pasture areas.
4. Scientific and technical studies to promote development and sustainable use of medicinal plants and melliferous species.
5. Protection and management of the ripisylves.

Targets and Indicators

The final target is to establish full natural green cover to contribute in water saving, air purification, climate stability and biodiversity conservation under natural conditions.

The indicators to use are: plant intensity, reappearance of species thought extinct or endangered, leaf area midi, plant age (s) and size(s), species richness, and changes in fauna populations and species.

Objective 2

To manage forests and ranges for productivity and sustainability.

Analysis

Forest management is a sustainable and multifunctional process. It aims to ensure the perenniality of the ecosystem, to maintain its potentialities, and to improve and sustain its functions. Lebanese forests have particular features (complexity, fragility, and specificity). Any undertaken actions have multiple impacts (soil evolution, micro-fauna) and could be irreversible for a long time. Benefits are a long -term objective, thus implying sustained efforts.

Concerning the natural environment, the socio-economic needs, farmer practices, physical characteristics, vegetation, trees, shrubs and richness in fauna, harvest of forest resources is an eminent need.

Sensitivity maps of natural habitats can be drawn, based on factors such as topography, nature and structure of the vegetation. Forests are also a source of accessory or secondary products (seedlings, medicinal and industrial plants, fruits, mushrooms, honey). This issue is to be seriously considered due to the positive socio-economical interest of these products amongst the local population. In fact, and to the opposite of wood production, this mode of exploitation is widely spread in Lebanon. Unfortunately, it is completely uncontrolled and over-practised, especially when it comes to charcoal and wood art manufacturing. On the other hand, picking of pine kernels is well organised, particularly in private-owned forests whereas public woodlands are totally neglected.

Proper forest management satisfies present and future needs of men in terms of products (timber, art wood, firewood, industrial plants, game animals) and services (biodiversity conservation, environmental protection and equilibrium, recreational activities).

Main Constraints

Lack of co-ordination, law enforcement incentives and individualism.

Strategic Response

The Lebanese government is ready to: (1) implement sustainable use practices taking into consideration the complexity of the social and legal systems, and the ecosystems fragility, and (2) update and implement the law of forests and provide incentives for communities caring properly for their forest and range areas. These actions require co-ordination between the Ministry of Agriculture, the Ministry of Finance, the Ministry of Tourism, and the Ministry of Municipalities, as well as the law enforcement and the promotion of public awareness by the Ministry of Interior.

Action Agenda

1. Establish a forest management plan.
2. Build up capacities that are currently poor.
3. Co-ordinate between involved institutions (Agriculture, Environment, Research and Education).
4. Organise hunting to sustain equilibrium in ecosystem, provide economic incentive and allow for a recreational sport activity.
5. Reduce grazing pressure and develop pasture conditions to maximise animal products.
6. Reduce tourism (e.g. no visits during fire hazard season, Sept-Oct).
7. Choose the optimal criteria (age and diameter) for a sustainable use.
8. Determine the ideal structure of forest tree populations.
9. Spatial and temporal organisation, in other terms planification, of all actions considering each and every previously identified forest product or service.
10. Follow-up and monitor (1) to make sure that the suggested actions are correctly undertaken, (2) to correct any occasional mismanagement, and (3) to be able to supply quick remedy for any natural hazard outburst.

Targets and Indicators

The major target of managing terrestrial biodiversity is to adopt practices leading to sustainable use with local community involvement.

Indicators to use are wood harvesting (quality and quantity), recreational activities and their socio-economic impacts, number and extent of fires, amount and value of medicinal and aromatic plants.

6.2- <u>Fresh Water Biodiversity Conservation</u>

Goal
  To conserve fresh water biodiversity, manage and wise use fresh water resources sustainably.

Objective
  To save, use and study biodiversity in fresh water ecosystem.

Analysis
  Total fresh water for Lebanon is estimated at 9.2 BCM, of which 4.3 BCM are considered as overflows from seasonal rainfall. The rest is ground water.

  Lebanon houses fifteen permanent-flow rivers and twenty-three rivers having seasonal flow. The topography of the country having two chains of mountains running from the north-east to the south, with various elevations up to 3000 m, impose various micro-environments for terrestrial and fresh water biodiversity. The western Mount Lebanon chain rainshadows the Bekaa' valley and results in a relatively dry and cold area. The Anti-Lebanon mountains, east of Bekaa' valley are more inland and receive lower amounts of rain. Higher humidity over the Mount Lebanon concentrates water sources on the western side. Only three rivers start inland. The Assi, in northern Bekaa', flows north through Syria, the Hasbani flows south through Palestine, and the largest Lebanese river, the Litani, crosses the Bekaa' valley southwards and winds west inside the southern valleys ending along the South Lebanon coast (Qasmieh). All other rivers flow west from Mount-Lebanon directly to the Mediterranean so they are relatively very short. The Kabir river is the longest and is less than 60 km long. The highly variable flows and the steep, stony slopes give difficult and characteristic environments for the hardy plants and animals.

  There are 1100 water sources (fountains) starting on mountain slopes or sides and offering permanent flows to some rivers and a source of domestic and irrigation water for the villages scattered all over the country. Many of these sources are valuable in terms of tourism, heritage, and water quality. The largest flows (sites of attraction) are noted for Jeita (main source of Beirut water), Afqa, Yammouni, Ain Zarka, Wazzani, Safa, Shamsine and Berdaouni.

  Marine fresh water sources are noted all along the Lebanese coast. These sources are not yet exploited. They may add to the wealth of Lebanon in this important resource. Located at about 500 meters from the coast, the Chekka source is estimated to provide 300 million cubic meters annually. Also 300 - 400 million cubic meters may be the estimated flow of Qasmieh source. Other sources are noted in the sea waters around Saadiate, Wadi El Zeina, and Sour. There are probably other sources that need further identification.

The dams, ponds and pools system in Lebanon is not very extensive. The only dam of Qaroun has a capacity of 220 million cubic meters. Artificial lakes of notable size are Mrouj, with a capacity of 380 thousand cubic meters, and Kawashri, with a capacity of 120 thousand cubic meters.

Perhaps, the most threatened forms of life, under the prevailing conditions in Lebanon belong to organisms inhabiting the fresh water ecosystems. Water is a limited resource in semi-arid areas. Though Lebanon is considered a wet country in comparison with countries of the West Asia region, the present water use on per caput basis is expected to drop from 1533 m^3 to 767 m^3 by the year 2025 if water resources are not managed properly. Management, need and the present way of life, requiring enough water for irrigation, household use and industry, resulted in extreme pressures on the freshwater ecosystem which was already fragile and harsh for the Lebanese geomorphology. The seasonal rhythm of typical Mediterranean rainfall and the steep slopes of most river basins constitute very drastic pressures on fresh water organisms. Most river flows are seasonal, dry basins are the norm and organisms native to these habitats are very hardy, and should be able to survive under these hard variable conditions.

Piping fresh water for urban use, bottling the highest quality water, improving irrigation systems by cement canals or pipes, lining drainage canals along road sides, and pumping water for irrigation had negative effects on moisture availability on the fresh water ecosystem.

