1.1 DESCRIPTION OF THE REGION

Main data of Catalonia

Catalonia is a Mediterranean country located on the north-eastern triangle of the Iberian Peninsula, situated within the Spanish state. Catalonia is an autonomous region and exercises its self-government in accordance with the Constitution and with the Statute of Autonomy, which is its basic institutional law. The Generalitat is the institutional system around which Catalonia's self-government is politically organised.

From an administrative point of view, the state division into provinces (Barcelona, Tarragona, Lleida and Girona) overlaps with the division of the Catalan Administration into 41 comarques (regions), the capital is Barcelona. There are currently 946 municipalities in Catalonia.

Nowadays, Catalonia has more than seven million inhabitants (7,134,697 people). Approximately, 60% of the population in Catalonia lives in the Barcelona metropolitan area. The least populated areas are the regions of the Pyrenees. Catalan is the language of Catalonia. It has the category of official language along with Spanish.

The country displays a notable geographical diversity on a relatively reduced area of about 32,000 km² and about some 580 km of coastal strip. The relevant relief features are the Pyrenees - Pre-Pyrenees, the Central or Ebro Depression and the Catalan Mediterranean system, apart from the coastal plains and the Serralada Transversal mountain range.
Mediterranean climate is subdivided into 5 subtypes of Mediterranean climate, due to the difference of the amount of annual rainfall and temperatures.

The climate of Catalonia is typically Mediterranean, with many hours of sunshine, mild in winter and warm in summer. The Pyrenees and the neighbouring areas have a high-altitude climate, with minimum temperatures below 0ºC, annual rainfall above 1,000 mm and abundant snow during the winter. The hinterland, far from the sea, has a continental Mediterranean climate, with cold winters and very hot days. The coastal area has a milder climate, with mean temperatures between 14 and 17ºC and rainfall between 500 and 700 mm.

<table>
<thead>
<tr>
<th>Group/Type</th>
<th>Subtype</th>
<th>Annual mean rainfall (mm)</th>
<th>Seasonal rainfall pattern</th>
<th>Mean annual temperature (ºC)</th>
<th>Temperature annual width</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCEANIC</td>
<td>Val d’Aran</td>
<td>900 – 1,100</td>
<td>Balanced</td>
<td>6 – 10</td>
<td>13 – 15</td>
</tr>
<tr>
<td>PYRENAIC</td>
<td>Eastern</td>
<td>1,000 – 1,200</td>
<td>Maximum in summer and minimum in winter</td>
<td>3 – 9</td>
<td>13 – 16</td>
</tr>
<tr>
<td></td>
<td>Western</td>
<td>1,000 – 1,300</td>
<td>Balanced</td>
<td>2 – 9</td>
<td></td>
</tr>
<tr>
<td>PRE-PYRENAIC</td>
<td>Eastern</td>
<td>850 – 1,100</td>
<td>Maximum in summer or spring and minimum in winter</td>
<td>9 – 12</td>
<td>16 – 19</td>
</tr>
<tr>
<td></td>
<td>Central</td>
<td>750 – 1,000</td>
<td>Balanced</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Western</td>
<td>650 – 900</td>
<td>Balanced</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTINENTAL</td>
<td>Humid or Eastern</td>
<td>700 – 850</td>
<td>Minimum un winter</td>
<td>11 – 13</td>
<td>17-20</td>
</tr>
<tr>
<td></td>
<td>Subhumid or Central</td>
<td>550 – 700</td>
<td>Balanced</td>
<td>12 – 14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dry or Western</td>
<td>350 – 550</td>
<td>Balanced</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRE-COASTAL</td>
<td>Northern</td>
<td>750 – 1,000</td>
<td>Equinocial Maximums</td>
<td>14 – 15</td>
<td>15 – 18</td>
</tr>
<tr>
<td></td>
<td>Central</td>
<td>600 – 900</td>
<td>Maximum in autumn</td>
<td>11 – 15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>600 – 800</td>
<td>Equinocial Maximums</td>
<td>12 – 14</td>
<td></td>
</tr>
<tr>
<td>COASTAL</td>
<td>Northern</td>
<td>550 – 750</td>
<td>Maximum in autumn</td>
<td>14.5 – 16</td>
<td>14 – 15</td>
</tr>
<tr>
<td></td>
<td>Central</td>
<td>550 – 700</td>
<td>Maximum in autumn</td>
<td>14.5 – 16.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Southern</td>
<td>500 – 600</td>
<td>Maximum in autumn</td>
<td>15.5 – 17</td>
<td></td>
</tr>
</tbody>
</table>

The distribution of the different climatic regions in Catalonia can bee seen in the following map:

**Soil qualities**

Catalonia has a great variety of soils due to the variety of factors that create the different type of soils (climate, geologic material geography and vegetation).

The geologic material is silicic in some parts of the Pyrenees and Coastal mountain system and lime in most part of the rest of the territory.

In the Pyrenees area the most common soils are distric cambisols, humic cambisols and lime litosols. Cambisols are characterized by a low thickness, high amount of stones, and low amount of bases. Litosols are poor soils with a low development over the stone. Over the rest of Catalonia there’s a variety of soils, as lime litosols, lime regosols, lime feozems, luvisols, gleisols, district litosols, etc... For example lime feozems are characterized by a great quantity of organic material, but with a lime basis. The hydric regime also varies, but mostly is not very humid. Regosols are developed over not consolidated and distorsioned materials with fine textures.

Feozems are soils reach in organic matter, medium texture and good drainage and ventilation. In general are not very deep, stony and very inestable, that’s why they are usually used for grazing.
Luvisols are mainly developed from different kind of not consolidated materials (from glaciers, wind erosion, river erosion). They are more common in flat areas, smooths slopes of cold-temperated or hot, but with a dry station and other wet station, as Mediterranean climate.

Gleisols are soils with bad drainage. They are commonly flooded in a permanent or semipermanent way. The freatic level suffers changes on the first 50 cm.

Litosols are the first stage of the generation of a soil. The depth is lower than 10 cm. The amount of organic matter is important with a high fertility. They are usually placed in steep slopes, which maked difficult its economic exploitation.

**River basins of Catalonia**

The river basins in Catalonia are divided into two groups, those which are completely inside the Catalanian territory (Internal river basins) and the other river basins which also are situated in other autonomous community of Spain, or other country (International and intercomunitary river basins).

**Internal river basins**

The internal river basins group is divided into 28, hydrological units, basins, subbasins or group of little basins which occupy an area of 16,600 km\(^2\) (52% of Catalanian territory). The Generalitat of Catalonia has its competence and their management is entrusted to the Catalonia Water Agency.

**International and intercomunitary river basins**

The group of intercomunitarian basins are composed by the Catalanian part of Ebro and Júcar rivers and their management is regulated by law. The Garona River is part of an international basin. All together occupy an area of 14,000 km\(^2\) this means the 48% of Catalanian territory. The management of intercomunitarian river basins is shared with Basin Organisms to which they belong (Hydrographical Confederation of Ebro River and Hydrographical Confederation of Jucar River. The Garona River is managed in its Catalanian part between the Agency and the Hydrographical Confederation of Ebro River.
Forest area

The 61 % of the total surface of Catalonia (31,930 km²) is forest area: 19,567.91 km².

About the orography, comparing with other land uses, the wooded area increases from the level of the coast until the 1,000 m. From this altitude, the area of wooded area decreases until disappearing around the 2,400 m. About the slope, the wooded area increases until the interval of 40-50 %, from this slope the percentage of wooded area is constant.
The wooded area is composed of:

<table>
<thead>
<tr>
<th>Specie</th>
<th>Surface (ha)</th>
<th>Thousands of feet</th>
<th>Annual growth (m³/ha/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>With bark</td>
</tr>
<tr>
<td>Abies alba</td>
<td>13,346</td>
<td>14,715</td>
<td>8.4</td>
</tr>
<tr>
<td>Pinus uncinata</td>
<td>54,613</td>
<td>61,118</td>
<td>4.3</td>
</tr>
<tr>
<td>Pinus sylvestris</td>
<td>219,754</td>
<td>223,769</td>
<td>4.4</td>
</tr>
<tr>
<td>Pinus nigra</td>
<td>140,627</td>
<td>160,864</td>
<td>4.1</td>
</tr>
<tr>
<td>Pinus pinaster</td>
<td>14,040</td>
<td>12,611</td>
<td>8.6</td>
</tr>
<tr>
<td>Pinus pinea</td>
<td>36,294</td>
<td>19,242</td>
<td>3.6</td>
</tr>
<tr>
<td>Pinus halepensis</td>
<td>239,092</td>
<td>181,549</td>
<td>3.5</td>
</tr>
<tr>
<td>Other conifers</td>
<td>2,766</td>
<td>7,052</td>
<td></td>
</tr>
<tr>
<td>Quercus suber</td>
<td>62,937</td>
<td>39,159</td>
<td>1.1</td>
</tr>
<tr>
<td>Quercus ilex</td>
<td>184,654</td>
<td>373,116</td>
<td>1.9</td>
</tr>
<tr>
<td>Quercus petraea</td>
<td>9,162</td>
<td>12,452</td>
<td>4.2</td>
</tr>
<tr>
<td>Other Quercus</td>
<td>74,764</td>
<td>119,669</td>
<td>2.0</td>
</tr>
<tr>
<td>Castanea sativa</td>
<td>12,237</td>
<td>20,578</td>
<td>7.2</td>
</tr>
<tr>
<td>Betula pendula</td>
<td>6,323</td>
<td>11,593</td>
<td>2.2</td>
</tr>
<tr>
<td>Fagus sylvatica</td>
<td>28,726</td>
<td>36,144</td>
<td>5.4</td>
</tr>
<tr>
<td>Other deciduous</td>
<td>32,601</td>
<td>95,766</td>
<td></td>
</tr>
<tr>
<td>Mixed wooded area</td>
<td>62,207</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Approximately 31.5% of annual growth is harvested.

