



**REVISION**

**OF**

**THE JABAL AL RIHANE**

**BIOSPHERE RESERVE-LEBANON**

APRIL, 2007





## BIOSPHERE RESERVE NOMINATION FORM



[February 2004]  
(<http://www.unesco.org/mab/docs/brnomform.htm>)

### INTRODUCTION

Biosphere Reserves are areas of terrestrial and coastal/marine ecosystems, or a combination thereof, which are internationally recognized within the framework of UNESCO's Programme on Man and the Biosphere (MAB). They are established to promote and demonstrate a balanced relationship between humans and the biosphere. Biosphere Reserves are designated by the International Coordinating Council of the MAB Programme at the request of the State concerned. Individual Biosphere Reserves remain under the sovereign jurisdiction of the State where they are situated. Collectively, all biosphere reserves form a World Network in which participation by States is voluntary.

The World Network is governed by the Statutory Framework adopted by the UNESCO General Conference in 1995 which presents the definition, objectives, criteria and the designation procedure for biosphere reserves. The actions recommended for the development of biosphere reserves are set out in the "Seville Strategy". These documents should be used as basic references for the completion of this nomination form.

The information presented on this nomination form will be used in a number of ways by UNESCO:

- (a) for examination of the site by the Advisory Committee on Biosphere Reserves and by the Bureau of the MAB International Coordinating Council;
- (b) for use in a world-wide accessible information system, notably the UNESCO-MABnet, facilitating communications and interaction amongst persons interested in biosphere reserves throughout the world.

The nomination form consists of three parts:

Part one is a summary indicating how the nominated area responds to the functions and criteria for biosphere reserves set out in the Statutory Framework, and presents the signatures of endorsements for the nomination from the authorities concerned. Part two is more descriptive and detailed, referring to the human, physical and biological characteristics as well as to the institutional aspects. An annex to be used for updating the Directory of Biosphere Reserves on the MABnet, once the site has been approved as a biosphere reserve.

The form should be completed in English, French or Spanish. Two copies should be sent to the Secretariat, as follows:

1. The original hard copy, with the original signatures, letters of endorsement, zonation map and supporting documents. This should be sent to the Secretariat through the Official UNESCO channels, i.e. via the National Commission for UNESCO and/or the Permanent Delegation to UNESCO.
2. An electronic version (on diskette, CD etc.) of the nomination forms and if possible of maps (especially the zonation map). This can be sent directly to the MAB Secretariat:

UNESCO  
Division of Ecological Sciences  
1, rue Miollis  
F-75352 Paris Cedex 15, France  
Tel: ++33 1 45 68 41 51  
Fax: ++33 1 45 68 58 04  
Email: [mab@unesco.org](mailto:mab@unesco.org)

## PART I : SUMMARY



### 1. PROPOSED NAME OF THE BIOSPHERE RESERVE:

[It is advisable to use a locally accepted geographic, descriptive or symbolic name which allows people to identify themselves with the site concerned (e.g. Rio Platano Biosphere Reserve, Bookmark Biosphere Reserve). Except in unusual circumstances, Biosphere Reserves should not be named after existing national parks or similar administrative areas]

### JABAL AL RIHANE BIOSPHERE RESERVE-LEBANON

### 2. COUNTRY: LEBANON

### 3. FULFILLMENT OF THE THREE FUNCTIONS OF BIOSPHERE RESERVES

(Article 3 of the Statutory Framework presents the three functions of conservation, development and logistic support. Explain in general terms how the area fulfills these functions.)

3.1 "Conservation - contribute to the conservation of landscapes, ecosystems, species and genetic variation" (Stress the importance of the site for conservation at the regional or global scales)

*"Within the Mediterranean area, 25,000 square kilometers of Lebanon/Israel are identified as the priority area for the East Mediterranean. This area has some 250 endemic plants. But the region is also important as a representative of the entire Mediterranean fauna and flora"* (John Burton/ World

Land Trust).The proposal to declare the Jabal Al Rihane in southern Lebanon a biosphere reserve is therefore of international significance

The proposed Jabal Al Rihane Biosphere Reserve covers an area of 18430 ha. at an altitude ranging between 270 meters in the south, where the Litani River constitutes a natural boundary, and 1500 meters to the north, at Mzairaa south to the Jezzine and Niha villages; and extends along the ridge of the southern Mount Lebanon Chain overlooking both the Beqaa Valley (Rift Valley) to the east and the Mediterranean sea to the west.

This relatively large wild area was protected by municipal legislations that are aiming at conserving the ecological integrity, natural systems and species as primary objective. In 2005, the Ministry of Environment announced the Jabal Al Rihane a protected area for the aspect of local participation in its management, in particular regarding the protection of its natural resources including a large number of threatened and endemic species.

In 2005, the Council for Development and Reconstruction incorporated, in collaboration with the Directorate General of Urban Planning, the Ministry of Environment and the Ministry of Agriculture, the Jabal Al Rihane into the National Master Plan<sup>1</sup> of Landscapes that are in need of most conservation attention. This is strengthened by the recognition in the South of Lebanon of many wilderness areas of which the Rihane is the largest.

On 9 March, 2006, Lebanon's Council of Ministers approved by its Decision number 25/06 the draft Law declaring Jabal Al Rihane a nature reserve<sup>2</sup> for its importance for the plant species of economic value, the migrating birds, and for its environmental services on ensuring

the water supply for nearby urban and rural areas. Subsequently, the conservation function of the proposed Biosphere Reserve will be served by the Cabinet decision no. 25/2006 that will be aided by the strong complementary municipal legislation and the adequate management of the Rihane under the overall surveillance of the Ministry of Environment, guided by the appropriate management of the adjacent successful protected area, the Al Shouf Biosphere Reserve<sup>3</sup>.

The Rihane that is an important water-catchment's area protects excellent representation of the Litani, Zahrani, Mechraa, Tasseh rivers; several streams particularly in Sujud and Mlikh; and many springs, mainly in Rihane village, Aichyeh, Mlikh and Aramta; riparian habitats, undisturbed glacial valleys, barren and semi-barren lands, landraces areas, rangelands, huge caves of stalagmites and stalactites, historic agricultural terraces; historic areas with



<sup>1</sup> See Map 15

<sup>2</sup> See Doc.16

<sup>3</sup> See Map 14

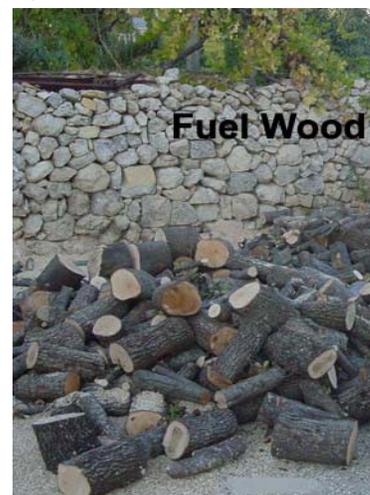
tombs and sarcophagi; old winepress with stone hods; old (more than 500 years) mixed forests with oak (*Quercus spp.*) as dominant species; pine groves, olive groves, maquis, garrigues, and undisturbed wildlife habitats for hyraxes, birds and reptiles. The Jabal Al Rihane represents the thermo (270-500 m. altitude), meso (500-1000 m. altitude) and supra (1000-1500 m. altitude) Mediterranean levels described in Corine classification. Thus its conservation practices can be beneficial to other similar areas in the country and the Mediterranean region and can complement the conservation efforts made at Al\_Shouf Biosphere Reserve which lies between 1000 and 2000 m to the north of Rihane, encompassing as such the Supra (1000-1500 m), Montane (1500-1900 m) and the Oro (above 1900 m) Mediterranean levels. Consequently, the thermo and meso-Mediterranean levels were not previously represented in a biosphere reserve in Lebanon.

The Jabal Al Rihane Biosphere Reserve lies along the main regional avian migratory flyway and hosts 168 bird species, of which 15 are regionally and/ or globally threatened. As such it is proposed an Important Bird Area to BirdLife International. Its mammals ranging from bats to wolves and hyenas are also regionally and globally threatened. In addition to 44 endemic plant species (about half of the endemic species of Lebanon), the flora of Jabal Al Rihane include southern species of plants that are not easily found in the other parts of Lebanon.



3.2 "Development - foster economic and human development which is socio-culturally and ecologically sustainable". (Indicate the potential of the proposed biosphere reserve in fulfilling this objective).

Development that is ecologically, socially and culturally appropriate will be encouraged and supported by the Rihane Biosphere Reserve "Transitory<sup>1</sup> Management Council" and the "Appointed Protected Area Committee". The Rihane Biosphere Reserve doesn't envision a markedly different economy within the region, but rather a series of improvements to current activities through utilization of "best practice" standards, and recognition of the value of maintaining traditional and cultural activities. Within this context, the relationship between cultural and biological diversity in Rihane has been given increasing attention over the last two years in order to sensitize policy makers, development practitioners, media professionals, relevant NGOs and community leaders on the interdependence between cultural and biological diversity. However this interdependence of cultural-biological diversity has revealed at Rihane that the exploitation of wood forest products is limited to local charcoal production and fuel and construction wood gathering; whereas the exploitation of non-wood forest



<sup>1</sup> In accordance with the approved draft Law by the Cabinet's Decision No. 25 on 9/3/2006, a Committee will be appointed by the Ministry of Environment to manage the reserve. Subsequently, the Management Council will turn to function as an Advisory Body assisting the Committee.

products (NWFPs) has increased in the very recent years due to the increasing recognition that NWFPs can provide important community needs for improved rural livelihood; contribute to household food security and nutrition; help to generate additional employment and income; offer opportunities for processing enterprises; contribute to foreign exchange earnings; and support biodiversity conservation and other environmental objectives. The exploitation of NWFPs at Rihane appears to be presently directed mainly for local subsistence use through collection of culinary, medicinal and aromatic plants; food processing (jam, condiment, wine, olive oil, distilled water of flower, to name a few) and production of final items such as textiles, baskets, pottery, toys, etc.

### Traditional products from Rihane



Food tray



Dry fig



Basket



Rosary



Embroidery



Embroidered silk



Scarf silk knitting



Wool knitting



Rug



Lebanese pottery

Extractive activities are strictly prohibited from core areas through the draft Law that was approved by the Cabinet Decision 25/06, the policies and regulations set by municipalities and the draft management plan<sup>1</sup>. Some other areas (within buffer and transition zones) are controlled by the laws that regulate hunting, forestry<sup>2</sup>, plant picking, and prohibit queries and

<sup>1</sup> See Doc.18

<sup>2</sup> See Doc.16

other non sustainable development activities. Also, in transition and some buffer zones where a number of lands are under public ownership, the municipal management of the large woods of Stone Pine proved to be highly successful, sustainable and providing continuing employment to the local communities of Jabal Al Rihane. Several lands within the proposed buffer zone of the Jabal Al Rihane Biosphere Reserve will be subject to appropriate utilization by the forest department at the Ministry of agriculture and hydroelectric power generation utility particularly at Naba'a el Tasseh in Loueize village.

The moderate to low human population in Jabal Al Rihane that is combined with the availability of scenic views, historic sites (old monastery, the more than 100 year-old Church



of Saint Anthony as well as a shrine dedicated to the prophet Rkab and a school built in 1873 in Aramta; big Citadel and old mosque in Rihane), caves (Crusader Grotto, Old Monastery's Cave, Khallet Khazem Old Cave in Aichyeh and Rihane, huge natural cave located on the border of Rihane village with Aramta), traditional agriculture terraces, forests and healthy environment allow for the establishment of income generating eco-tourism industry in appropriate zones and

subsequently for poverty alleviation and for stopping immigration from rural areas. This industry is already recognized by the local communities of the biosphere reserve and initiated through the establishment of trails for hiking, bird watching and cave visiting.

3.3 "Logistic support - support for demonstration projects, environmental education and training, research and monitoring related to local, regional, national and global issues of conservation and sustainable development".

(Indicate current or planned facilities).

A locally based Municipal Association and two NGOs ("Green Future" and "Society for the Protection of Environment at Jabal Al Rihane") have been established to coordinate their efforts in order to administer the affairs of the biosphere reserve with respect to logistic support, to provide a local focal point of contact for the Arab and international biosphere reserve networks and for international researchers, and to coordinate and fund community-based research, monitoring, education and training in the Jabal Al Rihane area. According to the draft management plan, a priority research agenda associating conservation, resources development and education is developed. Presently, a significant multidisciplinary project is under implementation by the Lebanese University in the Jabal Al Rihane for biodiversity assessment and monitoring within the context of ecosystem approach. This project focuses on fauna, flora, water resources, land use, socio-economic aspects and sustainable development and intends to find solutions for threatened species, improper land uses and other environmental issues. Its deliverables includes posters, brochures, maps and

databases for increasing awareness, advocating decision-makers, promoting conservation and wise use of resources, providing educational tools and establishing benchmarks for future studies, monitoring and researches.

During 2004-2005, the Jabal Al Rihane was selected at national and regional levels to be the Lebanon's demonstration site for the *in-situ* conservation of Economically Important Wild Plant Species (EIWPS) project. This project covers Lebanon, Egypt, Morocco and Turkey and is being implemented by the United Nations Environment Programme (**UNEP**) with the following supporting agencies: **FAO**: Food and Agriculture Organization of the United Nations, Rome, Italy. **Diversitas**: Paris, France. **IPGRI**: International Plant Genetic Resources Institute, Rome, Italy.

**The outputs and outcomes of these two projects above and other foreseen studies will be shared with the international MAB Network for comparative studies of similar environmental problems in different parts of the world; for commenting, testing, standardizing and transferring new methodologies; and for cooperating in the development of information management systems.**

On the other side, the Young Men's Christian Association (YMCA) of the USA and the YMCA of Lebanon signed a cooperative agreement in 2003 with the U.S. Agency for International Development (USAID) to undertake an integrated environment program initiative - *Sustainable Environmental Practices and Policies Program (SEPP)* - whose aim is to improve environmental practices and policies for the management of both solid waste and water waste in rural Lebanon through the establishment of solid waste treatment centers that process waste and treat wastewater from 98 villages. The communities of Jabal Al Rihane lodged complaints against the solid waste center project on its territories. Subsequently, the project was halted



and moved to another community outside the Jabal Al Rihane Biosphere Reserve but still can serve some of its villages, namely Jarjouh, Louaizeh and Mlikh. As for the water waste treatment center, it was established in Aichyeh village and completed in 2005. A public workshop for community members of Aichyeh was conducted in September 2005 to raise awareness on the new sewerage network, the wastewater treatment plant and the positive impact the facility will have on the community on all levels and in the long-run. The YMCA project seeks to strengthen the capacity of the local municipality and community in an effort to implement an all-inclusive, comprehensive, sustainable, environmental management program in the region. In an effort to influence and educate communities on sound environmental policies and practices, the YMCA will provide training, education, technical resources, materials and practical solutions to improving waste management in the area.

The Jabal Al Rihane Biosphere Reserve offers existing modest research infrastructure in some of its villages, including meteorological stations, offices, computers and accommodation facilities. New facilities may be considered in a number of local communities to support the work of the Municipal Association, NGOs and researchers. In addition, logistic and technical assistance can also be provided to Jabal Al Rihane by the Al\_Shouf Biosphere

Reserve whose southern border is adjacent to the northern border of Jabal Al Rihane<sup>1</sup>. Such cooperation between the two reserves will strengthen the institutional capacities of the local authorities of the Jabal Al Rihane but it will also promote the national reconciliation that is in great need after the 17 years of civil war in Lebanon, especially between the Druze of the Shouf area and the Shia'a and Christians of Jabal Al Rihane area. Moreover, logistic support from the Capital is also doable as Beirut is only 51 km away from the Jabal Al Rihane Biosphere Reserve.

**However, a particular focus of the Transitory Management Council, the Municipal Association and the NGOs as well as the local communities will be the development of communications and education programs to broadly communicate the fundamental concepts of cooperation and partnership that underlie the biosphere reserve.**

#### 4. CRITERIA FOR DESIGNATION AS A BIOSPHERE RESERVE

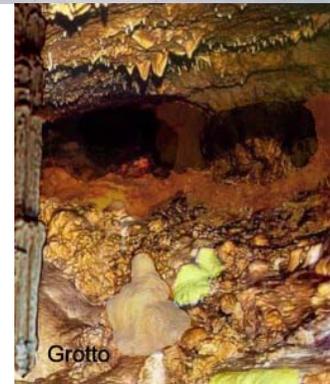
[Article 4 of the Statutory Framework presents 7 general criteria for an area to be qualified for designation as a biosphere reserve which are given in order below.]

4.1. "Encompass a mosaic of ecological systems representative of major biogeographic regions, including a gradation of human intervention"

(The term "mosaic" refers to a diversity of natural habitats and land cover types derived from human uses such as fields, managed forests, etc. The term "major biogeographic region" is not strictly defined but it would be useful to refer to the map of the "World Network of Biosphere Reserves" which presents 12 major ecosystem types at a global scale).

The Jabal Al Rihane Biosphere Reserve is a true mosaic of ecological systems broadly representing the "evergreen sclerophylic broussailles and forests" biogeographic region within a Mediterranean biome. Deciduous woods and forests occupy much smaller areas. This region encompasses the thermo, meso and supra Mediterranean levels of Corine Classification and it is widely shaped by several physical and biotic factors, including anthropologic factors:

- Litani, Zahrani, Mechraa, Tasseh rivers as well as several water courses and streams intersected the region and determined riparian habitats and wetlands where the living organisms are adapted or accommodated with the humidity of the soil and/ or the atmosphere.
- Some rain-attracting topography created an important water-catchment area and a variety of microclimates and subsequently a variety of ecological units.
- Snow may cover the land for a few days in the winter and affect the landscape and the distribution or the activity and distribution of the fauna.
- Water percolation in the karstic rocks (sponge-like limestone) shaped scenic deep caves with stalagmites and stalactites and appropriate habitat at the entrances for certain sciaphilic flora and fauna.
- A karstic aquifer with argillaceous walls is determined by the Cenomanian-Albian of the Jurassic, captures several springs at the bottom of the valleys.
- Undisturbed glacial valleys with grasslands contrast with barren rocky and barren sandy soil areas. Barren areas are usually a result of fire, overgrazing activities and



<sup>1</sup> See Map14

unsustainable wood cutting for timber which prevailed in Lebanon mainly during the Ottoman Empire.

- Isolated stands of trees witness a process of long term degradation of forests and woods.
- Some landraces places and rangelands characterize many inter-forests areas.
- Forests of Stone pine trees regularly harvested by locals for their pine stones.
- Plantation of olive trees is represented by wide groves over hills, terraces and gentle slopes.
- Traditional agriculture man-made terraces on deep mountainous slopes for vegetable and fruit trees add to the landscape of the region and its history.



Pinus pinea stand



Dense oak forests

- Old forests with oak as dominant species intermingled with few Palestine Pistachio, Sumac and Karroub trees in public and municipal lands extend over a significant surface area, whereas mixed forests of evergreen and deciduous trees extends over a smaller areas. These forests represent alone two distinguished ecosystems: 1) mountainous with mainly limestone rocky substratum and 2) mountainous with sandy and argillaceous substratum.

#### 4.2 "Be of significance for biological diversity conservation"

(This should refer not only to the numbers of endemic species, or rare and endangered species at the local, regional or global levels, but also to species of globally economic importance, rare habitat types or unique land use practices (for example traditional grazing or artisanal fishing) favouring the conservation of biological diversity. Give only a general indication here.)

The Jabal Al Rihane Biosphere Reserve offers one of the last remaining old oak forests in



Hyrax



Otter

southern Lebanon where larger mammals that once roamed the region can still be found, such as the wolf, wild boar, hyena, badger, polecat and wild cat. These forests are also an important roosting

and resting site for the huge number (c.200.000 individuals) of migratory birds of prey which pass over/ and or roost in the forests twice per year (during autumn and spring migration). In fact, those raptors which are known for being unable to cross the sea during their migration pass throughout Lebanon which is considered by BirdLife International as a bottleneck for migratory raptors. They benefit from the thermals that are formed in the valleys and the wind drifts that are formed when the sea wind hits the mountain of Rihane to soar high as a mean of saving energy. When it is sunset time, they dive to roost in the forests that are found right

below them. Hence the significant interdependence raptor-Rihane forest relies on the topography of the reserve and its situation facing (perpendicular to) the sea breeze along the N-S and S-N flyways.



Chameleon  
Globally threatened

The rocky area of Jabal Al Rihane hosts the only population of Hyrax found in Lebanon, whereas the portion of the Litani River in the reserve offers a refuge to the globally threatened Otter.



Corncrake  
Globally threatened



*Galanthus fosteri* (endemic)  
Photo G. Tohmé

The reserve contains 24 globally, regionally and locally threatened plant species, 17 southern plant

species that are only found in Rihane area but not in other parts of Lebanon, 38 medicinal and 44 endemic plant species.

Under a regional project (UNEP/GEF Project EP/INT/204/GEF) aiming at improving global food security through effective conservation of economically wild plant species *in situ*, Jabal Al Rihane was selected as a demonstration site for “Design, Testing and Evaluating of Best Practices for *in situ* Conservation of Economically Important Wild Plant Species” because it is one of the centres of plant diversity, belonging to the Near Eastern and Mediterranean Vavilov Centres of Crop Diversity and Origins, and rich in diversity and genetic resources of globally important crop plants, including many cereals, food legumes, vegetables, forages, fruit trees and nuts, medicinal and aromatic plants and forestry species, and because of the willingness and commitment of its local communities to implement the project.



*Orchis romana libanotica*  
(endemic species) Photo G. Tohmé

Mammals include 34 species that are known to occur at Jabal Al Rihane, 11 are globally and regionally threatened, 6 are significantly declining, none is endemic but 2/3 of the Rihane mammals are formed of species that are wholly or partially limited to the Middle East region.

Among the 33 herptile (herpetofauna) species of Jabal Al Rihane, only the Chameleon is considered as globally threatened whereas none of them is endemic or limited to Rihane area.

The total number of recorded bird species at Rihane is 168. Of them 15 are globally and/ or regionally threatened and 33 are raptors. However, it is worthy to note that the

Jabal Al Rihane appeared to encompass several sites that are considered hotspots for birdwatchers; a reason for which the reserve has been proposed as an Important Bird Area and a potential area for ecotourism relying mainly on bird watching activities.

#### 4.3 "Provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale"

(Describe in general terms the potential of the area to serve as a pilot site for promoting the sustainable development of its region (or "eco-region"))

Rihane provides an opportunity to work with public land managers and private landowners on sustainable development issues. The core areas are owned by municipalities and state, whilst the buffer zones are also owned by the municipalities or the government beside the Catholic Church, and to a much lesser extent by individuals with holdings ranging from less than one hectare to over 400 hectares (e.g. KHALLET KHAZEM that is the oldest protected area in Lebanon declared a reserve by private initiative in Rihane). The result is a mosaic of working and protected lands, with forestry and agriculture industries, tourism operators and recreational enthusiasts utilizing the landscape for several purposes. In fact, there is a good potential to use the proposed biosphere reserve activities as a mechanism to encourage "best practice" techniques, building on the willingness of local communities to develop their region environmentally and to look for a better economic life standard, while maintaining the unique nature and landscape values of this region.

Within this context, there are at Jabal Al Rihane Biosphere Reserve many opportunities for:

- dissemination of reports of lessons learned from the wastewater treatment centre of Aichyeh village in order to promote the installation of similar small scale centres in other villages, with the aim of improving environmental practices and policies for the management of wastewater.
- dissemination of reports of lessons learned and best practices of the reforestation campaign at Rihane village that was implemented in 2005 by both the Ministry of Environment and The Association for Forests, Development and Conservation (AFDC-NGO) to assist other villages in the management of lands burnt during the past military activities.
- better use of water resources through traditional collaborative management and preservation of watershed areas,
- improving forest practices with regards to the rotation of pine stone exploitation, carob and sumac trees harvest,
- extending the existing ecological trails model of Rihane village to other villages of Jabal Al Rihane in order to conserve water catchments, scenic landscapes and biodiversity as well as to promote eco-tourism, including hiking, visits to traditional manufacturing places of pottery, olive oil extraction, historic winepress and old water mills along the river of tasseh; and bird watching.
- demonstrating through the GEF/ UNEP project on "Economically Important Wild Plant Species" that Jabal Al Rihane contributes to the global food security, *in-situ* conservation of landraces, wild relative, aromatic, medicinal and culinary plant species.
- improving generation of incomes through production of labelled wood forest and non wood forest products with wise use of natural resources. One of the villages of Jabal Al Rihane is rich in myrtle tree (Rihane in Arabic means Myrtle) and is called "Rihane village". This tree is of high cultural and economic value for the use of its branches in

cemeteries at national and regional levels and the use of its leaves and fruits in popular medicine, kitchen, perfumes, liquors, etc. Its sustainable use will certainly contribute to the generation of incomes to benefit not only Rihane village but also the Jabal Al Rihane Biosphere Reserve as a whole.

- Improving sources of incomes through increased green farming areas and improved facilities for irrigation and access to agricultural lands. In fact, the United States Agency for International Development (USAID) assisted 4 villages in Jabal Al Rihane (Kfarhoune, Rihane, Sujud, Louaizeh and Aichyeh) in providing them with agricultural and feeders roads and rainfed pools. Mlikh village is on the waiting list.



#### 4.4 "Have an appropriate size to serve the three functions of biosphere reserves"

(This refers more particularly to (a) the surface area required to meet the long term conservation objectives of the core area(s) and the buffer zone(s) and (b) the availability of areas suitable for working with local communities in testing out and demonstrating sustainable uses of natural resources.)

The proposed Jabal Al Rihane Biosphere Reserve is representative of the southern east Mediterranean region and covers a total area of 184.3 km<sup>2</sup> that is relatively large if compared to the surface area of the whole country which covers 10452 km<sup>2</sup> only. It is the second largest protected area in Lebanon since the first is the Al\_Shouf Biosphere Reserve. It encompasses 27 cadastral zones, including 9 villages (Aichyeh, Aramta, Jarjouh, Kfarhoune, Louaizeh, Mlikh, Rihane, Srairi and Sujud.) and 20 small hamlets or farms (Ain Bou Souar, Chbeil, Daraiya, Dimecshqiye, Jarmaq, Mahmoudiye, Mazraat [farm] Aadour, Mazraat Aaqmata, Mazraat Aarajii, Mazraat Aarqoub, Mazraat El Btadiniye, Mazraat El Kaoukh, Mazraat El Rohbane, Mazraat Louzyde, Mzairaa, Ouardiye, Ouzaaiye, Qotrani, Qrouh, Zaghrine) which care for the reserve jointly.

The area of this biosphere reserve offers a special natural design to serve the three functions of the biosphere reserve; the core and buffer zones count on the suitable surface to reach the objectives of long term conservation, their design ensure the protection of the core zones which comprise the most delicate and most biologically important areas. The buffer zones comprise a research experimental area for the Economically Important Wild Plant Species and some other minor activities that are compatible with the protection of the core areas. The transition zone which includes the agglomerations of villages and their agricultural and recreational lands as parts of the natural areas appears to be suitable for local communities to test out and demonstrate sustainable uses of natural resources.