Chemicals from factories and sewer wastes have changed the nature of the rivers they are dumped in. The Ghadir river, crossing Kfarchima through the Southern suburbs of Beirut, is a dead river. No living organism can be found in Ghadir waters as these waters are heavily polluted with factory wastes. Visitors of the touristic valley of Bardaouni, Zahle', can tell from the smell, that the amount of sewer water exceeds that of fresh water during the low-flow season, which starts in mid-summer. Practically all distant areas from coastal cities, have the problem of sewers discharging into lower areas, mostly valleys, aggravating the upper fresh water system and endangering the underground water with pollution.

Over 70 % of fresh water sources, tested (1996), were polluted. The open-bottom sewer tanks and sewer surface discharge constitute a serious pollution hazard to groundwater. Biological indicators of pollution are increasing in most fresh water sources and the degradation in habitat is definite.

On average, the Lebanese have a low intake of about 4 kg of fish yearly, and, in some cases, may have no fish protein intake at all, because of unequal food distribution. Fish protein is the cheapest among meats, especially that coming from fresh water sources. Single cell proteins are efficiently produced by a large number of algae (*Spirulina* sp.) that are abundant in Lebanon waters, and may

be economically used. Fresh water fishing is practised as a hobby. Fish species inhabiting fresh water sources are not numerous and their carrying capacity is low. Direct risks combined with indirect ones may lead to a catastrophic situation. The use of explosives, poisonous chemicals, and small-eyed nets for fishing reduces fish populations and endangers other plant and animal species. Chemical and organic pollution of water canals, storage dams, and pools constitute a threat to biodiversity in aquatic habitats. The almost complete disappearance of *Mugil* fish from the Awali river near Sidon, is an example of pollution and over-fishing.

Main Constraints

- Insufficient integration of environment and development in national planning and project execution.
- Land tenure laws are not well defined, specifically along water bodies and riverbanks.
- Communication between the scientific community and policy makers is very insufficient.
- Fresh water biosystematists are very scarce.

Strategic Response

The Lebanese government is spending lots of efforts to conserve nature. Multi-institutions are involved in activities related to fresh water issues. The importance and strategic richness of fresh water is widely recognised. Expansion of storage reservoirs (dams, lakes), well-drilling, hydro-electric powerplants are responsibilities of the Ministry of Hydro-electric Resources. Irrigation water plans are executed by the Ministry of Agriculture. The Ministry of Public Works is in charge of road construction and riverbed management. Industrial and municipal pollutants to fresh water come from various sources with different administrative references.

These institutions will integrate plans and join in activities related to keeping the fresh water habitat wet, clean and natural. The government will also build capacities (locally and overseas) to manage more scientifically fresh water biological resources.

Action Agenda

Immediate term (short) 1-3 years

1. Establish a water quality control system and implement safe water use programmes.
2. Well-drilling should be managed to conform to aquifer capacity.
3. Water sources polluters should be asked to reduce pollution, pay to rehabilitate or encouraged to alleviate pollution pressure.

4. Impact assessment of projects dealing with water storage (dams, lakes) is needed prior to project execution.
5. Exercise very close and strict conditions on introducing new species.
6. Wetland conservation areas should be established and aquaria set-ups must be implemented.
7. Implement public awareness programmes in water use, quality, saving.

Medium term 3-5 years

1. Forest control programmes should expand to cover river basin habitats.
2. Establish a data base system for fresh water richness and endangered species.
3. Expand fresh water fish farms to reduce pressure on natural habitats.
4. Strengthen plant aquaculture to produce protein and organic matter efficiently.

Long term 5-10 years

1. Mountain lakes have to be extended all over appropriate areas including protected areas.
2. Research, building of capacities and studies on fresh water biodiversity should be expanded and supported.

Targets and Indicators

The main target of fresh water conservation is to reduce the number of endangered species and provide a habitat for biodiversity richness.
   Indicators to use are:
a. change and richness in species
b. chemical and biological pollutants
c. sediment change with time
d. number , capacity and distribution of water bodies
e. number, area, distribution and richness of wetland protected areas.

6.3 - <u>Marine Biodiversity Conservation</u>

Goal

To protect Lebanon's coastal and marine Biodiversity and develop their resources in a sustainable way.

Objective 1

To protect coastal and marine ecosystems and Biodiversity.

Analysis

The Lebanese coastline is about 220 km long along a north-south axis in the eastern Mediterranean. Along the coastline there are 3 bays, several headlands and river deltas. The coast is sandy or pebbly. Typical rocky terraces represent an important feature of the coast. Most of the sandy beaches and sand dunes to the south of Beirut have been lost to development and urbanisation. Beach erosion, sand and pebble extraction from the coastal areas and river beds, together with coastal erosion are major problems that need to be addressed.

The Lebanese coastline is highly industrialised (relative to other parts of the country) and has a very high population density. It is home to 70 % of the population, and about 73% of the national GDP is produced in the coastal zone. Illegal constructions have created irreparable damage to the coast. This state of affairs coupled with lack of law enforcement and land use plans has resulted in the gradual exclusion of the public from the coastal zone .As a result there is apathy and, at times, a lack of co-ordination amongst the various stakeholders. The Advisory Council for the Environment that will set -up through the Ministry of Environment is expected to take on this co-ordinating role.

It is fortunate however, that there are still a few coastal areas that have preserved their natural biotopes and beauty. These, together with a number of river valleys, must be protected along with the Palm Island reserve. It is precisely along this thinking that marine turtles, after a long absence, have recently been spotted.

The coastal waters, however, allow for a rich biological system. The marine ecosystem comprises 1685 species of fauna of which 50 are commercially important fish species .The number of planktonic primary and secondary producers is over 1250 species. These await proper documentation and conservation because they are subjected to pollution from land based sources (industry, sewage discharges, power plants and oil lines just to mention a few).

Main Constraints

Lack of institutional capacity, non-oriented legislation, and hesitant law enforcement are major constraints in addition to budgetary restrictions (more significantly inefficient budgetary allocations and waste). On the other hand, the absence of co-ordination and harmonisation of various competing needs and requirements further complicates an already difficult situation, thus causing irreversible damage to the ecosystem and biodiversity.

Strategic Response

The government of Lebanon will enhance the public awareness through the well-developed media and education system. Institutional capacities will be built by expanding recruitment and training of specialists, locally and overseas. More budget is allocated to alleviate sources of marine pollution and to introduce clean industrial practices. Legislation will be reviewed, updated and consolidated.

Action Agenda

Immediate term (short term) 1-3 years

1. Identify hot spots and land based sources of pollution in addition to man-caused maritime sources of pollution such as petroleum.
2. Limit further industrial development along the coast.
3. Introduce incentives for a clean industry and legislate for "polluter pays" principle.
4. Conduct environmental impact assessment surveys prior to construction of treatment plants.
5. Develop National Action Plan within the framework of Mediterranean Action Plan.