The type of the forest land owner in Catalonia is:

5 % of Government of Catalonia and Spanish state
20 % of local public organizations
75 % of private owners

1.2 FUNCTIONS OF FORESTS TO SOCIETY

In the last years, the plans of management of the woodlands have contemplated the three basic functions of the forests:
- Production of wood and other forest resources (cork, pines,)
- Ecological functions: hydrology regulation, soil conservation, biodiversity conservation…
- Social functions: sport activities, fishing …

Nowadays, the production is decreasing and society gives much more importance to ecological and social functions, so more conservation areas have been declared and forests welcome more visitants every day.

The main laws, policies and plans about the management of the forest and environment are:

a) Level of Catalonia

- Forest law 6/1988, of the 30th of the March, of Catalonia
- General Plan of Forest Policy 2007-2016 (pending of approval). It is structured around five programs:
  1. Conservation and improvement of the health and vitality of the forest ecosystems
  2. Improvement of the productive functions
  3. Management of the conservation of the biodiversity and protect functions
  4. Improvement of the socioeconomic conditions and social use
  5. Cross and accompaniment actions
- Catalan Strategy for the Conservation and Sustainable Use of the Biodiversity (pending of approval)
- Catalan Strategy to Fight against Climate Change (pending of approval)

b) Level of Spanish state

- Law of forests 43/2003, of the 21st of the November
- Law 10/2006, of the 28th of April, which modifies the law of forests 43/2003, of the 21st of the November
- Spanish forest strategy
- Spanish forest plan
- National Action Program against the desertification
- Hydrological - forestry Restoration Plan
- Spanish climate change strategy

2.1 ORGANISATIONAL STRUCTURE – AS ORGANIGRAMM AND DESCRIPTION

Level of Spanish state

GOVERNMENT OF SPAIN

Environment, Rural and Marine Department
## Level of Catalonia

<table>
<thead>
<tr>
<th>Government of Catalonia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Department of the Environment and Housing</strong></td>
</tr>
<tr>
<td><strong>Secretariat – General of the Environment and Housing</strong></td>
</tr>
<tr>
<td>Territorial Service of the Environment in Barcelona</td>
</tr>
<tr>
<td>Territorial Service of the Environment in Girona</td>
</tr>
<tr>
<td>Territorial Service of the Environment in Lleida</td>
</tr>
<tr>
<td>Territorial Service of the Environment in Tarragona</td>
</tr>
<tr>
<td>Territorial Service of the Environment in Terres de l’Ebre</td>
</tr>
<tr>
<td><strong>Directorate – General for the Natural Environment</strong> Núria Buenaventura</td>
</tr>
<tr>
<td><strong>Subdirectorate – General of forests and biodiversity management</strong> Ignacio Rodríguez</td>
</tr>
<tr>
<td><strong>Forest Management Service</strong> Xavier Clopés</td>
</tr>
<tr>
<td>Natural Park Service</td>
</tr>
<tr>
<td>Flora and Fauna Protection Service</td>
</tr>
<tr>
<td><strong>Subdirectorate – General of biodiversity protection</strong></td>
</tr>
<tr>
<td>Planning and Environment Management Service</td>
</tr>
<tr>
<td><strong>Subdirectorate – General of rural agent</strong></td>
</tr>
<tr>
<td><strong>Forest fire prevention Service</strong></td>
</tr>
<tr>
<td><strong>Responsible of Planning and Management</strong></td>
</tr>
<tr>
<td><strong>Hunting activities Service</strong></td>
</tr>
<tr>
<td><strong>Continental fishing Service</strong></td>
</tr>
<tr>
<td><strong>Management of resources Service</strong></td>
</tr>
<tr>
<td><strong>Directorate – General for the Environment Policies and Sustainability</strong></td>
</tr>
<tr>
<td><strong>Climate Change Office</strong></td>
</tr>
<tr>
<td><strong>Directorate – General for the Quality Environment</strong></td>
</tr>
<tr>
<td>Water Catalan Agency</td>
</tr>
<tr>
<td>Catalan Forest, S.A.</td>
</tr>
<tr>
<td>Forest Owner Center</td>
</tr>
<tr>
<td>Meteorological Service of Catalonia</td>
</tr>
</tbody>
</table>
2.2. Bodies

- **Technological and research centres**
  
The main technological and research centres of Catalonia and Spain with ones the Forest Management Service works usually are:

  - **CREAF**: Ecological and Forestry Applications Research Centre (http://www.creaf.uab.cat)
    The CREAF is a public research institution that was created in 1987 by the Generalitat of Catalonia, the Autonomous University of Barcelona (UAB) and the Institute of Catalan Studies (IEC), to promote basic and applied research in terrestrial ecology. CREAF’s main objective is to generate knowledge and create new methodological tools in the field of terrestrial ecology, with special emphasis on forest ecology, in order to improve environmental planning and management in rural and urban areas.

  - **CTFC**: Technologic Forestry Centre of Catalonia (http://www.ctfc.cat)
    The CTFC is a centre for applied research, training and technology transfer, located in the Catalan pre-Pyrenean region. The CTFC is a publicly supervised body formed by the local council of Solsona, the Lleida University, the Lleida regional council, the Catalan Foundation for Science and Innovation, the Catalonian Rural Development Centre, and the Region of Catalonia. The mission of CTFC is to contribute to the modernisation and competitiveness of the forest-based sector, and to the sustainable development of natural spaces in the Mediterranean area, through research, training and technology transfer towards the society as a whole.

  - **IRTA**: Research Institute and Agricultural and Food Technology (http://www.irta.es)
    IRTA is a research institute of the Catalan Government. IRTA’s activities are concerned with scientific research and technology transfer in the area of agriculture, aquaculture and the agrifood industry and it functions under private sector law.

  - **CSIC**: Superior Council of Scientific Research (http://www.csic.es)

  - **INIA**: National Institute of Research and Agricultural and Food Technology (http://www.inia.es)
    The INIA is a public research institution; it belongs to the Ministry of Science and Innovation. The mission of CTFC is to research, develop and innovate in the area of agriculture, cattle, agrifood, forest and environment.

- **Forest owners associations of Catalonia**
  
  - Forest consortium of Catalonia (http://www.forestal.cat)
  - Union of farmers of Catalonia (http://www.uniopagesos.es)
  - Young farmers of Catalonia (http://www.jarc.es)
  - Association of forest defence (http://mediambient.gencat.cat/cat/el_medi/incendis/agrupacions_defensa_forestal.jsp)

  Other associations of forest owners of determined place:
  - Association of forest owners of Tinença-Ports
  - Association of forest owners of Argençola
  - Association of forest owners of Serra de Bellmunt-Collsacabra
  - Association of forest owners Rebrot
  - Association of forest owners Friends of the forest
  - Association of forest owners of forests of the north of the Bages
  - Association of forest owners of Serralada Prelitoral del Penedès
  - Association of forest owners Tres Castells
  - Association of forest owners of Serra de Rubió
  - Association of forest owners of Guilleries-Savassona
  - Association of forest owners of Corredor-Montnegre
  - Association of forest owners of Bages-Vallès
- Association of forest owners of Green Berguedà
- Association of forest owners of Montserrat environment
- Association of forest owners of Valls de Montcau

- **Companies processing timber**

In Catalonia there are around 80 companies of first transformation processes. The most important companies processing timber in Catalonia are:

_Explotacions Forestals de l’Alt Urgell, S.A. (EFAUSA)_
_Fustes Castellarnau, S.L._
_Fustes Sebastià, S.L. (structural wood)_
_Josep Ma Matjes Llas (poplar boxes for fruit)_
_Fusta del Solsonès S.L._
_Fustes del Pirineu Català, S.A., "Fupicsa" (sawmill, beech, structural wood)_
_Fustes Jané, S.L. (sawmill)_
_Fustes Verdaguer, S.A. (sawmill, beech)_
_Serradora Cunill S.L. (pallets, packaging, structural wood)_
_Serradora Boix, S.L. (sawmill)_
_Impregnación de Maderas, S.A. (wood for building)_
_Induforest, S.L. (poles and wood for fences)_
_Fustes Oliveras, S.A. (sawmill, laminated wood, beams)_
_IDENCO, S.A. (plywood)_
_MADEGESA - Maderera Gerundense, S.A. (chestnut, beech)_
_Maderas Coll Viader, S.L. (structural wood)_
_Maderas Magret, S.A. (pinus sylvestris)_
_Palets J. Martorell, S.A. (pallets)_
_Suca, S.A (packaging wood)_
_Tradema (Grup FINSA)_
_PYMSA, S.A. (poles and wood for fences)_
_Santa Sussana, S.A. (impregnated wood)_

Another important field in the Forest industry sector is the cork industry. The most important companies are:

_Amorim Forestal-Catalunya, S.L._
_Corcho del País, S.A._
_Francisco Sagrera, S.L._
_I.D. Corcho Sanjaume, S.L._
_Mundial Cork, S.A._
_Subertap, S.A._

**2.2 OBJECTIVES OF WORK IN FOREST POLICY AND FOREST MANAGEMENT**

**A) MAINTAINANCE OF AN APPROPRIATE INCREASING OF THE FOREST RESOURCES AND ITS CONTRIBUTION TO THE CARBON CYCLE.**

a1. The forest management should try to maintain or increase the forest and increase the quality of economical, ecological, cultural and social values of the forest resources, including the soil and water. This should be made by encouraging the uses related to forests, as planning of the use of the soil and preserving nature.

a2. An inventory and cartography of forest resources should be established and maintained.

a3. A periodically actualization of the forest plans should be done, according to its size and use. The plans should be based on the forest and environment legislation and on the current plans of use of the soil, and cover the forest resources.
a4. A monitoring and evaluation process of the management of forest resources should be periodically done. Its results should be used in the planning process.

