

‘Diagnosis of climatic vulnerability in El Montseny’

Executive Summary

May 2017

Coordinador

Socis



Introduction

This document has been written within the framework of the LIFE15 project CCA/ES/000102 *Fostering resilience. Opportunities and challenges of the local economy and society to adapt to climate change*. In particular, it builds on the work outlined in its action A1, and aims to study the effects of climate change on El Montseny and its aspects related to diagnosis, impacts and vulnerability. The project is coordinated by Barcelona Provincial Council, and the Catalan Office for Climate Change (OCCC) is a beneficiary partner and responsible for Action A1.

In geographical terms, the study area is the Montseny Biosphere Reserve, which includes El Montseny Natural Park (hereinafter the RBM-PN). The area focuses thematically on the economic areas in which LIFE Clinomics aims to take action: agriculture, livestock farming, forestry and tourism (although LIFE also includes fishing, in the Montseny region it is negligible as an economic activity).

According to the LIFE Clinomics project, the work in Action A1 takes place in three phases, which also provide the structure for this document:

- A1.1 Assessment of the studies carried out
- A1.2 Vulnerability analysis
- A1.3 Diagnosis of impacts

A1.1 Assessment of the studies carried out

This section summarises the information available about the area and the economic sectors studied. The information, which is structured in dossiers according to the various thematic sections, is presented in appendix 2 of the study.

The following conclusions can be drawn from the information gathered:

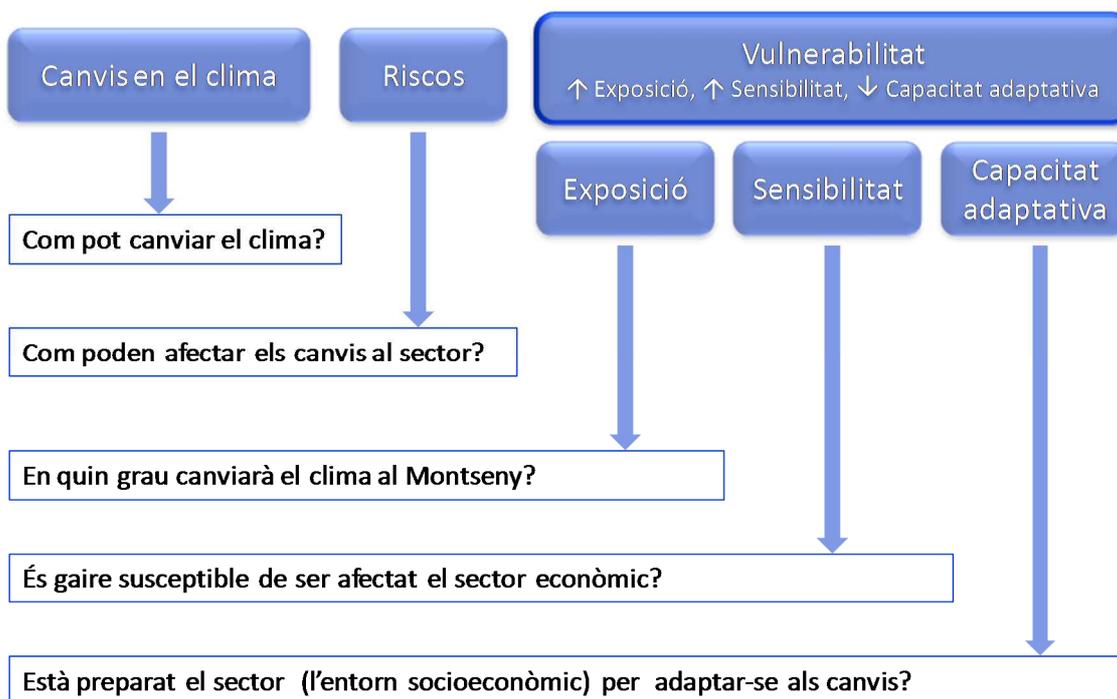
Seventy per cent of the RBM-PN is currently covered by forest. This figure has remained very stable in recent decades, and is unlikely to change a great deal in the future. Crops occupy a much smaller area, which is being reduced. These crops are mainly dry farmed cereals, although there are also some irrigated cereals and small areas of vineyards, fruit trees and olive trees. Livestock farming has undergone a process of intensification, especially for pigs and poultry.