#### 4.5 Through appropriate zonation :

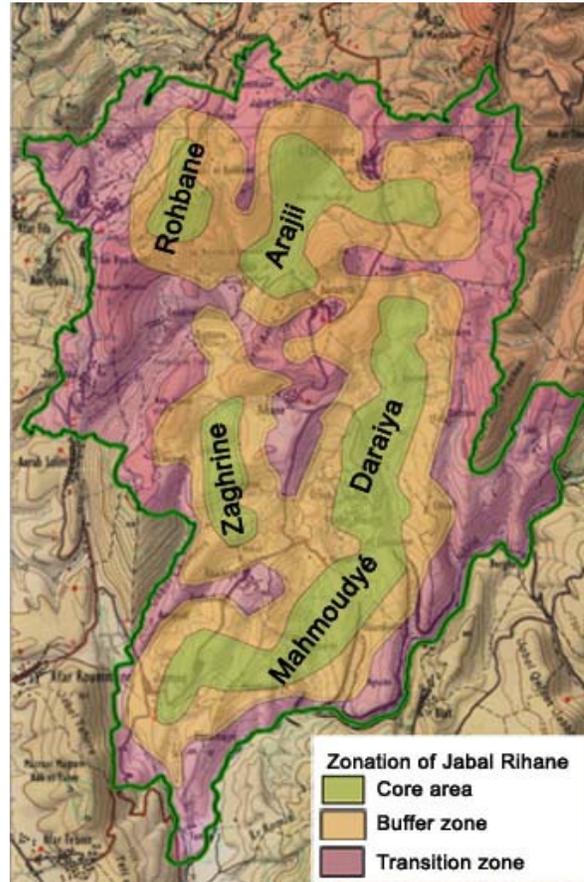
"(a) a legally constituted core area or areas devoted to long term protection, according to the conservation objectives of the biosphere reserve, and of sufficient size to meet these objectives" ?

(Describe the core area(s) briefly, indicating their legal status, their size, the main conservation objectives)

The proposed core areas are formed from parts of the public and municipal owned lands of Aichyeh, Aramta, Jarjouh, Kfarhoune, Louaizeh, Mlikh, Rihane, Sujud and Srairi that

acquired protection from the draft Law which was approved by the Ministerial Decision and submitted to Parliament for endorsement, and from the forestry law; and given high priority for conservation in the National Master Plan that was developed by the Council for Development and Reconstruction in collaboration with the Directorate General of Urban Planning and the Ministry of Environment. They cover an area of 3178.50 ha. or 17.25% of the total biosphere reserve surface area.

The Jabal Al Rihane Biosphere Reserve includes four core areas<sup>1</sup> that are relatively separate and legally constituted protected areas in accordance with the conservation criteria of the MAB biosphere reserve program. Their shapes and sizes are mainly determined by the topography of the reserve, and the objectives for their conservation. Furthermore, they are selected according to the higher value of their natural resources, their obvious representativeness of the ecosystems of the whole biosphere reserve, the lower level of alteration by anthropologic activities and for their current status of being almost free from all human activities. In these core areas, only individual activities of scientific research and monitoring with the intention of obtaining the data that allow knowing the ecosystems in their evolutionary dynamics, as well as the degree of their conservation are allowed. The four identified core areas are:



- 1) The Mahmoudy -Daraiya core area: It extends along the East and the South of the Reserve and it is the greatest of the four since it covers 1850 ha. or 10.04% of the total surface area of the Reserve. It represents the supra and meso-Mediterranean bioclimatic zones and to a much lesser extent the thermo-Mediterranean zone. Subsequently, this core area offers a gradation of habitats from dense forests to barren lands belonging to the communes Aramta, Rihane, Srairi and Aaichye. In addition, this core area includes the oldest protected area that was declared a reserve in Lebanon through a private initiative, the Khamlet Khazem which covers alone 400 ha. The Daraiya-Mahmoudy 's priority and main objective is to conserve and maintain the integrity of natural processes and biodiversity in the Jabal Al Rihane Biosphere Reserve area before it loses its virginity; especially that it was left intact during 20 years (1982-2002) due to military tensions.
- 2) The Aaraji core area: It lies in the North East parts of the Reserve and covers an area of 778.50 ha. or 4.22% of the total surface area. It belongs to the communes Kfarhoune, Aramta and Mlikkh. Being mostly located in the supra-Mediterranean zone, this core area is represented by forests of oaks, pine and juniper trees that form an important watershed area, but also by barren rocky areas which constitute the only Hyrax habitat in the country. The objectives of this Aaraji core area are biodiversity

<sup>1</sup> See details in Map3

and watershed conservation, information and public awareness as well as monitoring of scientific knowledge.

- 3) The Zaghrine core area. It lies in the central West of the reserve and covers an area of 320.00 ha. or 1.74% of the total reserve surface area and belongs to the communes Louaize, Sujud, Rihane, Jarjoui and Aaichye. Lying mainly in the meso-Mediterranean zone, it comprises reasonably protected stands of evergreen and deciduous forests and sclerophyllic scrubby lands. It contributes to sustaining a watershed area that drains into Nabaa El Tasseh where the hydro-electric plant is installed, Zahrani River and Litani River. The main objectives of this core area are conservation of rain catchment areas and migratory bird hotspots, research, restoration of its damaged northern part by fire due to previous military activities, and monitoring of changes.
- 4) The Rohbane core area that is located in the northern West of the Reserve and includes 1.25% of the total of the reserve with a surface of 230.00 ha. It comprises Jabal Safi and belongs to Kfarhoune and Mlikh communes in the supra-Mediterranean zone where oak dominating forests alternate with sparse grasslands and fords to form spectacular vegetal associations. This core area that is known for its richness in endemic and localized plant species and as roosting site for the bulk of migrating raptors during fall and spring migration has for objective the conservation of natural heritage and the hosting habitats for the avian migrants. However, this small core area may grow in the future on the expenses of the buffer and transition zones if the agricultural areas, mainly to the West, are left to be fallow and to enter ecological succession through adaptive management of landscapes.

"(b) a buffer zone or zones clearly identified and surrounding or contiguous to the core area or areas, where only activities compatible with the conservation objectives can take place..."

(Describe briefly the buffer zones(s), their legal status, their size, and the activities which are ongoing and planned there).

Whereas the core areas are intending to achieve *in-situ* conservation of the natural ecosystems, the buffer zone objective is to minimize any effect on the core areas and to conserve and maintain those ecosystems that were created or influenced through human use (e.g. cultural landscapes, semi-natural ecosystems, etc.) and ensure sustainable use of the natural resources through studies and monitoring that allow obtaining good results when applying adapted techniques of use. Based on the above, a buffer zone of 7088.5 ha. or 38.46% of the total reserve surface area surrounds the four core areas<sup>1</sup>. This is formed from public and municipal owned lands (70% of the buffer zones) that are protected by legal ordinances. The remaining 30% is protected by three instruments, the municipal regulation, the national master plan and the forestry law # 85 and its amendment in Law # 558<sup>2</sup>. The latter designates a zone of 1000 meters directly surrounding the forests where traditional agricultural, educational activities and ecotourism activities may take place provided that no major construction or industrial activities are allowed.

The outer shape of the buffer zone is to some extent imposed by the villages and the main roads that are connecting them.

The intercalated buffer zone between the protected core areas and the transition zone comprises a diversity of places (cultivated terraces, stone pine woods, oak woods, scrubby sclerophyllic lands, riparian areas, grasslands and barren rocky areas) that are generally

<sup>1</sup> See details in Map3

<sup>2</sup> See translated copy in Doc.16

more or less exploited by humans. Since the first declaration of the Jabal Al Rihane a nature reserve at the level of the Ministry of Environment in 2005, the destructive practice of over-grazing was stopped and controlled grazing was gradually introduced to allow herders to use buffer areas for grazing in order to create a working partnership between the Reserve and the herders and minimize the risk of forest fires through planned grazing. In addition the exploitation of pine seeds is wisely sustained whilst the hunting is banned. Charcoal production that was relying on wood cutting is presently restricted to the use of only naturally fallen branches which are dispensed by the forestry department.

Despite the fact that the Jabal Al Rihane area suffers from rural poverty, lack of sufficient planning and lack of infrastructure to promote tourism in the reserve, some initiatives took place through the establishment of trails for hiking, bird watching and cave and historic tombs visiting. These initiatives took advantages from the moderate to low human population that is combined with the availability of scenic views, historic sites, caves, traditional agriculture terraces, dense forests and healthy environment which allow for the establishment of income generating eco-tourism light industry in appropriate places of the buffer zone and subsequently lead to poverty alleviation, stopping immigration from rural areas, improving environmental education and training on sustainable conservation planning. Any activity that will not ensure the sustainability of the natural resources shall be forbidden, whilst the farming activities will be regulated in order to diminish the impact on the natural resources whereas, in parallel, the green organic farming will be promoted. The domain of each activity in the buffer zone will not exceed the limits which may make it incompatible with the protection of the core areas.

In these buffer zones of the Jabal Al Rihane Biosphere Reserve and under a regional project (UNEP/GEF Project EP/INT/204/GEF) aiming at improving global food security through effective conservation of economically wild plant species *in situ*, demonstration sites for "Design, Testing and Evaluating of Best Practices for *in situ* Conservation of Economically Important Wild Plant Species" were selected. This selection is due to the fact that the Jabal Al Rihane was assessed as one of the centres of plant diversity, belonging to the Near Eastern and Mediterranean Vavilov Centres of Crop Diversity and Origins, and rich in diversity and genetic resources of globally important crop plants, including many cereals, food legumes, vegetables, forages, fruit trees and nuts, medicinal and aromatic plants and forestry species, and because of the willingness and commitment of its local communities to implement the project.

"(c) an outer transition area where sustainable resource management practices are promoted and developed"

(The Seville Strategy gave increased emphasis to the transition area since this is the area where the key issues on environment and development of a given region are to be addressed. The transition area is by definition not delimited in space, but rather is changing in size according to the problems that arise over time. Describe briefly the transition area as envisaged at the time of nomination, the types of questions to be addressed there in the near and the longer terms. The size should be given only as an indication).

The transition zone of Jabal Al Rihane Biosphere Reserve covers a non definitive area of 8163.00 ha that is equivalent to 44.30% of the total surface area of the reserve. It corresponds to the living, working and recreation areas of the reserve's population. Though, the transition zone comprises the settled areas including 9 villages (Aichyeh, Aramta, Jarjough, Kfarhoune, Louaizeh, Mlikh, Rihane, Sujud and Srairi) and 6 hamlets (Ain Bou Souar, Dimecshqiye, Mazraat Aaqmata, Mazraat Aarqoub, Mazraat El Btadiniye and Qrouh). Moreover, the transition zone comprises habitats that are representative of those found in

other zones but fragmented or dispersed. Being bordered from the central East to the South by the Litani River, the Jabal Al Rihane Biosphere Reserve may initiate negotiations with lands outside the reserve, specifically on the other bank of the river, to exchange reciprocal interests and to promote sustainable development as well as to protect the globally threatened otter.

In this transition zone where the influence of humans gradually decreases towards the other zones, it should be kept in mind that needs of nature and people are equally met. In doing so, the transition zone of Jabal Al Rihane provides possibilities for production and marketing of environmentally friendly products that are demanded by visitors (Myrtle, honey, jam, condiment, distilled water of flower, textiles, baskets, pottery, toys, syrup, wine, Aarak [alcoholic pastices], olive oil, etc.) and provides possibilities for development of environmentally and socially compatible recreational uses (stargazing, hiking, climbing, bird watching, photographing; visiting caves, agricultural traditional terraces, green organic farming, historic tombs, etc.); such uses contribute to sustainable development and increased incomes. Recognizing the importance of eco-tourism, the villagers of Jabal Al Rihane hosted in 2006 a workshop on training guides and received the participants of the workshop in their houses during overnights. This experience constituted the spark which leads the Green Future NGO to design an eco-lodge that is now waiting for co-funds.

Following a recent study in the transition zone on man-environment relationships, it appears that the residents of villages depend heavily on agriculture as a source of income, but their areas lack agricultural roads that help access cultivated lands (mainly olive groves, tobacco, cereals and vegetables), and water for irrigating those lands. In order to increase the farmers' economic opportunities through increased productivity and decreased cost of transportation, a collaborative project between 4 villages (Kfarhoune, Rihane, Aichyeh, Sujud and Louaizeh) and the United States Agency for International Development (USAID) was implemented providing villagers with agricultural and feeders roads and rain-fed pools. Another project (small scale wastewater treatment plant) that was previously implemented in Aichyeh village is expected to be also implemented in other villages of the reserve through **extension and demonstration activities**. In this transition zone that is privately and to a much lesser extent publicly owned, cutting and collection of wood for charcoal production and heating purposes are prohibited whereas collection of snails, mushrooms and culinary plants for domestic use are permitted. The draft management plan sets series of touristic activities that are allowed without permits, with permits and not allowed. However, more researches and monitoring will take place in the transition zone to assist promoting sustainable resources management practices. They will focus primarily on the structure, productivity, function and efficiency of ecosystems.

Furthermore, most of the damaged forests during the war and the degraded macquies referred to by the residents as "Areeds" are included for repairing purposes within the transition area as **regeneration zones**.

4.6 "Organizational arrangements should be provided for the involvement and participation of a suitable range of *inter alia* public authorities, local communities and private interests in the design and the carrying out of the functions of a biosphere reserve."

(Are such arrangements in place or foreseen)

Presently, the Reserve is managed by a joint and coordinated effort between the Association of the 9 municipalities that represent the 9 villages of Jabal Al Rihane (elected bodies), the

Green Future (NGO), the Creative Association (NGO) and the Society for the protection of Jabal Al Rihane (NGO) through a “Transitory Management Council” of 17 members from local communities, local authorities, scientific bodies and a coordinator as follow:

- one delegate for each of the following municipalities: Aramta, Jarjough, Kfarhoune, Mlikh, Louaizeh, Rihane, Srairi, Sujud and Aichyeh (They represent the elected local authority);
- one representative of the Green Future NGO (It represents the local communities);
- one representative of the Society for the protection of Jabal Al Rihane (NGO);
- one representative of the farmers of Jabal Al Rihane area);
- one representative of the Forestry Sector;
- one representative of the Hydroelectric plant of Nabaa El Tasse in Louaizeh village;
- one expert in fauna/ from local communities
- one expert in flora/ from local communities
- Coordinator

The Transitory Management Council is responsible for the planning and management of the Biosphere Reserve, development of resources, drafting of the legislations of relevance to the Biosphere Reserve, development of the drafted management plan, coordination of activities between all stakeholders, promotion of eco-tourism and environmental education, attraction of researchers and generation of incomes through projects and donors. The composition of the Management Council allows all stakeholders to participate and coordinate their planning and designs for a better carrying out of the three functions of the biosphere reserve.

The drafted bylaw of the Transitory Management Council allows inviting to the meetings, when appropriate, representatives from the following bodies:

- The MAB National Committee
- The Council of the South
- The Shouf Biosphere Reserve
- The Lebanese University
- The American University of Beirut
- The National Council for Scientific Research
- The Forest fire brigades
- The Ministry of Education
- The Ministry of Tourism
- The Ministry of Water and Energy
- The tour operators

As for the management working team that is presently working under the direct supervision of the Transitory Management Council it comprises rangers and guides from municipalities, forest guards and volunteers. A work team manager is expected to be appointed soon together with educational, fundraising and scientific officers.

However, a greater level of organizational coordination is foreseen for the proposed Jabal Al Rihane Biosphere Reserve. In fact, the Council of Ministers has already approved on 9 March 2006 the set up of an “Appointed Protected Area Committee (APAC)” that will comprise seven representatives from municipalities, ministry of agriculture, NGOs and scientists to replace the Transitory Management Council. The latter will turn to function as Coordination Council for the biosphere reserve. The APAC that is not composed yet due to the political situation in Lebanon (resignation of the Minister of Environment) will be financially and

administratively autonomous and will appoint members of the management team in close cooperation with the Ministry of Environment and the local communities<sup>1</sup>.

**From the above, it can be concluded that the Management authority is focussing on involving local people, among others, in the decision-making process pertaining to the management of the reserve and to its various activities.**

#### 4.7 Mechanisms for implementation

Does the proposed biosphere reserve have :

"(a) mechanisms to manage human use and activities in the buffer zone or zones" ?

(Briefly describe)

The managing accountable entity is the Transitory Management Council that is responsible not only for the buffer zone but also for the whole reserve. Therefore, human use and activities are managed by the Council under the overall supervision of the Ministry of Environment (MoE) that is responsible for the management of biodiversity conservation and sustainable use of biological resources in the entire country. The presence of a representative of the MoE in the Council is to diminish the procedures that would be undertaken if an activity requires approval and to ensure coordination at national level.

The management of human use and activities by the Transitory Management Council should anyway have a respect not only to the Law of forestry number 85 and its amendments or the Cabinet Decision number 25/2006 about the Jabal Al Rihane but also to the "Code of Environment" (Law 444/02) that is compatible in its details with the three concerns of the biosphere reserves. This environmental law will allow the Transitory Management Council to manage both illegal activities and human usage. Patrolling of the buffer zones will make part of the rangers' job. Practically, the management team is representing the Transitory Management Council on the ground.

Currently the Transitory Management Council is in the process of defining the parameters of management which must meet the buffer zones objectives. These include the fire forest action plan, harvest of noteworthy plant species management plan, mechanism for application of sustainable hunting in Rihane area in case the ban on hunting is suspended, visitor plan, rotating grazing, beekeeping, etc.

"(b) a management plan or policy for the area as a biosphere reserve" ?

(Briefly describe)

Yes<sup>2</sup> - a draft management plan exists for the Jabal Al Rihane as a protected area that can be expanded to include the buffer and transition zones of the proposed biosphere reserve. It can be reviewed and subjected to adaptations in order to incorporate those elements that are particular to a biosphere reserve.

Whatsoever, the following **policies** are extracted from the mentioned draft management plan that was a result of a collaborative participation (see Annex for the Draft Management Plan).

- Management will be in accordance with the principles of the Natural Heritage Charter.
- All species of native plants and animals will be protected and conserved. Economical species and other natural resources will be sustainably used.

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<sup>1</sup> See Doc.16

<sup>2</sup> See Doc.18

- Management priority will be given to conservation of all rare and threatened species. Highest priority will be given to species which are endemic, globally rare or threatened.
- All species of native plants and animals used in rehabilitation or regeneration in the Reserve will be propagated from local material or from sources which can be guaranteed genetically identical to populations in the biosphere reserve.
- All newly introduced species of plants and animals will be eradicated where practicable, consistent with any cultural heritage considerations. Prior to eradication activities, all reasonable efforts will be made to investigate, recognize and prevent threat to non - target species or individuals.
- Permanent records of species recorded, eradicated or reintroduced will be maintained.
- No rock or soil material will be excavated or removed from the core and buffer areas of the biosphere reserve except where required for activities otherwise authorized under a formal plan (e.g. professional archaeological excavations, visitor facilities, removal of explosives, etc...)
- Management will be in conformity with the principles of the Burra Charter.
- Internal procedures will be developed, in co-operation with the Directorate of Antiquities, to provide a routine process for assessment of cultural heritage values which may be encountered in management activities.
- All groups/individuals wishing to conduct archaeological investigations in the core and buffer zones of the biosphere reserve will require a research permit.
- Scientific research and investigation of cultural and historical sites and values will be promoted and facilitated.
- Priority will be given to promoting elimination of all dumps that discharge their garbage or toxic compounds into all zones of the biosphere reserve.
- Work cooperatively with local Municipalities and Government agencies to minimize pollution and other activities that may impact on the biosphere reserve.
- All proposals initiated by the management of the reserve will be subject to environmental impact assessment, and no development proposal will be approved where it can be demonstrated that wise and feasible alternative sites exist outside the proposed biosphere reserve.
- All development proposals will be subject to the test of 'No Net Detriment'. It will be the responsibility of the proponent to demonstrate how the principal of 'No Net Detriment' is to be met.
- All development proposals will be investigated and evaluated for possible contributions of "net benefit" to the Reserve. All proposals for net benefit will be optional and negotiable.
- All development proposals are to be assessed for compliance with the management plan that is in preparation and such assessment is to be documented and publicly available on request.
- A Research Agenda will be maintained which details and prioritized research needs to support the management objectives and priorities for the Biosphere Reserve.
- Environmental education is a preferred public use of the proposed Biosphere Reserve.
- Education programs will be guided by an Environmental Education Plan(EEP)
- The principle of "the community has the right to know" will be adopted.
- Visitor management planning will have regard for the creation and maintenance of a quality experience to promote community support for the biosphere reserve.

- The cost of providing visitor facilities and services will be, at least in part, recovered by the application of the 'User Pays' principle in the form of an appropriate of access fees on visitors where lawful.
- Generation of any socio-economic benefits to the local community, direct or indirect, must be the product of sound conservation management of the biosphere reserve and not an independent primary objective.
- Information systems will be developed which facilitate rapid access to information and equally rapid delivery to potential users.
- Sound financial management will be guided by a 10 year Business Plan which will be reviewed annually.
- Planning for financial support will adopt the principle of funding diversification to increase security of funding and will avoid dependence on one source from any one sector.

The draft management plan of Jabal Al Rihane has developed a guiding document to identify how each policy component may contribute to the objectives of the reserve.

"(c) a designated authority or mechanism to implement this policy or plan" ?  
(Briefly describe)



Yes



No



Planned

The implementation of the management plan or the policies is assigned by the Ministry of environment to the "Appointed Protected Area Committee" if exists; otherwise to the existing Transitory Management Council and to the Green Future NGO. At present, the Transitory Management Council provides and will continue providing logistic support and coordination functions relating to the activities of a number of different management, research, education, and training organizations. In addition, the management of the Rihane Biosphere Reserve will benefit from the following supporting laws:

- Law number 326 date 28/6/2001, for the execution of reforestation projects at the national level,
- Forest Code (Law 85 date 12/9/1991), amended by the Parliament in 1996 (Law 558 date 24/7/96) stipulating that all cedar, fir, juniper forests and "other coniferous forests" in Lebanon are protected *in facto*.
- The Forest Code (law # 85) designating a zone of 500 meters directly surrounding the forests where agricultural and ecotouristic activities may take place provided that no major construction or industrial activities are allowed.
- Law for the Protection of Environment (law 444/02) dedicating an entire chapter for the management of natural resources and conservation on biological diversity - specifically articles 47 to 49 which call for the protection and sustainable use of biodiversity, the establishment of nature reserves and for regulating access to genetic resources. Furthermore, the Law 444 stipulates that incentive measures be given to actions that avoid or minimize impact on environment including biodiversity.
- The draft EIA decree stating that all major development, infrastructure and industrial projects will have to undergo an EIA study including effects on biodiversity, in order to promote conservation activities before receiving approval.

- The draft law on “access and benefit sharing” that was developed in the year 2005 and once issued will lead to the regulation of the access to the Lebanese biological and genetic resources and will reduce unsustainable consumption.
- Ministerial Decision issued by the Minister of Agriculture regulating the export of all medicinal and aromatic plants (Decision 92/1 dated 27/2/1996)
- Ministerial Decision issued by the Minister of Agriculture (Decision 108/1, dated 12/9/1995) prohibiting the import and introduction of all cedar seeds and plants
- Ministerial Decision issued by the Minister of Agriculture prohibiting the picking and export of ferrula plant & roots (Decision 340/1 dated 1/8/1996), a plant having aphrodisiac properties.
- Ministerial Decision issued by the Minister of Agriculture in 1998 regulating the harvesting of oregano and salvia (Decision 177/1)
- Law 580/4 regulating the hunting at national level.
- The Master Plan that was developed by the Council for Development and Reconstruction in collaboration with other ministries, particularly the Ministry of Environment, considering Jabal Al Rihane an area that needs most conservation attention.
- The Cabinet Decision (25/2006) approving the draft Law of establishing the Jabal Al Rihane nature reserve and setting a mechanism for its conservation and management. This draft Law anticipated the nomination of Jabal Al Rihane a biosphere reserve by dividing the nature reserve into two parts: 1) area of absolute protection (=core area), and 2) area of sustainable development (=buffer zone).

(d) programmes for research, monitoring, education and training"?

(Describe briefly research/activities monitoring (ongoing or planned) as well education and training activities)

Due to its relative virginity, Jabal Al Rihane Biosphere Reserve has attracted several researchers in various domains such as botany, herpetology, mammalogy, ornithology, hydrobiology, limnology, entomology, geology, socio-economy, etc. The reserve serves as a site for the implementation of the Lebanese university monitoring program. In fact, outstanding efforts have been made in fields of plants, birds, herptiles and geology. These researches made a significant contribution to the conservation and understanding of Rihane's ecological diversity. Research, assessment and monitoring continue in order to better evaluate the functioning systems of Rihane area. The designation of Rihane a biosphere reserve will certainly be a motivator to group all research publications and monitoring results from different universities and research centres into a database system that could be used for resource management within Jabal Al Rihane and for information sharing with other biosphere reserves. The already obtained information from scientific research and monitoring in the core, buffer and transition zones at Jabal Al Rihane is directly valuable for industry and educators far beyond Jabal Al Rihane boundaries, and will further establish and support Lebanon's role and ability to take effective action in environmental protection. Currently, annual habitat research and inventory is undertaken for focal species such as the Hyrax which appeared to be retreated in Lebanon to Jabal Al Rihane area only. The hyrax constitutes an essential element of eco-tourism beside bird-watching. Other focus species include marten, wolf, wild cat, otter, hyena and bats. Monitoring of plants and birds is ongoing. Recently the Transitory Management Council developed a priority research agenda targeted to university students aiming at completing their studies with graduation projects in the Jabal Al Rihane Biosphere Reserve. The required studies are not limited to natural science but also to socio-economic areas.

Within a GEF/UNEP project that is in implementation by the Lebanese University on behalf of the Ministry of Environment, researches and monitoring are targeting the economically important wild plant species (EIWPS) in Jabal Al Rihane area that is used as demonstration site for their *in situ* conservation. This project is implemented in collaboration with FAO, Diversitas and Epgri. The project intends to develop curricula, as necessary, to increase education at all levels about *in situ* conservation of EIWPS, plan to provide guidelines for trainers and lecturers and to develop a system based on training and identification of indicators for long-term monitoring to update the future management plan of EIWPS *in-situ* conservation.

The *Sustainable Environmental Practices and Policies Program (SEPP)* - whose aim was to improve environmental practices and policies for the management of wastewater in Aichyeh village - targets women and students and also seeks to strengthen the capacity of local municipalities and communities in an effort to implement an all-inclusive, comprehensive, sustainable, environmental management program in the Jabal Al Rihane area. In an effort to influence and educate communities on sound environmental policies and practices, the YMCA of Lebanon provides training, education, technical resources, materials and practical solutions to improving waste management in the Jabal Al Rihane area.

It is also planned to conduct research to assess the impact of July 06 war on the forests of the Jabal Al Rihane, to highlight priority management for rural development, to monitor the trend of land use, to evaluate the cultural value conservation activities, to benefit students from an educational kit and research facilities, to train management team on interpretation of nature and adaptive management, and to train guides on guiding techniques and eco-tourism attraction.

## **5. ENDORSEMENTS**

5.5 Signed on behalf of the MAB National Committee or focal point:

Full name : Prof. Dr. Georges Tohmé/



Title : President of Lebanon's National MAB Committee \_\_\_\_\_

Date: 19/04/2007 \_\_\_\_\_

National MAB Committee  
of Lebanon

- In accordance with the draft Law of establishing Jabal Al-Rihan Nature Reserve, a follow up committee composed of 7 members of volunteers appointed by the Minister of Environment will provide an over all supervision on the proper management of the Nature Reserve. The Transitory Management Council will then turn to function as an Advisory Body to assist the APAC. Subsequently, the National MAB Committee will timely inform MAB-UNESCO about the above changes when they occur.
- Despite the fact that the proposed biosphere reserves has a history of research, the Lebanon's MAB National Committee certify that the administrative authorities responsible for the planning and management of the proposed biosphere reserve acknowledge their commitment to facilitate a more comprehensive programme of research and monitoring.
- The MAB National Committee acknowledges its commitment to pursue the objectives identified in the Action Plan for Biosphere Reserves and will make sure that the Jabal Al Rihane BR will work within the international MA B framework for comparative studies of similar environmental problems in different parts of the world; for testing, standardizing and transferring new methodologies; and for cooperating in the development of information management systems.
- The National MAB Committee assisted the following agencies who participated beside many other stakeholders in the preparation of the revised nomination of Jabal Al Rihane Biosphere Reserve: *Abela Foundation International, Green Future NGO, Creative Association NGO, Aram Society, Society for the Protection of Environment at Jabal Al Rihane and the Transitory Management Council of Jabal Al Rihane.*
- The draft management plan that was prepared by the Transitory Management Council will be reviewed by the Appointed Committee (APAC) in accordance with the draft Law of establishing Jabal Al Rihane Nature Reserve and approved by the Ministry of Environment for a period of 5 years. However, the National MAB Committee is committed to provide the APAC with management guidelines aiming at adapting the said plan to be for the management of Jabal Al Rihane as biosphere reserve.
- Recognizing that the management of the transition area is the responsibility of a variety of authorities, the National MAB Committee provided appropriate arrangements for a better coordination of tasks between the seven actively participating municipalities of the Jabal Al Rihane region.
- The National MAB Committee reviewed the revised nomination of Jabal Al Rihane BR. and concluded that it responds to the criteria set for BRs and that it also responds to the recommendations that are mentioned in the final report of Meeting of the Bureau of the International Co-ordinating Council, 27-29 June, 2005.