Medium term, 3-5 years

1. Conduct a comprehensive survey of the situation of the coastal zone and review land use maps and legislation. Legislate for the necessity of co-ordination within the public sector in particular.
2. Enhance law enforcement authorities and put into place a co-ordination mechanism. Introduce the concept of the environment police.
3. Establish contingency plans to combat pollution or mitigate their harmful effects.
4. Organise a network of observation stations centred around the National Centre for Marine Sciences or the NCSR , and assist in the rehabilitation of research centres in general

5. Develop partnership and co-ordinate action with all concerned parties such as the government, the industry, and NGK's, and conduct public awareness campaigns targeting society at large.
6. Integrate action with international activities and pool expertise.

Long term, 5-10 years

1- Establish natural reserves and marine parks representing major eco-geographical areas.
2- Develop an environmental monitoring programme for pollutants and other bio-indicators.

Targets and Indicators

The main target should be having a natural ecosystem with a minimum of human disturbance and yet allowing for natural and non-destructive recreational activities. Indicators to monitor should include:
- Organisms indicating organic pollution.
- Other bioindicators as suggested in recent literature.
- Litter and tar balls along the coast.
- Chemical indicators of water quality.
- Rate of coastal erosion and sea level change.

The indicators to monitor in the marine ecosystem consist of:
- swimming water quality (coliforms, flora, fauna, heavy metals, organic pollutants as oil and pesticides).
- amount of litter on beaches.
- presence and intensity of tar balls.
- intact coast stretches and their proportions.
- water turbidity and sediment deposition.

Objective 2

To use marine and coastal resources in a sustainable manner by creating partnerships with the stakeholders, in particular, the local communities.

Analysis

Fishing in Lebanon is traditional and should remain so. There are no trawler fleets as there are no trawling grounds. Statistics on fisheries including number of fishermen and fishing boats are at best educated guesses. It is estimated that the annual catch is between 4,000 and 6,000 tons. Imported fish, mostly from

Turkey, Egypt and from the Gulf, amount to 6,000-10,000 tons per annum. Based on these estimates annual fish consumption per capita stands at 3-5 Kg.

Fresh local fish are well appreciated by the Lebanese, even though market surveys indicate a lack of specialised knowledge as to the origin of the fish people normally order in restaurants as local fresh fish. There is potential in developing and marketing the high value of local fish. This will increase the market value of the local fish and consequently fishermen will be more appreciative of the value of legislation aimed at their conservation and sustainable utilisation. It is unfortunate that lack of law enforcement and illegal fishing practices are stressing the populations. In the absence of any studies on fish stock assessment, it is not possible to confirm the belief that some of these quality fish are becoming rarer.

Mostly because of financial considerations, Lebanese have abandoned many of their traditional cottage industries that were linked to the sea. There are numerous salt extraction ponds that could be revitalised, coupled with other traditionally coastal practices such as olive oil and carob extraction. A whole new meaning could be given to the idea of the integrated village along the coast.

In this context, it is relevant to consider introducing new industries such as aquaculture like in neighbouring countries such as Cyprus. Such practices will ease the pressure on wild stocks and, at the same time, will provide employment to fishermen.

Main Constraints

Weak law enforcement and need to legislate or modernise existing legislation. Focussing solely on sectorial interests (fishing) without giving due consideration to other interests because of the lack of co-ordination amongst stakeholders and incentives for alternative activities. Absence of in-service or adult education campaigns. Because fishermen are a vocal group, there is apathy on the part of the politicians as regards any action which could be perceived as limiting the activities of fishermen. Past experience has shown this to be true.

Strategic Response

The government undertakes to update legislation and to enforce fishing regulations. There is a need to educate fisherman before issuing fishing licenses and to explore possibilities of introducing alternative activities. These activities traditionally rest within the authority of the Ministry of Agriculture, the Ministry of Interior, the Ministry of Education and the Ministry of Transport.

Action Agenda

Immediate term, 1-3 years

1. Enhance the economic impact of monitoring programmes such as coastal quality monitoring for bacterial indicators, in order to enhance the market value of the local beaches and produce.
2. Study the fishing sector scientifically (practices, needs, potential, and stocks).
3. Develop new legislation or modernise existing ones as regards fishing periods, fishing technology, gear, etc. to protect turtles and marine mammals.

Medium term, 3-5 years

1- Identify all types of traditional industries that were marine oriented such as salt production and sponge fishing.
2- Create partnerships with the local population, particularly the fishermen and local municipalities. NGK's could play a catalytic role in this.
3- Develop training programmes and awareness campaigns, particularly as regards the importance of conservation of biodiversity.

<u>Long term, 5-10 years</u>

1. Compile an updated national database of local biotopes, flora and fauna. Specify species that are under-utilised or with potential for economic impact. Highlight the unique nature of terraces and the coastal historical settlement sites since prehistory (e.g. sites used for the manufacture of stone tools in Rauche)
2. Study the potential of marine fresh water sources.
3. Enhance the concept of integrated village developing traditional industries and other related activities associated with coastal areas such as olive oil and carob production.
4. Develop new sectors such as mariculture in order to improve employment conditions of marine operators including fishermen (co-operatives). Local environmental conditions are more favourable than the western Mediterranean basin.
5. Highlight the cultural, traditional and artistic significance of the sea by encouraging non-destructive traditional sports.
6. Put into place a co-ordinating mechanism of stakeholders.

Targets and Indicators

The target is to exploit resources sustainably.
    Indicators to monitor are:
- Periodic fish stock assessment, fishing practices and price fluctuations.
- Water quality and quality of local wild fish.
- Bioindicators, such as exotic organisms, migratory forms and rare species, including harmful alga bloom causing organisms.

6.4 - <u>General Measures for the Conservation of Agrobiodiversity in Lebanon</u>

Goal

To protect Lebanon's agricultural diversity from degradation, and to maintain agricultural resources availability, while maximising both environmental and economic benefits.

Objective 1

To protect the agricultural ecosystems and to maintain native biological diversity.

Analysis

Lebanon is currently experiencing a tremendous loss of biodiversity primarily due to the conversion and degradation of habitat. Biological resources are degraded and lost through activities such as:

a) The conversion of agricultural and wild lands to urban areas.
b) Soil erosion, desertification and deforestation.
c) Indiscriminate use of agrochemicals.
d) Pollution of water resources and disposal of solid wastes and sewage.
e) Changes in farm animal production systems, from large and extensive to small and intensive.
f) Disuse of many traditional native plants and animals.

The increase in population growth and associated development has led to an unprecedented rate of genetic erosion. Agrobiodiversity in Lebanon is further diminished due to economic inflation, poverty, negligence and illiteracy of a significant proportion of people. Sustainable land use practices are not common in Lebanon, natural and agricultural reserves are not available, and the support of the national authorities and international community is limited.

Native biological diversity is a natural resource that must be protected and maintained. To maintain and increase the levels of agricultural productivity, agricultural ecosystems must be protected and wholly or partly conserved.

Main Constraints

- Population pressure; internal, regional and international migration; and associated development.
- Conversion of agricultural and wild lands to urban uses.
- Lack of agricultural land use planning and zoning.
- Environmental illiteracy among the Lebanese people.
- Introduction of new crop and livestock varieties and modern production technology.
- Expansion of crop monocultures.
- Lack of scientific research.
- Israeli invasion in 1982/1996 and bombing of the southern part of the country on daily basis.

Strategic response

The government should set priorities to enforce and implement existing environmental policies and measures to help preserve and conserve our natural resources. Sustainable policies and regulations must also be updated or initiated.