B) MAINTAINANCE OF THE HEALTH AND VITALITY OF FOREST ECOSYSTEMS.

b1. Forest management should try to maintain and increase the health and vitality of forest ecosystems, and try to restore degraded forest ecosystems, when this is possible by sylvicultural methods.

B2. The health and vitality of forest ecosystems should be periodically revised, especially the biotic key factors as plagues, diseases, overgrazing, fires and damages caused by climatic factors, air pollutants and forest management operations.

B3. The management plans should specify the systems and means to minimize the risks of degradation and damages in forest ecosystems. Forest planning should use the political instruments which support these activities.

C) MAINTAINANCE AND IMPROVEMENT OF THE PRODUCTIVE FUNCTIONS OF FORESTS (WOOD AND OTHER PRODUCTS).

c1. Forest Planning should try to maintain the production capacity of a number of forest products and services, wood and other, about sustainability.

c2. Forest planning should try to reach an economic performance taking into consideration important economical, ecological and social factors of costs and profits.

c3. Management plans should take into consideration the different functions and uses of the forest managed area. The planning should use the political instruments created for sustain the production of goods and forest services, commercial and no commercial.

D) MAINTAINANCE, CONSERVATION AND IMPROVEMENT OF BIOLOGICAL DIVERSITY IN FOREST ECOSYSTEMS

d1. Forest management should maintain, conserve and improve biodiversity in the ecosystem, in species and genetic level, when appropriate, the diversity and landscape level.

d2. Planning should establish an inventory and maps of forest resources. Important ecologically forest biotopes should be included, as riparian zones and wetlands, areas with endemic species and threatened species habitat or in danger or protected.

E) MAINTAINANCE AND APPROPRIATED IMPROVEMENT OF THE PROTECTOR FUNCTIONS OF FOREST MANAGEMENT (ESPECIALLY ON SOIL AND WATER)

e1. Forest management should try to maintain and improve the protector functions of the forest to society, as the protection of infrastructures, protection of soil erosion, protection of hydric resources and protection of flooding and snowbreaks.

e2. The areas with specific recognized protection functions should be registered and cartographed, and forest management plans should take into account these areas.

F) MAINTAINANCE OF OTHER FUNCTIONS AND SOCIAL-ECONOMICAL CONDITIONS

f1. Forest planning should try to respect the multiple functions of the forest for society. Should respect the role of the forest-related matters in the rural development and consider the new working opportunities in connexion with the social-economic functions of the forest.

f2. The property rights should be clearly defined, documented and be established by the relevant forest area. In the same way, the legal and traditional rights referring to forest areas should be clarified, recognized and respected.
f3. Public access with recreational aims should be provided, respecting the property and third-parties rights, the effect on ecosystems and forest resources, and with the compatibility with other functions of the forest.

f4. The places with a recognized historic, cultural or spiritual significance should be protected or managed in a way respecting this significance

f5. Forests managers, contractors, workers and owners should dispose of enough information and be encouraged to remain informed by continued training in relation to the sustainable management of the forests.

The **Forest Management Service** is a Public Authority in Catalan forests. Some of the main functions of this Service are:

a) The management of forests belonging to the Generalitat of Catalunya and tutelage of other public forests: to approve the management plans, to authorize harvestings, technical support for public owners…

b) To plan the aids to promote sustainable forest management and control its execution and results.

c) The management of plans and programs of forestation and reforestation.

d) All forest policies from seeds to forest industry.

The **objectives** of the Forest Management Service on the project **FUTUREforest** are:

- The exchange of forest experience between the partners of the project.
- To get rules of good practises to adapt the Catalan forests to the climate change.
- To get good ideas for new forests policies, plans and programmes.

The **Forest fire prevention Service** functions are:

a) Produce and control the Action and prevention plans, according to the emergency and civil protection plan for forest fire in Catalonia.

b) Establish the areas which will be consider as forest fire risk areas.

c) Support the Associations of forest owners against forest fire through subsidies and technical support.

d) Manage forest fire infrastructures.

e) Study the causes of forest fires in collaboration with the Department of Interior.

f) Produce reports and statistics of forest fire.

The **Natural Park Service** has the following functions:

a) Coordinate, supervise and manage natural protected areas owned by the Generalitat de Catalunya according to the Natural areas law.

b) Execute the management programmes and their actions in protected natural areas with designed special protection zones.

**2.3. Subsidy programmes.**

Different subsidies programs are released related to Forestry by the Forest Administration. The Forest Management Service promotes the Sustainable Forest Management subsidies which subsidizes the following actuations in public forests:
**Section 1: Planning and support to associations**

- Development of Forest management projects and plans.
- Expenses for creation of forests owners associations.
- Development of projects held by forests associations.

The budget for this section for public forests is aprox. 590,000 €.

**Section 2: Sustainable Forest management**

**Infrastructures**
- Construction and maintenance of tracks for harvestings

**Reforestations**
- Planting of trees in former agricultural lands
- Planting of slow growth species in agroforestral systems

**Sylvicultural treatments**
- Thinnings
- Selective felling
- Selection of shoots
- Prunnings for timber and forest fruits
- Brushings out
- Cork barking
- Fitosanitary treatments
- Vegetal treatments beside tracks

The budget for this section is for public forests aprox. 2,000,000 €.

**Section 3: Recuperation of forest potential in burned areas**

- Felling of vegetation affected by forest fires and treatment of produced rests
- Planting of forest species in burned woodlands
- Fail spotting in previously reforested burned woodlands
- Cork barking in burned woodlands

**Forest fire prevention**
- Reduction of forest fuel
- Diversification of vegetation: Plantation of new species
- Treatment of vegetal rests beside tracks

**Infrastructures for fire prevention**
- Construction and maintenance of tracks suitable for vehicles for fire extinction
- Opening of forest fire stripes with elimination of vegetal rests
- Construction of water tanks for fire extinction

The budget for this section is for public forests aprox. 2,400,000 €.

**Section 4: Diversification of rural economy**

- Treatment and logging of forest biomass
- Densification of biomass
- Support for establishing leasing contracts for acquisition of a heating system using biomass as fuel

**Truffle production**
- Plantation of micorrhizated species for truffle production.

The budget for this section for public forests is aprox. 300,000 €.

**Section 5: Transformation and commercialization of forest products**

- Acquisition of new machinery (processors, skidders, lorries). Subsidy finances up to 20% of the costs.
The budget for this section for public forests is approx. 900,000 €. In private forests the whole amount for the Sustainable Forest Management subsidies is 9,500,000 €.

3.1 CLIMATE CHANGE ON REGIONAL LEVEL

At a regional level, very few studies have been made in Catalunya dealing with the prediction of climate change. The reason for this is that the predictions system at a regional level is not enough developed, so these studies don’t have the same reliability as the prediction made at a global scale.

The results of future foresights for the Catalonia region are extracted from bigger studies referring to bigger areas.

Despite of this, we can foresight the following changes in Catalonian climate:

_Rainfall pattern will not vary significantly in the next following years. As it’s shown in some studies, Catalonia could undergo a lightly decreasing of the number of days with rain during the year, but with a higher intensity. It’s expected a light decreasing of rainfall during the summer period (up to a 20%) and a light increase (up to a 10%) of rainfall during the winter season. Geographically, there will be a decrease of rainfall in Pyrenees and pre-Pyrenees area and an increase of rain in the rest of the territory.

_Air temperature could increase near the earth surface, as a consequence of the global warming. It’s not easy to predict exactly the increase of temperature, but most experts predict that the increasing will be a bit higher than the mean value for the planet (approximately an increase of 3.5ºC for the end of XXI century).

With regard to the climate change in forests, the variation of the weather conditions will affect differently to the existing species according to their adaptation capacity in response to higher temperatures and the available water in the soil. These conditions will also increase the vulnerability of forests to plagues and diseases, and will raise the forest fire risk. High forest fire risk will reach areas which nowadays have low fire risk.

Vegetation distribution in Catalanian forests could be affected. Mediterranean forest could go up in altitude in mountain areas, and mountain forests could reduce their area. These mountain communities will be the most affected type of forest due to climate change conditions.

3.2 THREATS

Water:

_Reduction of the recharge of underground water reserves, reduction of water flow in rivers (excepting extreme rainfall events).

_Draught episodes will be more frequent and more intense, especially in summer period.

Soil:

_Erosive processes will appear in woodlands affected by forest fire, plagues or draught caused by climate change.