UNESCO - Man and the Biosphere (MAB) Programme - Biosphere reserve nomination form - February 2004

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## PART II : DESCRIPTION

### 6. LOCATION ( LATITUDE AND LONGITUDE ):

[Indicate in degrees - minutes, seconds the coordinates of the central point AND the external limits of the proposed biosphere reserve to be used for a Geographic Information System (GIS) ]

**Central Point:** Latitude 33 degrees, 27 minutes, 01.17 seconds North  
Longitude 35 degrees, 33 minutes, 47.17 seconds East

**External Limits:**

**Maximum North:** Latitude 33 degrees, 32 minutes, 51.34 seconds North  
Longitude 35 degrees, 33 minutes, 31.64 seconds East

**Maximum East:** Latitude 33 degrees, 27 minutes, 23.61 seconds North  
Longitude 35 degrees, 38 minutes, 19.42 seconds East

**Maximum West:** Latitude 33 degrees, 31 minutes, 25.45 seconds North  
Longitude 35 degrees, 29 minutes, 11.26 seconds East

**Maximum South:** Latitude 33 degrees, 19 minutes, 58.74 seconds North  
Longitude 35 degrees, 31 minutes, 39.67 seconds East

### 7. AREA

**Total: (ha): 18430**

7.1 Size of terrestrial Core Area(s):  3178.50  ha;  
If appropriate, size of marine Core Area(s);   ha.

7.2 Size of terrestrial Buffer Zone(s):  7088.50  ha;  
If appropriate, size of marine Buffer Zone(s);   ha.

7.3 Approx. size of terrestrial Transition Area(s) (if applicable):  8163.00  ha;  
If appropriate, approx. size of marine Transition Area(s);   ha.

7.4 Brief rationale of this zonation (in terms of the various roles of biosphere reserves) as it appears on the zonation map. In the cases where a different type of zonation is also in force at the national level, please indicate how it can coexist with the requirements of the biosphere reserve zonation system:

The large wild areas of communal and governmental owned lands that comprise the core areas protect the lands of ecosystem complexes that, to date, are not sufficiently represented in biosphere reserves in Lebanon or even in the Levant. They comprise several vegetal associations and landscapes as well as their related significant biodiversity, waters and water-catchments areas of at least three major watersheds and sub-watersheds, allowing as such conservation objectives to be fulfilled, while also supporting individual research and monitoring.

The delimitation of the core areas is based on the results of a participatory consultation involving the local communities and other stakeholders and on the fact that:

- they comprise the areas of lowest level of alteration by human activities
- they are free from villages
- they encompass the highest values of natural resources in Jabal Al Rihane Biosphere Reserve
- they belong to the 9 villages of the of the biosphere reserve
- they are legally protected by the draft Law that was approved by the Cabinet decision 25/2006 and by the forestry law 85 and its amendments.
- they possess a surface area whose borders mainly depend on topography (cliffs, fault, deep slopes, rivers, etc.) and conservation objectives.
- They represent the three available Corine classification levels.

In the core areas, all human activities (hunting, plant collection, economic development, recreational activities, etc.) are not permitted. Instead, individual research and monitoring are allowed and regulated.

The buffer zones are also protected by the legal ordinances whereas a portion of the buffer zones is protected by the actively managed hydroelectric power generation of Nabaa El Tasseh. The buffer zones surround the core areas to protect them and support them through the management and conservation of the impacted areas by humans within the buffer zones. The latter, like the core areas, harbour a broad spectrum of different habitats of many different animal and plant species, including threatened ones. The delimitation of these buffer zones depends on the topography of the area and takes in consideration the involvement of the local communities of the 9 villages in the adaptive management of the buffer zones.

These buffer zones will be active laboratory of sustainable resource utilization, primarily concerning the science and management of forests, biodiversity, recreation and environmental education. Hence, the buffer zone allows controlled activities with limited impacts on the biosphere reserve such as reforestation, demonstration sites for *in-situ* conservation, eco-tourism models, water quality research, and other socio-cultural light activities). In addition, the draft Law approved by the Cabinet Decision 25/2006 adds to the buffer zones a belt of 500 meters in which any activity should first be submitted to a preliminary impact study and/or Environment Impact Assessment.

The transition zone covers the remaining area of the Jabal Al Rihane Biosphere Reserve. It includes the 9 villages as well as 6 hamlets (Ain Bou Souar, Dimechqiye, Mazraat Aaqmata, Mazraat Aarqoub, Mazraat Btadiniye and Qrouh) that are surrounding the buffer zones to constitute a working, recreational and living place for the local population and to have the landscape's typical natural appearance shaped by sustainable uses.

The transition area provides the greatest possibilities for production and marketing of environment friendly products, and for development of environmentally and socially compatible recreational uses; such uses contribute to sustainable development, poverty alleviation and support of the core and buffer zones. However while designing the transition zone, settlement and land-use patterns that are typical for the landscape were taken into account together with possibilities of studying the structure, function, productivity and efficiency of ecosystems, and carrying out Integrated Monitoring and environmental education.

Finally it is worthy to note that the national legislation (draft Law approved by Decision 25/2006 of the Council of Ministers) considered for the first time in Lebanon a zonation in Jabal Al Rihane that is made from core areas surrounded by a buffer zone to suite the organisational aspect of the predicted biosphere reserve. Hence, this was not a coincidence but a contribution from the government of Lebanon, particularly the Ministry of Environment, to promote new biosphere reserves in the country.

## **8. BIOGEOGRAPHICAL REGION:**

[Indicate the generally accepted name of the biogeographical region in which the proposed Biosphere Reserve is located. You may wish to refer to the map of the World Network of Biosphere Reserves presenting 12 major ecosystem types.]

### Sclerophillic forests and bushes with persistent leaves.

Forêts et broussailles sclérophilles à feuilles persistantes

Reference: Map of the World Network of Biosphere Reserves

The Jabal Al Rihane Biosphere Reserve is in the middle of the Palaeartic Realm which is one of the most biologically diverse regions on the globe because it is at the junction between three continents: Africa, Asia and Europe. It is also home to a remarkable diversity of civilizations, cultures and languages.

## **9. LAND USE HISTORY:**

[If known, give a brief summary of past/historical land use(s) of the main parts of the proposed biosphere reserve]

The finding in the valleys between Kfarhoune and Mlikh of some old pieces of artefact work of different sizes, including the remains of old smooth or carved or even painted kitchen tools revealed in the Jabal Al Rihane Biosphere Reserve past human activity from the Neolithic age. Furthermore, the walls of the some terraced lands in front of Mlikh may be considered of the same age too. At the northern entrance of Mlikh there is a carving in form of fish that belongs to the first Christian era.

For thousands of years of its history Lebanon has been influenced and mostly dominated by foreign powers as it passed from one empire to another. Lebanon's rich and varied culture is therefore the product of all these influences, from the Sumerian, Babylonian, Ancient Egyptian, Greek, Roman, Byzantine and Ottoman empires to the more recent French mandate. Rihane wasn't an exception. These foreign powers harvested food in the form of plants, birds and mammals, as well as using wood for industry and commerce; and other plants for heat, food preparation and shelter. Agricultural lands and their typical terraces on the slopes around villages witness the persisting traditional ways of using the lands.

Between Mlikh and Aramta, there are remains of olive oil industry referred, as per the local community, to the beginning of the last century.

Due to the turbulent situation that existed in South Lebanon for the last 22 years of the last century, farmers from Jabal Al Rihane neglected their lands for the duration of the conflict. Few continued to look to farming as their main source of income but did so in areas far away from the front lines such as Saida and Tyre. Very few remained in the villages all year round to grow tobacco, vegetables and cereals as well as to raise some cows and goats. The high costs of production mainly due to lack of access to cultivated lands prevents the majority of the farmers from benefiting from agricultural based income and thereby discourages them from returning to their villages.

The villages of the transition zone are popular summer resorts. The majority of the local population, especially the professional men and women, live in Beirut and its suburbs during the winter. The reasons for this are the availability of jobs in Beirut, better schools and warmer weather.

The people who returned to their villages in the recent years suffer from absence of agricultural credit and organized marketing. In addition, the high prices of chemical fertilizers and insecticides, lack of irrigation pools, and absence of agricultural roads make the agricultural sector unprofitable. As a result many of these farmers are now mechanics, builders and storekeepers – or they are unemployed.

A study that was conducted by YMCA Lebanon in 2001 regarded agricultural projects as the main activity to benefit farmers, therefore the villages' priorities. The study found that rain-fed pools and feeder roads would decrease production costs for farmers by minimizing transportation needs, thereby encouraging the displaced to return to their village.

Upon the return of some displaced, queries for extraction of limestone, intensified illegal hunting and wood cutting from forests for charcoal production prevailed in the area prior to the declaration of Jabal Al Rihane a reserve. Nowadays all these activities that negatively impacted the environment are banned.

Presently, the activities of villagers neglect the orchards as well as the cereal cultivation to focus on the easier and more returning tobacco cultivation, on pine stone and olive groves harvesting, on growing some vegetables, burning some lands for better grazing, bee keeping; wild plant (culinary, medicinal and aromatic plants; mushroom and snail) collecting for domestic use and consumption. With the increased number of visitors to the area of Jabal Al Rihane, some food processing activities (dried fruits, jam, condiment, honey, and distilled water of flower) and production of final items such as textiles, baskets, pottery, toys, etc. took place upon an increased demand from visitors. The products of these activities are increasingly exhibited in villages for sale.

## 10. HUMAN POPULATION OF PROPOSED BIOSPHERE RESERVE:

[Approximate number of people living within the proposed biosphere reserve]

permanently / seasonally

10.1 Core Area(s): \_\_\_\_\_None / None\_\_\_\_\_

10.2 Buffer Zone(s): \_\_\_\_\_1402/ 5614\_\_\_\_\_

10.3 Transition Area(s): \_\_\_\_\_12280/ 33090\_\_\_\_\_

Many people from Beirut have second homes in Jabal Al Rihane and come to the mountains to escape the summer heat in the city. Similarly, the majority of the local population of Jabal Al Rihane, especially the professional men and women, move to Beirut and its suburbs during the winter season where jobs, better schools, and warmer weather are available.

### 10.4 Brief description of local communities living within or near the proposed Biosphere Reserve:

[Indicate ethnic origin and composition, minorities etc., their main economic activities (e.g. pastoralism) and the location of their main areas of concentration, with reference to a map if necessary]

The Jabal Al Rihane Biosphere Reserve encompasses a great mix of cultures and ethnic groups which have been building up for more than 6,000 years. Although most of the population of Jabal Al Rihane \_ as it is the case of the country \_ is today considered Arab, in the sense that Arabic is the national language, the actual *ethnic* backgrounds vary. Generally it can be said that all religious sects comprise many different ethnic backgrounds, and that clear ethnic boundaries are difficult to define. Still, religious and ethnic distinctions sometimes coincide, since religious sects have tended to marry within the group, thus preserving not only religious but ethnic characteristics. Also, one could claim that over time many of the religious sects have evolved into ethnic communities in their own right: the Druzes which are a minority in Jabal Al Rihane Biosphere Reserve but a majority in Shouf biosphere reserve are a prime example of this. Other minorities of Jabal Al Rihane are formed from Greek Orthodox (which tend to focus on the Greek heritage of the region from the days of the Byzantine Empire), and Muslim Sunnites and Roman Catholic (which are believed to be of a mixed Levantine origin). However, the Greek Catholics and Maronite Christians which see themselves as descendants of the Phoenicians/Canaanites/Mardaites/Syriacs form the majority in the Jabal Al Rihane Biosphere Reserve. As for the Shi'ites, the history of Lebanon shows that they have lived in Jezzine and in Jabal 'Amil (including Jabal Rihan) since Fatimid times. The Muslims of Jabal 'Amil were converted to Shi'ism in the ninth century by the Abbasids.

Jezzine became a very important Shi'ite centre during the Mameluke period. The fourteenth century represents its golden age. After the Shi'ite revolution against the Mamelukes at Kisrawan between 1305 and 1307 A.D., a large number of Shi'ites sought refuge in Jezzine, which became along with Jabal 'Amil (including Jabal Rihan) a major centre of Shi'ism in the Lebanon. The first Shi'ite school of *fiqh* was founded in Jezzine during the second half of the fourteenth century by Imam Shams al'Din Muhammad B. Makki al'Jezzini, assassinated by Mamelukes in 1384. The history of bloody conflicts between Shi'ites and Sunnis on the one hand and Shi'ites and Druzes on the other ended with the extermination of Shi'ism in several regions of the Lebanon, especially at Kisrawan and Jezzine. The end of Shi'ism in Jezzine began in the fifteenth century with the Druze influence of the Shouf, which attempted for two centuries to wipe out any Shi'ite presence in the region. The situation became worse during the sixteenth and seventeenth centuries with the Emirs (Princes) of the Shouf, supported by the Sunni governors of the country. In 1711, Jabal 'Amil and Jezzine came under the authority of the Sunni Emir Haidar Shehab. The Druze family Jumblatt, which later extended its authority over the Iqlim Toffah region in the vicinity of Jabal Al Rihane, exercised their feudal power over Jezzine and Jabal Rihan. The Druzes of the Shouf and the Sunni governors, especially at Iqlim Toffah, gradually expelled the Shi'ites of Jezzine and several villages round about, from their lands during the sixteenth and seventeenth centuries. At the same time, from the end of the seventeenth century, Druzes facilitated the emigration of Maronites from the North of Lebanon to Jezzine and the Shuf region in order to cultivate the land instead of the Chiites.

So the town of Jezzine and the villages of the surrounding area became Christian from the beginning of the eighteenth century. From that time on, the region of Jezzine has always remained predominantly Christian and mainly Greek Catholic and Maronite. The whole region of Jezzine and Jabal Rihan used to be under the authority of the Emir Bashir al'Kabir II (1788-1840) and since the eighteenth century, they have been an integral part of the geography and history of Mount Lebanon.

The table below indicates the religion for each village and the economic activities for each of the villages and the hamlets or farms in the Jabal Al Rihane Biosphere Reserve. It also indicates the size of populations in summer and winter. These populations increase in summer and decrease in winter because the majority of the local population, especially the professional men and women, live in Beirut and its suburbs during the winter. The reasons for this are the availability of jobs in Beirut, better schools and warmer weather.

<b>Village</b>	<b>Religion</b>	<b>Economic Activities</b>	<b>Population in summer</b>	<b>Population in winter</b>
Aichyeh	Christian Maronite	Employees Agriculture	900	350
Aramta	Muslim Shia'a	Employees Agriculture Pastoralism	8614	3000
Jarjough	Greek Catholics & Maronites 40% Muslim Chia'a 60%	Employees Agriculture Pastoralism	5000	2500
Kfarhoune	Christian Greek Catholics 75% Muslim Shia'a 25%	Employees Agriculture Pastoralism	8500	3500
Louaizeh	Muslim Shia'a	Employees Agriculture	2400	1500
Mlikh	Muslim Shia'a 50% Maronites 40% Melkkites 10%	Employees Agriculture	1000	400
Rihane	Muslim Shia'a	Employees Agriculture Pastoralism	4000	1300
Sujud	Muslim Shia'a	Employees Agriculture	1000	300
Srairi	Maronites 90% Druze 10%	Employees Agriculture	500	180
<b>Hamlets/ Farms</b>			<b>Population in summer</b>	<b>Population in winter</b>
Ain Bou Souar			120	30
Chbeil			531	150
Daraiya			490	100
Dimechqiye			112	30
Jarmaq			600	140
Mahmoudiye			38	3
Mazraat Aadour			1327	300
Mazraat Aaqmata			170	40
Mazraat Aarajii			23	-
Mazraat Aarqoub			417	90
Mazraat Btadiniye			187	16

Mazraat Kaoukh			112	10
Mazraat Rohbane			796	250
Mazraat Louzyde			910	300
Mzairaa			180	12
Ouardiye			24	-
Ouazaaiye			23	-
Qotrani			500	120
Qrouh			170	24
Zaghrine			160	17

As indicated above, most of the Jabal Al Rihane's people are farmers growing vegetables, cereals, tobacco, harvesting olive groves and raising goats and cows; employees teaching in schools, working in hospitals, clinics and hydroelectric power plant or for the Ministry of Agriculture as forest guards. Storekeepers selling household items including local non-wood forest products are found nearly everywhere.

#### 10.5 Name(s) of nearest major town(s):

**Saida:** 15km bird flight to the west of the north west corner of Jabal Al Rihane biosphere reserve at 33° 34' 50.52"N and 35° 23' 06.46E; 10 m altitude and 43 km from Beirut. Saida (Sidon) was the third great Phoenician city-state, rivalling Byblos and Tyre as a naval power. In Darius' time, towards the end of the 6th century B.C., it was the capital of the fifth Persian satrapy and a showplace of buildings and gardens.

**Jezzinee:** 3km bird flight to the east of the north east corner of Jabal Al Rihane biosphere reserve at 33° 31' 49.28"N and 35° 39' 40.87E; 980 m altitude and 65 km from Beirut. Jezzinee is a historical town, where ancient sarcophagi and Crusader remains were found. To this remote past also belongs a ruined old mosque.

**Marjayoun:** 4km bird flight to the east of the south east corner of Jabal Al Rihane Biosphere Reserve at 33° 20' 00.21"N and 35° 37' 08.45E; 783 m altitude and 85 km from Beirut. It is important locally as the largest Lebanese town of the South Beqaa and as the district headquarters, as well as being the market centre of the region.

**Nabatyeh:** 2km bird flight to the west of the south west corner of Jabal Al Rihane Biosphere Reserve at 33° 20' 03.79"N and 35° 31' 09.69E; 400 m altitude and 78 km from Beirut. It dates back to Mesolithic Age. The caves surrounding it like "Ushul Ghorab" (crow's nest) and "Moghor Mehla", with ancient tombs carved in the rocks, and the pottery objects found in them, go back to the Neolithic Age. Colored beads found in Nabatiyeh date back to the Phoenicians.

#### 10.6. Cultural significance:

[Briefly describe the proposed Biosphere Reserve's importance in terms of cultural values (religious, historical, political, social, ethnological)]

Descending the hills from Kfarhoune to Mlikh, and in the vicinity of an area called "Alwata" some old pieces of artefact work of different sizes can be found. They strongly indicate the remains of old smooth or carved or even painted kitchen tools. Future excavations in their proximity may reveal past human activity from the Neolithic or more recent ages. In addition

there are some arc-lined walls which belong to an old village. Also the walls of the terraced land in front of Mlikh may be considered of the Neolithic age too.

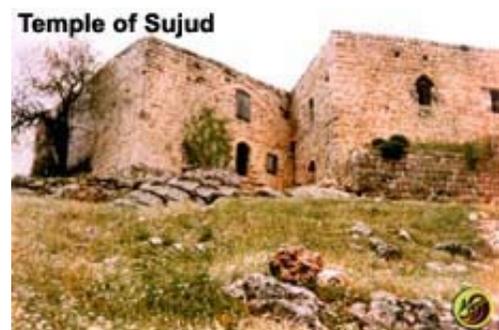
The first archaeological research carried out at Jabal Al Rihane showed that it was occupied during the Roman and Byzantine periods (evidenced by the presence of necropolis and other materials). This research has also brought to light two fish carved out of the Mlikh rock. One is on the inner road of the village, fifty metres west of the Church of St. Elijah. The other is in the historic region of Tanas upstream of the main entrance to the Wadi (the Mlikh Valley). The carving of these two fish is original and was probably sculpted in Christian antiquity. Christian history tells us that the fish was a Christian symbol during times of persecution and was often used by early Christians to mark places of assembly and prayer. There are at least three indicators that confirm Christian presence in Jabal Al Rihane, particularly in Mlikh before the Byzantine era:

- the earliest historical and archaeological sources provide evidence of continuous human occupation in Mlikh during the Roman and Byzantine periods.
- the Mlikh Valley (Wadi) and the rest of the village have provided refuge for those fleeing persecution, right up to the present.
- sculpted fish are found in areas with a wealth of natural caves suitable for small gatherings.

There is no known historic or archaeological information available about the presence of Christians in Jabal Al Rihane from Arab to Ottoman times. However, there is plenty of evidence for Shi'ite presence in Jabal Rihan in the Fatimid period.

Several historic cemeteries are dispersed here and there like the Byzantine necropolis of Mlikh or inside caves. More investigation is required to gain more knowledge about the potential archaeological resources and sites, especially that the Rihane area is found very rich in archaeological fragments of amphora, dishes, plates, jars, cooking pots, etc. As for the more recent cultural sites, one may refer to the old cemeteries of Muslims and Christians that date back to the 18<sup>th</sup> century or the churches and mosques that date back to the 19<sup>th</sup> century in most villages as well as to the old water mill hods that are in the major places of villages for community uses.

There exists at Sujud a little temple with a tomb that the inhabitants call “the tomb of the prophet Sujud,” in Arabic *nabi Sujud*. The villagers living around “nabi Sujud” assert that the person buried in this shrine is a “Jewish prophet” revered by the Jews of Saida until the creation of the State of Israel in 1948. Dr. Estee Dvorjetski verbally stated that late Jewish tradition considers the tomb of the “prophet” of Sujud as that of Oholiab, son of Ahisamach, of the Jewish tribe of Dan. It was chosen to help Bezalel build a sanctuary during the wandering of the people of Israel in the desert. Dvorjetski recounts how the Jewish tribe of Dan settled to the north of Israel. The tomb of Oholiab could well be that of the “prophet Sujud” at the summit of Mount Sujud.



To the east of Mlikh and Aramta, there are remains of olive oil industry referred, as per the local community, to the beginning of the last century.

## 11. PHYSICAL CHARACTERISTICS

### 11.1. General description of site characteristics and topography of area:

[Briefly describe the major topographic features (wetlands, marshes, mountain ranges, dunes etc.) which most typically characterize the landscape of the area.]

The proposed Jabal Al Rihane Biosphere Reserve covers an area of 18430 ha. at an altitude varying between 270 and 1500 meters and extends along the ridge of the southern Mount Lebanon Chain overlooking both the Beqaa Valley (Rift Valley) to the east and the Mediterranean sea to the west.

A dominant feature of the study zone is the existence of many mountain peaks such as Jabal Safi, Jabal Sujud, Jabal Bir Kallab, and Jabal Bourqab that culminate at 1300, 1200, 1360 and 1300 meters respectively. This mountainous relief gives rise to a number of eco-zones, thus promoting diversity and actually harbouring many species. Furthermore, because the micro-relief is composed of a set of relatively steep slopes, a number of small basins appear naturally in the landscape. From a more aesthetic point of view, such a landscape, dominated by peaks and basins, offers wonderful limitless views.

Stands of old oak trees (more than 500 years old), particularly in Kfarhoune where they count for more than 200.000 individual trees, are recognized as outstanding scenic landscapes, the larger oaks contributing in a most distinctive way to the landscape. Individual trees can and do attract a lot of positive response from visitors to the area. The aesthetic experience of seeing some of the larger oaks is undoubtedly enhanced for the visitor by awareness of the important part they played in the history of Lebanon.

The variation between forest types and agricultural crops surrounding small villages form an infinite mosaic in the landscape. The Jabal Al Rihane Biosphere Reserve is a green island amidst wide extensions of bare lands represented by the semi-arid Bekaa valley to the East and the relatively dry plains to the South.

The Stone pine is found on a soil that originates from sandy rocks at the reserve's slopes which dominate Aichyeh from the side of the road Khardaly-Rihane.

At the entrance of the reserve from the Loueizeh side, a mixture of medium sized trees mainly of oak and Palestinian pistachio is observed on limestone substratum.

While traversing Mlikh, the road passes through the bottom of the village in parallel with a temporary water stream (which dries out at the end of the spring season).

Between Mlikh and Kfarhoune, there is a platform of agricultural area which reveals, in the proximity of Kfarhoune, the bottom of a valley in which runs a winter stream similar to that of Mlikh and Aramta-Mlikh or the stream of Sujud Valley at the feet of Rihane Village.

Arriving to the reserve from Jezzinee side, the visitor of Kfarhoune has to traverse barren rocky area with sometimes scattered small trees.

According to Corine classification (Corine booklet [1999] that was developed by the European Committee for the Environment), the reserve lies within three levels:

- the Thermo-Mediterranean level which comprises areas between 0-500 meters altitude with mainly garrigue formation,
- the Meso-Mediterranean level which encompasses areas between 500 and 1000 m altitude with mainly oak and coniferous trees, and

- the Supra-Mediterranean level (1000-1500m) with dominance of oak, *Quercus infectoria* and some pine trees; especially between Rihane and Aramta villages. This level is sometimes considered as an extension of the first level. Also there are some pine trees over Kfarhoune village.

11.2.1 Highest elevation above sea level: 1500 metres

11.2.2 Lowest elevation above sea level: 270 metres

11.2.3 For coastal/marine areas, maximum depth below mean sea level:  
\_\_\_\_\_ metres

### 11.3. Climate:

[Briefly describe the climate of the area using one of the common climate classifications]

The Jabal Rihane Biosphere Reserve enjoys a typical Mediterranean climate with four distinct seasons. The summers are warm and dry while the winters are cool and wet, but the mean annual temperature is 16.4°C. Precipitation is the source of both surface streams and groundwater. The major portion of this occurs as rain. The latter varies between 800 mm mainly in the south of the reserve and 1700 mm in the north. Generally the rain increases with altitude or with rain attracting topography. The mean annual precipitation is c.1000 mm. The pluviothermic quotient of Emberger [ $Q_2=3.43xp/M-m$ ] at Jabal Rihane biosphere reserve is 207. It indicates that the biosphere reserve is located in the humid Mediterranean Bioclimatic Stage with thermic variant of temperate winter.

Snowfall often occurs at the upper elevations but snow seldom persists more than a few days. Freeze-days are much less frequent than in similar areas further to the north.

A large proportion of the exposed surface karstic rock in the reserve is cavernous, fissured and broken limestone, and its porous condition makes it very permeable. This results in much of the precipitation infiltrating with minimum surface runoff despite the often-shallow soils and sparse vegetative cover. Water percolates downward through the various formations and feeds the many large springs found on lower slopes in the area. Such springs help maintain stream-flow during the April to November dry season like [Ain=spring] Ain al'Sohhah, Ain al'Hayat, Ain El Qaryeh and Ain Abou el Fateh in Aramta, Ain Al Qalaa El Kabira and Ain El Saghira in Rihane village, Ain El Dayaa El Qadima and Ain El Fawwar in Aichyeh, Naba'at Qla'it, Ain Achchamiyé, Ain Kfarchanna, Ain el'Arájé, etc.

Surface water flows originating on the range are mostly seasonal but some are perennial. Underground water generates Outflow Rivers such as the Zahrani, Mechraa and Tasseh rivers.

