

# Climate Change

## 6. FORESTRY

### 6.1 INTRODUCTION

The forestry sector in Lebanon provides opportunities for mitigating climate change through:

1. Reducing emissions of GHG by maintaining existing carbon sinks through conservation and protection of forests; and improvement of management practices.
2. Sequestering carbon by expanding forest cover and increasing carbon storage in forest, soils and in long-term products.

The Lebanese government's forestry orientations aim at the conservation of the environment and bio-diversity, the protection of soil and water and the provision of social services through:

- Protection and conservation of natural forests and improvement of forest management.
- Expansion of the forest area from 75,000 hectares to 200,000 hectares as a low target and up to 282,000 hectares as a high target through reforestation, agro-forestry, and urban forestry.

Table 20 shows the land use pattern in Lebanon in year 1994 (base year) and the most likely trends (Baseline scenario) in land use change in years 2000, 2005, 2015 and 2040 respectively.

Table 20. Land use pattern, Baseline scenario (Area x 1000 hectares)

2040	2015	2005	2000	1994 <sup>1</sup>		
					Forest land:	1
93	54	39	32	32	> 40% crown cover	
20	34	39	43	43	10 - 40% crown cover	
22	47	57	60	60	< 10% crown cover: Woodlands	
147	147	147	147	147	<b>Range lands</b>	
282	282	282	282	282	Sub-total	
(36)	(20)	(12)	(6)		Protected land <sup>2</sup>	2
253	293	308	316	316	Grass land (pasture)	3
360	320	305	297	297	Crop land	4
126	126	126	126	126	Other	5
1021	1021	1021	1021	1021	Total	

<sup>1</sup>Sources: Bio-diversity Country Study (1996) and agriculture census (1998), Ministry of

agriculture. Trends of land change are based on officials and experts' estimation since no official statistics are available.

<sup>2</sup>For the record, this area is already included in forestland.

## 6.2 MITIGATION SCENARIOS

The approach used in this study consists of:

1. Identification of Mitigation options significant to Lebanon;
2. Assessment of the current and future land area available for restraining emissions and for carbon sequestration;
3. Determination of the land area and wood production scenarios;
4. Estimation of the emission reduction and the carbon sequestration per unit area of forests for each mitigation option;
5. Estimation of the total and unit costs and benefits of each option;
6. Evaluation of the cost-effectiveness of mitigation options.

In addition to the changes already taking place in the baseline scenario in the field of forest protection and management as well as in reforestation, more intensive management/protection and more expansion of forest area are foreseen. In particular,

- 1) In the first mitigation scenario; all the forests will become dense (crown cover more than 40%) and the total forest area will increase up to 200,000ha it means additional 87,000ha versus the baseline scenario.
- 2) In the second mitigation scenario the total forest area will reach the amount of 282,000ha that means an additional 82,000ha will be reforested versus the first mitigation scenario.

### 6.2.1 Forest protection and management

The total carbon pool sequestered by forest protection is:

- In the Baseline scenario: t.c: 14,587,500
- In the Mitigation scenario: t.c: 20,175,000, and
- The incremental carbon sequestered: t.c: 5,587,000

The protection of 75,000 ha of natural forest from the year 2000 up to 2040 will produce the results shown in Table 21: (Discount rate used is 10%)

Table 21. Cost-effectiveness indicators

Incremental C. sequestered		Equivalent Co <sub>2</sub> reduced		Total cost
Total t.c	Initial cost \$/t.c	t. Co <sub>2</sub>	Cost \$/t. Co <sub>2</sub>	In \$
5,587,500	0.403	20,450,250	0.110	2,251,726

### 6.2.2 Expansion of carbon sinks by reforestation

To expand the stock of carbon in biomass, soil, and wood products, it was assumed

that carbon will need to be stored in perpetuity and so the amount of stored carbon on a given area needs to be estimated over an infinite number of rotations. Thus the options will be based on:

- the amount of reforested area taken as 125,000 ha (first scenario) and 207,000ha (second scenario) and
- the length of the rotation age taken as 75, 100 and 125 years in each scenario

The C. pool for each scenario is summarized in Table 22 below:

Table 22. Total C. pool reforestation

<u>Reforested Area / ha</u>	<u>Rotation Age / years</u>	<u>Mitigation C. pool t.c</u>	<u>Incremental C. sequestered t.c</u>
<u>125,000</u>	<u>75</u>	<u>23,529,750</u>	<u>19,439,750</u>
-	-	-	<u>25,242,000</u>
-	<u>100</u>	<u>29,337,000</u>	-
-	<u>125</u>	<u>32,213,850</u>	<u>31,118,850</u>
<u>207,000</u>	<u>75</u>	<u>42,123,250</u>	<u>38,028,250</u>
-	<u>100</u>	<u>43,404,000</u>	<u>49,303,000</u>
-	<u>125</u>	<u>64,819,950</u>	<u>60,724,950</u>

For a rotation age of 100 years and a discount rate of 10% the results will be as shown in Table 23.

Table 23. Cost-effectiveness indicators

<b>Reforested Area / ha</b>	<b>Incremental C. sequestered</b>		<b>Co<sub>2</sub> reduced</b>		<b>Total cost In \$</b>
	<b>t.c</b>	<b>Initial cost</b>	<b>t. Co<sub>2</sub></b>	<b>\$/t. Co<sub>2</sub></b>	
125,000	25,242,000	19.7	92,385,720	5.38	497,267,4
207,000	49,303,000	10.10	180,448,980	2.76	497,960,3

### 6.3 STRATEGY / RECOMMANDATIONS

The main policies that aiming at maintaining carbon stocks and expand carbon sinks should include the following:

#### Forest protection and conservation policies

To preserve existing forests in a sustainable fashion, the following measures have to be taken:

- Undertaking a new-forest inventory and mapping (the first one was done in 1966) including a descriptive structure and composition of forests stands.
- Developing forest management systems that improve the long-term productivity and ecological integrity of the forests.
- Developing sound methods of fighting fire, insects, and diseases.

### **Reforestation**

- Long rotation periods adapted to species' characteristics will increase carbon stock periods and reduce the cost per reforested unit area as well as the cost of the carbon sequestered.
- Quality of wood produced should permit its use for long life products; thus more carbon will be stored away. Quality of wood depends on forest species and management systems.
- Research on species and seeds provenance and on appropriate techniques for harvesting and regeneration of forests.

### **Other measures**

- Amendment of the forest laws to allow various parties to participate in implementing reforestation programs and forest management plans.
- A comprehensive land use planning and zoning through which appropriate land is spread for agriculture, forestry and pasture.
- Grazing, in forests and reforested lands should be managed to avoid damages that goats and sheep could cause to regeneration of old forest stands or to the growth and development of young forest and new reforested lands. Serious prejudices will affect any forestry development plan if the grazing problems are not solved.