_Reduction of organic material, reduction of the vegetation cover, reduction of water infiltration which causes hillside erosion.

_Soil structure changes.
Biodiversity:

Most of vegetal species will change their habitat moving to the north and higher in altitude. Land and aquatic ecosystems will experience changes in composition, but also their geographical distribution could change.

Water availability is the most important factor dealing with plant composition and distribution of land animal species.

A list of the Communitarian habitats of interest in woodlands present in Catalonia can be seen in point 5.3.

Timber:

Timber production in Mediterranean region will improve due to the new climatic conditions (increase of temperature and rainfall) and the increasing atmospheric CO\textsubscript{2}, for most tree species, however negative effects in wood production will appear when draught takes place.

Air quality:

Atmospheric CO\textsubscript{2} concentrations are progressively increasing due to fossil fuels combustion. The consequences to the forests of this atmospheric CO\textsubscript{2} increasing are not totally clear or predictable.

SO\textsubscript{2} levels are progressively decreasing due to the substitution of fuels (from coal to other kind of fuels) in urban areas.

Levels of NO\textsubscript{2} are clearly over the limits permitted, and it will be the focus of the reduction of atmospheric pollution in cities.

Carbon sequestration in the soil:

Soils of Catalonia have a high potential of carbon sequestration, although the lack of water blocks the estabilization of carbon (in humus-form). So the lack of water storage can mortgage this potentiality.

Natural risks:

Climate change will produce an increment of disaster events which will produce damages on forests. The different expected risks are:

Erosion processes caused by the new expected rainfall pattern.

Draught episodes.

Forest fires. There’s a general increasing tendency of the number of fires. Mostly they occur in summer period. More than half of the fires are human-caused (negligences 19%, accident15%, intentioned 19%). About 23% are naturally caused and another 22% are caused by unknown reasons. The restant 2% is are revived fires.

Pests and diseases. See point 5.6.

Economical impact:

Climate change will cause damages in forests (effects of plagues, natural disasters…) which will cause economic losses. The prediction of these losses is difficult to evaluate in advance.
3.3. NEW OPPORTUNITIES

Unfortunately there are no positive new opportunities due to climate change for Catalonia.

3.4 MEANS TO ADAPT

The Government approved the Framework Plan for Climate Change Mitigation 2008-2012, for compliance with the Kyoto Protocol. The aim of the Plan is to contribute proportionally to the Spanish commitment to compliance, while, at the same time, to be ready to incorporate the agreements being negotiated in Europe to reduce greenhouse gases (GHG) for the period 2013-2020.

The Framework Plan quantifies the efforts to be made by each sector and identify the actions to be taken to reduce emissions. But this plan is not focused in the forestry sector, as it doesn’t deal with the effects to the forest sector or doesn’t consider the positive effects of the woodlands against climate change.

The Plan will be enacted through two specific programmes for the periods 2008-2010 and 2011-2012, which will specify the action to be taken, the department responsible, the budget, the deadline for execution and the forecast reduction in emissions.

The overall cost of implementing the Plan is estimated at 196.1 million euros per year.

Kyoto Protocol


The problem for Spain in the distribution of commitments of emission treshold is that this entails different economic limits for each country of the U.E. Spain, from 1990 has reached an spectacular economic growth, which meant an increase of the transport and energetic consumption of the families and industry.

The energetic consumption is proportional to the economic development and the CO\textsubscript{2} emission level is proportional to energetic consumption. For this reason, inside a competitive and free market in the U.E, Spain is not in equal opportunities as the rest of the countries. Spain is far away from its commitments. It’s the secon country in the world in wind power and the reference country in percentage of renewal energy of the total consumed.

The objective of Spain should be to continue the increasing of renewables, increase the efficiency and demand the equality in the limit amounts of CO\textsubscript{2} per habitant and year with the other UE countries.

4. COMMUNICATION

External communication

The means to communicate to the forest owners the new challenges, new threats, good forest practices, etc. in Catalonia are:

- Technical study visits
- Conferences
- Forest magazines
- Guides of good practises

Internal communication

- Technical courses
- Conferences
- Manuals, instructions and laws of good practises
5. DIMENSIONS OF COMMON WORK

5.1 WATER MANAGEMENT CYCLE

In Catalonia, the Catalan Water Agency (ACA) is responsible for the application of the Directive and is working to achieve a better quality of water through the diverse and proactive participation of society and with the objective of defining the Hydrological Plan for Catalonia. The ACA is working on the implementation of the Water Framework Directive, following the calendar and the requirements set by the Directive.


The concept of ecological status, which is introduced by the legal text of the Water Framework Directive, appears in Catalan water legislation (Law 6/1999) and in the revised text of the legislation governing water in Catalonia (Legislative Decree 3/2003 of 4 November).

About the participation in the WFD, the ACA and the Directorate-General for Citizen Participation have drawn up a protocol for the implementation of a participation process that is open to all.

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2000</td>
<td>Publication and entry into force of the Water Framework Directive</td>
</tr>
<tr>
<td>December 2004</td>
<td>Analysis of the characterisation of hydrographical demarcation, study of the repercussions of human activities on the status of surface waters and groundwaters (analysis of pressures and impacts and the risk of non-compliance with the Directive objectives) and economic analysis of the costs of water-related services and the current percentage of costs recovered (Articles 5, 6 and 7) (IMPRESS document).</td>
</tr>
<tr>
<td>December 2006</td>
<td>Drawing up of the programme for monitoring and control of the environmental and chemical status of surface water and the chemical and qualitative status of groundwater (Article 6).</td>
</tr>
<tr>
<td>December 2006</td>
<td>Publication and public provision of the calendar, the consultation measures and the working programme for drawing up the Catalan River Basin District Management Plan (Article 14).</td>
</tr>
<tr>
<td>December 2007</td>
<td>Publication and public availability of a provisional outline of the important subjects dealt with in determining measures and drawing up the Catalan River Basin District Management Plan (Article 14).</td>
</tr>
<tr>
<td>December 2008</td>
<td>Publication and public availability of an outline of the draft of the Catalan River Basin District Management Plan (Article 14).</td>
</tr>
</tbody>
</table>
| December 2009 | Approval of the programme of measures to be contained in the work carried out (plans and programmes) and the management measures to be carried out in order to attain the objectives of the Directive, namely the good ecological status of water by the end of 2015 (Article 11). It should be remembered, as set down in the Water Framework Directive, that for the most
appropriate measures to be defined a cost-effectiveness analysis must first be carried out.

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2010</td>
<td>Member States must ensure that they apply a water-pricing policy that provides the necessary incentives for efficient water use and an appropriate tax contribution or policy that will lead to the full recovery of costs for water-related services. Costs will be broken down into domestic, industrial and agricultural, and financial, environmental and resource or opportunity costs will be taken into account (Article 9).</td>
</tr>
<tr>
<td>December 2012</td>
<td>The Member States must ensure they apply a combined approach involving the control and reduction of point and diffuse sources of pollution in line with best available techniques (Article 10). The programme of measures required to attain the good status of water will also be operational (Article 11).</td>
</tr>
<tr>
<td>December 2015</td>
<td>The Member States must attain the good status of their bodies of water: the highest ecological and chemical status for surface water (inland and coastal) and the highest chemical and quantitative status of groundwater, with the exception of bodies of water that have been declared heavily modified and those for which temporary exemption has been requested for a justified reason (Article 4).</td>
</tr>
</tbody>
</table>

The following technical documentation is available:

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demarcation of hydrographical areas or the river basin district of Catalonia</td>
<td>The Decree regarding the demarcation of the river basin district of Catalonia is available, together with the georeferenced information for this demarcation.</td>
</tr>
<tr>
<td>Preliminary work on analysing the ecological status of various aquatic systems</td>
<td>Studies analysing the characteristics of the main aquatic systems in Catalonia in order to design the indicators of their biological quality.</td>
</tr>
<tr>
<td>Protocols for the evaluation of the ecological status of various aquatic systems</td>
<td>The sampling protocols, the processing of the data and the methods for obtaining biological and hydromorphological quality indicators are available for various aquatic systems in Catalonia.</td>
</tr>
<tr>
<td>IMPRESS document assessing the risk of non-compliance with the objectives of the Water Framework Directive</td>
<td>The documents characterising the bodies of water in Catalonia are available, together with the analysis of pressures resulting from anthropic activity and the impacts measured. A map and information management system can also be used to make consulting the IMPRESS document more convenient.</td>
</tr>
<tr>
<td>Consultation model and calendar for drawing up the Catalan River Basin District Management Plan</td>
<td>This is the model of citizen consultation and participation that the Catalan Water Agency plans to carry out, together with the calendar anticipated for drawing up the Catalan River Basin District Management Plan.</td>
</tr>
<tr>
<td>Guidelines for drawing up the Catalan River Basin District Management Plan</td>
<td>Provisional outline of the most important points dealt with in the Catalan River Basin District Management Plan, as an accompaniment to Article 14(b) of the Regulation on hydrological planning (Decree 380/2006).</td>
</tr>
<tr>
<td>Full document (October 2007)</td>
<td>Guidelines for drawing up the management plan in which the main environmental problems are analysed and the main lines of action.</td>
</tr>
</tbody>
</table>
Main actions developed by ACA in forest areas

1. Recovery of the riparian forest

Riverbanks in Mediterranean climates host species that are at the very edge of their area of distribution and that have evolved to support their survival by adapting to the variable water levels: periods where water is lacking, floods and greater exposure of the soil to extreme temperatures. The greater or lesser extent of disturbance to river areas determines the diversity of habitats and the complexity of the system, and well-preserved river areas are much more diverse. The natural value of Mediterranean riverbank ecosystems means that it is important to conserve these spaces.