The summit of the range is considered as a divide between two hydrological systems because of the difference between the two slopes of the mountain. The eastern slope is much steeper and favours surface stream flows, whereas the western slope is less steep and favours ground water aquifers.

The rivers that flow in the valleys are the major source of agriculture irrigation and supply the Jabal Rihane villages with domestic water and some villages to the East and West of the reserve.

The above may probably explain the high diversity of flora and fauna in the area where animals and plants originated from Palestine, Hermon and Lebanon do occur at the same time in one place.

11.3.1 Average temperature of the warmest month: 21.30 °C in **August**

11.3.2 Average temperature of the coldest month: 4.80 °C in **January**

11.3.3 Mean annual precipitation: 1000 mm

11.3.4 If a meteorological station is in or near the proposed Biosphere Reserve, indicate the year since when climatic data have been recorded:

a) manually: 1967

b) automatically: \_\_\_\_\_

c) Name and location of station: **Habbouch** station at 440 m above sea level, with average precipitation of 790 mm annually and average temperature of the warmest month 24.1 °C and average temperature of the coldest month 6.7 °C

a) manually: 1938

b) automatically: \_\_\_\_\_

c) Name and location of station: **Jezzine** station at 945 m above sea level, with average precipitation of 1250 mm annually and average temperature of the warmest month 22.5 °C and average temperature of the coldest month 4.3 °C.

11.4. Geology, geomorphology, soils:

[Briefly describe important formations and conditions, including bedrock geology, sediment deposits, and important soil types]

## 1. Generalities and Tectonics

The Tectonic dominates the general geological view of the Jabal Al Rihane area. The whole area, along the central axis of Kfarhoune-Mlikh-Loueizeh, is presented as a perched synclinal with eastern and particularly western erected flanks. The main direction of the axis extends S-SW to N-NE, in parallel with the main tectonic structures of the area, especially the Jurassic axis which is located further north of Jabal Niha and the Yammouneh Fault. The Cenomanian heart of the synclinal is covered by the Jurassic at its eastern flank and bordered by it at its NW side. A karstic (sponge-like limestone) aquifer with argillaceous walls is determined by the Cenomanian-Albian of the Jurassic, capturing as such several springs at the bottom of the valley. It is worthy to note that the relation between tectonics and water sources is best represented at Rihane and below Loueizeh villages.

The perched synclinal of Jabal Al Rihane and its Jurassic eastern flank constitute, approximately, the southern end of the high massif of Mount Lebanon that is limited to the west by the Roum-Chhim fault and to the east by the Yammouneh fault. The latter is the eastern border of the Beqaa tectonic depression.

The perched synclinal structure that is normally evoked by the symmetric disposition of layers is not obvious on the Marjayoun map for the western flank but it is more significant on

the map of Jezzinee which is a northern prolongation to this flank. This is due to the absence of viability and roads in the area at the time during which the map was developed. Taking into account the stratigraphy of the sector and despite the easy identification of the lithologic nature, there are no indications of inclines in this area. Nowadays, the synclinal structure of the region is clearly revealed through the presence of modern carved roads with relief marked by erected hard calcareous layers.

The absence of more recent lands than these of the Cenomanian, especially in the protected zone of the perched synclinal heart, is in the favor of Dubertret hypothesis which places the first phase of Mount Lebanon orogenesis at a post-cenomanian period.

## 2- Stratigraphy

The stratigraphy characterizes the succession of layers and their localization in the study area. The identification of the layers is done through rock facieses and confirmed through fossils. However, our knowledge was confirmed through several fossiliferous levels.

The layers are described according to an inverse direction to the stratigraphy, from the centre of the synclinal to its borders, from Mlikh to Aramta or from the centre of the reserve to its eastern border.

- The Cenomanien (C4): It is formed from hard calcareous layers, solidified in the central part of the synclinal and of marl in altitude towards the flanks. These gray layers of dolomite aspect in certain levels contrast well with their corresponding marl-calcareous layers of central Lebanon and both are differently eroded. Several silicified layers mark a facies of little deep formation and confirm the presence, at that period, of a shallow epi-continental sea as well as a slow carbonate deposition.
- The Albian (C3): It characterizes Deir Mzeiraah on top of Kfarhoune and is found at Aramta village as well as further north where it matches with the main cultivated areas which are extended over its argillaceous and yellow marl lands. Two large yellowish marl-calcareous layers intercalated into the argil, as in Jezzinee, characterize the series of this age. At Rihane we found the "Ammonite Knemiceras", a fossil of the Albian, together with sea-urchins, mollusks, Gastropods and Lamellibranches. In central Lebanon and precisely north to Mdeirej, the marl-calcareous layers are less consistent; the argil is tinged with green, red or dark grey and alternates, for example, at Aqoura, with fossiliferous layers. The more carbonated Albian geological layers of Rihane and the southern parts of Mount Lebanon indicate deep marine facies of deposition. The remaining northern parts of Mount Lebanon keep, at that period, a more neritic character, nearer to the emersion.
- The superior Aptian (C2 sup.): Illustrated by the white calcareous rocks those constitute the cliffs of "Blanche" or Jezzinee. The marine transgression which extends over all Mount Lebanon is shown here at its maximum, with sometimes, more silicified facies (Hragel). South to Aramta, it was noticed that the cliff of "Blanche" became narrower with less accused relief. This is most probably in relation with the amplitude of volcanism of the underneath. The variation

among the calcareous consistency throughout the Mount Lebanon apparently indicates the phenomenon of differential subsidence in different regions.

- The inferior Aptian (C2 inf.): Fossiliferous sandy stone of marine facies passing into pale yellow sandy-calcareous material. It appears to be discrete in the study region whereas its extension in the Al Chouf area or Jbail is obvious. In addition, the inferior Aptian is found to be not individualized on the geological map, especially from the Neocomian whilst it is individualized further to the north on the Jezzinee map where it appears as narrow edge.
  - The Neocomian (C1): An age of more continental features with stony sand, sand, argil, lignite and amber. The basalt (black volcanic rock) found at the borders of Aichyeh is represented by medium sized smooth gravel. The basaltic formations are to be considered in relation with major paleo-tectonic events of that period. The Jurassic basalt is probably the only provider of the gravel of the synclinal depression, mainly in the vicinity of Jabal Niha. Moving north towards Jabal Barouk, it is possible to see that the summits of the southern Mount Lebanon (bordered as mentioned above by the Yammouneh Fault) are formed from Jurassic outcrops. Near the southern border of Aichyeh (on the road Khardaly-Jezzinee), thick lignite depositions are found in the passage of an old water course with traces of fern and branches of gymnosperms, indicating a floral continental biodiversity of the Neocomian.
  - The Jurassic. The description of the Jurassic will not be detailed here since its outcrops do not directly interest the reserve's project.
  - The Quaternary. The Quaternary is the most recent age in the earth's history. The details of the present relief as well as the geomorphological characters may be attributed to it. The hard calcareous layers are eroded by superficial water courses and other factors of erosion. Several valleys –deeper on the eastern flank- cut perpendicularly the synclinal structure to join the deep valley which forms its canyon at the bottom of the synclinal depression. Hence, the scenic view of Jabal Al Rihane. Along the sides of the cultivated lands that are situated on a hill which is traversed by the road Kfarhoune-Mlikh, there are paleosurface depositions of old basaltic gravel of probably north-east Neocomian origin. Sandy stones and basaltic gravels are probably traces of past material transportation by the stream which extends below Mlikh before reaching the water pump station of Nabaa el Tassa.

### 3. Geomorphology

Jabal Al Rihane Biosphere Reserve belongs to one of the five geomorphological regions of Lebanon, the Mount Lebanon region that is about 160 km long and 25-40 km wide. It includes middle and high elevation zones above 250 meters. It rises from Akkar in the North and extends south to the hills of Jabal Amel. Mount Lebanon peaks at 3,088 meters at Kornet es-Saouda in the north. Further south from Shouf Biosphere Reserve, the highest peak of Jabal Al Rihane Biosphere Reserve is at 1500 meters at Mzairaa to the North East of Kfarhoune. The trend from north to south is for the eastern slopes to change from very steep

to less steep and for the western slopes to become increasingly steep. The top of the Rihane range becomes increasingly narrow towards the south.

#### 4. Soil

Physical characteristics of the soils are:

- Homogenous, belonging to the red brown Mediterranean soils formed on hard marl limestone.
- derived from Jurassic, Balthonian, Callovian to Oxfordien – Portlandian marl limestone
- Stone contents ranges from 80 – 90 %, especially at Kfarhoune Village where the rock stock is estimated about 2 billion m<sup>3</sup>.

From an erosion point of view these soils are in a state of equilibrium due to:

- High permeability
- Mask of calcareous fragments
- Good vegetative cover
- Good drainage

#### 5. Geological relation with Climate and Vegetation cover

The limestone and marl-calcareous rocks of the synclinal depression, mentioned above, are favourable to the development of diversified wooded garrigue ("Areed" in local language such as "Areed of Shumar" on top of the eastern side of Mlikh) or even to the development of more important forest cover provided that the anthropologic activities (grazing, wood cutting) are reduced. Human activities explain the presence of several relatively barren slopes that once were subject to wood cutting followed by grazing. The outbreak of the Common Asphodel *Asphodelus microcarpus* can be considered as one of the best indicators of land degradation. Only the garrigues of Jabal Sujud which face the road Jarjough-Loueizeh appear to be well preserved within the petrological context of the Cenomanian. The protection of the slopes over tens of years will help restoring the garrigues as demonstrated in those of Rihane and the "Shumar garrigue" of Mlikh villages. It is worthy to note that the raised awareness of the local communities is a pre-requisite for a successful restoration.

## 12. BIOLOGICAL CHARACTERISTICS

[List main **habitat types** (e.g. tropical evergreen forest, savanna woodland, alpine tundra, coral reef, kelp beds) and **land cover types** (e.g. residential areas, agricultural land, pastoral land). For each type circle REGIONAL if the habitat or land cover type is widely distributed within the biogeographical region within which the proposed Biosphere Reserve is located to assess the habitat's or land cover type's representativeness. Circle LOCAL if the habitat is of limited distribution within the proposed Biosphere Reserve to assess the habitat's or land cover type's uniqueness. For each habitat or land cover type, list characteristic species and describe important **natural processes** (e.g. tides, sedimentation, glacial retreat, natural fire) or **human impacts** (e.g. grazing, selective cutting, agricultural practices) affecting the system. As appropriate, refer to the vegetation or land cover map provided as supporting documentation.]

**The Jabal Al Rihane Biosphere Reserve is mainly represented by four major habitats where each has its own characteristic species and plant association.**

### 12.1. First type of habitat/land cover: The rocky karstic habitat with oak trees.

**DISTRIBUTION:** Regional.

It is found in both meso (public property of Mlikh) and supra-Mediterranean levels (up to eastern border of Kfarhoune). Often, it is a habitat of mixed forest with dominance of Kermes

oak *Quercus calliprinus* and Cyprus oak *Quercus infectoria*. The cover range from sparse (less than 20%) to dense (more than 80%) especially in the western sections of the following districts: Kfarhoune, Mlikh, Louaize, Aaqmata, Rihane Sujud and Zaghrine. This habitat covers an area of 25 km<sup>2</sup>.

#### 12.1.1 . Characteristic species:

Some of the characteristic or associated species with Kermes oak *Quercus calliprinus* formation, on gravel or rock or calcareous soil:

Syrian maple *Acer syriacum*  
 Common hawthorn *Crataegus azarolus*  
 Persian cyclamen *Cyclamen persicum*  
 Falcate eryngo *Eryngium falcatum*  
 Foster's snowdrop *Galanthus fosteri*  
 Palestine pistachio *Pistacia palaestina*  
 Slender-leaved madder *Rubia tenuifolia elliptica*

Where the habitat exhibits degradation, the following plants, mainly the Spiny burnet, increase:

Thorny-broom *Calycotome villosa*  
 Cretan cistus *Cistus creticus*  
 Thyme leaved St John's-wort *Hypericum thymifolium*  
 Spiny burnet *Sarcopoterum spinosum*

Of the main associated herbs with this formation:

Two-spiked beard-grass *Andropogon distachyus*  
 Shaggy hyparrhenia *Hyparrhenia hirta*

Some of the characteristic or associated species with Cyprus oak *Quercus infectoria* formation, on calcareous soil (first level):

Three-leaved garlic *Allium trifoliatum*  
 Judas tree *Cercis siliquastrum*  
 Storax *Styrax officinalis*  
 Oriental black-bryony *Tamus orientalis*

Some of the characteristic or associated species with Cyprus oak *Quercus infectoria* formation, on calcaireous soil (second level):

Lebanon woodruff *Asperula libanotica*  
 Etruscan honeysuckle *Lonicera etrusca*  
 Viscous phlomis *Phlomis viscosa*  
 Oriental black-bryony *Tamus orientalis*

Wherever degradation in the habitat is observed the following plants, mainly the Spanish broom, increase (first and second levels):

Syrian marjoram *Origanum syriacum*  
 Spanish broom *Spartium junceum*  
 Distance woundwort *Stachys distans*

#### 12.1.2. Important natural processes:

This habitat comprises most of the remaining old growth forest (more than 500 years old stands) in the Jabal Al Rihane area, and as such, still retains the natural climax ecosystems, and their communities, that have been badly destroyed elsewhere. The habitat represents dynamic oak communities as the oak stands which were decimated by fire 10 years ago have partly regenerated since. The sparse parts of this habitat constitute the habitat of the Hyrax in Lebanon.

#### 12.1.3. Main human impacts:

Prior to the approved draft Law declaring Jabal Al Rihane a protected area and the initiative of the Municipal Association and the Green Future NGO to effectively protect the area, overgrazing, wood cutting for charcoal production, quarrying and extensive hunting constituted the main threat to the region. Presently, the threats identified are: past introduction and possible proliferation of wild boar; and migration of youth.

#### 12.1.4. Relevant management practices:

Prohibition of all cutting, charcoal production and quarrying. Setting a plan for fire combating and wild boar decimation. Control of urban encroachment.

### 12.2. Second type of habitat/land cover: The formation of sandy soil with Stone pine trees *Pinus pinea* and Calabrian pine trees *Pinus brutia*

**DISTRIBUTION:** Regional

It is also found in both levels (meso and supra-Mediterranean) up to eastern Kfarhoune border. It includes pure and mature stands of *Pinus pinea* and, to a lesser extent, mixed stands of *Pinus pinea* and *Pinus brutia*. Pine extensions were/are mainly located in eastern sections of the study zone, mainly Daraya, Qotrani, Khallet Khazem, Chbail, Mazraat Louzid, Aarqoub, Aychieh, and Qrouh. Important pine forests are located West of Roumane Jezzine and Mazraat el Rohbane. This habitat covers an area of 12.5 km<sup>2</sup>.

#### 12.2.1. Characteristic species:

Some of the characteristic species:

Yellow chamomile *Anthemis tinctoria*  
 Sweet vernal-grass *Anthoxanthum odoratum*  
 Great quaking-grass *Briza maxima*  
 Prickly juniper *Juniperus oxycedrus*  
 French lavender *Lavandula stoechas*  
 Mountain timothy *Phleum montanum*

The most significant associated species with this formation, especially under the pine of Aichyeh:

Hair-grass *Aira elegans*  
 Sage-leaved cistus *Cistus salviifolius*

Hirsute lupin *Lupinus hirsutus*  
 Roman orchid *Orchis romana libanotica*  
 Nerved-covered star-of-Bethlehem *Ornithogalum neurostegium*  
 Autumn squill *Scilla autumnalis*  
 Medusa's clover *Trifolium medusaeum*  
 Spotted rockrose *Tuberaria guttata*

### 12.2.2. Important natural processes:

This habitat is especially sensitive to forest fires, both natural and induced. Extensive and recurrent fires have severely reduced the coniferous forest cover during the political and military tension period. Burnt pine forests regenerate very poorly if and when fires were induced before seed maturation or during the mid-summer period (zero precipitation and low soil moisture).

On the other side, the distinct local climate of Jabal Al Rihane with its warm summer temperatures supports in the pine forest habitat a rich herpetofauna which includes southern species. In addition representatives of southern species can be found among birds and mammals as well as plants.

### 12.2.3. Main human impacts:

Pine harvesting was an important economic activity in the past (both in private estates and in communal lands). Public lands were rented for pine harvesting and the production of charcoal. The presence of many landmines since the mid 1970s has prevented villages from exploiting and/tending to the forests. However, remaining pine stands that were saved from fires are probable testimony to a former extensive forest cover, which may have reached 70-80% canopy closure in some areas, such as Kfarhoune, Aramta and Daraya.

It is important to note that many stands appear to have been abandoned for a while, most probably due to the presence of landmines and the political and military tensions.

### 12.2.4. Relevant management practices:

The vigor of several pine stands observed in the Rihane region indicate the potential harvesting of an important quantity and quality of pine seeds. Hence, these forests represent an important source of income<sup>1</sup> to local communities in surrounding villages. Furthermore, villagers showed good knowledge of stone pine forest management, including harvesting of pine seeds.

Transitory Management Council, municipalities and Green Future NGO have policies to ensure environmental protection and sustainable management of pine resources: The Pine species is economically important for its timber, pulp, tar, turpentine and seeds. The tree has

<sup>1</sup> Stone or Umbrella pines (*P. pinea*) have an edible seed gathered by indigenous peoples (and sometimes commercially) and often comprising a major seasonal food source. By many accounts, they are also an aphrodisiac (Santesson 2000). Pines are also popular ornamentals.

Umbrella pines have been used to produce turpentine, a semi-fluid, yellow or brownish resin (oleoresin). "Pine resin flows on the external surface of a tree after a wound is inflicted to form a protective coat that seals the wound to pathogenic microorganisms and prevents loss of sap. To obtain resin commercially, a tapping cut is made in the pine bark and the resin drops are collected into buckets or bags. The principal products of pine resin are rosin and turpentine oil. The most significant hard resin from a commercial point of view is rosin, which is obtained by distillation of pine resin. Rosin is used in paper glue and soap manufacturing, as a constituent of varnishes and paints, and for coating strings of musical instruments. Oil of turpentine is also produced by pine resin distillation and is used for thinning and dissolving paint and varnish, as well as for shoe polish and sealing wax manufacturing. It also has medical properties and can be used as stimulant, antispasmodic, astringent, diuretic and anti-pathogenic. In the past, crude pine resin had been used in sailing vessels as packing material and for waterproofing".

long been a principal source of timber for all purposes, including firewood, construction and woodworking. It continues to be a leading genus in agroforestry production, dominating plantations in Jabal Al Rihane area.

### **12.3. Third type of habitat/land cover: Valleys' bottom formation near water streams with Platane and Oliender.**

#### **DISTRIBUTION** Regional

This habitat is limited to the thermo and meso-Mediterranean level and found near water streams, ditches and rivers, always with Oleander and often with Platane trees.

Numerous springs are found in the Rihane mountain region ((Ain al'Sohhah, 'Ain al'Hayat, 'Ain Abou el Fateh, Naba'at Qla'it, 'Ain Achchamiyé, 'Ain Kfarchanna, 'Ain el'Arájé, etc.)), evidenced by the frequency and distribution of wet spots. These wet spots, characterized by dense and lush mixed vegetation, contrast well with bare lands.

#### **12.3.1. Characteristic species:**

Oriental alder *Alnus orientalis*  
 Glabrous cyperus *Cyperus glaber*  
 Hairy willow-herbe *Epilobium hirsutum*  
 Common hemp-agrimony *Eupatorium cannabinum*  
 Jersey cudweed *Gnaphalium luto-album*  
 Laurel *Laurus nobilis*  
 Oleander *Nerium oleander*  
 Oriental plane *Platanus orientalis*  
 White willow *Salix alba*  
 Water woundwort *Stachys hydrophila*

#### **12.3.2. Important natural processes:**

This habitat is found in the low and mid-altitude region of the Jabal Al Rihane and being largely away from urban areas, except for the Litany River which borders the reserve from the middle of the East to the south western corner. It is the main attracting habitat for the wildlife (wolf, cat, fox, porcupine, etc.) in the area. In addition, the rich biodiversity of the habitat is considered a source of shelter and food for countless smaller organisms. Moreover, the streams are either permanently or seasonally running.

#### **12.3.3. Main human impacts:**

Urban encroachment, local impact on the Zahrani River's bed from the hydroelectric power plant at Nabaa El Tasse, illegal fishing, degradation due to cultivation and cutting of vegetation.

#### **12.3.4. Relevant management practices:**

Biodiversity education programmes, control of urban encroachment, setting up of water management plan and riparian habitat management plan,

### **12.4. Fourth type of habitat/land cover: Barren rocks and bare lands habitat.**

**DISTRIBUTION:** Regional but also local within microclimates

The Bare lands include all lands which are remote, poorly accessible, eroded (shallow soils), or agriculturally unattractive. They cover about 14 km<sup>2</sup>.

The Barren rocks include areas where rock formations appear at the surface (no soil cover). They cover about 6 km<sup>2</sup> and are found mainly between Mlikh and Kfarhoune as well as in the public property of Rihane Village (Jlal Hassan).

Both lands are also rich in endemic species.

#### 12.4.1. Characteristic species:

Party-colored birthwort *Aristolochia poecilantha*  
 Golden rod *Bongardia chrysogonum*  
 Lebanon fritillary *Fritillaria libanotica*  
 Oriental hyacinth *Hyacinthus orientalis*  
 Common lion's-leaf *Leontice leontopetalum*  
 Love apple *Mandragora autumnalis*  
 Bunch-flowered narcissus *Narcissus tazetta*  
 Butterfly orchid *Orchis papilionacea*  
 Egyptian honesty *Ricotia lunaria*  
 Oriental mullein *Verbascum orientale*

#### 12.4.2. Important natural processes:

A critical habitat for lizards and snakes and for raptors hunting in open areas as well as for Hyrax.

#### 12.4.3. Main human impacts:

Areas mainly used to collect wild edible plants (*Cichorium intybus*, *Eryngium creticum*, *Foeniculum vulgare*, *Myrtus communis*, *Origanum maru*, *Pistacia palaestina*, *Salvia sclarea*, *Urtica*, *Portulaca olearacea*) that are used in the preparation of traditional meals; wild aromatic and therapeutic plants (*Alcea setosa*, *Ceterach officinarum*, *Cichorium intybus*, *Equisetum telmateia*, *Eryngium creticum*, *Feniculum vulgare*, *Ficus carica*, *Geranium robertianum*, *Hyoscyamus aureus*, *Hyssopus officinalis*, *Inula viscosa*, *Juniperus oxycedrus*, *Laurus nobilis*, *Matricaria chamomilla*, *Mentha aquatica*, *Myrtus communis*, *Portulaca olearacea*, *Rubus sanctus*, *Salvia sclarea*, *Salvia fruticosa*, *Sambucus ebulus*, *Spartium junceum*, *Taraxacum officinale*, *Tilia cordat*, *Trifolium arvense* L.).

#### 12.4.4. Relevant management practices:

Beehives that are observed in different regions of the area indicate the presence of a great number of aromatic plant species. The development of these plants beside the medicinal, edible and ornamental plants and their introduction to the local market could significantly contribute to the conservation of Mediterranean landscapes, as well as improve/assist rehabilitation and restoration plans.

Controlled collection of economically important wild plant species to allow for sustainable harvest while at the same time prohibiting inappropriate activities.

#### 12.5. Fifth type of habitat/land cover: Agriculture lands.

**DISTRIBUTION:** Regional

Agriculture and related activities (horticulture, field crops, orchards, vineyards) were clearly a major economic and social sector before the military occupation of the Jabal Al Rihane area. Today, very few lands are cultivated (mostly by some elderly). This type of land covers an area of about 22 km<sup>2</sup>.

#### **12.5.1. Characteristic species:**

Olive, Apple, Pear, Prune, Pistacio, Walnut, Berries, Wheat, Barley, Tobacco and grapes.

#### **12.5.2. Important natural processes:**

Agriculture lands are mainly evolving under human impacts such as land abandoning or switching from cereal to vegetable cultivation and vice versa or focusing on fast returning products like tobaccos.

#### **12.5.3. Main human impacts:**

Rural migration, insecurity and changing lifestyles have resulted in the breakdown of the agricultural sector, most evidently manifested by decayed orchards, abandoned terraces (erosion detected), and the deterioration of irrigation systems and canals. Recently, some villagers have expressed the hope that agricultural activity will resume in years to come, with the support of the government.

#### **12.5.4. Relevant management practices:**

Promoting the use of landraces, facilitating the access to agriculture lands through providing villagers with agricultural and feeders roads and/ or rain-fed pools. Discouraging monocultivated lands and Promoting diversification of agricultural sector (production of aromatic/medicinal plant species), supporting apicultural sector, encouraging the production of organic goods, reintroducing silk production and prepare a marketing study for local products.

### **12.6. Sixth type of habitat/land cover: Abandoned agricultural lands.**

**DISTRIBUTION:** Regional

Abandoned agricultural lands comprise all lands that were cultivated in the past, including abandoned terraces. This type of land covers an area of about 24 km<sup>2</sup>.

#### **12.6.1. Characteristic species:**

Thorny-broom *Calycotome villosa*  
 Cretan cistus *Cistus creticus*  
 Thyme leaved St John's-wort *Hypericum thymifolium*  
 Spiny burnet *Sarcopoterum spinosum*  
 Syrian marjoram *Origanum syriacum*  
 Spanish broom *Spartium junceum*  
 Distance woundwort *Stachys distans*

#### **12.6.2. Important natural processes:**

Abandoned lands may show signs of early garrigue formations, characterized by the encroachment of low shrubs and woody vegetation. Abandoned traditional terraces show signs of soil erosion.

**12.6.3. Main human impacts:**

Rural migration, insecurity and changing lifestyles have resulted in the breakdown of the agricultural sector. Landmines over a significant area restricted the movement of farmers and subsequently their access to their fields.

**12.6.4. Relevant management practices:**

Removal of landmines, providence of access to abandoned agriculture lands through well planned agricultural and feeders roads and/ or rain-fed pools, adoption of enough incentive measures to ensure biologically friendly development of agriculture. Allowing some abandoned agriculture lands to be subject to natural regeneration within the transition area as regeneration zone. so that it can be added in the future to the buffer or the core areas.

**12.7. Seventh type of habitat/land cover: Urban areas.****DISTRIBUTION:** Regional

Urban areas include all areas that were built prior to the military occupation and all areas that were built after the return of refugees and the resumption of residential and non-residential construction, this land cover is expected to expand in the years to come.

**12.7.1. Characteristic species:**

A group of fruit and ornamental trees (common myrtle, Figs, grapes, almond, olive, walnut, Cyprus) and vegetables (tomatoes, parsley, onion, menth, garlic, etc) as well as aromatic and exotic plants used for local domestic use; poultry, sheep, goats, cattle and caged birds.

**12.6.2. Important natural processes:**

Urban areas evolved progressively since the return of displaced to encroach in scenic landscapes and important natural features.

**12.6.3. Main human impacts:**

Loss of scenic landscapes and biodiversity, and fragmentation of natural habitats. Increased risk of hazards due to potential escapes of some undesired introduced species.

**12.6.4. Relevant management practices:**

Control of urban encroachment and related quarrying as a step in the implementation of the land use master plan for the region. Support the introduction of sound building codes/standards.

**13. CONSERVATION FUNCTION****13.1. Contribution to the conservation of landscape and ecosystem biodiversity**

[Describe and give location of landscapes, ecosystems, habitats and/or land cover types of particular significance for the conservation of biological diversity.]

The Jabal Al Rihane Biosphere Reserve is a green island amidst wide extensions of bare lands represented by the semi-arid Bekaa valley to the East and the relatively dry plains to the South. It is formed from several mountainous peaks culminating between 1200 and 1500 meters, bordered with slopes of forests or terraces looking at deep valleys, and dissected with water courses and agricultural fields.