The area of land dedicated to agricultural and livestock farming is expected to decrease (due to the exodus from farming) and these areas will gradually be occupied by scrubland and forest, following natural dynamics. Climate change may make farms less profitable and further encourage an exodus from farming. Open habitats would gradually be lost, which would have negative consequences for the conservation of biodiversity and the quality of the landscape as it is currently rated.

Forested areas are anticipated to undergo a reduction in the areas occupied by deciduous forests (beech, oak and chestnut trees and riverside forests), as well as by fir, with an increase in the height of beech trees and a loss of subalpine meadows. The areas where beech trees can no longer live will be occupied by holm oaks.

A1.2. Vulnerability analysis

The vulnerability of each sector to a given risk depends on three variables (exposure, sensitivity and adaptive capacity), according to the Catalan Strategy for Adapting to Climate Change. ESCACC. Horizon 2103-2020 (Catalan Office for Climate Change, 2012).



The vulnerability analysis has been produced based on:

- Obtaining indicators of vulnerability to significant risks for each economic sector.
- A comparison of results with participants from each economic sector and gathering opinions and perceptions regarding the risks posed.

The results of the 21 indicators studied are classified in a range from 0 - green (not very vulnerable) to 10 - red (highly vulnerable). They are as follows:



| Vulnerability of the agriculture and livestock farming sector | | | |
|--|---|-------------------------|---------------|
| Risk | Vulnerability indicator name | Value in the RBM | Colour |
| Changes in crop types | AGR03 = Changes in crops (EVM) | 2.94 | |
| Changes in plant productivity | No data to define the appropriate indicators is available | - | |
| Increased irrigation needs | AGR01 = Increased irrigation needs in agriculture and livestock farming (EVM) | 2.38 | |
| Changes in the distribution of cultivable areas | CLINpast = Reduction of pastureland areas (CLIN) | 1.78 | |
| Changes in the type of livestock farms | CLINram = Changes in types of livestock farms (CLIN) | 2.44 | |
| Reduced water availability (increased evapotranspiration and increased recurrence of droughts) | AGR01 = Increased irrigation needs in agriculture and livestock farming (EVM) | 2.38 | |
| | CLINpast = Reduction of pastureland areas (CLIN) | 1.78 | |
| Increased risk of forest fire | AGR02 = Increased risk of fire in agriculture (EVM) | 3.06 | |
| Shorter duration of snow cover | CLINinn = Interest of snow-covered areas for crops (CLIN) | 6.06 | |
| Risk of increase in invasive species | CLINexo = Risk of increase in the number of invasive species (CLIN) | 1.25 | |

| Vulnerability of the forestry sector | | | |
|--|--|-------------------------|---------------|
| Risk | Vulnerability Indicator Name | Value in the RBM | Colour |
| Reduced water availability (increased evapotranspiration and increased recurrence of droughts) | FOR02 = Reduced availability of water for forestry (climate impact: rising temperatures) | 0.56 | |
| | FOR03 = Reduced availability of water for forestry (climate impact: drought) | 2.00 | |
| Changes in the distribution of forest species | CLINbosc = Changes in the distribution of species of interest for forestry (CLIN) | 4.29 | |



| Vulnerability of the forestry sector | | | |
|---|---|-------------------------|---------------|
| Risk | Vulnerability Indicator Name | Value in the RBM | Colour |
| Decline in the production of wood and other forest products | CLINfor = Decline in forestry (CLIN) | 4.27 | |
| Reduced flow levels in rivers and streams and longer duration of low water levels | CLINriu= Reduced water flow in rivers | 5.27 | |
| Increased risk of forest fire | FOR01 = Increased risk of fire in forestry (EVM) | 3.35 | |
| Loss of biodiversity | CLINrib = Loss of riparian forest area (CLIN) | 1.56 | |
| | CLINbio = Risk of loss of biodiversity (CLIN) | 4.74 | |
| Risk of increases in invasive species | CLINexo = Risk of increase in the number of invasive species (CLIN) | 1.25 | |