The main objective of management measures must be to maintain the natural dynamic in order to ensure minimum intervention levels, achieved through proactive management. The holistic vision of the river basin is essential in order to conserve a network of river corridors.

Reactive management is based on the environmental recovery of damaged or altered spaces, the restoration of altered environmental systems that have no significant impact and awareness rising and the spreading of information concerning the actions carried out.

2. Flood prevention

The Agency has drawn up and works with the best maps available in order to be aware of the risk of flooding that exists in Catalonia and to provide information on those elements that have been noted due to their unique nature. The Agency’s actions are based on maintaining and improving the current status of the river area (rivers, streams, the water, the vegetation, riverbeds, etc.) of the different river basins in Catalonia.

2.1 Riverbed maintenance and conservation actions

The main aim is to ensure compliance with the Water Framework Directive and the European Parliament Directive on the assessment and management of flood risks, in terms of ensuring the good ecological status of bodies of surface water that is compatible with the rational use of the resource and the improvement and protection of the natural system. The actions programmed involve preventative maintenance and improvement of riverbeds, from both an environmental and a hydrological-hydraulic perspective, and emergency actions resulting from temporary situations.

Riverbed maintenance and conservation actions have to comply with the following two objectives:

- Improving the quality of the river area and riverbank vegetation: removing non-native species and encouraging the recovery of native riverbank woodland and its natural environmental functions.
- Improving hydraulic capacity, ensuring correct hydraulic flow: avoiding the deposit of materials that could lead to floods, endangering people and property or blocking bridges and other infrastructures.

This is why conservation work focuses solely on the removal of invasive plant species and improving the hydraulic condition of the river itself, without modifying its morphometry, in order to guarantee the flow of water in case of flooding, while at the same time encouraging the restoration of the riverbank vegetation system.
2.2 River area planning actions

With the aim of improving the current state of the river area in the different river basins, a series of different types of activities are planned that are grouped into two categories, management (non-structural) and works (structural actions). The priorities or the need for execution have been organised according to two basic criteria: firstly, improving the hydraulic situation of unique points and reducing the risk of problems in those stretches that flow through urban areas or stretches with consolidated uses; secondly, improving the ecological status of the fluvial system of the basin according to the potential and the conditions of reference for the other stretches. Social demand and potential links with other sector plans have been taken into consideration in terms of the priority level.

Publications concerning riverbank recovery: “Technical conditions for carrying out riverbed conservation, planning and cleaning projects”

There are also subsidies for river area restoration actions and subsidies for river environment improvement actions.

5.2 IMPACT ON SOIL PROTECTION

Ministerio de Medio Ambiente, Rural y Marino is preparing and updating the Soil Erosion National Inventory (INES) and the corresponding Erosive Soil Situation Map.

The Soil Erosion National Inventory (INES) has as targets: detect, quantify and reflect using cartography the main erosive processes in the national territory and to establish their evolution making an inventory in a continuous way in time. The results of the INES will improve and update former erosive soil situation maps. It has been started in 2001 and it will be finished in 2012.

In Catalonia the soil inventory is being carried, so we don’t know the results, as it hasn’t been published yet.

Soil erosion situation map:

In the next table, mean values of soil loss for different soil uses can be observed. These mean values are calculated for the whole national territory.
<table>
<thead>
<tr>
<th>Stratum</th>
<th>Area (ha)</th>
<th>Average of soil loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivated Irrigated land</td>
<td>3,054,078</td>
<td>10.35</td>
</tr>
<tr>
<td>Cultivated trees and dried vineyard</td>
<td>5,113,437</td>
<td>78.93</td>
</tr>
<tr>
<td>Dry herbaceous cultivated land</td>
<td>14,804,776</td>
<td>30.53</td>
</tr>
<tr>
<td>Wasteland, scrubs and wooded area with cover &lt; 0.2</td>
<td>8,231,174</td>
<td>17.46</td>
</tr>
<tr>
<td>Pasture</td>
<td>2,141,306</td>
<td>8.08</td>
</tr>
<tr>
<td>Scrubs</td>
<td>5,200,907</td>
<td>19.14</td>
</tr>
<tr>
<td>Wooded area with cover between 0.2 and 0.7</td>
<td>5,984,709</td>
<td>8.36</td>
</tr>
<tr>
<td>Wooded area with cover &gt; 0.7</td>
<td>4,535,843</td>
<td>5.16</td>
</tr>
</tbody>
</table>

The type of soil it’s not as important as the location of the soil, in particular what refers to the slope and the working practices when analyzing the erosive potential from the human transformation point of view.

This erosive risk potential is maximum in wooden and herbaceous non-irrigated crops situated in high slope lands, without soil conservation practices, in junction to deteriorated woodlands formations with a non-developed wooded cover, scrublands with low denseness and deteriorated grasslands and wastelands in high slope areas.

Referring to erosion effects, to damages produced in eroded soils, which reduce production capacity, also the catastrophic water events and the irregularity of river-flow pattern, the sedimentation in reservoirs and the degradation of water quality have to be taken in consideration as the most relevant effects. All this effects related among them, and related to the desertification process, allow to consider erosion as one of the main causes and as a symptom at the same time.

5.3 BIODIVERSITY

Catalonia contains very different natural environments which represent many of the European and North Africa landscape structures. This is because of its orography and the special geographic situation, half way from the tropical and artic areas. This aspect explains the extraordinary biological diversity which has been preserved until nowadays.

On the other hand, the intense human influence in the territory has transformed many of these landscapes causing the presence of some species and excluding other species. This situation has generated a rich landscape mosaic formed by different ecosystems and different levels of transformation.

Catalonia has long led Spain in public concern for environmental degradation. Law 12/1985 on natural areas also pioneered the integration of biodiversity as a fundamental aim of legal protection, since in Article 1 it establishes as objectives “to protect, conserve, manage and, if necessary, restore and improve the genetic diversity, wealth and productivity of natural areas in Catalonia”.

Protected forest area

In Catalonia the protected forest area is the 925,970 ha, the 47% of forest area. It is distributed in:

<table>
<thead>
<tr>
<th>National Parks</th>
<th>Natural Parks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aiguèstortes and Estany de Sant Maurici</td>
<td>L’Alt Pirineu Natural Park</td>
</tr>
<tr>
<td></td>
<td>Aiguamolls de l’Empordà</td>
</tr>
<tr>
<td></td>
<td>Cadi-Moixeró</td>
</tr>
<tr>
<td></td>
<td>Cap de Creus</td>
</tr>
<tr>
<td></td>
<td>Delta de l’Ebre</td>
</tr>
<tr>
<td></td>
<td>Els Ports</td>
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<tr>
<td></td>
<td>Montseny</td>
</tr>
<tr>
<td></td>
<td>Montserrat</td>
</tr>
<tr>
<td></td>
<td>Sant Llorenç de Munt</td>
</tr>
<tr>
<td></td>
<td>Serra de Montsant</td>
</tr>
<tr>
<td></td>
<td>The Volcanic Region of La Garrotxa</td>
</tr>
</tbody>
</table>
National sites of national interest

<table>
<thead>
<tr>
<th>Natural Sites of National Interest</th>
<th>L’Albera</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature Reserves</td>
<td>Poblet</td>
</tr>
<tr>
<td>Marine Reserves</td>
<td>Delta del Llobregat</td>
</tr>
<tr>
<td>Areas of Natural Interest</td>
<td>Medes Islands</td>
</tr>
</tbody>
</table>

In Catalonia, protected natural areas are often linked to a special protection plan, under which standards of protection and territorial organization are established. At the present time, 111 of the areas of the Plan for Areas of Natural Interest (PEIN) have such a special plan. Twelve of the areas have plans from before the PEIN was approved PEIN (14-12-92). The remaining 55 have received final approval, and 44 are being processed.
The Catalan Natura 2000 Network Proposal

On 5th September last, the Government approved the Catalan proposal on the Natura 2000 Network. This approval included all areas that make up the Natura 2000 network in Catalonia, and, therefore, includes all the areas that were already part of the Network, along with the extension of some areas and the creation of new ones. The agreement thus includes the designation of Special Protection Areas for Birds (SPAB) and the proposal of new Sites of Community Importance (SCI). The final proposal increases the area included in the Natura 2000 network up to 1,040,155 hectares. 957,051 of these hectares are terrestrial (29.8% of Catalan territory) and 83,104 marine, which facilitate representation of the habitats and species of community interest, and made possible to close several infringement proceedings opened by the European Commission against Catalonia.

Threat to biodiversity

The effects of climate change can accelerate the changing of species dynamic which is nowadays taking place in Catalonia. Events as forest fire and drought can promote the death of big forest areas.

Forests with pronounced Mediterranean characteristics as Holm oak (*Quercus ilex*) forests and Aleppo pine forests will increase their area and expand to northern latitudes. Holm oak trees grow up on very poor and thin soils, which don’t provide enough water to vegetation. These Holm oak forests have already suffered death episodes caused by drought and will probably become scrubland in a short time.

Oak tree forests in a short term period will increase their area taking the place of beech and scots pine forests. Forest fires could also help oak tree forests to expand, as they coppice forest with power and makes regeneration much higher to the scots pine forest.