Existing habitats within the Jabal Al Rihane Biosphere Reserve represent a wide range of landscapes and micro-habitat types of sufficient size to protect ecosystems and biodiversity. The Jabal Al Rihane Biosphere Reserve will play an important role in the conservation of these landscapes and ecosystems. The Reserve contains 20% of the remaining most dense old oak forests in Lebanon and will offer protection to their associated plant formations as well as to their karstic water-catchment areas. The oak forests and mixed forests with dominance of oaks in the core areas and buffer zones, chiefly in the North and North East of the reserve have already shown a remarkable resurgence in natural regeneration during the past few years since they were protected from uncontrolled harvesting for firewood and charcoal. Oak forests are a roosting site for more than 200.000 raptors including 4 globally threatened species but they are also an ecosystem in which large mammals find refuge, food, breeding sites, and enough territories.

The stone pine forests include pure and mature stands of *Pinus pinea* and, to a lesser extent, mixed stands of *Pinus pinea* and *Pinus brutia*. Pine extensions are mainly located in eastern sections and to a lesser extent in western sections of the Jabal Al Rihane, mainly Daraya, Qotrani, Khamlet Khazem, Chbail, Mazraat Louzid, Aarqoub, Aychieh, Mazraat El Rohbane, Roumane and Qrouh. The Jabal Al Rihane Biosphere Reserve will certainly conserve the existing pine forests through protection and sustainable harvesting but will also help restoring these coniferous forests to their previous extensive areas and allow the natural regeneration of the degraded and burnt stands. The removal of landmines will provide access to some abandoned pine forests increasing as such the benefits to the local communities. The pine stone forests are a major roosting attraction to more than 300.000 white storks every migration season.

The preservation of the wetlands that are formed from springs (e.g Nabaa el Tasse in Loueize, Ain al'Sohhah, 'Ain al'Hayat, 'Ain Abou el Fateh, Naba'at Qla'it, 'Ain Achchamiyé, 'Ain Kfarchanna, 'Ain el'Arajé, etc.), rivers (Litany delimiting the eastern and southern borders of the reserve; Zahrani traversing the hills westward to reach the Mediterranean; Machraa running eastward to pour into the Litany River), the streams (in nearly every valley bottom), and rain-fed pools (in every village's suburb) is crucial for the conservation of the scenic landscapes and the protection of the aquatic and riparian habitats which constitute a major attraction for a diversified wildlife, including the globally threatened otter. However, over 100 bird species were recorded in this landscape alone.

The mountain ridge, including the barren karstic rocks with their rare flora and fauna species constitutes a prominent part of the scenic landscape of southern Lebanon and the Beqaa Valley. The scenic landscape values of the reserve are a legitimate cultural heritage value that is totally compatible with protection of the natural ecological values of the reserve. The mountain ridge is a home for the animals which are considered among the most sensitive species to climate change.

The Jabal Al Rihane Biosphere Reserve will contribute to the conservation of the barren karstic rocks with their relatively scattered but valuable vegetation (mainly between Mliikh and Kfarhoune as well as in the public property of Rihane Village [Jlal Hassan]) and their caves (particularly in Rihane), and tombs (in village suburbs). Ice, wind and rain carved the rock formations of Jabal Al Rihane to form majestic striated sculptures that decorate the

landscape. These naturally sculptured rocks form a vast scenic view of attraction to nature lovers and eco-tourists. This landscape is renowned for the diversity of its flora that comprises a high level of endemism and for being the unique remaining home for the hyrax in Lebanon.

The agricultural lands and the abandoned agricultural lands will be conserved/ developed within their traditional and cultural aspects especially that they witness the wise use of lands during at least the past three centuries.

In villages, the "Lebanese house" is usually a stone building with a large arch framing a vaulted ceiling on the ground floor, three arches centered over a narrow balcony on the upper floor, all topped by a steep, red-tiled roof; this exterior format was adapted from the villas of Venice sometime in the middle of the 19th century. Or perhaps it is a more humble house with walls of roughly-hewn stones and a timber-and-mud roof with a stone roller (mahdaleh) to keep it compacted. Or it may be an elegant palace from the late 18th or early 19th century. These clusters of houses as well as old churches and mosques will be conserved before they are destroyed by the name of "progress".

One of the primary conservation objectives of the Jabal Al Rihane Biosphere Reserve is to maintain stream flow rates and water quality so as to maintain historical and natural seasonal riverine productivity, and to maintain habitats, natural species biodiversity and historic levels of productivity in critical habitats, such as the rocky habitats of the hyrax, the valley bottoms with streams for waterbirds and the climax vegetal formations for maintaining the climax fauna structure.

### 13.2 Conservation of species biodiversity

[Identify main species (with scientific names) or groups of species of particular interest for the conservation of biological diversity, in particular if they are rare or threatened with extinction; use additional sheets if need be.]

The Jabal Al Rihane Biosphere Reserve contains populations and remnant populations of several species at risk including 24 globally, regionally and locally threatened plant species; 44 endemic plant species; 17 restricted to Rihane area; 38 medicinal plant species; 11 globally and regionally threatened mammal species with 6 significantly declining and one restricted to Rihane area, the hyrax; one reptile globally threatened species, the chameleon; 15 globally and regionally threatened bird species. In addition, Jabal Al Rihane appears to encompass several sites that are considered hotspots for roosting, sheltering and resting of migrants in general and globally and regionally threatened species in particular.

The following flora species: (1) threatened, (2) endemic, (3) rare and (4) economic [culinary, aromatic, medicinal] merit conservation at Rihane area.

SCIENTIFIC NAME	English name	1	2	3	4
<i>Adiantum capillus-veneris</i>	True maden-hair				+
<i>Pinus pinea</i>	Stone pine				+
<i>Arrhenatherum elatius</i>	Tall false-oat	+		+	+
<i>Arrhenatherum palaestinum</i>	Palestine false-oat				+
<i>Arundo donax</i>	Giant reed				+
<i>Briza maxima</i>	Great quaking-grass				+
<i>Bromus intermedius</i>	Intermediate brome			+	
<i>Corynephorus deschampsoides</i>	Deschampsia club-grass		+		
<i>Dactylis glomerata</i>	Orchard-grass				+

<i>Eragrostis pilosa</i>	Hairy love-grass	+		+	
<i>Gastridium ventricosum</i>	Southern bent-grass				+
<i>Hyparrhenia hirta</i>	Shaggy hyparrhenia				+
<i>Melica ciliata laxiflora</i>	Ciliate melick				+
<i>Melica inaequiglumis</i>	Unequal-glumed melick				+
<i>Oryzopsis miliacea</i>	Millet mountain-rice				+
<i>Phleum montanum</i>	Mountain timothy				+
<i>Poa diversifolia</i>	Diversely-leaved meadow-grass				+
<i>Stipa barbata</i>	Bearded feather-grass				+
<i>Stipa bromoides</i>	Brome feather-grass				+
<i>Trisetaria flavescens</i>	Yellow-oat				+
CYPERACEAE	Cyperaceae				
<i>Cyperus rotundus</i>	Nut-grass				+
<i>Tamus orientalis</i>	Oriental black-bryony		+		
<i>Allium carmeli</i>	Carmel garlic		+		
<i>Allium emarginatum</i>	Emarginate garlic		+		
<i>Muscari commutatum</i>	Dark grape-hyacinth				+
<i>Galanthus fosteri</i>	Foster's snowdrop	+	+	+	
<i>Ixiolirion tataricum</i>	Mountain lily				+
<i>Crocus thiebauti</i>	Thiebaut's crocus	+	+		
<i>Iris histrio</i>	Histrio iris				+
<i>Anacamptis pyramidalis</i>	Pyramidal orchid	+			
<i>Cephalanthera longifolia</i>	Long-leaved helleborine	+			
<i>Epipactis consimilis</i>	Similar epipactis	+			
<i>Limodorum abortivum</i>	Aborted limodore	+		+	
<i>Ophrys bornmuelleri</i>	Bornmueller's ophrys	+			
<i>Ophrys fuciflora</i>	Drone ophrys	+			
<i>Orchis anatolica</i>	Anatolian orchid	+			
<i>Orchis coriophora fragrans</i>	Bug orchid	+			
<i>Orchis italica</i>	Italian orchid	+			
<i>Orchis laxiflora dielsiana</i>	Jersey orchid	+			
<i>Orchis morio picta libani</i>	Green-winged orchid	+			
<i>Orchis papilionacea</i>	Butterfly orchid	+			
<i>Orchis romana libanotica</i>	Roman orchid	+	+		
<i>Orchis tridentata commutata</i>	Three-toothed orchid	+			
<i>Spiranthes autumnalis</i>	Autumn Lady's-tresses			+	
<i>Juglans regia</i>	Common walnut				+
<i>Populus nigra</i>	Black poplar				+
<i>Ficus carica</i>	Common fig				+
<i>Morus alba</i>	White mulberry-tree				+
<i>Morus nigra</i>	Black mulberry-tree				+
<i>Aristolochia altissima</i>	Tall birthwort			+	
<i>Aristolochia poecilantha</i>	Party-colored birthwort				
<i>Aristolochia scabridula</i>	Rough birthwort		+		
<i>Polygonum kitaibelianum</i>	Kitaibel's knotweed				+
<i>Chenopodium urbicum</i>	Upright goosefoot			+	
<i>Silene astartes</i>	Astarte's catchfly		+		
<i>Silene makmeliana</i>	Makmel catchfly		+		
<i>Silene siderophila</i>	Siderophilous catchfly		+		
<i>Silene vulgaris colorata</i>	Common catchfly			+	
<i>Nigella ciliaris</i>	Ciliata nigella		+	+	
<i>Ceratocarpus palaestina</i>	Palestine corydalis		+		
<i>Alyssum murale</i>	Wall madwort				+
<i>Nasturium officinale</i>	Common water-cress				+
<i>Raphanus sativus</i>	Garden radish				+

<i>Ricotia lunaria</i>	Egyptian honesty		+		
<i>Rorippa macrocarpa</i>	Yellow-cress	+	+		
<i>Saxifraga tridactylites</i>	Rue-leaved saxifraga			+	
<i>Crataegus monogyna</i>	White hawthorn				+
<i>Geum urbanum</i>	Herb-bennet				+
<i>Rosa canina</i>	Dog rose				+
<i>Anthyllis maura</i>	Moorish kidney-vetch				+
<i>Astragalus gummifer</i>	Gum milk-vetch				+
<i>Colutea cilicica</i>	Bladder-senna				+
<i>Cytisus syriacus</i>	Syrian broom		+		
<i>Lathyrus digitatus elongatus</i>	Fingered vetchling	+			+
<i>Lotus corniculatus alpinus</i>	Horned birdsfoot-trefoil				+
<i>Medicago lupulina</i>	Black medick				+
<i>Medicago minima</i>	Least medick				+
<i>Melilotus sulcatus libanoticus</i>	Grooved melilot		+		
<i>Ononis natrix</i>	Shrubby restharrow				+
<i>Ononis spinosa leiosperma</i>	Spiny restharrow				+
<i>Spartium junceum</i>	Spanish broom				+
<i>Trifolium medusaeum</i>	Medusa's clover		+		
<i>Trifolium nervulosum</i>	Nerved clover				
<i>Trifolium physodes</i>	Bladder clover	+			+
<i>Trifolium plebium</i>	Common clever		+		
<i>Trifolium repens</i>	White clover				+
<i>Linum bienne</i>	Pale flax				+
<i>Rhus coriaria</i>	Sumach				+
<i>Halimium umbellatum syriacum</i>	Umbelled halimium		+		
<i>Opuntia ficus-indica</i>	Barbary fig				+
<i>Chaetosciadium trichospermum</i>	Hairy-seeded chervil		+		
<i>Exoacantha heterophylla</i>	Various-leaved exoacantha			+	
<i>Foeniculum vulgare</i>	Common fennel				+
<i>Malabaila secacul</i>	Arabian hartwort				+
<i>Oenanthe media</i>	Intermediate dropwort			+	
<i>Sison exaltatum</i>	Lofty sison		+		
<i>Smyrniium olusatrum</i>	Common alexanders				
<i>Synelcosciadium carmeli</i>	Carmel synelcosciadium		+	+	
<i>Turgenia latifolia</i>	Broad-leaved bur-parsley				+
<i>Periploca graeca</i>	Silk-vine			+	
<i>Styrax officinalis</i>	Storax				+
<i>Olea europaea</i>	Common olive				+
<i>Vinca libanotica</i>	Lebanon periwinkle				+
<i>Convolvulus coelesyriaca</i>	Coelesyrian bindweed		+		
<i>Convolvulus scammonia</i>	Syrian bindweed				+
<i>Heliotropium schweinfurthii</i>	Schweinfurth's heliotrope		+		
<i>Symphytum palaestinum</i>	Palestine comfrey				+
<i>Verbena officinalis</i>	Common vervian				+
<i>Ballota antilibanotica</i>	Anti-Lebanon horehound		+		
<i>Eremostachys laciniata</i>	Cut-leaved phlomis				+
<i>Lavandula stoechas</i>	French lavender				+
<i>Marrubium vulgare</i>	Common white-horehound				+
<i>Melissa inodora</i>	Scentless balm		+		
<i>Mentha microphylla</i>	Small-leaved mint				+
<i>Micromeria barbata</i>	Bearded savory		+		+
<i>Micromeria myrtifolia</i>	Myrtle-leaved savory				+
<i>Origanum syriacum</i>	Syrian marjoram	+			+
<i>Prunella vulgaris</i>	Common self-heal				+

<i>Salvia fruticosa libanotica</i>	Shrubby sage		+		
<i>Salvia hierosolymitana</i>	Jerusalem sage		+		
<i>Salvia viscosa</i>	Viscous sage				+
<i>Saturea thymbra</i>	Summer savory				+
<i>Scutellaria utriculata</i>	Bladder skullcap		+		
<i>Sideritis pullulans</i>	Branching ironwort		+		
<i>Stachys distans</i>	Distance woundwort				+
<i>Stachys hydrophila</i>	Water woundwort		+		
<i>Stachys neurocalycina</i>	Nerved-calyxed woundwort		+		
<i>Teucrium polium</i>	Felty germander				+
<i>Datura stramonium</i>	Stramonium				+
<i>Verbascum libanoticum</i>	Lebanon mullein		+		
<i>Asperula libanotica</i>	Lebanon woodruff	+	+		
<i>Galium verum</i>	Ladies bedstraw				+
<i>Valerianella orientalis</i>	Oriental cornsalad				+
<i>Campanula sidoniensis</i>	Sidon bellflower	+	+	+	
<i>Atractylis comosa</i>	Beautiful distaff-thistle		+		
<i>Bellis perennis</i>	Perennial daisy				+
<i>Carlina curetum orientalis</i>	Curetum carline		+		
<i>Carthamus tenuis</i>	Slender safflower		+		
<i>Centaurea cyanoides</i>	Syrian corn-flower		+		
<i>Centaurea speciosa</i>	Showy knapweed		+		
<i>Centaurea verutum</i>	Dwarf knapweed		+		
<i>Cichorium intybus</i>	Common chicory				+
<i>Cichorium pumilium</i>	Dwarf chicory				+
<i>Cnicus benedictus</i>	Blessed thistle				+
<i>Crepis syriaca</i>	Syrian hawkweed		+		
<i>Eupatorium cannabinum</i>	Common hemp-agrimony				+
<i>Gundelia tournefortii</i>	Gundelia				+
<i>Helichrysum c. conglobatum</i>	Globe everlasting	+		+	
<i>Matricaria chamomilla</i>	Wild chamomile				+
<i>Ptilostemon diacantha</i>	Two-spined ptilostemon		+		
<i>Pulicaria dysenterica</i>	Common fleabane				+
<i>Scorzonera phaeopappa</i>	Grey-pappused viper's-grass				+
<i>Silybium marianum</i>	Lady's-thistle				+

The following mammal species: (1) threatened, (2) nationally threatened (3) rare and (4) only found at the proposed reserve, merit conservation at Rihane area.

Scientific name	English name	1	2	3	4
<b>Fam. Erinaceidae</b>					
<i>Crocidura leucodon judaica</i>	Bicolor white toothed shrew			+	
<i>Crocidura suaveolens</i>	Lesser white toothed shrew			+	
<i>Rhinopoma microphyllum microphyllum</i>	Great mouse tailed bat	+		+	
<i>Rhinolophus ferrumequinum ferrumequinum</i>	Greater horseshoe	+		+	
<i>Rhinolophus euryale judaicus</i>	Mediterranean horseshoe	+			
<i>Myotis blythi omari</i>	Lesser Mouse-eared Bat			+	
<i>Myotis nattereri hovei</i>	Natterer's Bat		+		
<i>Pipistrellus pipistrellus pipistrellus</i>	Common Pipistrelle	+		+	
<i>Pipistrellus kuhli ikhawanius</i>	Kuhl's Pipistrelle	+			
<i>Miniopterus schreibersi pallidus</i>	Schreiber's Bat	+		+	
<i>Canis lupus pallipes</i>	Wolf	+	+	+	
<i>Vormela peregusna syriaca</i>	Marbled polecat	+			
<i>Meles meles canescens</i>	Badger	+	+		

<i>Hyaena hyaena syriaca</i>	Striped Hyaena	+	+		
<i>Felis silvestris tristrami</i>	Wild cat		+	+	
<i>Procapra capensis syriaca</i>	Hyrax		+		+
<i>Sciurus anomalus syriacus</i>	Squirrel			+	
<i>Hystrix indica indica</i>	Porcupine		+		
<i>Acomys dimidiatus dimidiatus</i>	Spiny Mouse			+	

The following herpetofauna species: (1) Globally threatened, (2) Regionally and nationally threatened (3) endemic and (4) rare, merit conservation at Rihane area.

Scientific name	English name	1	2	3	4
<i>Bufo viridis</i>	Green Toad		+		
<i>Rana bedriagae</i>	Levant Frog		+		
<i>Hyla savignyi</i>	Common Tree Frog		+		
<i>Testudo graeca terrestris</i>	Tortoise		+		
<i>Chamaeleo chamaeleon restricta</i>	Chameleon	+	+		
<i>Mauremys caspica rivulata</i>	Terrapin		+		
<i>Hemidactylus turcicus turcicus</i>	Turkish Gecko		+		
<i>Lacerta laevis laevis</i>	Wall Lizard		+		
<i>Hemorrhoids nummifer</i>			+		
<i>Eirenis decemlineatus</i>			+		
<i>Eirenis lineomaculatus</i>			+		
<i>Elaphe hohengeri</i>			+		
<i>Rhynchocalamus melanocephalus</i>			+		
<i>Micrelaps muelleri</i>			+		+

The following bird species: (1) Globally threatened, (2) Regionally threatened (3) endemic and (4) rare breeders (former breeders [F], Probable breeders [P]), merit conservation at Rihane area.

Scientific name	English name	1	2	3	4
<i>Ciconia ciconia</i>	White Stork		+		
<i>Pernis apivorus</i>	Honey Buzzard		+		
<i>Accipiter brevipes</i>	Levant Sparrowhawk		+		F
<i>Gyps fulvus</i>	Griffon Vulture		+		PF
<i>Aquila pomarina</i>	Lesser Spotted Eagle		+		
<i>Aquila clanga</i>	Spotted Eagle	+			
<i>Aquila heliaca</i>	Imperial Eagle	+			
<i>Falco biarmicus</i>	Lanner Falcon		+		P
<i>Falco cherrug</i>	Saker Falcon		+		
<i>Circaetus gallicus</i>	Short-toed Eagle				P
<i>Aquila verreauxii</i>	Verreaux's Eagle				P
<i>Aquila chrysaetos</i>	Golden Eagle				+
<i>Hieraaetus fasciatus</i>	Bonelli's Eagle				P
<i>Buteo rufinus</i>	Long-legged Buzzard				+
<i>Alectoris chukar</i>	Chukar Partridge				+
<i>Crex crex</i>	Corncrake	+			
<i>Anthropoides virgo</i>	Demoiselle Crane		+		
<i>Clamator glandarius</i>	Great Spotted Cuckoo				P
<i>Bubo bubo</i>	Eagle Owl				+
<i>Apus melba</i>	Alpine Swift				+
<i>Dendrocopos syriacus</i>	Syrian Woodpecker				+

<i>Motacilla cinerea</i>	Grey Wagtail				P
<i>Pycnonotus xanthopygos</i>	Yellow-vented Bulbul		+		+
<i>Sylvia mystacea</i>	Menetries's Warbler		+		P
<i>Hippolais languida</i>	Upcher's Warbler		+		
<i>Parus lugubris</i>	Sombre Tit				+
<i>Nectarinia osea</i>	Palestinian Sunbird				+
<i>Carpospiza brachydactyla</i>	Pale Rock Sparrow				+
<i>Serinus syriacus</i>	Syrian Serin		+		+
<i>Carduelis cannabina</i>	Linnet				P
<i>Emberiza caesia</i>	Cretzschmar's Bunting				+
<i>Emberiza melanocephala</i>	Black-headed Bunting				+

### 13.3. Conservation of genetic biodiversity:

[Indicate species or varieties of traditional or economic importance and their uses, e.g. for medicine, food production, etc.]

The following 12 plant species were identified, among other 63 species, as being important to agriculture or forestry or as having some other economic importance (such as being medicinal or aromatic species...) and occurring in natural habitats and in traditional farming systems of Jabal Al Rihane Biosphere Reserve. Their selection is the result of the implementation of the national part of a regional project entitled 'Design, Testing and Evaluating of Best Practices for in situ Conservation of Economically Important Wild Species (EIWPS)'. This project is funded by the Global Environment Facility (GEF) and it is implemented by the United Nations Environment Programme (UNEP) with the following supporting agencies: FAO: Food and Agriculture Organization of the United Nations, Rome, Italy; Diversitas: Paris, France; IPIGRI: International Plant Genetic Resources Institute, Rome, Italy. The national part was executed in Lebanon by the Ministry of Environment in collaboration with the Lebanese University.

#### ➤ **Common mallow** *Malva sylvestris*

Annual plant up to 30-60 cm long usually found in plowed fields, roadsides and abandoned agriculture lands of Jabal Al Rihane Biosphere Reserve.

**Culinary:** used cooked; young plants are collected by locals and sold on street corners.

**Medicinal:** Leaves contain vitamins A, B and C. All parts contain mucilage. A pink water soluble pigment is extracted from flowers. Externally, it is used as a decoction for bathing and as a gargle for inflammation of the mucous membrane. Internally, it is used as an infusion for urinary and digestive diseases

#### ➤ **Mastic tree** *Pistacia lentiscus*

Small evergreen tree 1-5 m high found in woodlands of the reserve, abundant in the oak maquis and prefers sandy soils up to 1000 m above sea level.

**Economic:** resin obtained from punctured stems is used in varnish-making.

**Traditional medicine:** mastic was used to prepare a paste for the liver, chest and respiratory system; another paste with borax used as a laxative; ointment with lead burnt with sulphur is to treat ulcerations. Mastic may be used as chewingum for gum preservation.

#### ➤ **Za'atar** *Origanum syriacum*

Perennial aromatic plant with white flowers, found to be common in various habitats of Jabal Al Rihane Biosphere Reserve.

**Culinary:** Used to prepare the very popular « Mankouchi» which is a kind of pizza made with dry young leaves and flowers added as condiment with a powder of dried fruits of sumac (*Rhus coriara*) and olive oil.

**Medicinal:** Produces an essential oil containing thymol, origanen and tannin. Their principal properties are: tonic, stomachic and expectorant (as an infusion).

**Honey-yielding plant:** Bees visit flowers and give one of the best honeys.

➤ **Common myrtle** *Myrtus communis*

Small evergreen sub-tree, that grows up to 2.5 m high. Fruit is a dark blue berry. The cultivated variety leucocarpa has white berries. Found in Jabal Al Rihane up to 800 m above sea level, usually on calcareous soil.

**Mythical:** It is believed that Venus held a branch of Myrtle as a symbol of peace and love.

**Economic:** Oil of flowers, leaves and bark, is used in perfumery

**Culinary:** Dark blue berries with alcohol and sugar make famous liquor. The white berries of the variety leucocarpa are edible. Myrtle is incorporated in beauty care products.

**Culturally:** used to decorate tombs in cemeteries.

**Ornamental:** For decoration of flower bouquets.

**Medicinal:** Used for epilepsy, spleen rigidity, migraine, bad breath, toothache, stomach cramp, indigestion, diarrhoea, etc.

➤ **Tanner's Sumac** *Rhus coraria*

Small tree 1- 3 m high. Fruit: kidney-shaped, brown purple and hairy. Found in Jabal Al Rihane in dry stony/ rocky hills and waste grounds up to 1800 m altitude.

**Economic:** Exported.

**Industrial:** It produces a yellow dye and a valuable tanning agent for leather preparation.

**Culinary:** Used as an acid condiment. Added to marjoram (*origanum*) for Mankouchi making. Used for decoration of food.

**Medicinal:** As an ointment or lotion to preserve the health of the eye, and for eeth whitening, anti-swelling, anti-vomiting, mouth gargle, gum softener, antidiarrhea.

➤ **Carob Tree** *Ceratonia siliqua*

Tree up to 10 m high. Fruits or pods leathery and pulpy, green then turning brown. Found at Jabal Al Rihane up to c.600 m., mainly on slopes facing sea.

**Environmental and Agricultural:** Used in reforestation and to feed cattle.

**Economic:** The hard wood is used for marquetry. Mashed pods (fruit shells) produce largely eaten or exported delicious molasses

**Medicinal:** As a powder, is used to relieve stomach ache; as a gargale it is used for coughs; also used as a digestive, and for anti-diarrhoea and anti-nausea purposes; and to correct an overdose of laxative; loss of appetite and for gastric trouble. A massage with fresh carob is used to treat warts.

➤ **Tournefort's gundelia** *Gundelia tournefortii*

A Spiny succulent plant 40-50 cm high, branching from the base. Found in roadsides, waste ground and abandoned agriculture lands up to 1500 m.

**Economic:** Tinned, a kg of young shoots is worth about 10 US\$. 1 kg of fresh material is worth about \$2.

**Culinary:** The young shoots and young leaves are edible. The best are the young buds. It is prepared and eaten by various ways. After taking off all spines, it is grilled or boiled with

meat or curds. Often the meal is served with rice. It is considered a delicacy dish and is in great demand.

➤ **Ribwort plantain** *Plantago lanceolata*

Perennial herb, 30-60 cm long. All leaves lanceolate and basal. Found in rocky places, roadside and woodlands of Jabal Al Rihane.

**Medicinal:** Analgesic, anti-inflammatory, emollient and expectorant. The whole plant is used to prepare a decoction or syrup to treat bronchitis and asthma. The leaves are used externally to treat ulcers, varicose veins and wounds; as eyewash, it is prescribed for conjunctivitis.

➤ **Shrubby Sage** *Salvia fruticosa*

Small shrub with a woody base, pink violet flowers, growing up to 150 cm. Found in maquis, calcareous slopes and stony soils between up to 800m above sea level in Jabal Al Rihane.

**Economic:** Exported mainly to Jordan.

**Environmental:** Proposed as suitable shrub for restoration of limestone quarries (Khater & al. 2003).

**Medicinal:** Its volatile oil varies in accordance with altitude (Hilane and Sfeir 1996). Shade dried leaves are used to prepare an infusion for nervous disorder, abdominal disorder, anti-diabetic and a disinfectant product.

**Honey-yielding plant:** Bees visit its flowers.

➤ **Pointless terebinth** *Pistacia mutica*

This tree has a large crown and can reach 15 m high. Found in woodlands or dry places up to 800 m. above sea level..

**Agricultural:** In grafting, this plant is the best for *Pistacia vera*.

**Environmental:** It can be used for reforestation projects.

**Economic:** Timber and charcoal. Locals in South Lebanon used to extract oil from the berries for illumination. Berries are edible.