Ministries are required to propose agricultural land use planning and zoning. The planning policies must be enforced through penalising and removing illegal constructions and developing arable lands. Also, land classification and land use coding must be introduced as soon as possible.

Innovative approaches to in-situ and on-farm conservation must be initiated along with policies for management of soil, vegetation and animals. The government should recognise the rights of the farmers. This includes the right to benefit from, to share and to further develop germplasm, as well as the right to refuse appropriation and commercialisation. Establishing procedures for Prior Informed Consent in order to prevent biopiracy is also essential.

Action Agenda

Immediate term (short) 1-3 years

1. Conduct environmental/economic assessments for new construction projects, buildings, roads, etc., in agricultural areas.
2. Provide more executive authority to the Ministry of Environment to protect agrobiodiversity.
3. Implement legislation for the sustainable use of natural resources.
4. Support research on sustainable use of resources, applied agrobiodiversity, grazing pressure and biological diversity, and encourage research on native forage crops.

<u>Medium-term, 3-5 years</u>

1. Establish land use and zoning standards and policies.
2. Establish traditional farms to maintain and propagate the traditional or "heritage" varieties or breeds that are being replaced by "modern" varieties.
3. Establish a service to facilitate the exchange of material between farms, and disseminate local or regional collection to appropriate sites.
4. Establish nature reserves on several sites representing the major eco-geographical areas of Lebanon, that have a wide diversity of naturally growing plants and animals, and with as many wild relatives of agricultural crops as possible.
5. Establish at least one botanical garden for ex-situ conservation of perennial crops including cultivated trees, annuals and biennials.

<u>Long-term, 5-10 years</u>

Establish a central genebank, where the different aspects of ex-situ conservation are performed via 1) survey, collection and preservation of genetic resources; 2) evaluation and documentation of the collected material; and 3) breeding based on clearly defined goals and objectives.

Targets

To establish the National Steering Committee for the Conservation of Agrobiodiversity (NSCCA) as soon as possible. This committee will be the main coordinating body in charge of planing and monitoring the execution of the long, medium and short-term actions of the BSAP.

Indicators

Within 6 months, the BSAP must have been adopted by the parties involved in the NSCCA. The founding meeting must take place before June 1999, and must be accompanied by an awareness campaign about the BSAP and the NSCCA.

Objective 2
To protect agrobiodiversity from deleterious agricultural practices, and to develop and implement policies and practices to minimise loss in genetic diversity.

Analysis

Misuse and abuse of land have been two major causes of arable land degradation. Deforestation, wastes and agro-chemicals are relatively as important as the misuse of lands in the rural areas.

Indiscriminate and uncontrolled use of pesticides, as well as over utilisation of agricultural systems is leading to genetic erosion and loss of agrobiodiversity.

Immediate development of policies to control pesticide use, studies to assess their impact on biodiversity, as well as public awareness campaigns are needed.

Agrobiodiversity conservation depends on sustainable use of resources upon which agricultural production is based. Therefore, sustainable agriculture and integrated natural resources management are key factors for maintaining agrobiodiversity.

Main Constraints

- Indiscriminate use of agro-chemicals.
- Lack of an effective extension office.
- Lack of agricultural education, training centers and environmental programs.
- Environmental illiteracy among the Lebanese people.
- Economic competition between agricultural sector and other sectors.
- Reluctance of government officials to implement environmental policies.

Strategic Response

The Ministry of Agriculture will be required to review their present mandates and policies in terms of introduction of new crop cultivars, livestock and technology. A policy and campaign for public awareness and training in agrobiodiversity must be developed.

Action Agenda

<u>Immediate term (short), 1-3 years</u>

1. Reduce excessive use of agrochemicals through publications on integrated pest management, broad-spectrum pesticides, multiple cropping/season, extension programmes, etc.
2. Implement environmental education in schools.
3. Develop agrobiodiversity extension programs and training centers.
4. Issue guidelines for the conservation of agrobiodiversity.
5. Develop an education campaign on biodiversity conservation, to increase public awareness of the threats to agrobiodiversity.

<u>Medium-term, 3-5 years</u>

1. Develop a framework to assess the potential impact of agrochemical on biodiversity, and to identity the levels of biodiversity that are likely to be affected.
2. Develop incentives, taxation measures and penalties.
3. Regulate grazing.

<u>Long-term, 5-10 years</u>

Develop a better understanding of the impacts of the loss of genetic variability due to chemical stress.

Targets

To increase the use of sustainable farming practices in order to enhance agrobiodiversity conservation. These practices include integrated pest management and soil and water conservation.

Indicators

- Mechanism established for the continuous update of the legislation of pesticides and agrochemical use.
- Increased area of organically and ecologically cropped lands.
- Expansion of markets for organic and ecologically produced foods.
- Survey of pesticide and other chemical residues undertaken, and results published.
- Training programs for rural NGOs and farmers associations and cooperatives initiated.

Objective 3

To establish a national biodiversity database for documentation and monitoring of biodiversity.

Analysis

Little information is available on status and trends of agrobiodiversity in Lebanon. The lack of consistent, comprehensive data on the diversity components at the national level indicates that more information is required to understand and manage agrobiodiversity. No comprehensive database was found on the status and changing trends in use of native food crops, native plants, mirco-organisms and livestock. Another important concern is the absence of co-ordination of available data among concerned agencies and limited research on agrobiodiversity.

Accessible information on existing biodiversity, collaborative research, and standardised methods of assessing biodiversity are essential prerequisites for successfully monitoring agrobiodiversity and predicting future problem areas.

Main Constraints

- Lack of consistent, comprehensive data on the diversity components at the national level.
- Environmental policies are not enforced or implemented.
- Absence of co-ordination of available data among agencies.
- Lack of scientific research, ecological maps and ecological research stations.

Strategic Response

The government should establish a national agrobiodiversity database accessible and useful to policymakers, scientists and the public. The government should support the development and implementation of environmental awareness programs at public and private educational institutions. Also, assessment and monitoring of biodiversity must be established in collaboration with national and private Universities, research institutions, and agencies.

Action Agenda

Immediate term (short), 1-3 years

1. Assess the present status of agrobiodiversity at the national level.
2. Support environmental and socio-economic research.
3. Support all institutions involved in environmental and biodiversity conservation including municipalities.
4. Develop a national GIS lab.

Medium- term, 3-5 years

1. Develop guidelines and standards for designing and implementing an agrobiodiversity-monitoring network on arable land.
2. Establish a national database for crops, weeds and livestock, including a database for tracking livestock migration and immigration.

Long-term, 5-10 years

Establish an environmental research station to study the ecological changes over time.

Target

Increased involvement of academic, research, education and media community in agrobiodiversity. This will contribute to broadening the knowledge base while remaining in touch with the population.

Indicators

- Increase in funds allocated to agrobiodiversity research work.
- Adoption of agrobiodiversity concepts in science education curriculum.
- Academics involved in monitoring programs.
- Increased mention of agrobiodiversity in media programs.
- Academics and researchers involved in media programs for mass education in agrobiodiversity.

Objective 4

To develop partnerships with the environmental community at the national, regional and international level.