Protected species

Protected species are those whose populations occupy very specific areas or are scarce in Catalonia. They also include those that, although numerous, are useful because they help to control other species which are harmful to human health or that can become pests to agriculture, such as certain rodents and insects. In order to guarantee their conservation, it has been considered appropriate to protect them legally, prohibiting their hunting and capture, keeping them in captivity or showing them publicly whether alive, dead or stuffed.

The list of protected species in Catalonia, and their protection regulations are included in Law 3/1988, of 4th March, of animal protection.
In some specific cases, which must be justified, and always for scientific, conservation or dissemination reasons, authorizations may be issued for their capture.

Studies of protected species carried out over the years enable us to establish the state of their populations. Those in more unfavourable situations have been the object of a conservation programme, and considered threatened species, and thus included in the Catalogue of Threatened Species of Catalonia.

Communitarian habitats of interest

The Communitarian habitats of Interest (forest habitats) present in Catalonia are:

Forests of temperate Europe

- **Atlantic acidophilus beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (Quercinion robori-petraeae or Ilici-Fagenion)**
  Beech forests with *Ilex*, growing on acid soils, of the plain to montane levels under humid Atlantic climate. The acid substrate corresponds to alterations of acid rocks or to silt with flints more or less degraded or, to old alluvial deposits. The soils are of acid brown type, leaching or with an evolution towards podsol type. The humus is of moder to dysmoder type.

- **Asperulo-Fagetum beech forests**
  Fagus sylvatica and, in higher mountains, Fagus sylvatica-Abies alba or Fagus sylvatica-Abies alba-Picea abies forests developed on neutral or near-neutral soils, with mild humus (mull), of the medio-European and Atlantic domains of Western Europe and of central and northern Central Europe, characterised by a strong representation of species belonging to the ecological groups of Anemone nemorosa, of Lamiastrium (Lamium) galeobdolon, of Galium odoratum and Melica uniflora and, in mountains, various Dentaria spp., forming a richer and more abundant herb layer.

- **Medio-European subalpine beech woods with *Acer* and *Rumex arifolius***
  Fagus sylvatica woods usually composed of low, low-branching trees, with much sycamore (*Acer pseudoplatanus*), situated near the tree limit, mostly in low mountains with oceanic climate of estern Europe and of central and northern Central Europe. The herb layer is similar to that of the forests of Asperulo-Fagetum beech forests or locally of Luzulo-Fagetum beech forests and contains elements of the adjacent open grasslands.

- **Medio-European limestone beech forests of the Cephalanthero-Fagion**
  Xero-thermophile Fagus sylvatica forests developed on calcareous, often superficial, soils, usually of steep slopes, of the medio-European and Atlantic domains of Western Europe and of central and northern Central Europe, with a generally abundant herb and shrub undergrowth, characterized by sedges (Carex digitata, Carex flacca, Carex montana, Carex alba), grasses (Sesleria albicans, Brachypodium pinnatum), orchids (Cephalanthera spp., Neottia nidus-avis, Epipactis leptochila, Epipactis microphylla) and thermophile species, transgressive of the Quercetalia pubescentipetraeae.
  The bush-layer includes several calcicolous species (Ligustrum vulgare, Berberis vulgaris) and Buxus sempervirens can dominate.

- **Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli**
  Forests of Quercus robur (or *Quercus robur* and *Quercus petraea*) on hydromorphic soils or soils with high water table (bottoms of valleys, depressions or in the vicinity of riparian forests). The substrate corresponds to silts, clayey and silt-laden colluvions, as well as to silt-laden alterations or to siliceous rocks with a high degree of saturation. Forests of *Quercus robur* or natural mixed forests composed of *Quercus robur*, *Quercus petraea*, *Carpinus betulus* and *Tilia cordata*.

- **Tilio-Acerion forests of slopes, screes and ravines**
  Mixed forests of secondary species (*Acer pseudoplatanus*, *Fraxinus excelsior*, *Ulmus glabra*, *Tilia cordata*) of coarse scree, abrupt rocky slopes or coarse colluvions of slopes, particularly on calcareous, but also on siliceous, substrates (*Tilio-Acerion Klika 55*). A distinction can be made between one group which is typical of cool and humid environments (hygroscopic and shade
tolerant forests), generally dominated by the sycamore maple (*Acer pseudoplatanus*) - sub-alliance Lunario-Acerenion, and another which is typical of dry, warm screes (xerothermophile forests), generally dominated by limes (*Tilia cordata, T. platyphyllos*) - sub-alliance *Tilio-Acerenion*. The habitat types belonging to the Carpinion should not be included here.

- **Bog woodland**
  Coniferous and broad-leaved forests on a humid to wet peaty substrate, with the water level permanently high and even higher than the surrounding water table. The water is always very poor in nutrients (raised bogs and acid fens). These communities are generally dominated by *Betula pubescens, Frangula alnus, Pinus sylvestris, Pinus rotundata* and *Picea abies*, with species specific to bogland or, more generally, to oligotrophic environments, such as *Vaccinium spp.*, *Sphagnum spp.*, *Carex spp.*

- **Alluvial forests with Alnus glutinosa and Fraxinus excelsior** (*Alno-Pandion, Alnion incanae, Salicion albae*)
  Riparian forests of *Fraxinus excelsior* and *Alnus glutinosa*, of temperate and Boreal Europe lowland and hill watercourses (44.3: Alno-Padion); riparian woods of *Alnus incanae* of montane and sub-montane rivers of the Alps and the northern Apennines (44.2: Alnion incanae); arborecent galleries of tall *Salix alba*, *S. fragilis* and *Populus nigra*, along medio-European lowland, hill or sub-montane rivers (44.13: Salicion albae). All types occur on heavy soils (generally rich in alluvial deposits) periodically inundated by the annual rise of the river (or brook) level, but otherwise well-drained and aerated during low-water. The herbaceous layer invariably includes many large species (*Filipendula ulmaria, Angelica sylvestris, Cardamine spp.*, *Rumex sanguineus, Carex spp.*), and various vernal geophytes can occur, such as *Ranunculus ficaria, Anemone nemorosa, A. ranunculoides, Corydalis solida*.
  
  This habitat includes several sub-types: ash-alder woods of springs and their rivers (44.31 – *Carici remotae-Fraxinetum*); ash-alder woods of fast-flowing rivers (44.32 - *Stellario-Alnetum glutinosae*); ash-alder woods of slow-flowing rivers (44.33 - *Pruno-Fraxinetum, Ulmo-Fraxinetum*); montane grey alder galleries (44.21 - *Calamagrosti variae-Alnetum incanae* Moor 58); sub-montane grey alder galleries (44.22 - *Equiseto hyemalis-Alnetum incanae* Moor 58); white willow gallery forests (Salicion albae). The Spanish types belong to the alliance Osmundo-Alnion (Cantabric Atlantic and southeast Iberia peninsula).

**Mediterranean deciduous forests**

- **Galicio-Portuguese oak woods** with *Quercus robur* and *Quercus pyrenaica*.
  *Quercus pyrenaica* -dominated forests (*Quercion robori-pyrenaicae*).

- **Quercus faginea and Quercus canariensis** Iberian woods
  Forests and woods dominated by *Quercus faginea, Quercus canariensis* or *Quercus afares*. The humid formations of south-western Iberia (41.772 and 41.773) are forest types of unique character in Europe and of extreme biological importance.
  Sub-types:
  - Spanish *Quercus faginea* forests
  - Catalanian *Quercus canariensis* stands
  - *Carici depressae-Quercetum canariensis* Formsations of Catalonia rich in *Quercus canariensis*.

- **Castanea sativa** woods
  Supra-Mediterranean and sub-Mediterranean *Castanea sativa*-dominated forests and old stablished plantations with semi-natural undergrowth.

- **Salix alba and Populus alba** galleries
Populus caspica, Populus euphratica (Populus diversifolia), are usually dominant in height; they may be absent or sparse in some associations.

- **Southern riparian galleries and thickets (Nerio-Tamaricetea and Securinegion tinctoriae)**

Tamarisk, oleander, and chaste tree galleries and thickets and similar low ligneous formations of permanent or temporary streams and wetlands of the thermo-Mediterranean zone and south-eastern Iberia, and of the most hygromorphic locations within the Saharo-Mediterranean and Saharo-Sindian zones. The formations with Tamarix africana should not be taken into account.

**Mediterranean sclerophyllous forests**

- **Quercus suber forests**
  West-Mediterranean silicicolous forests dominated by Quercus suber, usually more thermophile and Hygrophile.
  Sub-type:
  Tyrrhenian cork-oak forests *Quercion suberis*
  Mostly meso-Mediterranean Quercus suber forests of Italy, Sicily, Sardinia, Corsica, France and north-eastern Spain. They are most often degraded to arborescent matorral.