**Traditional medicine:** Young leaves were used as a chewing gum for sweetening the breath. Oil and galls were used like a dry shampoo by friction. Leaves and berries were used for various stomach illnesses.

➤ **Umbrella Pine** *Pinus pinea*

Tree up to 25 m high. Branches emerge from the summit of the stem as an umbrella. Pinecones are brown-reddish with brief peduncle. Commonly found in Jabal Al Rihane (see above).

**Environmental:** For reforestation on slopes of deep soil.

**Economic:** Nuts are marketed and wood appreciated as timber, in marquetry and in bakery.

**Culinary:** Nuts or pine kernels are exported to Europe and USA to prepare oriental food and sweets. The price is about 20 \$/kg.

**Medicinal:** Used as balsam or emulsion for headache, earache, pneumonia, colic, dysentery, rheumatism, nephritis and as cardiac tonic drink.

➤ **Common Chicory** *Cichorium intybus*

Perennial non-spiny 30-60 cm high plant. Common on waste, abandoned and cultivated lands and track sides. Found at Jabal Al Rihane up to 1200 m.

**Economic and Culinary:** Widely collected by locals, eaten as salad, cooked with olive oil or sold in markets. In some countries (not in Lebanon), roots of the chicory of commerce are roasted for adding to coffee. It is said that cattle appreciate it.

**Medicinal:** Dried leaves or roots can be prepared as an infusion to treat digestive troubles. It is used as a tonic, diuretic and for stomachache.

Most known landraces and wild relative plant species found at Jabal Al Rihane Biosphere Reserve are: wheat, barley, lentils, lathyrus, vetch, medics, clover, almonds, plums, pears, pistachio, figs, onion and garlic.

## 14. DEVELOPMENT FUNCTION

14.1. Potential for fostering economic and human development which is socio-culturally and ecologically sustainable:

[Describe how the area has potential to serve as a pilot site for promoting the sustainable development of its region or "eco-region]

The Jabal Al Rihane area is located in the southern half of Lebanon and shows similarity in its characteristics with the southern western slopes of Hermon and other areas further to the south. It groups a mixture of fauna and flora which reflect both altitude and hot dry climate. Although the area was mostly saved from wood cutting during the civil war and the past military occupation as is still conserving high virginity. Recent illegal logging coupled with an expected continued high rate of urban development appears to be a start for habitat destruction or degradation and thus loss of resources. Subsequently an unprecedented pressure on local ecosystems will be created. As a remedy or avoidance, the biosphere reserve concept on how to try and retain the functioning essence of local ecosystems while at the same time allowing and encouraging viable, sustainable economies to develop is an urgent need. It is believed that with the additional support and interconnections associated with having biosphere reserve designation, it will be possible to move quickly to investigate alternative options. In so doing, it will be a time to demonstrate what is achievable if a community works together towards an identified, commonly defined vision of the future, and in so doing, be a model area for the region. In addition, the biosphere reserve of Jabal Al Rihane that is in possession of local communities depending primarily on the agricultural sector and its extensive lands, on forest products and other natural resources will create in presence of the well represented cultural and historical heritages an opportunity to involve local people and local tourism industry in the education of the public as to the historical traditions and cultural practices of local communities, but will also assist both economic and human development in the region by providing research on the sustainability of the virgin woodlands, including the traditional methods of logging which proved to be sustainable. In Lebanon, most of the fresh water shows some degrees of pollution whereas in Jabal Al Rihane the water catchments area lies in the protected zones of the reserve and the huge aquifers are also protected. Hence there is an opportunity to economically profit from the healthy water of the reserve to benefit the development of the local communities. Moderate and guided tourism and eco-tourism including the discovery of the nature is also an essential component of the economic aspect of this area. So water and both forestry and eco-tourism will necessarily create new jobs to an area almost deprived from employment opportunities, while at the same time balancing ecological and economic values will be respected.

14.2. If tourism is a major activity:

- how many visitors come to the proposed Biosphere Reserve each year?
- is there a trend towards increasing numbers of visitors? (Give some figures if possible)

The Jabal Al Rihane Biosphere Reserve is progressively becoming one of the centres of attraction for eco-tourism in Lebanon. Visitors come all year but mostly in the summer months with July and August as the peak months. Local visitors mainly come to enjoy picnicking in the scenic forests whilst the others use the reserve for hiking, climbing, camping, and birding. In addition to local visitors the Jabal Al Rihane Biosphere Reserve is receiving increasing numbers of foreign tourists from neighbouring countries and from Europe. The total number of visitors during the past two years to the reserve was 8000 in 2005 and 11,000 in 2006. This impressive annual increase is expected to continue for a number of years to come provided that the tourist facilities (roads, visitor centres, restrooms, trails, ecolodges, etc.) are expanded to meet the increased demand.

14.2.1. Type(s) of tourism

[ Study of flora and fauna, recreation, camping, hiking, sailing, horse riding, fishing, hunting, skiing, etc.]

Tourists visit the Jabal Al Rihane Biosphere Reserve for its relative mild winter and prolonged sunny but mild cool summer weather.

There are three types of tourism in the reserve:

- 1- Recreational tourism: the wide range of recreational options (hiking, climbing, picnicking, bike riding and camping) attracts a wide variety of visitors ranging from individuals to families and groups. The activities depend on the age and skills of the individual.
- 2- Discovery tourism: the richness in biotic and abiotic diversity (such as caves and naturally sculptured rocks) and the abundance of migratory bird species in the reserve attract birdwatchers as well as students and even researchers of flora and fauna. Students of schools and universities that are practicing nature discovery showed during the last two years progressive increase in numbers chiefly due the improved awareness level, especially among young people.
- 3- Cultural tourism: the attracting events (celebrations of cultural nights, festivals and folkloric events in summer times) and the availability of accommodation coupled with the friendliness of the people constitute a destination for seasonal mass visitation.

14.2.2. Tourist facilities and description of where these are located and in which zone of the proposed biosphere reserve:

There are no tourist facilities in the core areas of the Jabal Al Rihane Biosphere Reserve. Instead they are available in the transition zone and to a much lesser extent in the buffer zones.

**Walking trails:** there are two existing walking trails: one in the buffer zone of Rihane village property for birdwatching and hiking and one much smaller in the buffer zone that is within the Mlikh village property. The first one also leads to a huge cave of stalagmites and stalactites. The municipality of Rihane fixed at the entrance of the 160 meters deep cave a telephone cabinet for visitors.

**Horse and donkey tours:** with guides are the most popular for groups in most of villages.

**Camping:** special sites are available for camping, and overnight facilities are provided in the buffer zone, near Kfarhoune and Mahmoudyeh.

**Accommodation:** there are very few hotels, motels in the transition zone. Villagers also offer rooms or houses in the transition zone for low prices.

**Recreation:** mountain bike riding are organized by tour operators in cooperation with the Transitory Management Council.

**Information centres:** the Transitory Management Council proposed three information centers at the three main entrances to Jabal Al Rihane: one at the entrance of Kfarhoune on the road Saida-Jezzine, one at the entrance Jarmaq from Kfar Roummane and one at the entrance of Ouazaiye from Marjayoun. The Transitory Management Council is in the process of preparing a plan aiming at educating visitors about history, heritage, culture, caves, flora, fauna and on how users can enjoy the available facilities.

**Interpretive signs:** are planned for the identification of major flora and advice to visitors.

**Studies:** study of the flora and fauna are slowly gaining in popularity.

**Birdwatching:** A trail leading to hotspots for birding was established in Rihane village. However, the Transitory Management Council is proposing 3 birdwatching towers in Sujud, Mazraat El Rohbane, Rihane and Mazraat Louzyde; and four huts (hides) for observation of mammals (location to be identified).

**Guiding:** most of the villagers are willing to guide their guests and expresses happiness when they do so, especially with foreigners as they are either bilinguals or tri-lingual (Arabic-French and English), a matter which is in the favor of tourism.

**Folkloric festivals:** each of the villages of Rihane focuses on one festival or event during the summer period. Accordingly the whole summer is full with attractions such as flower day, heritage day, photography competition week, country music ceremony, protected areas day, etc.

**Historic sites:** availability of historic tombs, water mills, olive oil press, old vouted houses, churches, mosques and artisanal stores.

**Restaurants:** there are few restaurants in the transition zone of the reserve but every single bakery offers traditional breakfasts (thyme pizza, cheese pizza) or fresh traditional "labneh" with menthe over local rural bred; and lunch made from patty with meat, spinach, kishk, sujuk, etc.

**Natural products:** processed food (jams, condiments, distilled water of flowers, rose water, sage water, honey, molasses, kishk, fresh labneh, and fresh cheese).

**Artefacts:** products of local final items such as textiles, silk hand work, baskets, embroideries, pottery, toys, etc. are in sale in each village. Green farming is still in its infancy at the Jabal Al Rihane biosphere reserve.

#### 14.2.3. Indicate positive and/or negative impacts of tourism at present or foreseen:

Tourism, particularly if ecosystem oriented, increases public awareness of the value of sustainable resource usage and management. However, there are some positive and other negative impacts foreseen:

Positive impacts:

- Additional revenues will be injected into the local economy.
- Opened up opportunities for improvement to the services offered within the communities.
- New opportunities for small business owners to develop new business or expand existing ones to meet the needs of increased traffic and the diversified needs and desires of the additional visitors.
- Decreased immigration from rural areas to costal cities.

- Increased support of the reserve.
- New job opportunities for residents in tour guiding and interpretation of nature and culture.
- Attraction of funds for research and monitoring activities.
- Conduction of research on changes affecting communities as a result of tourism growth.

Negative impacts:

- If tourists become too numerous, then there will be an emerging cost in urbanization and infrastructure, whereas the potential that sensitive, vulnerable or shy species will be negatively affected increase.
- Overuse of facilities leading to harm the environment.
- Loss of identity of local culture as a result of only pleasing the visitor.
- Competition between the visitors and local population on the use of facilities, especially in areas where carrying capacity is limited.
- Inconvenience for the locals who were accessing the reserve for free and now they have to pay fee entrance.
- Loss of local values if the local population has to weigh their values against the revenues from higher visitation size.

In order to mitigate the negative effect of eco-tourism on the Jabal Al Rihane Biosphere Reserve, the Transitory Management Council intends to develop a business plan as well as visitation plan so that tourism becomes well controlled, carrying capacity is well measured and biodiversity is better conserved. The Management Council believes that if appropriate planning and consideration of environmental concerns are addressed on an on-going basis, with effort directed towards determining how humans can live sustainably with the local environment, and then concern can be transformed into positive actions, making initiatives as potential models for other local areas experiencing similar concerns.

#### 14.3. Benefits of economic activities to local people:

[Indicate for the activities described above whether the local communities derive any income or benefits directly or indirectly from the site proposed as a Biosphere Reserve and through what mechanism]

Local communities were encouraged to have their area designated a biosphere reserve when the principles of BR were explained to them, especially after they knew that, in a such reserves, they can continue their traditional activities with wise and sustainable use of natural resources and that they can derive incomes and benefits, especially if they get access to best practices and exchange their findings with others. However, their partnership as stakeholders will be strengthened when they share the benefits with the reserve managing authority and make part of a sustainable development.

Most of the touristic activities are managed by families and small enterprises of the region. The tourism plan mentioned above will adopte the benefit sharing principles and will coordinate the efforts; distribute the activities and help providing the basic infrastructure in order to benefit all inhabitants of the Jabal Al Rihane villages.

Presently, the local communities derive direct income from the sale of home made products such as jam, distilled water of flowers, molasses, Kishk, labneh, cheese, dried fruits, dried vegetables, fresh legumes, rural bred, syrup, wine, Arak, etc.; and from the sale of final

products like embroideries, silk, cover sheets, sculptured wood, hand made knives, toys, etc. The local communities also derive direct incomes from: 1) rental of rooms or houses for visitors' overnight accommodation, 2) cooking to supply healthy local food to participants of workshops that are conducted within villages, 3) guiding tourists to visit the reserve, including the natural and cultural monuments, and 4) selling items frequently searched by tourists like hats, insect repellent, binoculars, walking sticks, etc.

The local communities also benefit from indirect income from the extra tourist traffic attracted by the Biosphere Reserve. The indirect income is primarily food and drinks consumed at restaurants and souvenirs and fresh fruits bought in local shops. Other indirect benefits could be in form of information and culture exchange or in form of new friendship established with people from other regions or overseas, including national reconciliation after the past civil war.

The beekeepers in the region of the Biosphere Reserve also benefit from the great value granted to their honey since they are allowed to place their hives in the clean and healthy core zone of the reserve during the flowering season and to sell their products at the entrances of the Reserve.

These economic and other benefits will certainly create employment opportunities for young people that tend to migrate to cities. They will also create employment and money generation opportunities for women of the area. Many women in rural villages work without monetary remuneration and thus are not seen as contributors to the family. The proposal to nominate Jabal Al Rihane a Biosphere Reserve aims to help correct the situation and to offer an opportunity to help women finding a market for their products as well as to help farmers improving their goods

## **15. LOGISTIC SUPPORT FUNCTION**

### 15.1. Research and monitoring

15.1.1. To what extent has the past and planned research and monitoring programme been designed to address specific management questions in the potential biosphere reserve? (For example, to identify areas needing strict protection as core areas, or to determine causes of and means to halt soil erosion, etc.).

All the research and monitoring programmes since the withdrawal of military forces in 2000 were designed to compile a reliable inventory of the flora and fauna of the area, to identify its physical components and to determine what questions need to be addressed in the management of the Jabal Al Rihane Biosphere Reserve.

The Lebanese NGO "Green Line" was contracted in 2000 to to conduct an evaluation of the Rihane Mountain region and to highlight management priorities that could promote rural development in the region. Specifically, this survey examined the natural importance of the region (with focus on existing flora), and recommended sustainable management practices for the future.

The Lebanese University conducted in 2001 an archaeological study at Mlikh village. The findings of the study were posted on the Jabal Al Rihane website ([www.jabalrihane.org](http://www.jabalrihane.org)).

A Rochas that is an international Christian nature conservation organisation was also contracted in 2001 to conduct ornithological studies in the Jabal Al Rihane area to assess the avifauna and propose management measures.

The National Council for Scientific Research was contracted in early 2002 to provide the necessary research and verification work in and around the Jabal Al Rihane Biosphere Reserve and to avoid purely academic research with no direct application. They were asked to concentrate on practical research and to adopt a systematic, integrated, cause and effect perspective to the research undertaken. A series of reports were produced within a final report in 2003 and posted on Jabal Al Rihane website ([www.jabalrihane.org](http://www.jabalrihane.org)).

During 2004-2005, the Jabal Al Rihane was selected at national and regional levels to be the Lebanon's demonstration site for the *in-situ* conservation of Economically Important Wild Plant Species (EIWPS) project. This project covers Lebanon, Egypt, Morocco and Turkey and is being implemented by the United Nations Environment Programme (UNEP) with the following supporting agencies: FAO: Food and Agriculture Organization of the United Nations, Rome, Italy. Diversitas: Paris, France. IPGRI: International Plant Genetic Resources Institute, Rome, Italy.

Individual scientists recently focused on Jabal Al Rihane because of its intact nature that was protected from harvesting and exploitation of resources due the past 22 years of military tension in the area. Some of the researches relate to human activities while some others to the status of the resources in the area. Lists of flora and fauna can be used today as a benchmark for future monitoring and the identified threats to them can be considered a step towards the determination of how to minimize habitat fragmentation and sustain or even restore the remaining elements. Briefly, the data collected to date through research constituted the elements required to the developed management plan draft for the potential biosphere reserve.

Today's planned research aims at providing the necessary tool and elements in order to make easy the development of more plans such as business plan, fundraising plan, community relation plan, visitation plan, education plan, etc.

#### 15.1.2. Brief description of past research and/or monitoring activities

[Indicate the dates of these activities and extent to which the research and monitoring programmes are of local/national importance and/or of international importance.]

•Abiotic research and monitoring [climatology, hydrology, geomorphology, etc.]

1- Hydrologic studies at Rihane were subject to research undertaken since 2000 by the Lebanese University and by the Ministry of Water and Energy through its hydroelectric power plant at Nabaa el Tasse.

Importance: Local/ Regional.

2- Preliminary geomorphologic studies were conducted by Greenline NGO in 2000.

Importance: Local.

3- Tohmé, G.; Tohmé, H.; Ramadan-Jaradi, G.; Hrawi, S.; Gèze, R. (2002-2003) – The Jabal Al Rihane Reserve: Biodiversity assessment and monitoring.

This study incorporated geological research that was conducted by Gèze, R. and climatologic research conducted by Tohmé, G.

Importance: Local/ Regional/International

Posted on: [www.jabalrihane.org](http://www.jabalrihane.org)

See also Aram Society ([www.aramsociety.org](http://www.aramsociety.org)), “Jabal Al Rihane Reserve”, *ARAM Periodical*, volume 17 (2005), pages 285-356.

4- Badawi, H. (2001) – Preliminary Archaeologic and historic study at Mlikh/ Jabal Al Rihane. The archeological study was implemented by an archeologist of the Lebanese University. It describes the archaeological heritage, including the archeobotany of the natural resources and the archaeological vestiges and objects.

Importance: Local/ Regional/ International.

Posted on: [www.jabalrihane.org](http://www.jabalrihane.org)

See also ARAM Society ([www.aramsociety.org](http://www.aramsociety.org)), “Mlikh: Étude préliminaire historique et archéologique”, *ARAM Periodical*, volume 15 (2003), pages 275-376.

• Biotic research and monitoring [flora, fauna]:

According to the President of the National Council for Scientific Research, the nature of Jabal Al Rihane had never been studied by the researchers. Until 2000, it even was completely neglected in spite of the ecological importance which it represents. Consequently, all the past research activities were conducted between 2000 and 2006 as follow:

1- Darwish, A.; El-Khoury, L.; Sattout, E.; Jisr, K. (2000) – Assessment of natural resources in Rihane mountain region.

This study was completed by a team of four professionals from Green Line NGO with relevant experience in the fields of territorial planning, ecosystem management, in-situ conservation and biodiversity. The study used available maps, satellite images, and GPS readings for validation. Current land covers were reassessed to meet the study objectives. It is important to note that the quality of the data gathered during field visits was compromised by the presence of landmines throughout large sections of the study zone.

Importance: Local/ Regional.

2- Naylor, C. (2001) – Inventory of the birds of Jabal Al Rihane.

This study was initiated by a member of A Rochas International. After one year it was interrupted for safety precautions.

Importance: Local

3- Tohmé, G.; Tohmé, H.; Ramadan-Jaradi, G.; Hrawi, S.; Gèze, R. (2002-2003) – The Jabal Al Rihane Reserve: Biodiversity assessment and monitoring.

This study was completed over two years of field work by professionals from the Lebanese University (botanist, mammalogist, ornithologist, herpetologist and geologist). The assessment and monitoring of biological diversity within this ecologically wealthy site highlighted the importance and viability of protection, and provided a well documented scientific database of its natural assets.

Importance: Local/ Regional/ International.

Posted on: [www.jabalrihane.org](http://www.jabalrihane.org)

See also Aram Society ([www.aramsociety.org](http://www.aramsociety.org)), “Jabal Al Rihane Reserve”, *ARAM Periodical*, volume 17 (2005), pages 285-356.

4- Ramadan-Jaradi, G., Bara, T., Al-Mecija, M. & Ramadan-Jaradi, M. (2004).- Significant bird notes from Lebanon during 2002-03. *Sandgrouse*, 26 (1): 29-34.

The study includes ornithological observations from Jabal Al Rihane.

Importance: Regional/ International

5- Ramadan-Jaradi, G, Waterbury, S. P. & Ramadan-Jaradi, G, M. (2005) - Ornithological observations from Lebanon during 2003-04. *Sandgrouse* 27(1): 69-73.

The study includes ornithological observations from Jabal Al Rihane.

Importance: Regional/ International

6- Ramadan-Jaradi, G. and Ramadan-Jaradi, M. (*in prep.*) - Autumn routes of migrating raptors and other soaring birds in southern Lebanon.

This is large scale survey in southern Lebanon (including Jabal Al Rihane) to trace the main routes of migrating raptors and other soaring birds, aiming at contributing to the conservation of flyways and stopover sites through the identification of areas where protection is most needed.

Importance: Regional.

7- Dia, A. (verb. Com.) made hydrobiological surveys in all streams and rivers of Jabal Al Rihane. His findings made parts of different publications.

Importance: Local/ Regional/ International.

• Socio-economic research [demography, economics, traditional knowledge, etc.]:

1- Darwish, A.; El-Khoury, L.; Sattout, E.; Jisr, K. (2000) – Assessment of natural resources in Rihane mountain region.

This study incorporated results of research concerning boundaries, landscapes, land tenure, land use and economic plant species in Jabal Al Rihane Biosphere Reserve.

2- Tohmé, G. & Ramadan-Jaradi, G. (2005) – Study of the economically important wild plant species for in-situ conservation. Report submitted to FAO- Roma/ Italy.

This study was conducted under a regional project (UNEP/GEF Project EP/INT/204/GEF) aiming at improving global food security through effective conservation of economically wild plant species *in situ*, Jabal Al Rihane was selected as a demonstration site for “Design, Testing and Evaluating of Best Practices for *in situ* Conservation of Economically Important Wild Plant Species” because it is one of the centres of plant diversity, belonging to the Near Eastern and Mediterranean Vavilov Centres of Crop Diversity and Origins, and rich in diversity and genetic resources of globally important crop plants, including many cereals, food legumes, vegetables, forages, fruit trees and nuts, medicinal and aromatic plants and forestry species, and because of the willingness and commitment of its local communities to implement the project.

Importance: International

Report submitted to Ministry of Environment/ Lebanon, FAO- Roma/ Italy, and UNEP.

15.1.3. Brief description of on-going research and/or monitoring activities:

The Research and Monitoring Program of the Jabal Al Rihane Biosphere Reserve is a Program ran by the Transitory Management Council of the Reserve in cooperation with a number of national and international NGOs, universities and research institutions. Research

and monitoring is to be undertaken at a later stage by the follow-up appointed committee through subcontracting a management team who is responsible for the day to day management of the nature reserve.

• Abiotic research and monitoring [climatology, hydrology, geomorphology, etc.]:

None at the present time. However, the declaration of Rihane a biosphere reserve will certainly attract researchers from all over the country and elsewhere, and will lead to monitoring strategies and programs.

• Biotic research and monitoring [flora, fauna]

- Effect of green farming on breeding bird populations in Tyre, Jabal Al Rihane and Aammiq Swamp. Ramadan-Jaradi, G. (NCSR Project: 2006-2008).

Continuous Mammal, bird and herpetofauna ecological studies and surveys as well as monitoring continue to support ongoing ecosystem science information and management needs for the proposed biosphere reserve. Bird monitoring is still carried out to trace the flyways of migration and to measure the avian productivity of the Rihane area. Data from these monitoring projects will be provided to local resource managers so that optimal ecosystem management can be achieved.

Some paleo-ecological studies in the area are undertaken in an attempt to understand past climate through the floral record.

• Socio-economic research [demography, economics, traditional knowledge, etc.]:

Presently, there are no on-going *sensu-stricto* demographic studies at Jabal Al Rihane. Instead socio-economic research continues to be collected by students and NGOs:

1- Plants used or neglected by the community of Jabal Al Rihane. Maitrise es Science graduation project, (Academic year 2006-2007). Awada, Jamil. Lebanese University.

2- Rate of urban encroachment in Jabal Al Rihane after the withdrawal of military forces in 2002. MS. Thesis, (Academic year 2006-2007). Dhayni, Rami. Lebanese University.

3- Potential impact of eco-tourism development on the economy of the Rihane Village. Green Future (NGO).

#### 15.1.4. Brief description of planned research and/or monitoring activities:

• Abiotic research and monitoring [climatology, hydrology, geomorphology, etc.]:

Meteorological monitoring sites are planned to be established in the 10 different villages. Project proposal is in preparation for potential fundraising. Hydrological studies are strongly needed and figure on the priority list of the research agenda.

• Biotic research and monitoring [flora, fauna]:

- Surveys and distribution of mammals, birds, herptiles, butterflies, dragonflies and plants are planned to be implemented in order to make interpretive and educational leaflets which show the distribution of the most common species in the different habitats available. The leaflet project will also provide fascinating facts about flora and fauna in order to facilitate the mission of interpreters.

- Site-specific and species-specific strategies for monitoring are planned to be developed to facilitate the job of the managing entity.

- Identification of indicators for adaptive management is a priority for monitoring of the management success or failure and for further update of the management plan.
- Conduction of a breeding bird census aiming at mapping of nesting avifauna in Jabal Al Rihane Biosphere Reserve.
- Development of a biotic database for the Jabal Al Rihane biosphere reserve.
- Establishment of a Herbarium for the Jabal Al Rihane biosphere reserve.
- Development of an Integrated and Practical Ecological Monitoring Manual for Jabal Al Rihane biosphere reserve.

•Socio-economic research [demography, economics and traditional knowledge]:

- Monitoring socio-economic aspects which can have impact on nature conservation.
- Establishment of a database for written and unwritten traditional knowledge and traditional best practices.
- Feasibility of a comprehensive regional approach to eco-tourism activities in the Jabal Al Rihane biosphere reserve.
- Main demographic features of communities in Jabal Al Rihane and their effect on rural development.

15.1.5. Estimated number of national scientists participating in research within the proposed biosphere reserve on:

- a permanent basis: Two Lebanese scientists
- an occasional basis: About twelve Lebanese scientists

15.1.6. Estimated number of foreign scientists participating in research within the proposed Biosphere Reserve on:

- a permanent basis: Zero
- an occasional basis: Three

15.1.7. Estimated number of masters and/or doctoral theses carried out on the proposed biosphere reserve each year:

One to two Doctoral or Master Theses each year.

15.1.8. Research station(s) within the proposed Biosphere Reserve:

[1] = permanent: Three meteorological stations: one in Jarjough, Rihane and Loueizeh respectively; and one hydrological research station at Loueizeh (Nabaa El Tasseh).

[2] = temporary: Two temporary research stations: one in each of the two buffer zones for agrobiodiversity and one at Litani for hydrobiology.

A total of about three research sites are planned to provide the necessary data and equipment to effectively assist in the management of the whole biosphere reserve as a single entity.

15.1.9. Permanent research station(s) outside the proposed Biosphere Reserve:

[If no permanent research station exists within the proposed Biosphere Reserve, indicate the location, distance to the core area, name and address of the most relevant research station]

The most important and nearest permanent research station is located at the Lebanese University at Nabatyeh that is at 2km bird flight to the west of the south west corner of Jabal Al Rihane Biosphere Reserve.

There are also many other research stations outside the proposed biosphere reserve that include universities (Lebanese University, American University, Balamand University, St. Joseph University, etc.) and Lebanese agriculture Research Institute. Also there is a National Council for Scientific Research. A few examples of additional research stations include: weather and climate monitoring and record keeping at universities, airports, agricultural stations; water quality monitoring at different hydrological stations and monitoring station of birds at Aammiq wetland. All these mentioned stations are reachable within 10-40 minutes from the core area of the proposed biosphere reserve.

#### 15.1.10 . Permanent monitoring plots

[Indicate the year established, the objective of monitoring, the type and frequency of observations and measurements, and whether an internationally recognized protocol is being used, for example the Smithsonian-MAB MAPMON protocol for monitoring forest biodiversity]:

There are no permanent monitoring plots at present however permanent plots are expected as one of the deliverables of the project “Develop an Integrated and Practical Ecological Monitoring Manual for Jabal Al Rihane biosphere reserve” mentioned above.