Analysis

Conserving biodiversity cannot be a viable option unless all parties in the agricultural sector, at all levels, are involved in conservation efforts. Links with other international bodies should also be encouraged.

Main Constraints

Limited co-ordination between the CBD, intergovernmental and NGOs, the private sector, local communities and academic institutions for the conservation, utilisation and benefit sharing from agrobiodiversity.

Strategic Response

The government should collaborate with private, regional and international agencies to achieve the ultimate goal of sustainable agroecosystems. The government must establish and maintain national, regional and international partnerships to develop the national biodiversity network and promote sustainable agriculture.

Action Agenda

Immediate term (short), 1-3 years

1. Establish a national biodiversity committee or department to oversee agrobiodiversity policies and programmes.
2. Investigate potential linkages with the Biotrade Initiative, the ICGB Program and other international initiatives, particularly with regard to controlling bioprospecting and ensuring sustainable benefits.

Target

Impart financial dimension to agrobiodiversity in order to monetarize benefits from conservation. This will serve to sway the opinion of policy makers and to help persuade farmers to cooperate.

Indicators

- Studies underscoring the financial gains from agrobiodiversity conservation.
- Contact established with bioprospecting companies.
- Program for indigenous germplasm developed.
- Agrobiodiversity declared part of national natural heritage, and benefits obtained from "agro-tourism" initiatives.

6.5 – <u>In-Situ Biodiversity Conservation in Lebanon</u>

Goal

To conserve biodiversity under natural conditions and establish a balanced ecosystem where plants and animals evolve naturally.

Objective

Expand and manage the protected areas system in terrestrial, marine and fresh water environments.

Analysis

Considering the great climatic and geomorphologic diversities in Lebanon, there are about forty protected areas in the country. These are distributed everywhere: in the north, centre, and south of Lebanon, at different elevations in the mountains as well as in the plains and islands.

The protected areas in Lebanon are often considered either as locations for exotic vacations, or as prohibited areas for visitors. To modify this situation, these protected areas have to procure more advantages to the country, especially to the local communities. Therefore, they don't have to contribute only to the conservation of biodiversity, but also to sustainable human development, by modifying their management. Therefore, actions have to focus on the prevention of threats against the protected areas, as well as the needs for economic development of the surrounding population. Hence, measures have to be taken for the development of each protected area taking into account benefit sharing, sustainable use and considering incentive measures as long term viability components.

6.2.1)- <u>Nature reserves</u>

These are managed by the Ministry of Environment, with the assistance of the Global Environment Facility and UNDP. The nature reserves authorised by law are three, namely, the Palm Islands, the forest of Ehden, and the Chouf Cedars reserve. The wetland reserve of Tyre Coast, Sour, has been recently (October 28,1998) added.

Palm Islands Reserve represents an eastern mediterranean marine island ecosystem and is made up of the Palm, Sanani and Ramkine islands. The islands and surrounding water constitute a natural marine basin with a surface area of 5 km^2 and lie 5.5 km north-west of the city of Tripoli. They form an integrated marine nature unit close to the shoreline.

Twelve species of birds visit the islands for spring-summer nesting, and 153 migratory species are visitors of which 7 species are endangered. Forty-two species rest on the islands before reaching inland areas for nesting. Reports indicate that the sand beaches of the islands were egg laying sites for sea turtles such as the loggerhead *Caretta* and the Green Turtle *Chelonia mydas*. The islands are full of wild flowers and medicinal plants. Lizards, snakes and distinctive bats are also present.

Horsh Ehden Reserve represents a mountainous ecosystem of the northern mount Lebanon chain (1200 - 2000 m) having a total area of 10 km^2 of which 405 km^2 are forested naturally. It is located 3.5 km from the summer resort of Eden, 35 km from the city of Tripoli and 100 km from Beirut. Temperatures vary from -5 to 25 ^{0}C, and snow cover lasts four months.

Horsh Ehden has one of the larger stands of the native Cedar of Lebanon *Cedrus libani* with thousands of trees of elegant stature. Mixed in with the cedars are conifers such as the high juniper *Juniperus excelsa* , and broad-leaved trees such as the maple *Acer tauricolum* , and the endemic wild apple *Malus trilobata* .

The total number of tree species is 39 of which 10 are endemic. Other plants count 1030 species and there are 300 mushroom species.

Horsh Ehden is a sanctuary for resident and migratory birds (150 species), spring, and summer breeders and winter visitors. Many are endangered. It also has many of the surviving and threatened native mammals, and is home to a variety of reptiles and amphibians particularly snakes, lizards, turtles, salamanders, frogs, toads and newts.

Al-Chouf Cedars Reserve represents a mountainous ecosystem of central Mount Lebanon chain. Its altitude varies from 1200 to 1900 meters and is made up of series of peaks, the highest culminating at 1948 meters, parallel to the sea. Al-Chouf Cedars is the southern-most limit for the cedar of Lebanon *Cedrus libani,* and despite the heat and dryness of the area, the cedar has adapted by sending down deep roots. The flora of the area is represented by a wide variety of trees, shrubs, grasses and herbs. Al-Chouf Cedars is one of the last remaining areas in Lebanon where larger mammals that once roamed the region can still be found, or can be reintroduced. An impressive number of birds use this protected area as a resting area during the annual migrations.

Tyre Coast Reserve–Sour is located south of Sour and has the potential to host fresh water and marine biodiversity, the Ras-El-Ein was established as a natural reserve by the end of Oct. 1998.

6.2.2)- <u>Protected zones</u>

Several communal woods and terrains were declared as protected zones by decrees from the Ministries of Agriculture or Environment. There are fourteen of these, like the reserve of Karma Chbat, the nature reserve of Saissouk and the Cedar groves of Tannourine and Hadath-el-Jobbe".

Karm Chbat reserve is an area of 3 million m^2 located 10 km South - East of Kobeiate (the biggest city in old Akkar). Elevation varies from 1450 m (Safsafah) to 1950 m (Rooster Peak). It is estimated that 150,000 trees of cedars, abies, junipers and coclan cover this forest with an average of 20 m^2 for each tree. This relatively thick forest houses all types of animals, birds, shrubs and medicinal plants. Of notable existence are squirrels, foxes, wolves, hyenas, wild boars, hedgehogs, turtles, reptiles and various insects like wasps and bees. The forest is also rich in birds like the pheasant, falcon, vultures, and others. The species of berberies is an underground bush with edible fruit providing good feed to wildlife species. Kutteira or "Shilsh El Zallouh" or *Ferula hermonis Boiss* is predominant at high elevations in Karm Chbat forest. This herb is becoming almost as popular as the blue "Viagra" pill due to its aphrodisiac property. Economic harvesting of this herb was prohibited by the Ministry of Agriculture.

Saissouk, a very active and enthusiastic community in Akkar, conserved and protected the natural resources of one million m^2 of slopy land in that area. The natural vegetation consists mainly of pines and other *Quercus* species. It is an excellent habitat for various birds, wild animals, and aromatic and medicinal plants. This protected area gained formal and local attention; in the past two years, over 75,000 transplants of pines, carob, *Cupressus* and *Casuarina* were planted with assistance from MOA and the Lebanese army. Of notable interest in Saisouk, are the plans to build a visitors' tourist centre, a road access and a local pheasant farm.