- **Quercus ilex and Quercus rotundifolia forests**
  1) Forests dominated by Quercus ilex or Q. rotundifolia, often, but not necessarily, calcicolous.
  Sub-types:
  45.31 - Meso-Mediterranean holm-oak forests
  Rich meso-Mediterranean formations, penetrating locally, mostly in ravines, into the thermo-Mediterranean zone. They are often degraded to arborescent matorral and some of the types listed below no longer exist in the fully developed forest state relevant to category 45; they have nevertheless been included, both to provide appropriate codes for use in 32.11, and because restoration may be possible.
  - Supra-Mediterranean holm-oak forests
  Formations of the supra-Mediterranean levels often mixed with deciduous oaks, Acer spp. Or Ostrya carpinifolia. Isolated Quercus ilex-dominated stands occurring as a facies of dunal pine-holm oak forests.
  - Quercus rotundifolia woodland
  Iberian forest communities formed by Q. rotundifolia. Generally, even in mature state, less tall, less luxuriant and drier than the fully developed forests that can be constituted by the closely related Q. ilex, they are, moreover, most often degraded into open woodland or even arborescent matorral. Species characteristic of the undergrowth are Arbutus unedo, Phillyrea angustifolia, Rhamnus alaternus, Pistacia terebinthus.

- **Forests of Ilex aquifolium**
  Communities dominated by arborescent *Ilex aquifolium*, relict of various forests with a field layer rich in *Ilex* and sometimes with Taxus, of the supra-Mediterranean level on various substrates. These woods correspond to the senescence stage of a forest with a undergrowth with Taxus and *Ilex* (belonging among others to the *Ilici-Quercetum ilicis*), after the fading of the tree layer. They generally form patches inside or outside forests.

**Temperate mountainous coniferous forests**

- **Subalpine and montane Pinus uncinata forests (*if on gypsum or limestone)**
  Mountain pine (*Pinus uncinata*) forests, usually open and with a very developed shrubby understorey, of the subalpine and montane levels; on limestone, gypsum or siliceous substrate in a cool or thermophile situation depending on the region. Sometimes mixed with *Pinus sylvestris*, more rarely with *Larix-Pinus cembra*.
  Two major types: 42.41 - mountain pine forests of the western outer Alps, the Jura and Pyrenean ubacs, developed on siliceous or decalcified soils of the subalpine level with a predominately ericaceous undergrowth comprising Rhododendron ferrugineum (*Rhododendro-Vaccinion p.*); xerocline mountain pine forests of the inner Alps, of the western outer Alps and the Jura, and of Pyrenean adrets, accompanied by a shrubby undergrowth in which Rhododendron ferrugineum is absent or rare (*Juniper-Pinion p.*, *Erico-Pinion p.*)
Mediterranean and Macaronesian mountainous coniferous forests

- *(Sub-)*Mediterranean pine forests with endemic black pines

Forests of the montane-Mediterranean level, on dolomitic substrate (high tolerance to magnesium), dominated by pines of the Pinus nigra group, often with a dense structure.

Sub-type:
- Salzmann's pine forests - Pinus salzmannii forests of Spain (Pyrenees, northern Iberian Range, sierra de Gredos, serrania de Cuenca, Maestrazgo, sierras de Cazorla, Segura and Alcaraz, calcareous periphery of the Sierra Nevada) and the Causses.

- Mediterranean pine forests with endemic Mesogean pines

Mediterranean and thermo-Atlantic woods of thermophilous pines, mostly appearing as substitution or paraclimactic stages of forests of the Quercetalia ilicis or Ceratonio-Rhamnetalia. Longestablished plantations of these pines, within their natural area of occurrence, and with an undergrowth basically similar to that of paraclimactic formations, are included.

Sub-types:
- Mesogean pine forests
  - Forests of Pinus pinaster ssp. pinaster (=Pinus mesogeensis) of the western Mediterranean, mostly in siliceous meso-Mediterranean, upper meso-Mediterranean and supra-Mediterranean situations of Spain, Corsica, south-eastern France, north-western Italy, Sardinia and Pantelleria.

- Iberian mesogean pine forests
  - Pinus pinaster forests of the Iberian peninsula, appearing mostly as substitution communities of Quercus rotundifolia, Q. pyrenaica or, locally, Q. suber, Q. faginea woodlands.

- Iberian stone pine forests
  - Pinus pinea forests of the Iberian peninsula, where they reach their greatest development.

- Iberian Aleppo pine forests
  - Pinus halepensis forests of Spain, considered native for at least two-thirds of their considerable expanse; they are mostly restricted to eastern regions on the Mediterranean slope of the Catalonian mountains, the Maestrazgo, the pre-Baetic ranges of the upper Guadalquivir basin, the southern Andalusian mountains; they penetrate farther inland in the Ebro basin and around the headwaters of the Tagus and Guadalquivir systems.

- *Mediterranean Taxus baccata woods*

Woods dominated by *Taxus baccata*, often with *Ilex aquifolium*, of very local occurrence. This habitat type may have two origins: senescent phase of a beech wood or beech-fir wood, made up of clusters of Taxus after the fall of the tall species, surrounded by layered stands of beech-yew; residual Taxus stand with disappearance of the tall species, both above and in the proximity of Taxus.

Objectives of the Catalan Strategy

The Catalan strategy must be fully integrated into the concepts of other similar strategies of broader scope (on a national, European and worldwide level). At the same time, it must correspond to the reality and problems specific to the biodiversity of Catalonia, the knowledge we have of it and the scientific, technical, legal and political instruments available in this country.

The fundamental core objective of the Strategy is to reverse the current trend towards reduction or loss of diversity of ecosystems, species and intraspecific genetic material that make up the biological diversity in Catalonia until a satisfactory conservation status is achieved which is also compatible with the sustainable of this diversity throughout the region.

To achieve this we would obviously have to: remove or reduce any threats to the components of biodiversity in Catalonia and guarantee that any use or exploitation of the components of biodiversity in Catalonia is sustainable.
5.4 TIMBER – ECONOMIC VALUES

About the forest products, we must advance in the development of balanced, productive ecosystems, through the application of silviculture adapted to the features of the country and ensuring settled populations in mountain areas.

Boosting the sustainable harvesting of forest resources, which yield direct income, and increasing their value, will depend on the processing industry's ability to adapt to the demands of the market for products of greater added value.

Forest harvesting is based on the principle of conservation and improvement of the mass. Activities to obtain wood, firewood, cork and other forest products require permission from the forestry authority.

Cork is a raw material which, due to its properties (among them insulation) cannot be substituted. This makes the cork oak (*Quercus suber*), from which it is obtained, specie which is worth promoting. Cork oak groves are typical Mediterranean forests. The climate, rock and soil of certain parts of Catalonia are very suitable to the development of this specie. In addition to being of interest to the cork industry, once crushed, this product provides agglomerates that are used in numerous applications and is widely present on the market.

Pine nuts are the seeds of the pine found in the fruit or pine cone, usually from the stone pine (*Pinus pinea*), as, unlike the other pine species, these are edible. Pine nut harvesting is regulated, and requires both a licence and permission from the owner.

Statistics of harvesting during 2007 in Catalonia
<table>
<thead>
<tr>
<th>Product</th>
<th>Specie</th>
<th>Total forest area</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abies alba</td>
<td>0</td>
<td>843</td>
</tr>
<tr>
<td></td>
<td>Pinus uncinata</td>
<td>0</td>
<td>15,383</td>
</tr>
<tr>
<td></td>
<td>Pinus sylvestris</td>
<td>1,432</td>
<td>23,049</td>
</tr>
<tr>
<td></td>
<td>Pinus nigra</td>
<td>890</td>
<td>25,753</td>
</tr>
<tr>
<td></td>
<td>Pinus pinea</td>
<td>0</td>
<td>24,852</td>
</tr>
<tr>
<td></td>
<td>Pinus halepensis</td>
<td>0</td>
<td>18,303</td>
</tr>
<tr>
<td></td>
<td>Pinus radiata</td>
<td>0</td>
<td>4,896</td>
</tr>
<tr>
<td></td>
<td>Pinus menziesii</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Other conifers</td>
<td>0</td>
<td>2,932</td>
</tr>
<tr>
<td></td>
<td>Fagus sylvatica</td>
<td>0</td>
<td>21,783</td>
</tr>
<tr>
<td></td>
<td>Quercus petraea</td>
<td>0</td>
<td>18,698</td>
</tr>
<tr>
<td></td>
<td>Quercus faginea</td>
<td>0</td>
<td>10,211</td>
</tr>
<tr>
<td></td>
<td>Quercus ilex</td>
<td>0</td>
<td>10,211</td>
</tr>
<tr>
<td></td>
<td>Quercus suber</td>
<td>0</td>
<td>2,257</td>
</tr>
<tr>
<td></td>
<td>Castanea sativa</td>
<td>0</td>
<td>1,748</td>
</tr>
<tr>
<td></td>
<td>Eucalptus sp.</td>
<td>0</td>
<td>5,878</td>
</tr>
<tr>
<td></td>
<td>Populus canadiensis</td>
<td>5</td>
<td>55,793</td>
</tr>
<tr>
<td></td>
<td>Alnus glutinosa</td>
<td>0</td>
<td>1,748</td>
</tr>
<tr>
<td></td>
<td>Platanus hybrida</td>
<td>0</td>
<td>5,878</td>
</tr>
<tr>
<td></td>
<td>Fraxinus sp.</td>
<td>0</td>
<td>2,257</td>
</tr>
<tr>
<td></td>
<td>Ulmus sp.</td>
<td>0</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td>Betula alba</td>
<td>0</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Robinia pseudoacacia</td>
<td>0</td>
<td>451</td>
</tr>
<tr>
<td></td>
<td>Others sp.</td>
<td>0</td>
<td>1,805</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2,327</td>
<td>39,275</td>
</tr>
<tr>
<td>Cork</td>
<td>Cork</td>
<td>0</td>
<td>3,100</td>
</tr>
<tr>
<td>Firewood</td>
<td>Conifers</td>
<td>5</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Quercus sp.</td>
<td>790</td>
<td>1,550</td>
</tr>
<tr>
<td></td>
<td>Other sp.</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Scrubs</td>
<td>0</td>
<td>406</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>795</td>
<td>2,400</td>
</tr>
</tbody>
</table>
5.5 AIR QUALITY AND MITIGATION EFFECTS