#### 15.1.11. Research facilities of research station(s)

[meteorological and/or hydrological station, experimental plots, laboratory, computerized databases, Geographical Information System, library, vehicles, etc.]:

- Naba’a el Tassé hydrological power station within the proposed BR monitors water quality, level of water table fluctuation, quantities and trace elements in the water; and monitors climatic data such as pluviosity, temperature, wind and humidity. This station is equipped with acceptable level of computerized data and laboratory.
- Rihane and Jarjouh meteorological stations monitor climatic data such as pluviosity, temperature, wind and humidity. These stations are under-equipped.
- Universities research stations deal with all aspects of biotic and abiotic research and are well equipped with laboratories and have access to most references. Universities are also equipped with computerized databases, GIS, GPS, vehicles and libraries.
- Lebanese Agriculture Research Institute (LARI) has interest in forestry, agricultural products, edaphic issues, weather matters, genetic resources, analyses of plant ingredients, pollution, agrobiodiversity and control of exported-imported agricultural goods. LARI is well provided with all requirements.
- National Council for Scientific Research provides financial supports to researchers from different universities and individuals in all fields of research and has units for atomic energy and remote sensing. Also the NCSR has a computerized database and mapping facilities with GIS technology and vehicles.

#### 15.1.12. Other facilities

[e.g. facilities for lodging or for overnight accommodation for scientists etc.]:

Hotels and motels are available within the transition zone. Scientists are welcomed and offered overnight accommodation by municipalities and villagers. There is also an extensive network of public roads that allow access to virtually anywhere in the proposed BR.

15.1.13. Does the proposed biosphere reserve have an Internet connection?

Yes.

[www.jabalrihane.org](http://www.jabalrihane.org)

[jabalrihane@yahoo.com](mailto:jabalrihane@yahoo.com)

15.2. Environmental education and public awareness

[Environmental education -- sometimes now referred to as education for sustainable development -- can be aimed at schoolchildren, the adult population of the local communities, and visitors from home and abroad].

15.2.1 Describe environmental education and public awareness activities, indicating the target group(s):



Interpretation programs and science programs are developed for school children and other visitors. Interpretation of nature and culture by trained guides is proposed to all types of visitors along the trails, at hotspots and within villages for showing old houses, churches, mosques, home-bred baking with “Tannour” (cooking stove), etc. The science program targets only school and university students that are always accompanied by guides

from the reserve who provide equal time to recreation and education. Special educational walking trail with signs has been established in Rihane village where it ends at the grotto entrance for speleology, a rising popular adventure sport in Lebanon today. Such visits to the cave contribute to improving the students’ understanding of groundwater flow. Furthermore, the science program explains the life cycles and provides students with fascinating facts about the fauna and flora. This program will be strengthened by the production of the leaflets mentioned above (15.1.4). Every municipality has a lecture room for educational and awareness presentations that are regularly organized with experts volunteers from all over Lebanon.

Community training is being implemented in several villages within the Jabal Al Rihane biosphere reserve. The sessions target all people but women mainly. Their turn-out is often high and they show a lot of interest in the subjects, especially after they learn about how they can help protect the environment and their families’ health and increase their incomes.

Arrangements for awareness sessions in the schools are being made also. Contacts are being established with the guides of the reserve and with the principles of the schools to arrange for dates for the trainings. Materials for the training are below the required level.

Visitors from abroad are very few, occasional but extremely welcomed by the local communities of Jabal Al Rihane.

Another form for increasing awareness and educating students is represented by the press releases and interviews or reports to newspapers, magazines, radios and TVs.

15.2.2. Indicate facilities for environmental education and public awareness activities [visitors' centre; interpretative programmes for visitors and tourists; nature trails; ecomuseum demonstration projects on sustainable use of natural resources]:

An eco-museum is initiated in Rihane village with fossils of gastropods and other shells, dried samples of plants, bird-nest types, insects, etc.

Walking trails were also established in Rihane village.

Guided van tours are operated from villages with short stops and walks. This is apparently a preferred mean of visitation for elderly people.

Demonstration project on in-situ conservation of Economically Important Wild Plant Species is provided through a GEF/UNEP Project

Demonstration project on sustainable use of sedges, sumacs, pistachio, origanum, and chicory through their cultivation in villages to reduce pressure of collecting wild forms is also initiated.

Demonstration project on *Sustainable Environmental Practices* whose aim was to improve environmental practices for the management of waste water was also implemented in Aichyeh by YMCA-Lebanon.

Demonstration project on wise use of water for generation of electric power was implemented at Nabaa El Tasseh of Louaizeh.

The Transitory Management Council proposed three information centers at the three main entrances to Jabal Al Rihane: one at the entrance of Kfarhoune on the road Saida-Jezzine, one at the entrance Jarmaq from Kfar Roummane and one at the entrance of Ouazaiye from Marjayoun. The Transitory Management Council is in the process of preparing a plan aiming at educating visitors about history, heritage, culture, caves, flora, fauna and on how users can enjoy the available facilities.

### 15.3 Specialist training

[Acquisition of professional skills by managers, university students, decision-makers etc.]

[Describe specialist training activities: for example research projects for students; professional training and workshops for scientists; professional training and workshops for resource managers and planners; extension services to local people; training for staff in protected area management]

Between 2003 and 2007, eight major training workshops took place to introduce the basic concepts of protected area management, visitor management, business management, fundraising, assessment and monitoring techniques of biodiversity, management plan preparation, wastewater management, and ecotourism to members of the Transitory Management Council, municipalities, and other interested people from the local communities. These workshops that were well organized relied on foreign and national expert lecturers and trained participants on field and office works, using small working groups and brain storming techniques.

During March and October 2004, heads and members of municipalities from Jabal Al Rihane attended the meeting of the ArabMAB Coordinating Council in Beirut with the aim of understanding the biosphere reserves functions and goals.

Other training workshops were held by the Ministry of Environment for all protected areas in Lebanon, including Jabal Al Rihane Biosphere Reserve. These are:

- Means of Cooperation between the Ministry of Environment and public administrations. 11-13 Jul. 03, W. Beqaa. Masharif Saghbine Hotel. L: Role of protected areas in developing local communities.
- Towards the application of Project-Law of Hunting in Lebanon. AFDC/ Parliament Environment Committee/ Hans Seidel. Parliament, Beirut: 24/11/03
- Regional Technical Seminar "National Strategies and Policies for Wetlands" Beirut, 16-18 Feb. 2004
- National Workshop on Economically Important Wild Plant Species (EIWPS), (MOE-LU-FAO), NCSR, 27-29 July 2004.
- Eco-guide training on identification of birds and birdwatching. MOE, MedWetCoast, Hans Zeidel, Aammiq: 27-29 May, 2005.

- Workshop on SISPAM (Stable Institutional Structure for the Protected Areas Management), NAPPA (National Action Plan for Protected Areas) Draft Discussion (20 April 06) and Final Discussion (18 January 2007); Ecodit-MOE, Engineer's Order, Bir Hassan, Beirut. 2006 and 2007.

Seminars and public debates also added to the knowledge of the local communities in the Rihane area.

#### 15.4 Potential to contribute to the World Network of Biosphere Reserves

[Collaboration among biosphere reserves at a national, regional and global level in terms of exchange of scientific information, experience in conservation and sustainable use, study tours of personnel, joint seminars and workshops, Internet connections and discussion groups, etc. ]

Members from the Transitory Management Council and municipalities of Jabal Al Rihane biosphere reserve have been in close contact with representatives from other BRs during the two meetings of ArabMAB Network at Beirut in March and October 2004. Subsequently, they were encouraged to have their area as biosphere reserve and showed willingness to collaborate with other BRs, mainly within the ArabMab Network.

One of the roles of the coordinator in the Transitory Management Council is to establish dialogues and e-discussions with other biosphere reserves in order to provide arrangements for twinning, exchange of information, exchange of visits and expertises, and to conduct joint workshops and seminars.

##### 15.4.1. Collaboration with existing biosphere reserves at the national level (indicate on-going or planned activities):

Following discussions that were encouraged by the National MAB Committee between Jabal Al Rihane biosphere reserve and the already existing Shouf biosphere reserve, It was agreed that the two reserves will promote mutual cooperation, exchange of knowledge, exchange of expertise and best practices. In these discussions, the Shouf biosphere Reserve committed itself to provide the staff of Jabal Al Rihane with the necessary expertise in order to assist them to properly implement the three functions of their BR.

##### 15.4.2. Collaboration with existing biosphere reserves at the regional or subregional levels, including promoting transfrontier sites and twinning arrangements (indicate on-going or planned activities)

[Here, 'regional' refers to the regions as Africa, Arab region, Asia and Pacific Latin America and the Caribbean, Europe. Transfrontier biosphere reserves can be created by two or more contiguous countries to promote cooperation to conserve and sustainably use ecosystems which straddle the international boundaries. Twinning arrangements usually consist of agreements between sites located at some distance in different countries to promote activities such as cooperative research projects, cultural exchanges for schoolchildren and adults, etc.]

Collaboration with existing biosphere reserves in the region will be high on the list of priorities of the proposed Jabal Al Rihane Biosphere Reserve and will certainly be facilitated through the ArabMab Network and the National MAB Committee.

In spite of recent conflicts, the work on a possible future TBR between Lebanon and Syria continued at the technical level. Jabal Al Rihane intends to support the declaration of a transfrontier site with Syria, and to promote future activities with it such as cooperative research projects, cultural exchanges for schoolchildren and adults, etc. as well as with other regional BRs through twinning or Memos of Understanding.

15.4.3 Collaboration with existing biosphere reserves in thematic networks at the regional or international levels (indicate ongoing and planned activities) [Networks of sites which have a common geographic theme such as islands and archipelagoes, mountains, or grassland systems, or a common topic of interest such as ecotourism, ethnobiology etc.]

No such plans at present, but the possibility will be investigated once official biosphere designation is given.

15.4.4 Collaboration with existing biosphere reserves at the international level (indicate ongoing and planned activities: [Notably through Internet connections, twinning arrangements, bilateral collaborative research activities, etc.]

None at the present time.

## 16. USES AND ACTIVITIES

### 16.1 Core Area(s):

#### 16.1.1 Describe the uses and activities occurring within the core area(s):

[While the core area is intended to be strictly protected, certain activities and uses may be occurring or allowed, consistent with the conservation objectives of the core area ]

The selection of the core areas is due to the higher value of their natural resources, their obvious representativeness of the ecosystems of the whole biosphere reserve, the lower level of alteration by anthropologic activities and for their current status of being almost free from all human activities. In these core areas that are protected by legal ordinances, it is agreed that only individual activities of scientific research and monitoring with the intention of obtaining the data that allow knowing the ecosystems in their evolutionary dynamics, as well as the degree of their conservation are allowed. Accordingly, the overall objective of these core areas is to conserve and maintain the rain catchments area, the integrity of natural processes, and biodiversity in the Jabal Al Rihane Biosphere Reserve area before it loses its virginity; especially that it was left intact during 20 years (1982-2002) due to military tensions. Within the framework of this primary objective, some activities can be tolerated as far as they don't harm the protection aims, e.g.:

- Establishment of modest primitive trails, preferably ending into birdwatching hotspots so that the resulting information from individual research and monitoring can raise the awareness of the visitors and educate research students.
- Establishment of anti-fire belts around forest stands using controlled grazing in collaboration with goat herders from the local communities of Jabal Al Rihane biosphere reserve.
- Establishment of organized soft eco-tourism to holy places and historic premises that are located within the core areas, e.g.: Temples, Tombs and Sarcophagi.

16.1.2. Possible adverse effects on the core area(s) of uses or activities occurring within or outside the core area(s):

(Indicate trends and give statistics if available)

- Urbanisation in the transition zone has the potential to negatively impact the buffer zones and subsequently the core areas and the integrity of conservation. Illegal hunting or poaching may remain partly uncontrolled even in the core area. But the designation of Rihane a biosphere reserve will certainly encourage a more responsible and sustainable approach to these activities.
- Groundwater use is not fully and/ or equally regulated in the villages of Jabal Al Rihane area, and excessive groundwater extraction can potentially dry up streams in earlier stages before drought periods.
- Considering the higher density of forests in the core areas, the occurrence of man made fire may cause catastrophic results; especially that access to remote areas of the core zones for combating fire is very difficult.

## 16.2. Buffer zone(s)

16.2.1 Describe the main land uses and economic activities in the buffer zone(s):

[Buffer zones may support a variety of uses which promote the multiple functions of a Biosphere Reserve while helping to ensure the protection and natural evolution of the core area(s).]

The buffer zone in the proposed Jabal Al Rihane Biosphere Reserve is selected because of its moderate levels of habitation and economic development and because of the need to conserve and maintain those lands that are more or less influenced by humans and to use their resources in a sustainable way. Thus, the main land uses and economic activities identified in the buffer zone are:

- Activities of conserving the existing natural landscapes that bestride the core areas and oustipe it into the buffer zones.
- Activities of conserving the traditional agricultural terraces and maintaining the sustainable farming practices.
- *Activities of In-situ* conservation for the “Economically Important Wild Plant Species” within the experimental demonstration plots that are described under GEF/UNEP project above.
- Activities promoting the green farming in order to maintain better environment and to generate more incomes benefiting from the high demand on its products.
- Activities related to sustainable use of groundwater by the local communities.
- Activities of scientific research and monitoring,
- Activities of education and awareness,
- Activities of eco-tourism development.
- Activities of rearing livestock.
- Reforestation of the burnt forest areas during the military activities.

16.2.2 . Possible adverse effects on the buffer zone(s) of uses or activities occurring within or outside the buffer zone(s)in the near and longer terms:

Urbanisation in the transition zone will have the potential to negatively impact the buffer zone. Illegal hunting or poaching may remain partly uncontrolled in the buffer zones. But the designation of Rihane a biosphere reserve will certainly encourage a more responsible and sustainable approach to these activities.

### 16.3. Transition area

[The Seville Strategy gave increased emphasis to the transition area since this is the area where the key issues on environment and development of a given region are to be addressed. The transition area is by definition not delimited in space, but rather is changing in size according to the problems that arise over time. Describe briefly the transition area as envisaged as the time of nomination, the types of questions to be addressed there in the near and the longer terms. The size should be given only as an indication]

#### 16.3.1 Describe the main land uses and major economic activities in the transition area(s):

The transition zone comprises about 44.3 % of the Jabal Al Rihane Biosphere Reserve, with the predominant land use being forest management, traditional agricultural activities and seasonal recreation. About 64 % of the transition area is devoted to agriculture, 18 % to urbanization and human agglomeration (including hydroelectric power station, wastewater treatment station, schools and administrative premises), 10% to abandoned lands and inter-villages roads, and about 8% to forest management.

Because 84% of the transition zone is private land, including 20 ha for the Shia'a Shrine in Sujud and 370 ha at the northeastern parts of Kfarhoune village for the Catholic Church of Saïda; it is unlikely that significant change in land usage will occur in the foreseeable future. However, because of human population growth in the area, there is continuous pressure increase to allocate land for subdivisions and other usages related to urbanization.

Eco-tourism is in its infantile stage whereas the recreational events and festivals increase in the summer times.

#### 16.3.2 Possible adverse effects of uses or activities on the transition area(s):

Increased conversion of natural landscape for agricultural crop use and poor practices can directly impact wilderness and wildlife. Improved motorized access as a result of agriculture and forest road construction increases legal and illegal hunting pressure on bird species and their hotspots. Development of recreational areas and cottages along water streams will degrade water quality. The use of chemical herbicides and pesticides in the production of agricultural crops will have cumulative impact on wildlife. All these negative impacts will certainly be mitigated through the increased awareness, improved education and the rural planning which will all result from the designation of the Jabal Al Rihane as a biosphere reserve and from the future implementation of its management plan.

## 17. INSTITUTIONAL ASPECTS

### 17.1. STATE, PROVINCE, REGION OR OTHER ADMINISTRATIVE UNITS:

[List in hierarchical order administrative division(s) in which the proposed Biosphere Reserve is located (e.g. state(s), counties, districts)]

#### Country Name:

conventional long form: **Lebanese Republic**

conventional short form: **Lebanon**

local long form: **Al Jumhuriyah al Lubnaniyah**

local short form: **Lubnan**

#### Governorates (Muhafaza):

South Lebanon [ El Jnoub]

#### Districts (Qada/ Caza):

Jezzine

#### Region

Jabal Al Rihane

#### Municipalities (Baladiyat):

Aichyeh, Aramta, Jarjough, Kfarhoune, Louaizeh, Mlikh, Rihane, Sujud and Srairi.

## 17.2 UNITS OF THE PROPOSED BIOSPHERE RESERVE:

[Indicate the name of the different land management units (as appropriate, e.g. protected area, territories of municipalities, private lands) making up the core area(s), the buffer zone(s) and the transition area).

Municipal and governmental properties make the core area that is protected under the draft Law which was approved by the Cabinet decision: 25/2006.

Mixture of municipal and governmental properties and a few privately owned lands makes the buffer zone. They also benefit from legal ordinances of Decision 25/2006 and Forestry Law no. 85.

All other areas of villages and their immediate surrounding make the transition zone that is in majority made of private lands.

### 17.2.1. Are these units contiguous or are they separate?

[A biosphere reserve made up of several geographically separate units is called a "cluster biosphere reserve". Please state if this is the case of the proposal.]

The units (zones/areas) making up the proposed Jabal Al Rihane Biosphere Reserve are contiguous.

### 17.3. Protection Regime of the core area(s) and, if appropriate of the buffer zone(s)

The core areas of Jabal Al Rihane Biosphere Reserve are protected by the draft Law that was approved by the Cabinet Decision 25/06 which declares all government and municipal lands (public property) of Jabal Al Rihane a nature reserve.

70% of the buffer zones of Jabal Al Rihane are also protected by the same Cabinet Decision for being publicly owned lands whereas the 30% which corresponds to the privately owned lands are protected by one or more of the following legal ordinances:

- The draft Law approved by Cabinet Decision that adds to the public properties of Jabal Al Rihane a belt of 500 meters in which setting of fire and hunting of wildlife are prohibited.
- The Forest Code (law # 85) that designates a zone of 500 meters directly surrounding the forests where agricultural and ecotouristic activities may take place provided that no major construction or industrial activities are allowed.
- The Forest Code (Law 85 date 12/9/1991), amended by the Parliament in 1996 (Law 558 date 24/7/96) stipulating that all cedar, fir, juniper forests and "other coniferous forests" in Lebanon are protected *in facto*.
- The National Master Plan that consider Jabal Al Rihane an area of most conservation concern.

All zones of the Jabal Al Rihane can benefit from the following laws and decrees:

- o Law number 326 date 28/6/2001, for the execution of reforestation projects at the national level,
- o Law for the Protection of Environment (law 444/02) dedicating an entire chapter for the management of natural resources and conservation on biological diversity - specifically articles 47 to 49 which call for the protection and sustainable use of biodiversity, the establishment of nature reserves and for regulating access to genetic resources. Furthermore, the Law 444 stipulates that incentive measures be given to actions that avoid or minimize impact on environment including biodiversity.

- The draft EIA decree stating that all major development, infrastructure and industrial projects will have to undergo an EIA study including effects on biodiversity, in order to promote conservation activities before receiving approval.
- The draft law on “access and benefit sharing” that was developed in the year 2005 and once issued will lead to the regulation of the access to the Lebanese biological and genetic resources and will reduce unsustainable consumption.
- Ministerial Decision issued by the Minister of Agriculture regulating the export of all medicinal and aromatic plants (Decision 92/1 dated 27/2/1996)
- Ministerial Decision issued by the Minister of Agriculture (Decision 108/1, dated 12/9/1995) prohibiting the import and introduction of all cedar seeds and plants
- Ministerial Decision issued by the Minister of Agriculture prohibiting the picking and export of ferrula plant & roots (Decision 340/1 dated 1/8/1996), a plant having aphrodisiac properties.
- Ministerial Decision issued by the Minister of Agriculture in 1998 regulating the harvesting of oregano and salvia (Decision 177/1)
- Law 580/4 regulating the hunting at national level.

#### 17.3.1. Core area(s):

[Indicate the type (e.g. under national legislation) and date since when the legal protection came into being and provide justifying documents (with English or French summary of the main features)

- Draft Law approved by Cabinet Decision 25/06 establishing this protected area in 2006 (see Annex for English translation)
- The Forest Code (Law 85 date 12/9/1991), amended by the Parliament in 1996 (Law 558 date 24/7/96) (see Annex for English translation)

#### 17.3.2 Buffer zone(s):

[Indicate the type (e.g. under national legislation) and date since when the legal protection came into being and provide justifying documents (with English or French summary of the main features. If the buffer zone does not have legal protection, indicate the regulations that apply for its management.)

70% of the buffer zone is under legal protection (Draft Law approved by Cabinet Decision in 2006) and 30% are under the following regulations that apply for its management:

- The National Master Plan that consider Jabal Al Rihane an area of most conservation concern.
- The Forest Code (law # 85) that designates a zone of 500 meters directly surrounding the forests where agricultural and ecotouristic activities may take place provided that no major construction or industrial activities are allowed.
- The Forest Code (Law 85 date 12/9/1991), amended by the Parliament in 1996 (Law 558 date 24/7/96) stipulating that all cedar, fir, juniper forests and “other coniferous forests” in Lebanon are protected *in facto*.
- Law number 326 date 28/6/2001, for the execution of reforestation projects at the national level,
- Law for the Protection of Environment (law 444/02) dedicating an entire chapter for the management of natural resources and conservation on biological diversity - specifically articles 47 to 49 which call for the protection and sustainable use of biodiversity, the establishment of nature reserves and for regulating access to genetic resources. Furthermore, the Law 444 stipulates that incentive measures be given to actions that avoid or minimize impact on environment including biodiversity.

- The draft EIA decree stating that all major development, infrastructure and industrial projects will have to undergo an EIA study including effects on biodiversity, in order to promote conservation activities before receiving approval.
- The draft law on “access and benefit sharing” that was developed in the year 2005 and once issued will lead to the regulation of the access to the Lebanese biological and genetic resources and will reduce unsustainable consumption.
- Ministerial Decision issued by the Minister of Agriculture regulating the export of all medicinal and aromatic plants (Decision 92/1 dated 27/2/1996)
- Ministerial Decision issued by the Minister of Agriculture (Decision 108/1, dated 12/9/1995) prohibiting the import and introduction of all cedar seeds and plants
- Ministerial Decision issued by the Minister of Agriculture prohibiting the picking and export of ferrula plant & roots (Decision 340/1 dated 1/8/1996), a plant having aphrodisiac properties.
- Ministerial Decision issued by the Minister of Agriculture in 1998 regulating the harvesting of oregano and salvia (Decision 177/1)
- Law 580/4 regulating the hunting at national level.

17.4. Land use regulations or agreements applicable to the transition area (if appropriate)

19.60% of the transition area is protected by the draft Law approved by Cabinet Decision in 2006. The remaining parts are under the following regulations that apply for its management.

- The Forest Code (law # 85) that designates a zone of 1000 meters directly surrounding the forests where agricultural and ecotouristic activities may take place provided that no major construction or industrial activities are allowed.
- The Forest Code (Law 85 date 12/9/1991), amended by the Parliament in 1996 (Law 558 date 24/7/96) stipulating that all cedar, fir, juniper forests and “other coniferous forests” in Lebanon are protected *in facto*.
- The National Master Plan that consider Jabal Al Rihane an area of most conservation concern.
- Law number 326 date 28/6/2001, for the execution of reforestation projects at the national level,
- Law for the Protection of Environment (law 444/02) dedicating an entire chapter for the management of natural resources and conservation on biological diversity - specifically articles 47 to 49 which call for the protection and sustainable use of biodiversity, the establishment of nature reserves and for regulating access to genetic resources. Furthermore, the Law 444 stipulates that incentive measures be given to actions that avoid or minimize impact on environment including biodiversity.
- The draft EIA decree stating that all major development, infrastructure and industrial projects will have to undergo an EIA study including effects on biodiversity, in order to promote conservation activities before receiving approval.
- The draft law on “access and benefit sharing” that was developed in the year 2005 and once issued will lead to the regulation of the access to the Lebanese biological and genetic resources and will reduce unsustainable consumption.
- Ministerial Decision issued by the Minister of Agriculture regulating the export of all medicinal and aromatic plants (Decision 92/1 dated 27/2/1996)
- Ministerial Decision issued by the Minister of Agriculture (Decision 108/1, dated 12/9/1995) prohibiting the import and introduction of all cedar seeds and plants

- Ministerial Decision issued by the Minister of Agriculture prohibiting the picking and export of ferrula plant & roots (Decision 340/1 dated 1/8/1996), a plant having aphrodisiac properties.
- Ministerial Decision issued by the Minister of Agriculture in 1998 regulating the harvesting of oregano and salvia (Decision 177/1)
- Law 580/4 regulating the hunting at national level.

#### 17.5. Land tenure of each zone:

[Describe and give the relative percentage of ownership in terms of national, state/provincial, local government, private ownership, etc. for each zone.]

##### 17.5.1. Core area(s):

Governmental	60.00%
Municipal	40.00%
Religious Trust	0.00%
Private	0.00%

##### 17.5.2. Buffer zone(s):

Governmental	45.00%
Municipal	25.00%
Religious Trust	05.60%
Private	24.40%

##### 17.5.3. Transition area(s):

Governmental	12.00%
Municipal	7.60.00%
Religious Trust	0.00%
Private	80.40%

##### 17.5.4. Foreseen changes in land tenure:

[Is there a land acquisition programme, e.g. to purchase private lands, or plans for privatization of state-owned lands?]

None foreseen at present.

#### 17.6. Management plan or policy and mechanisms for implementation

[The Seville Strategy recommends promoting the management of each biosphere reserves essentially as a "pact" between the local community and society as a whole. Management should be open, evolving and adaptive. While the aim is to establish a process leading to elaborating a comprehensive management plan for the whole site reflecting these ideas and involving all stakeholders, this may not yet exist at the time of nomination. In this case however, it is necessary to indicate the main features of the management policy which is being applied to guide land use at present for the area as a whole, and the 'vision' for the future.]

At the time of nomination for the Jabal Al Rihane Biosphere Reserve there exists a draft Management Plan for the Jabal Al Rihane Reserve that is presently circulated among stakeholders for comments and tuning.

The following policies are extracted from this draft management plan that was a result of a collaborative participation.

- Management will be in accordance with the principles of the Natural Heritage Charter.

- All species of native plants and animals will be protected and conserved. Economical species and other natural resources will be sustainably used.
- Conservation management priority will be given to conservation of all rare and threatened species. Highest priority will be given to species which are endemic, globally rare or threatened.
- All species of native plants and animals used in rehabilitation or regeneration in the Reserve will be propagated from local material or from sources which can be guaranteed genetically identical to populations in the biosphere reserve.
- All newly introduced species of plants and animals will be eradicated where practicable, consistent with any cultural heritage considerations. Prior to eradication activities, all reasonable efforts will be made to investigate, recognize and prevent threat to non - target species or individuals.
- Permanent records of species recorded, eradicated or reintroduced will be maintained.
- No rock or soil material will be excavated or removed from the core and buffer areas of the biosphere reserve except where required for activities otherwise authorized under a formal plan (e.g. professional archaeological excavations, visitor facilities, removal of explosives, etc...)
- Management will be in conformity with the principles of the Burra Charter.
- Internal procedures will be developed, in co-operation with the Directorate of Antiquities, to provide a routine process for assessment of cultural heritage values which may be encountered in management activities.
- All groups/individuals wishing to conduct archaeological investigations in the core and buffer zones of the biosphere reserve will require a research permit.
- Scientific research and investigation of cultural and historical sites and values will be promoted and facilitated.
- Priority will be given to promoting elimination of all dumps that discharge their garbage or toxic compounds into all zones of the biosphere reserve.
- Work cooperatively with local Municipalities and Government agencies to minimize pollution and other activities that may impact on the biosphere reserve.
- All proposals initiated by the management of the reserve will be subject to environmental impact assessment, and no development proposal will be approved where it can be demonstrated that wise and feasible alternative sites exist outside the proposed biosphere reserve.
- All development proposals will be subject to the test of 'No Net Detriment'. It will be the responsibility of the proponent to demonstrate how the principal of 'No Net Detriment' is to be met.
- All development proposals will be investigated and evaluated for possible contributions of "net benefit" to the Reserve. All proposals for net benefit will be optional and negotiable.
- All development proposals are to be assessed for compliance with the management plan (that is in preparation) and such assessment is to be documented and publicly available on request.
- A Research Agenda will be maintained which details and prioritized research needs to support the management objectives and priorities for the Biosphere Reserve.
- Environmental education is a preferred public use of the proposed Biosphere Reserve.
- Education programs will be guided by an Environmental Education Plan(EEP)
- The principle of "the community has the right to know" will be adopted.