| Vulnerability of the tourism industry | | | |
|--|--|-------------------------|---------------|
| Risk | Vulnerability Indicator Name | Value in the RBM | Colour |
| Reduced water availability (increased evapotranspiration and increased recurrence of droughts) | AG01 = Changes in the pattern of tourism demand in water management (EVM) | 2.18 | |
| Reduced flow levels in rivers and streams and longer duration of low water levels | CLINriu= Reduced water flow in rivers | 5.27 | |
| Increased risk of forest fire | No specific indicator of the tourism industry's vulnerability to this risk has been defined. | -- | |
| Shorter duration of snow cover | CLINneu = Interest of snow-covered areas in visits to the area (CLIN) | 6.00 | |
| Loss of biodiversity | CLINrib = Loss of riparian forest area (CLIN) | 1.56 | |

| Vulnerability of the tourism industry | | | |
|--|---|-------------------------|---|
| Risk | Vulnerability Indicator Name | Value in the RBM | Colour |
| | CLINbio = Risk of loss of biodiversity (CLIN) | 4.74 |  |
| Loss of landscape quality | CLINpais = Loss of landscape quality (CLIN) | 3.49 |  |
| Variation in climate comfort levels | CLINtur = Changes in the pattern of tourism demand in summer (CLIN) | 2.18 |  |
| Changes in the pattern of tourism demand | TUR01 = Changes in the pattern of tourism demand (EVM) | 2.28 |  |

The indicators show that the risks with the highest vulnerability are reduced water flows in rivers, and reduced areas and/or duration of snow cover.

The reduction in flow levels in rivers mainly affects the forestry and tourism sectors, while the shorter duration of snow cover affects the agricultural and tourism sectors.

The perception of the participants from the agriculture and livestock sector regarding the risks that threaten their business is higher in overall terms. This could be related to their concern about the trends observed that threaten the primary sector in global terms (the failure of the next generation to take over farms, the exodus from farming, decline in purchasing power, etc.).

The assessment of the increase in the risk of forest fires differs according to the methodological approach: the forestry sector's vulnerability to the increased risk of fire is low-medium (values of 3). This is mainly due to the predominance of forests with low sensitivity to fires in the RBM, and to various municipal instruments for dealing with fires. However, the stakeholders in the forestry and tourism sectors agree that the vulnerability of their respective sectors is very high.

- At the meetings, the participants all agreed that the tourism industry is extremely vulnerable to the loss of biodiversity (due to the interest that the area may have for some research and educational activities) and very vulnerable to the risk of loss of landscape quality (since the landscape is one of the main assets sought by visitors to El Montseny).

A.1.3. Diagnosis of impacts

The diagnosis is performed for each economic sector, and takes into account the numerical data obtained, the risks and potentialities identified, the results of the calculation of the vulnerability indicators and the perceptions of the economic stakeholders. Sometimes an impact does not have a single positive or negative reading, and it may not be rated equally by all economic sectors.

The priorities in terms of impacts were identified based on the criteria of the people participating in the meetings held with the various economic sectors.

Some of the positive and negative impacts that were rated as high priority are as follows:

| Agricultural / livestock sector | |
|---------------------------------|--|
| ● | The exodus from agriculture and livestock farming as a result of the decline in the economic returns from farms. Agricultural and livestock farming land is forecast to be gradually replaced by forest cover as those involved leave the farms. |
| ● | The possibility of promoting some livestock farming practices that may contribute to mitigating the effects of climate change and simultaneously favouring adaptation . In particular, it is possible to foresee a more integrated view of the agro-forestry-pastoral system and the production-distribution-consumption cycle . |