Tannourine and Hadath El-Jebbeh is one of the popular high-elevation areas, starting at 1200 m and going up to 2200 m. It is located at the leeward side of the middle Mount Lebanon area. Rainfall varies from 900 to 1500 mm. The area is rocky and mountainous with sharp slopes, deep valleys (Ain El Raha), and high erosion potential leading to complete desertification or barren slopes as is the situation in many high elevation areas of the Lebanese mountains. The most abundant and sacred trees are the cedars. This area is distinctive as the native land of *Cedrus libani*. Other companion trees are *Quercus, Cupressus, Pinus, Abies, Populus, Platanus, Juniperus* and *Pistacia*, and constitute a very rich ecosystem in plant species. The fauna described as being present in this type of unique ecosystem ranges from the various types of birds (eagles, owls, robins, etc...) to wild animals (hyenas, boars, wolves, squirrels, snakes, bats, and rats). Urbanisation (sand removal) constitutes a high risk on top of other natural hazards on this ecosystem.

6.2.3)- "De facto protected zones"

These zones have been conserved and protected as a result of private initiative, as is the case of the pine forest at Bentael and Yammouni 's fault.

Bentael is the first protected area which was developed by a non-government organisation in 1980, at a time when environmentalists started to influence public opinion. The land in Bentael is public and reserved for the protection of plants and animals that are specific to this habitat at elevations varying between 300 and 850 m elevation. Bentael means the daughter of God in the old Syriac language and the protected area is the new daughter of nature in the Lebanese environment. The ecosystem is predominated by pine trees, and few other plant types are present. The habitat is also rich in birds and animals. The existence of this protected area in the early eighties has helped the emergence of many other areas in the different parts of the country.

The Yammouni area is an interior valley located at 1100 m elevation with highly specialised characteristics. The Yammouni valley represents a geologic fracture between the two continents of Asia and Africa along the Eastern Mediterranean. The fresh water at this elevation and location constitutes a special ecosystem for animals (fish, reptiles, and birds), and plants (junipers, abies, cupressus and cedars) .The golden fish, thought to be extinct in this habitat, is believed to exist in small ponds and in few numbers. Rehabilitation is badly needed for this unique species of fish and distinct habitat. The medicinal plants, numerous at such habitats, have a very high potential and are important for future economic development. The legislation to establish Yammouni as a natural reserve is underway and soon it will add to the list of protected areas by law.

Main Constraints

Protected areas are the most attractive issues socially and politically. Their development faces a number of obstacles as:
1. Insufficient inter and intra-institutional co-ordination
2. Lack of a systematic approach in management and planning of protected areas.
3. Shortage of trained manpower in planning and management.
4. Incomplete and scattered legislation.
5. No clear distinction between various categories of reserves.

Strategic Response

The Lebanese government emphasises the value of nature conservation and the role protected areas play in providing a healthy environment, rich in Bio-Diversity and natural resources. Many archaeological and natural sites were designated as national heritage in view of protection and conservation. The environment code is in its final legislative phase, while the law of forests is in its final form awaiting implementation. The law of protected areas is in the preparation phase. The government and various involved institutions are ready to implement actions to safeguard the Lebanese ecosystems including protected areas. The Ministry of Agriculture plans to implement the fire-fighting system to control fire in forests and protected areas more effectively. The Ministry of Environment facilitates and encourages planning and legislation of protected areas. The protected areas project, sponsored by GEF / UNDP and implemented by IUCN receives full support and hospitality from the Ministry of Environment.

The protected areas implementation system is recent and willingness to participate in research, studies, expansion, development is always expressed by involved ministries (Ministries of Environment, Agriculture, Tourism, Information, and Transport) and private and public institutions (CDR, CNRS, AUB, LU, USEK, USJ, NGO's, newly elected local authorities, municipalities, etc.).

Action Agenda

Immediate term (short) 1-3 years

1- Introduce sustainable harvesting into some protected areas like honey production.
2- Manage sites according to the local needs and requirements.
3- Lease lands for use and avoid ex-appropriation.
4- Recruit locals to work on site (guards, technicians, etc.) and provide suitable training.
5- Characterise and classify protected areas. (mapping, protection, rehabilitation , updating inventories) .
6- Establish core (Biodiversity warehouses) and buffer zones with access to fire-fighters and restricted vehicles.

Medium term 3-5 years

1- Collect entry fees, and reduce prices for the local population.
2- Locate rehabilitation nurseries within the protected areas and use indigenous species.

Long term 5-10 years

1- Set up recreational areas, tourist centres, and open-air theatres to attract visitors for enjoyment, education, participation and economic involvement.
2- Set up, wherever possible, zoos, aquaria and aviaries for educational and touristic purposes.

Targets and indicators

The overall target of establishing protected areas and conserving Biodiversity in-situ is to profit from the numerous advantages of in-situ conservation. Allowing plants and animals evolve naturally, keeping their entity, and making use of their qualities should be the major aims of protected areas.

The indicators to use in evaluating and monitoring the progress of conservation are:
- Progress in reviewing literature and database establishment.
- Amount and design of fire barriers and fire-fighting technologies.
- Number and activities of personnel trained in protected areas management, ecotourism, and biosystematics.
- Quality and number of studies related to protected areas research and management (indicator species, new species identification, number of visitors , economic venues, etc.)

6.6 - <u>Urban Biodiversity Conservation</u>

Goal

To conserve Biodiversity ex-situ, utilising existing capacities.

Objective 1

To protect endemic species using urban and landscaping habitats.

Analysis

The requirements of the urban expansion and the development of the country's infrastructure are among the most severe, yet least controllable threats to Biodiversity .One of the requirements of this urban (and rural) expansion is the landscaping issue. Nowadays, it is almost impossible to conceive a road without alignment trees, a city without squares or public gardens, and houses without gardens.

Local nurseries did not have time to adapt to the fast reconstruction rate of the country, and grow high quality trees, shrubs and plants to meet the increasing demand. Besides, the Lebanese prefer by far commercial activities over production. It seems so much easier for them to import and sell ornamental plants, rather than grow and care for them several years. This phenomenon has evolved into a very flourishing business, leading to the opening of tens of " nurseries " all over the country.

The Lebanese flora is very rich in species that could be used for landscaping and ornamental purposes. In fact, some of the imported plants belong to the natural flora of Lebanon, like the *Celtis australis*, *Cercis siliquestrum, Laurus nobilis, Populus nigra, Arbutus andrachne, Myrtus communis, Rhododendron ponticum* and other species. Among the imported plants with local relatives belonging to the same genus, we cite: *Abies, Cedrus, Juniperus, Quercus, Acer, Prunus, Pyrus, Crataegus, Malus, Platanus, Pinus,* and *Pistacia.*

Formerly, the Lebanese have always used some of the native plants as ornamentals, like oaks, cedars, firs and *Celtis*. They have planted them next to religious monuments and along roadsides.

Despite the over-exploitation of the natural resources, our ancestors used to value the trees and plants, so much that some of our villages or streets have their names derived from them: Ain El Roummeneh *(Punica granatum*), Gemmayze (*Ficus socomor)*, Yarze (*Pinus halepensis)*, Ain -El - Kharroubi (Ceratonia*)*.