- Visitor management planning will have regard for the creation and maintenance of a quality experience to promote community support for the biosphere reserve.
- The cost of providing visitor facilities and services will be, at least in part, recovered by the application of the 'User Pays' principle in the form of an appropriate of access fees on visitors where lawful.
- Generation of any socio-economic benefits to the local community, direct or indirect, must be the product of sound conservation management of the biosphere reserve and not an independent primary objective.
- Information systems will be developed which facilitate rapid access to information and equally rapid delivery to potential users.
- Sound financial management will be guided by a 10 year Business Plan which will be reviewed annually.
- Planning for financial support will adopt the principle of funding diversification to increase security of funding and will avoid dependence on one source from any one sector.

The draft management plan of Jabal Al Rihane Reserve has developed a guiding document to identify how each policy component may contribute to the objectives of the biosphere reserve (see Annex for the full text of the draft management plan).

17.6.1. Indicate how and to what extent the local communities living within and next to the proposed biosphere reserve have been associated with the nomination process [This can range from being an entirely locally driven initiative, to a more 'top down' approach led by government authorities or scientific institutions. Describe the steps taken and the stakeholders involved]

The local communities living within and next to the proposed Jabal Al Rihane biosphere reserve have been associated with the nomination process through a locally driven initiative. The spark started with a meeting that was organized by Albertino Abela (Abela Foundation International, originated from Jezzine) with Rev. Dr Shafiq Abouzayd (originated from Mlikh). and John Burton (World Land Trust) in London on 18th January 2001. Dr Abouzayd had put forward a suggestion that one of the last remaining areas of forest (and probably the largest such area in Southern Lebanon) should be given some protective status. The Israeli occupation forces had retreated from the area in June 2000, and the area was still heavily mined, but as the minefields were cleared, there was a risk of uncontrolled development in the area. It was agreed that John Burton would make a pre-feasibility study to see if the area merits a protective status. The pre-feasibility study established contacts with local conservationists and municipalities that represent through their elected municipal councilors the communities living within and next to proposed biosphere reserve. The pre-feasibility study was followed by a feasibility study that led to the implementation of two main priorities: 1) delineation of the area to be considered for protection. This was based largely on surveys of the natural vegetation and other wildlife, and took into account watershed conservation; and 2) establishment of ownership and other rights affecting the proposed reserve area. Following discussions with non governmental (including NGOS) and governmental stakeholders (Ministries and Municipalities), the project for declaring the Jabal Al Rihane a nature Reserve was accepted by the Ministry of Environment in 2005 and approved by the Cabinet in 2006. Following the introduction of the Biosphere Reserve concept to the local communities by the National MAB Committee, all local and non local stakeholders

unanimously agreed on proceeding with the nomination of Jabal Al Rihane a Biosphere Reserve, particularly because it gives equal weight to development and conservation whilst the national reserve focus more on conservation than development. It was also agreed upon setting up a management plan (presently in its draft form) and a business plan as important actions to be undertaken. Finally, it is worthy to note that without the collaboration of the local communities the appropriate zonation of the Jabal Al Rihane biosphere reserve wouldn't be properly achieved.

#### 17.6.2 Main features of management plan or land use policy

(Describe the 'vision' of what the proposed biosphere reserve is expected to achieve in the short and longer term, and the benefits foreseen for the local communities and other stakeholders)

It is recognized that past use and inadequate management has resulted in degradation of the natural and cultural values of Jabal Al Rihane area. Therefore the vision and the objectives to be developed for the proposed management plan of Jabal Al Rihane as a biosphere reserve seek an improvement in the environmental condition of the natural and cultural values.

Further, it will be necessary to ensure that any change, which is externally imposed, is managed to as far as possible achieve a positive outcome. The Management of Jabal Al Rihane is therefore essential about initiating and managing change so that the changes achieve the management objectives through adaptive management.

It is also recognized that various changes may occur during the life of the plan. Some of these will occur naturally, some initiated as a part of management and some imposed from outside the area and the plan. Unless the net result of these changes is towards achieving the management objectives, those objectives will not be achieved.

To maximize the chances of achieving those objectives, five sets of guiding principles have been adopted in formulating a vision and policies for the future of the proposed biosphere reserve: Natural Heritage Charter (NHC), Burra Charter, Principle of "No Net Detriment", "Net Benefit", and Precautionary Principle.

The vision for the coming years for the proposed biosphere reserve is that it will be widely regarded in the Middle East and Mediterranean regions as an outstanding example of BRs because of its success in sustainable conservation and development. Such a reputation can only be achieved if:

- ◆ Jabal Al Rihane is recognized as an example of good conservation management in the region.
- ◆ All native species of plants and animals have been conserved and populations of formerly endangered species are more common.
- ◆ All non-native species of plants and animals have been eradicated, natural ecological processes operate and the Rihane are renowned for their contribution to the survival of birds, mammals and reptiles.
- ◆ The proposed biosphere reserve is zoned so as to provide for a variety of levels of protection and of visitor opportunities.
- ◆ Visitor management has been refined to ensure that the ecological significance of the Rihane area is not compromised and that the local communities are benefiting from eco-tourism incomes.

- ◆ All sources of pollution are controlled, and pertinent laws are enforced in the Jabal Al Rihane area.
- ◆ The visitor environment is clean, more beautiful, provided with appropriate visitor facilities and villages are sustainably and friendly environmentally developed.
- ◆ Cultural and historical sites are protected and appropriately managed under the guidance of specialists
- ◆ Research, education, awareness and sustainable development are fulfilling the functions of the Jabal Al Rihane biosphere reserve.
- ◆ Opportunities and facilities have been provided for appropriate visitor use and appreciation of the Rihane wilderness.
- ◆ Visitors have access to comprehensive and easily understood information about the natural and cultural history of the reserve.
- ◆ The Immigration from rural areas of Jabal Al Rihane is reduced, poverty is alleviated, and the Lebanese people are very supportive of the management and managers of the proposed BR.
- ◆ The municipalities and the local communities have demonstrated the cost effectiveness of reserve management by a combination of governmental and non-governmental organizations and are recognized as a model of delegated management to the local communities.
- ◆ The NGOs are committed to the management of the reserve and work as a harmonious team with the municipalities and the concerned ministries, and are supported by the local communities and the Government.
- ◆ The business plan and fundraising plan for the Rihane Biosphere Reserve proved to be adequate to support management consistent with the management plan.

17.6.3 The designated authority or coordination mechanisms to implement this plan or policy (Name, structure and composition, its functioning to date)

Presently, the designated authority to implement the management plan is the Transitory Management Council that is formed from representatives of the municipalities, NGOs, local communities, advisors such as scientists and legislators. In accordance with the draft Law of establishing Jabal Al-Rihan Nature Reserve, a follow up committee (Appointed Protected Area Committee or APAC) composed of 7 members of volunteers appointed by the Minister of Environment will provide an over all supervision on the proper management of the Nature Reserve. The Management Council will then turn to function as a Coordination Council or Advisory Body to assist the APAC. Once the latter is appointed, the Ministry of Environment will notify the National MAB Committee to allow it to timely inform the UNESCO about the changes.

17.6.4 The means of application of the management plan or policy (For example through contractual agreements with landowners or resources users, traditional users' rights, financial incentives, etc.)

Through the assignment of a larger management team that will be formed from people of the local communities to manage the reserve in accordance with the management plan and in close cooperation with all stakeholders. Memos of Understanding, contractual agreements and financial incentives with landowners and traditional resource user's rights may take place when appropriate.

17.6.5 Indicate how and to what extent the local communities participate in the formulation and the implementation of the management plan or policy (informed/consulted: decision making role etc.)

Regular meetings at each municipality will be held with almost all groups of local stakeholders, including renewable resource management agencies, concerned ministries, environmental groups, NGOs, local schools, shepherders, beekeepers, tour operators, scientists and community associations to agree on all aspects of planning from vision to outcomes through policies, activities and outputs. Comments, both written and oral, will be solicited and taken into consideration in producing the Final Biosphere Management Plan. Workshops will also take place to involve more decision makers and solve some issues. The implementation of the management plan will be executed by the management team under the direct supervision of the APAC and the overall supervision of the Ministry of Environment..

17.6.6 The year of start of implementation of the management plan or policy

One year after the approval of the nomination of the Jabal Al Rihane Biosphere Reserve.

17.7. Financial source(s) and yearly budget:

[Biosphere reserves require technical and financial support for their management and for addressing interrelated environmental, land use, and socio-economic development problems. Indicate the source and the relative percentage of the funding (e.g. from national, regional, local administrations, private funding, international sources etc.) and the estimated yearly budget in the national currency]

From Ministry of Environment	: 100.000.000 Lebanese pounds
From Donors	: 25.000.000 Lebanese pounds
From fundraising projects	: 70.000.000 Lebanese pounds
From eco-tours operators	: 10.000.000 Lebanese pounds
<b>Total estimated</b>	<b>: 205.000.000 Lebanese pounds</b>

17.8. Authority(ies) in charge

17.8.1. The proposed biosphere reserve as a whole:

Name: The Ministry of Environment

If appropriate, name the National (or State or Provincial) administration to which this authority reports:

17.8.2. The core area(s):

[Indicate the name of the authority or authorities in charge of administering its legal powers (in original language with English or French translation)]

Name(s): The Transitory Management Council of Jabal Al Rihane [Al Haya'a Al Idaryah Li Jabal Al Rihane] and the Green Future non-profit NGO [Jameyat Al Mustaqbal Al Akhdar]

Legal powers: Both the Transitory Management Council and the Green future are representing all the stakeholders of Jabal Al Rihane. In accordance with the draft Law of establishing Jabal Al-Rihan Nature Reserve, a follow up committee (Appointed Protected Area Committee or APAC) composed of 7 members of volunteers appointed by the Minister of

Environment will provide an over all supervision on the proper management of the Nature Reserve. The Transitory Management Council will then turn to function as a Coordination Council to assist the APAC. Once the latter is appointed, the Ministry of Environment will notify the National MAB Committee to allow it to timely inform the UNESCO about the changes.

#### 17.8.3. The buffer zone(s)

Name: The Transitory Management Council of Jabal Al Rihane [Al Haya'a Al Idaryah Li Jabal Al Rihane] and the Municipalities [Baladyat]

Legal powers (if appropriate): The Transitory Management Council is representing all the stakeholders of Jabal Al Rihane, including the municipalities. The municipalities' role will be focussing on logistic support. Once the APAC is set up, it will administer its legal power over the buffer zone.

### 18. SPECIAL DESIGNATIONS:

[Special designations recognize the importance of particular sites in carrying out the functions important in a biosphere reserve, such as conservation, monitoring, experimental research, and environmental education. These designations can help strengthen these functions where they exist or provide opportunities for developing them. Special designations may apply to an entire proposed biosphere reserve or to a site included within. They are therefore complementary and reinforcing of the designation as a biosphere reserve. They are therefore complementary and reinforcing to designation as a biosphere reserve. Check each designation that applies to the proposed biosphere reserve and indicate its name]

Name:

- UNESCO World Heritage Site
- RAMSAR Wetland Convention Site
- Other international/regional conservation conventions/directives [Please specify]
- Long term monitoring site [Please specify]  
Parts of Jabal Al Rihane Biosphere Reserve are sites for long term monitoring of Landraces, Wild relatives and Economically Important Wild Plant Species under the Project : "Design, Testing and Evaluating of Best Practices for *in situ* Conservation of Economically Important Wild Plant Species" UNEP/GEF Project.
- Other [Please specify]  
The Jabal Al Rihane Biosphere Reserve is proposed an IBA (Important Bird Area) according to the criteria of BirdLife International.

### 19. SUPPORTING DOCUMENTS (to be submitted with nomination form)

[Clear, well-labelled maps are indispensable for evaluating Biosphere Reserve proposals. The maps to be provided should be referenced to standard coordinates wherever possible. Electronic versions are encouraged]

#### General location map

A GENERAL LOCATION MAP of small or medium scale must be provided showing the location of the proposed Biosphere Reserve, and all included administrative areas, within the country, and its position with respect to major rivers, mountain ranges, principal towns, etc.

(X) **Biosphere Reserve zonation map** [large scale, preferably in black & white for photocopy reproduction]  
 [A BIOSPHERE RESERVE ZONATION MAP of a larger scale showing the delimitations of all core area(s) and buffer zone(s) must be provided. The approximate extent of the transition area(s) should be shown, if possible. While large scale and large format maps in colour are advisable for reference purposes, it is recommended to also enclose a Biosphere Reserve zonation map in a A-4 writing paper format in black & white for easy photocopy reproduction. It is recommended that an electronic version of the zonation map be provided ]

(X) **Vegetation map or land cover map**  
 [A VEGETATION MAP or LAND COVER MAP showing the principal habitats and land cover types of the proposed Biosphere Reserve should be provided, if available].

(X) **List of legal documents (if possible with English or French translation)**  
 [List the principal LEGAL DOCUMENTS authorizing the establishment and governing use and management of the proposed Biosphere Reserve and any administrative area(s) they contain. Please provide a copy of these documents, if possible with English or French translation].

(X) **List of land use and management plans**  
 [List existing LAND USE and MANAGEMENT PLANS (with dates and reference numbers) for the administrative area(s) included within the proposed Biosphere Reserve. Provide a copy of these documents]

(X) **Species list (to be annexed)**  
 [Provide a LIST OF IMPORTANT SPECIES (threatened species as well as economically important species) occurring within the proposed Biosphere Reserve, including common names, wherever possible.]

(X) **List of main bibliographic references (to be annexed)**  
 [Provide a list of the main publications and articles of relevance to the proposed biosphere reserve over the past 5-10 years].

**All the above are attached**

## **20. ADDRESSES (Through the National MAB Committee)**

### 20.1 Contact address of the proposed biosphere reserve:

[Government agency, organization, or other entity (entities) to serve as the main contact on the MABnet to whom all correspondence within the World Network of Biosphere Reserves should be addressed.]

Name: Ministry of Environment

Street or P.O. Box: Lazariéh Building – P.O.Box 11-2727 \_\_\_\_\_

City with postal code: Beirut \_\_\_\_\_

Country: Lebanon \_\_\_\_\_

Telephone: +961-1-976555 \_\_\_\_\_

Telefax (or telex): +961-1-976530 \_\_\_\_\_

E-mail: l.yamout@moe.gov.lb \_\_\_\_\_

Web site: <http://www.moe.gov.lb>

## 20.2. Administering entity of the core area:

Name: Transitory Management Council of Jabal Al Rihane/ Rev. Dr. Shafiq Abouzayd (chair)

Street or P.O. Box: \_\_\_\_\_

City with postal code: Mlikh/ Jezzine Caza \_\_\_\_\_

Country: Lebanon \_\_\_\_\_

Telephone: +961-7-825053, +961-3-162214, +961-1-892189 \_\_\_\_\_

Telefax (or telex): +961-1-615308 \_\_\_\_\_

E-mail: [Jabalrihane@yahoo.com](mailto:Jabalrihane@yahoo.com); [shafiq.abouzayd@oriental-institute.oxford.ac.uk](mailto:shafiq.abouzayd@oriental-institute.oxford.ac.uk) \_\_\_\_\_Web site: <http://jabalrihane.org>

## 20.2. Administering entity of the core area:

Name: Green Future NGO/ Eng. Mohamed Fakh (NGO President)

Street or P.O. Box: House of Dr. Mohamed Fares \_\_\_\_\_

City with postal code: Benwata Village/ Jezzine Caza \_\_\_\_\_

Country: Lebanon \_\_\_\_\_

Telephone: +961 1 382378, +961 3 732344, c/o the President Eng. Mohamed Fakh \_\_\_\_\_

Telefax (or telex): +961 (0) 7 781731 c/o Mr. Joseph Daher \_\_\_\_\_

E-mail: [Mohamad.fakh@gmail.com](mailto:Mohamad.fakh@gmail.com) \_\_\_\_\_

Web site: -----

## 20.3. Administering entity of the buffer zone:

Name: Transitory Management Council of Jabal Al Rihane/ Rev. Dr. Shafiq Abouzayd (Chair)

Street or P.O. Box: \_\_\_\_\_

City with postal code: Mlikh/ Jezzine Caza \_\_\_\_\_

Country: Lebanon \_\_\_\_\_

Telephone: +961-7-825053, +961-3-162214, +961-1-892189 \_\_\_\_\_

Telefax (or telex): +961-1-615308 \_\_\_\_\_

E-mail: [Jabalrihane@yahoo.com](mailto:Jabalrihane@yahoo.com); [shafiq.abouzayd@oriental-institute.oxford.ac.uk](mailto:shafiq.abouzayd@oriental-institute.oxford.ac.uk) \_\_\_\_\_Web site: <http://jabalrihane.org>

**Annex to Biosphere Reserve Nomination Form  
MABnet Directory of Biosphere Reserves  
Jabal Al Rihane Biosphere Reserve Description<sup>1</sup>**

**Administrative details**

**Country:** Lebanon

**Name of BR:** Jabal Al Rihane Biosphere Reserve - Lebanon

**Year designated:** *(to be completed by MAB Secretariat)*

**Administrative authorities:** (17.8): Ministry of Environment

**Name Contact:** (20.1): Berj Hatjian, PhD.

**Contact address:** (20.1): Name: Ministry of Environment

Street or P.O. Box: Lazarieh Building – P.O.Box 11-2727 \_\_\_\_\_

City with postal code: Beirut \_\_\_\_\_

Country: Lebanon \_\_\_\_\_

Telephone: +961-1-976555 Ext: 443 or 446 \_\_\_\_\_

Telefax (or telex): +961-1-976530 \_\_\_\_\_

E-mail: spue@moe.gov.lb \_\_\_\_\_

Web site: <http://www.moe.gov.lb>

Related links (*web sites*): <http://www.moe.gov.lb/ProtectedAreas/>

**Description**

**General description:** *(Site characteristics in 11.1; human population in 10; land management units in 17.2)*

The Jabal Al Rihane Biosphere Reserve (Latitude 33° 27' 01.17" N; Longitude 35° 33' 47.17"E) covers an area of 18430 ha. at an altitude ranging between 270 meters in the south, where the Litani River constitutes a natural boundary, and 1500 meters to the north, at Mzairaa south to the Jezzine and Niha villages; and extends along the ridge of the southern Mount Lebanon Chain overlooking both the Beqaa Valley (Rift Valley) to the east and the Mediterranean sea to the west. The Jabal Al Rihane Biosphere Reserve is a true mosaic of ecological systems broadly representing the "evergreen sclerophyllic broussailles and forests" biogeographic region within a Mediterranean biome. A dominant feature of this biosphere reserve is the existence of many mountain peaks such as Jabal Safi, Jabal Sujud, Jabal Bir Kallab, and Jabal Bourqab that culminate at 1300, 1200, 1360 and 1300 meters respectively. This mountainous relief gives rise to a number of eco-zones. From a more aesthetic point of view, such a landscape, dominated by peaks and basins, offers wonderful limitless views. Stands of old oak trees (more than 500 years old) are recognized as outstanding scenic landscapes.

The variation between forest types and agricultural crops surrounding small villages forms an infinite mosaic in the landscape. The Jabal Al Rihane Biosphere Reserve is a green island amidst wide extensions of bare lands represented by the semi-arid Bekaa valley to the East and the relatively dry plains to the South.

The core areas of Jabal Al Rihane are limited to those public municipal lands mentioned as nature reserve in the draft law that was approved with its submission to the Parliament for endorsement by the Decision of the Council of Ministers No. 25 on 9/3/06; whereas the buffer zone comprises lands that are cited by the same draft Law or protected by the Forestry Law 558/96. All other areas of villages and their immediate surrounding make the transition zone that is in majority made up of private lands. However, it is worthy to note that the draft Law was purposely tailored by the Ministry of Environment to match with the concept and the main functions of biosphere reserves.

<sup>1</sup> To be posted on the MABnet once the nomination has been approved. The numbers refer to the relevant sections of the nomination form.

The Jabal Al Rihane Biosphere Reserve lies along the main regional avian migratory flyway and hosts 168 bird species, of which 15 are regionally and/ or globally threatened. As such it is proposed an Important Bird Area to BirdLife International. Its mammals ranging from bats to wolfves and hyenas include 34 species. Of which 11 are globally and regionally threatened, 6 are significantly declining, none is endemic but 2/3 of the Rihane mammals are formed of species that are wholly or partially limited to the Middle East region. In addition to 44 endemic plant species (about half of the endemic species of Lebanon), the flora of Jabal Al Rihane include southern species of plants that are not easily found in the other parts of Lebanon.

Generally, Jabal Al Rihane is a low populated (c.23476 individuals) biosphere reserve. In winter, this number drops down to about 12000 as the professional men and women, move to Beirut and its suburbs where jobs, better schools, and warmer weather are available.

The vision for the coming years for the Jabal Al Rihane biosphere reserve is that it will be widely regarded in the Middle East and Mediterranean regions as an outstanding example of BRs because of its success in sustainable conservation and development. Such a reputation can only be achieved with wise management consistent with the management, visitor, community relations, environment education, business and fundraising plans.

**Major ecosystem type:** “Evergreen sclerophylic broussailles and forests”: Mountainous peaks, Slopes of dense forests, Deep valleys dissected with water courses, Agricultural fields, Rivers (wetlands), Water-catchments, Caves.

**Major habitats & land cover types:** Rocky karstic habitat with oak trees, Formation of sandy soil with Stone pine, Valleys' bottom formation near water streams, Barren rocks and bare lands habitat, Riparian habitats, Agriculture land, Abandoned agricultural lands, and Urban areas.

**Location** (latitude & longitude): Central Latitude 33° 27' 01.17" N; Longitude 35° 33' 47.17"E

**Area** (ha): 18430

**Total:** (7): 18430 ha

**Core area(s):** 3178.5 ha

**Buffer zone(s):** 7088.5 ha

**Transition area(s)** (when given): 8163.00 ha

**Different existing zonation:** (7.4):-None-

**Altitudinal range** (metres above sea level): 270-1500 metres

### **Research and monitoring**

**Brief description:** 15.1.3)

Approximately 5 lines

Research and monitoring is to be undertaken at a later stage by the follow-up appointed committee through subcontracting a management team who is responsible for the day to day management of the nature reserve. Presently, the Research Program of the Jabal Al Rihane Biosphere Reserve is temporarily ran by scientific people from the local communities of the Reserve in cooperation with a number of national and international NGOs, universities and research institutions. It focuses mainly on plants (wild relatives, landraces, culinary, aromatic, medicinal), mammals, birds and herpetofauna; and to a lesser extent on climatological and hydrological monitoring. Recognizing the role of eco-tourism in socio-economic development, individuals from the local communities are undertaking studies of the potential impact of eco-tourism development on the economy of the Rihane Villages. However, more researches and monitoring will take place in the transition zone to assist promoting sustainable resources management practices. They will focus primarily on the structure, productivity, function and efficiency of ecosystems.

**Specific variables (please fill in the table below and tick the relevant parameters)**

<b>Abiotic</b>		<b>Biodiversity</b>	
Abiotic factors	X	Afforestation/Reforestation	X
Acidic deposition/Atmospheric factors		Algae	
Air quality		Alien and/or invasive species	X
Air temperature		Amphibians	X
Climate, climatology	X	Arid and semi-arid systems	
Contaminants		Autoecology	
Drought		Beach/soft bottom systems	
Erosion		Benthos	
Geology	X	Biodiversity aspects	X
Geomorphology	X	Biogeography	
Geophysics		Biology	
Glaciology		Biotechnology	
Global change		Birds	X
Groundwater	X	Boreal forest systems	
Habitat issues	X	Breeding	X
Heavy metals		Coastal/marine systems	
Hydrology	X	Community studies	
Indicators	X	Conservation	X
Meteorology	X	Coral reefs	
Modeling		Degraded areas	X
Monitoring/methodologies	X	Desertification	
Nutrients		Dune systems	
Physical oceanography		Ecology	
Pollution, pollutants	X	Ecosystem assessment	X
Siltation/sedimentation		Ecosystem functioning/structure	X
Soil	X	Ecotones	X
Speleology		Endemic species	X
Topography	X	Ethology	
Toxicology		Evapotranspiration	
UV radiation		Evolutionary studies/Palaeoecology	
		Fauna	X
		Fires/fire ecology	X
		Fishes	
		Flora	X
		Forest systems	
		Freshwater systems	X
		Fungi	
		Genetic resources	
		Genetically modified organisms	
		Home gardens	
		Indicators	
		Invertebrates	
		Island systems/studies	
		Lagoon systems	
		Lichens	
		Mammals	X
		Mangrove systems	
		Mediterranean type systems	X
		Microorganisms	
		Migrating populations	X

		Modeling	
		Monitoring/methodologies	X
		Mountain and highland systems	X
		Natural and other resources	X
		Natural medicinal products	X
		Perturbations and resilience	
		Pests/Diseases	
		Phenology	X
		Phytosociology/Succession	X
		Plankton	
		Plants	X
		Polar systems	
		Pollination	
		Population genetics/dynamics	
		Productivity	
		Rare/Endangered species	X
		Reptiles	X
		Restoration/Rehabilitation	X
		Species (re) introduction	X
		Species inventorying	X
		Sub-tropical and temperate rainforest	
		Taxonomy	
		Temperate forest systems	
		Temperate grassland systems	
		Tropical dry forest systems	
		Tropical grassland and savannah systems	
		Tropical humid forest systems	
		Tundra systems	
		Vegetation studies	
		Volcanic/Geothermal systems	
		Wetland systems	
		Wildlife	X

<b>Socio-economic</b>		<b>Integrated monitoring</b>	
Agriculture/Other production systems		Biogeochemical studies	
Agroforestry		Carrying capacity	X
Anthropological studies		Conflict analysis/resolution	X
Aquaculture		Ecosystem approach	
Archaeology		Education and public awareness	X
Bioprospecting		Environmental changes	
Capacity building	X	Geographic Information System (GIS)	
Cottage (home-based) industry		Impact and risk studies	
Cultural aspects		Indicators	X
Demography		Indicators of environmental quality	
Economic studies		Infrastructure development	
Economically important species	X	Institutional and legal aspects	
Energy production systems		Integrated studies	
Ethnology/traditional practices/knowledge		Interdisciplinary studies	
Firewood cutting		Land tenure	
Fishery		Land use/Land cover	X
Forestry	X	Landscape inventorying/monitoring	
Human health		Management issues	
Human migration	X	Mapping	
Hunting	X	Modeling	
Indicators		Monitoring/methodologies	
Indicators of sustainability		Planning and zoning measures	X
Indigenous people's issues		Policy issues	
Industry		Remote sensing	
Livelihood measures		Rural systems	
Livestock and related impacts	X	Sustainable development/use	X
Local participation	X	Transboundary issues/measures	
Micro-credits		Urban systems	
Mining		Watershed studies/monitoring	X
Modeling			
Monitoring/methodologies	X		
Natural hazards			
Non-timber forest products			
Pastoralism			
People-Nature relations	X		
Poverty			
Quality economies/marketing			
Recreation	X		
Resource use			
Role of women	X		
Sacred sites			
Small business initiatives			
Social/Socio-economic aspects			
Stakeholders' interests	X		
Tourism	X		
Transports			