| | |
|-----------------------------------|--|
| ● | <p>Ruminants (cows, goats and sheep) are more tolerant of higher temperatures than pigs and poultry. This could be used to promote livestock farming that is more heavily based on ruminants, which would be more environmentally sustainable. Extensive livestock farming in the undergrowth helps to manage the risk of forest fire.</p> |
| ● | <p>The increase in the cost of animal feed may affect the economic returns from farms. The exodus from traditional activities and lower precipitation levels may lead to the loss of summer pastures for herds. Extensive (more resistant) livestock farming, which could be the basis for part of the sector's adaptive capacity, will suffer much more from the reduction in meadows and pastures.</p> |
| ● | <p>There may be increased damage due to a greater prevalence of diseases and pests affecting agricultural production.</p> |
| ● | <p>In a global economic context, there is a tendency towards increased consumption of some secondary products (organic products, and cheeses in particular).</p> |
| ● | <p>The RBM-PN may be the framework for the regulation of small-scale activities (initial transformations by traditional methods, internal production) so that this enhances their economic viability.</p> |
| <p>The forestry sector</p> | |
| ● | <p>The low economic returns from forests means that forestry is being neglected. Recognition of the value of forest products and the services provided by forests depends largely on the social context.</p> |
| ● | <p>An increase in the risk of forest fire is anticipated. This may negatively affect the growth of species such as the holm oak and cork oak. However, these species have a high capacity for subsequent recovery.</p> <p>In positive terms, all the municipalities in the RBM-PN, except one, have an approved fire prevention and extinction plan. Practically all the municipalities are part of Forest Defence Units.</p> |
| ● | <p>The fact that the holm oak and the cork oak are able to move to higher altitudes in the mountains (to the extent that the beech moves to higher altitudes), means that these two species may continue to occupy a significant area despite the climatic conditions being less favourable than at present.</p> |



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| ● | <p>Forestry can help some species become more resistant to drought. In general, large trees are more resistant to drought's effects on growth. Cork oak specimens with a thicker bark and larger trunks are more likely to survive and grow back. Cleared forests are better able to respond to drought.</p> |
| ● | <p>The forest managers believe that, depending on how the forest is managed, it will be possible to improve the water cycle and increase its availability.</p> |
| ● | <p>The LIFE Tritó Montseny project creates the opportunity to improve riparian habitats and water management from the headwaters, and to thereby affect the availability of water.</p> |
| ● | <p>Some secondary forest products (such as cork, pastoral uses and pine seeds) can continue to make a significant contribution to rural incomes where species persist despite climate change.</p> <p>However, non-wood forest products and ecosystem services have not yet been translated into a significant economic value. Nevertheless, the forest managers are beginning to understand that it is necessary to change the way the forest is managed, with a view to increasing returns and enhancing the value of secondary products. Society has also become more aware of the need to compensate for the services provided by forests.</p> |
| ● | <p>Rising temperatures and reduced precipitation levels aggravate the effect of pests.</p> |
| ● | <p>The consolidation of associations in the forestry sector will favour the adoption of measures for adaptation to climate change.</p> |
| <p>The tourism industry</p> | |
| ● | <p>Decline in landscape quality: a reduction of high quality forest areas for visitors (beech, oak, fir trees and riverside forests), the decline in chromatic changes during the year, a reduction in mosaic landscapes, which are also valued aesthetically, and forest areas that provide richness of landscape (bushes, meadows, water surfaces, etc.). The growth of the forest may lead to the disappearance of panoramic views on some routes. All these impacts may have negative effects on the influx of visitors.</p> |



| | |
|-----|--|
| ●/● | <p>Agriculture and livestock farming is essential if the RBM-PN is to remain of interest to tourism, since the landscape of the mountain and many of the products cultivated or produced by initial transformations that a tourist or a visitor can purchase depend on these activities continuing. Agriculture and livestock farming, which may evolve by becoming consolidated or maintaining a more uncertain future, is the determining factor for much of the future of tourism in the massif.</p> |
| ● | <p>The decline in the quantity and quality of water resources may have a negative effect on ideal conditions for tourism.</p> |
| ● | <p>The LIFE Tritó Montseny project creates the opportunity to improve riparian habitats and water management from the headwaters, and to thereby affect the availability of water.</p> |
| ● | <p>The increase in the risk of fires may affect natural assets and the landscape.</p> |
| ● | <p>Rising temperatures and the decline in precipitation levels may lead to a reduction in biodiversity and could lead to a loss of flora and fauna species and habitats of conservation interest, making El Montseny less appealing to visitors and of less interest for scientific tourism.</p> |
| ● | <p>The loss of climate comfort in the summer due to the rise in temperatures in coastal areas may be an opportunity to reduce the seasonal nature of the influx of visitors to El Montseny, which is currently highly concentrated in the spring and autumn.</p> |
| ● | <p>The European Charter for Sustainable Tourism (ECST) in El Montseny is an ideal framework for various initiatives to adapt to climate change. The sector believes that it is a useful tool.</p> |
| ● | <p>The consolidation of associations in the tourism sector will favour the adoption of measures for adaptation to climate change.</p> |