The development of the productive nursery sector should be encouraged. This would allow for the multiplication of ornamental plants of Lebanese provenance and for the production and marketing of high-quality plants for landscaping. This would certainly lead to the revalorization of several forest resources and the creation of new jobs.

The nursery business would involve the identification of the mother plants or populations, the collection of reproductive material, and production.

The development of the production sector should not inhibit or stop the importation business, as some of the imported plants do not exist in the natural flora of Lebanon, and still have some important ornamental values. However all imported plants should be of certified origin, free of pests and diseases, and, why not, submitted to quarantine regulations as well as import taxes.

Strategic Response

Public and private institutions are to join hands in increasing public awareness of the importance of local production on the economy and the future of Biodiversity in Lebanon.

Action Agenda

Immediate term (short) 1-3 years

1. Help in establishing zoos and aquaria.
2. Expand public awareness and qualities of local Biodiversity.
3. Apply strict regulations on imported germplasm (plants, animals, fish, birds)

Medium term, 3-5 years

1. Establish botanical gardens in cities , national parks …
2. Join efforts with municipalities and NGO's to use and conserve local germplasm.

Long term, 5- 10 years

1. Plant roadsides with endemic suitable plants which are numerous.
2. Cover landfills, roadsides, roofs, balconies, etc., with local green vegetation.
3. Establish germplasm banks, cryofrigeration and tissue culture technologies to conserve living material.

Targets and Indicators

The main target is to minimise on imports of exotic plants and animals and use local germplasm as much as possible.
The indicators to use are: import records, sales, kind and number of plants used in landscaping.

6.7 - <u>Biosafety</u>

Goal

To protect natural ecosystems from invading species.

Objective

To protect natural ecosystems and indigenous genetic biodiversity from the purposeful introduction or accidental release of exotic or genetically engineered plant and animal species.

Analysis

Plant introduction, and movement of living organisms from one place to another started with human settlements and established civilisations. Ecosystems have the capacity to absorb, adjust and evolve naturally with the newcomers of plants and animals. However, the movement of living organisms caused severe epidemics to plants, animals and humans. Plague, cholera, small pox, potato and maize blights are historic spots in the records of various civilisations. In essence, fear from the unknown is always exaggerated but reasonable. The rapid achievements of modern biotechnology resulted in new plants and animals genetically engineered for specific uses and economic reasons. Countries lacking developed technologies are hesitant and cautious to accept, understand or digest the ideas behind or the practices ahead of biotechnology. Medium technologies caused monoculture in plants and animals and endangered the natives. Introduced aggressive types competed, got established and dominated local biotypes. Agricultural plants and animals are mostly non-domestic species.

Action Agenda

1. Encourage the use of native rather than introduced species for aquaculture, mariculture and agriculture.
2. Establish environmental screening procedures for importation of plant and animal species. Ban or strictly control the import of potentially invasive species, and establish quarantine controls on all imports.
3. Establish an expert committee on biotechnology and genetic engineering to advise on regulatory requirements for dealing with biotechnology and genetically engineered organisms.
4. Develop biosafety policy, legislation and regulations dealing with the handling, release and disposal of exotic or genetically engineered organisms.

6.8- <u>International Cooperation</u>

Goal

To share global responsibilities in use; conservation and management of biodiversity.

Objective

To ensure effective participation in international and regional conventions, protocols, agreements and technical programmes regarding biodiversity.

Analysis

During the last few years, the Lebanese society has taken serious steps and given more attention to environmental issues that have a direct impact on the public such as industrial discharges, domestic waste and wastewater as well as air pollution. Recently Lebanon has signed a number of international conventions dealing with nature conservation including the Convention on Biological Diversity.

The government and non-governmental organisations have been actively involved in resolving and developing better understanding of environmental problems through awareness campaigns, international conventions and legal approaches.

The conservation and sustainable use of natural resources are major objectives of both public institutions and private societies on the international, regional and national levels. Regional organisations are focusing on problems related to an ecosystem rather than a national socio-political country level approach.

Lebanon had a very active role in the establishment of international organisations as FAO (Food and Agriculture Organisation) in 1945, in the declaration of human rights (UN) in the sixties, and in the founding of ICARDA (International Center for Agricultural Research in Dry Areas) in 1977. Lebanon is also a very active member in the organisation of The Arab League and its various development agencies. Regional and international co-operation are foregranted issues to the Lebanese and their government.

Strategic Response

The government has always responded positively to international efforts, approaches and activities.

Action Agenda

1. Review all international and regional conventions, protocols and agreements regarding biodiversity to determine their relevance to the State of Lebanon, and prepare a framework for effective participation.
2. Co-ordinate and minimise overlap in reporting.
3. Review bilateral and multilateral development and technical assistance programmes related to biodiversity or having biodiversity components, and prepare a framework to optimise participation.
4. Ensure that all development assistance agencies with programmes in Lebanon are aware of the Biodiversity strategy and Action Plan, and develop a framework for inter-ministerial co-ordination to prevent conflicting externally supported development activities.
5. Establish a centralised co-ordinating body (National Biodiversity Unit).

Targets and Indicators

To insure participation, exchange information, share benefits and ascertain the Lebanese presence in international Fora. The indicators to use are: Regional and international workshops held locally, number of activities attended by Lebanon externally and number of proceedings with Lebanese contributors.

<h1 style="text-align:center">6.9 - <u>Strategy Implementation</u></h1>

Goal

To share knowledge, costs and benefits with individuals and communities.

Objective

To implement the strategy and action plan in partnership with all relevant organisations.

Analysis

The traditional and permanent gap between legislation and implementation may be considered as an indicator to the socio-economic situation. The Lebanese have always been described as very careless in abiding by the law. Law enforcement agencies are numerous and implementation of action plans does not receive high priority unless higher authorities give maximum care, interest and will.

The MOE has played a very important role in planning and raising public awareness issues, pushing the administrative system to take immediate action in the direction of conservation of natural resources and management of environmental issues.

Main Constraints

Biodiversity issues relate to many private and public institutions. Inter-institutional co-ordination is still below high expectations. Development issues overshadow the importance of Biodiversity. The distribution of responsibilities and actions covers numerous institutions.

Strategic Response

Willingness to co-ordinate and co-operate is invariably expressed by public institutions and individual authorities. The mechanism has to be strengthened and standardised.

Action Agenda

<u>Immediate term (short), 1-3 years</u>

1. Strike a National Biodiversity Committee to oversee strategy and action plan implementation.
2. Establish a National Biodiversity Unit to co-ordinate, oversee and organise activities related to the conservation, study and use of Biodiversity.
3. Explore and implement funding arrangements for both priority and long-term activities identified in the strategy and action plan.

<u>Medium term, 3-5 years</u>

Develop appropriate institutional arrangements for effective strategy and action plan.

Targets and indicators

The main target is to implement the action plan in favour of biodiversity conservation.

The indicators to use are numerous. National budget allocation, foreign source funding, establishment of (NBC) and (NBU), degree of inter - institutional co-operation and co-ordination and joint-program exploitation.

VII - General Socio-economic infromation

NAME	The Lebanese Republic
POLITICAL SYSTEM	Parliamentary democracy
	The Presidents is elected by the Parliament for a 6-year, non renewable term.
	The Parliament consists of 128 deputies elected for 4-year term.
	The Prime Minister is nominated by the President of the Republic after obligatory consultations with the Parliament.
GEOGRAPHY	A Mediterranean nation of the Levant, lying between 33 and 34.40 latitude North and 35 and 36.40 Longitude East.
	Sea front length on the Mediterranean is 210 Km.
	Highest peak: Qornet Al Saouda (3.083m).
	Width varies from 34 to 100 Km.
AREA	Total area: 10.452 Km2.
	Arable area: 3.340 Km2.
	Planted area: 2.210 Km2.
CLIMATE	Temperature in Beirut
	Normal minimum : 10.5° - 23.7°
	Normal maximum : 16.4° - 31.8°
	Average : 13.4° - 27.8°
	Daily variance : weak, year, lower than 7 degrees.
	Relative normal humidity levels : 64 - 72 %.
	Sunlight: strong, 290 days / year on average.
	Rainfall: 78 days / year on average, speared over 4 moths.
	Between 700 and 1.500 mm / year, average: 893 mm.
SPOKEN LANGUAGES	Arabic 99%
	French 45%
	English 30%
	Armenian 5%
WEIGTHS & MEASURES	Metric System

DEMOGRAPHY 95

Population (in millions)	3.11
Density (inhabitants/km2)	294
Annual growth rate (estimation)	2.2%
Fertility rate (1990-95) children	2.6
Children mortality (0-4 years) per 1000 births	32.2
Life expectancy years	68.8
Urban population	86.6%
Number of inhabitants/doctors	400
Number of persons/household	4.7
Work force	30%

Agriculture	14%
Industry and Construction	25%
Services	61%

AGE DISTRIBUTION	Less	than	15	years
	29.2%			
	15	to	64	years
	63.8%			
	65	years	and	over
	6.9%			
RATE OF CELIBACY	Age			Women
	Men			
	20-24yrs			72.0%
	94. 5%			
	25-29yrs			46.6%
	70. 2%			
	30-34yrs			30.4%
	38. 4%			
	35-39yrs			21.0%
	19. 0%			
SOCIAL INDICATORS	Rate		of	illiteracy
	13.6%			
	Declared			unemployment
	7. 5%			
	Number	of	public	schools
	1120			
	Number	of	private	schools
	853			
	Number	of	operational	hospitals
	122			
	Cultural	and	sport	associations
	807			
	Religions			associations
	494			
	Charity	and	social	associations
	525			
RATE OF SCHOOL ATTENDANCE	Age			Girls
	Boys			
	6-9yrs			83.9%
	83.7%			
	10-14yrs			93.6%
	92.6%			
	15-19yrs			65.7%
	59.3%			
	20-24yrs			24.9%
	24.7%			
	25-29yrs			4.6%
	6.0%			

VIII - <u>Rough Cost Estimates</u>

1- <u>Terrestrial ecosystems and natural habitat</u>

Policy	Budget (Thousand Dollars)
Immediate term	
Reforestation	500 (largely depends on the size)
Establishing ecological tourism	Present in the market, needs advertising: 200
Medium term	
Develop a database	500
Long term	
Legislate to eliminate conflict of interest	Through the ministry of planning or administrative reform. Studies to cost about 100
Supporting research	150
Staff formation and information dissemination	100
Overgrazing and research	100
Protection of ripislyves	100

2 - <u>In-situ biodiversity conservation</u>

Policy	Budget (Thousand Dollars)
Immediate term	
Sustainable harvesting	50
Recruit locals and train them	50 for the sessions, 250 variable costs
Long term	
Characterize and classify protected areas (database)	500
Establish core and buffer zones	100 for research
Tourist centers, open air theaters,…	75 per site
Zoo, aquaria,…	200 variable costs

3 - <u>Fresh water biodiversity conservation</u>

Policy	Budget (Thousand Dollars)
Immediate term	
Water quality control system and implement safe water use	100 for research and 50 for technology dissemination
Well drilling conform to acquifer capacity	100 to determine acquifer size
Impact assessment of projects	25
Medium term	
Public awareness programs	200 for a full campaign
Expansion of forest control programs	100
Long term	
Supporting research	100

4 - <u>Marine biodiversity conservation</u>

4.1 - Goal 1: Biodiversity protection

Policy	Budget (Thousand Dollars)
Immediate term	
Identify sources of pollution	100
Environmental impact assessment for treatment plants	100
Medium term	
Develop a database	500
Observation stations and rehabilitation of research centers	300
Develop partnerships and public awareness	200 for full campaign
Long term	
Natural reserves and national parks establishment	4 000 (or $4 Million)
Development of environmental monitoring	100

4.2 - Goal 2: Use in a sustainable manner

Policy	Budget (Thousand Dollars)
Medium term	
Training and awareness	200 for full campaign 50 training
Long term	
Database	500
Study the potential of fresh water sources	100
Enhance the concept of integrated village	50 for information dissemination
Develop new sectors	100 for research
Highlight cultural and traditional significance of the sea	50 for exhibits

5 - <u>General measures for the conservation of agro-biodiversity</u>

5.1 - Goal 1: Protect ecosystems and maintain diversity

Policy	Budget (Thousand Dollars)
Immediate term	
Research	100
Medium term	
Establish land zoning	100 for research
Establish traditional farms	100 for feasibility and research
Establish service to facilitate exchange between farms	50 for information dissemination
Natural reserves	4 000 (or $4 Million)
Ex situ botanical garden	1 000 ($1 Million)
Long term	
Gene database	500

5.2 - Goal 2: Biodiversity protection from deleterious agriculture practices

Policy	Budget (Thousand Dollars)
Immediate term	
Reduce excessive use of agrochemicals	100
Develop agro-biodiversity extension programs	50
Issue guidelines for biodiversity conservation, develop a campaign	200
Medium term	
Framework for agrochemicals impacts	100 for research
Regulate grazing	100 for research
Long term	

Better understanding of the genetic loss	1000 (or $1 Million)

5.3 - Goal 3: National biodiversity database

Policy	Budget (Thousand Dollars)
Immediate term	
Agro-biodiversity state assessment	200
Support research	100
Develop GIS lab	100
Medium term	
Guideline development	100 for research and information dissemination
Database	500
Long term	
Environmental research stations	500

6 - <u>Urban biodiversity conservation</u>

Policy	Budget (Thousand Dollars)
Immediate term	
Public awareness	200 for full campaign
Medium term	
Establish botanical garden	1000 ($1 Million)
Long term	
Roadside planting	250 with the help of army draftees
Landscape	250
Germplast banks and in vitro culture	500

7 - <u>Summary of total cost estimated for strategy implementation</u>

	Budget (Thousand Dollars)		
Ecosystem	**Short**	**Medium**	**Long**
Terrestrial	700	500	550
In-situ	350		875
Fresh water	275	300	100
Marine	200	1250	4900
Agro-biodivesity	850	6050	2000
Urban	200	1000	1000
Total	2575	9100	9425

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