The Ecologic and Forestry Inventory of Catalonia (IEFC), elaborated by CREAF during the period 1988-1998, was one of the first ecologic inventories. Some of the results of this inventory are:

- Stocks of aerial biomass and production in Catalonia (dry weight):

<table>
<thead>
<tr>
<th>Area</th>
<th>Biomass (miles of tones)</th>
<th>Total aerial wood production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total aerial</td>
<td>Of wood</td>
</tr>
<tr>
<td>Catalunya</td>
<td>73,499.40</td>
<td>47,779.10</td>
</tr>
</tbody>
</table>

- Stocks of Carbon in the aerial biomass and production in Catalonia (dry weight):

<table>
<thead>
<tr>
<th>Area</th>
<th>Carbon stocks (miles of tones)</th>
<th>Total aerial wood production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total aerial</td>
<td>Of wood</td>
</tr>
<tr>
<td>Catalunya</td>
<td>36,442.30</td>
<td>23,694.30</td>
</tr>
</tbody>
</table>

It shows that catalan forests have an important function in the carbon sequestration.

5.6 PREVENTION OF RISKS

Forest fire risk

Catalonia is affected by forest fires every year. There is an extend legislation about the prevention on forest fire risk in Catalonia and Spain.

*Map of municipalities declared of high risk of forest fires:*
The high stock of forest biomass in catalan forest caused by the low harvesting of the last years is one of the main causes of the forest risk. The difference between harvestings (red columns) and growing of the forest (green columns) in each region of Catalonia is:

Statistics of the area affected by forest fires in Catalonia during the last years:

<table>
<thead>
<tr>
<th>Year</th>
<th>Fires</th>
<th>Wooded areas (ha)</th>
<th>Not wooded areas</th>
<th>Forest area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>563</td>
<td>43,335.41</td>
<td>22,476.30</td>
<td>65,811.71</td>
</tr>
<tr>
<td>1987</td>
<td>352</td>
<td>1,214.50</td>
<td>730.90</td>
<td>1,945.40</td>
</tr>
<tr>
<td>1988</td>
<td>646</td>
<td>868.66</td>
<td>2,215.47</td>
<td>3,084.13</td>
</tr>
<tr>
<td>1989</td>
<td>669</td>
<td>2,992.23</td>
<td>3,003.59</td>
<td>5,995.82</td>
</tr>
<tr>
<td>1990</td>
<td>591</td>
<td>638.66</td>
<td>468.19</td>
<td>1,106.85</td>
</tr>
<tr>
<td>1991</td>
<td>782</td>
<td>2,495.46</td>
<td>2,837.01</td>
<td>5,332.47</td>
</tr>
<tr>
<td>1992</td>
<td>368</td>
<td>255.72</td>
<td>1,297.98</td>
<td>1,553.70</td>
</tr>
<tr>
<td>1993</td>
<td>791</td>
<td>2,693.44</td>
<td>4,649.60</td>
<td>7,343.04</td>
</tr>
<tr>
<td>1994</td>
<td>1,217</td>
<td>62,574.80</td>
<td>14,050.60</td>
<td>76,625.40</td>
</tr>
<tr>
<td>1995</td>
<td>753</td>
<td>2,202.24</td>
<td>4,833.61</td>
<td>7,035.85</td>
</tr>
<tr>
<td>1996</td>
<td>463</td>
<td>531.04</td>
<td>494.67</td>
<td>1,025.71</td>
</tr>
<tr>
<td>1997</td>
<td>672</td>
<td>624.98</td>
<td>297.71</td>
<td>922.68</td>
</tr>
<tr>
<td>1998</td>
<td>961</td>
<td>13,714.18</td>
<td>7,278.08</td>
<td>20,992.26</td>
</tr>
<tr>
<td>1999</td>
<td>841</td>
<td>485.89</td>
<td>764.68</td>
<td>1,250.57</td>
</tr>
<tr>
<td>2000</td>
<td>790</td>
<td>2,637.17</td>
<td>5,705.09</td>
<td>8,342.26</td>
</tr>
<tr>
<td>2001</td>
<td>723</td>
<td>993.26</td>
<td>2,001.67</td>
<td>2,994.93</td>
</tr>
<tr>
<td>2002</td>
<td>544</td>
<td>951.73</td>
<td>1,147.94</td>
<td>2,099.67</td>
</tr>
<tr>
<td>2003</td>
<td>701</td>
<td>7,408.66</td>
<td>2,470.23</td>
<td>9,878.90</td>
</tr>
<tr>
<td>2004</td>
<td>565</td>
<td>393.22</td>
<td>674.05</td>
<td>1,067.27</td>
</tr>
<tr>
<td>2005</td>
<td>892</td>
<td>3,601.75</td>
<td>1,892.17</td>
<td>5,493.92</td>
</tr>
<tr>
<td>2006</td>
<td>629</td>
<td>1,810.66</td>
<td>1,594.02</td>
<td>3,404.68</td>
</tr>
<tr>
<td>2007</td>
<td>578</td>
<td>847.28</td>
<td>764.41</td>
<td>1,611.69</td>
</tr>
</tbody>
</table>

The Directorate General for the Natural Environment of the Department of the Environment and Housing is responsible for forest fire prevention. The forest fire risk evolution assessment system falls within this responsibility. This section presents the different tools for assessing forest fire risk.
used continually by the DGPRMN all year round. An evaluation is given for each of them individually and together, and they are used to draw up a daily risk map. This is used to support the decisions taken daily at the DGPRMN, such as whether to activate Plan Alpha, movement of personnel, coordination with the fire brigade and civil defence, notification of local authorities, fire permits, public warning, etc. These tools are:

- Direct field measurement of fine fuel moisture content
- Weather-based risk variable and index maps
- Basic variable percentile calculation
- Historical information on fires and situations occurring in recent years
- Graphs from specific sensors for risk monitoring
- Monitoring of synoptic weather patterns related to fire risk
- Static maps: forest fuel, inflammability, altimetry...

In order to calculate the risk and evaluate it globally for the whole territory, a forest fire risk map is generated daily. This is done by grouping the information gathered from the different sources offering relevant data on the evolution of forest fire hazard.

Plan Alpha is the procedure established by the DGMN to define the actions of surveillance and forest fire prevention agents deployed over the territory, in fire danger situations that may arise.

The activation of Plan Alpha depends on the daily forest fire risk map and other risk analysis tools and on danger situations rated on a scale of 4 operative levels, from 0 to 3, for each region.

Activation of each level involves a level of mobilisation of DGMN agents, the carrying out of certain preventive actions and, in the case of levels 2 and 3, also the activating of the pre-alert and alert phases anticipated in pla INFOCAT (special emergency plan for forest fires in Catalonia).

Direct knowledge of the state of the vegetation is a valuable datum. The DGPRMN samples the fuel in 9 Catalan localities throughout the year. Two or three species are sampled per locality. The sampled species are: Aleppo pine, kermes oak, rosemary, rockrose and the strawberry tree. Sampling is fortnightly or monthly according to the time of year and the risk situation.

The weather forecast is extremely important in drawing up the forest fire risk map. The forecasts of the Meteorological Service of Catalonia (SMC) are the reference tool. The Service also provides more detailed information when it is deemed necessary.

One of the system’s basic tools is the SMC’s automatic weather stations. Based on the stations, the first application for calculating the forest fire risk index was made in 1993. Altogether there are over a hundred stations that monitor hourly the evolution of the meteorological variables involved in the evolution of forest fire risk. The data from the automatic stations is used to generate maps and graphs of diverse variables and indexes. The periodicity with which they are drawn up (hourly, daily...) depends on the variable represented.

Based on the study of large forest fires in the past by the University of Barcelona, with the support of the DGPRMN, a series of synoptic patterns have been observed that repeat in large forest fires. Every day these patterns are monitored with the support of the Meteorological Service of Catalonia in order to detect potential risk situations and anticipate them as soon as possible.

When assessing any situation information on previous situations is essential since basically we learn from the past. The Wardens make reports and the Forest Fire Prevention Service maintains forest fire statistics. The Wardens’ knowledge of the territory and their experience are a continuous reference for current situations.

One of the tasks of the Forest Fire Prevention Service is to install more specific sensors for the assessment of forest danger situations. The graphs show a sensor that measures soils moisture content and another for dead fuel moisture content.
Diseases and plant pest

Although no statistic studies have been made about this fact, it’s very probable the observations of plague-insects and its behaviour have a lot to do with climate change.

From 1979, when the Forest management Service have the competencies of forest plagues, the two most important insects which have been more affected by climate change are the lepidopter pine processory moth *Thaumetopoea pityocampa* and the homopter *Kermococcus vermilio*.

From 1985 pine processionary has gradually been detected in altitudes up to 1,800 m., when normal altitudes until that year for that specie was from sea level to altitudes up to 1,400 m. The reason for this change was caused by the changing of climate conditions. From 1995 the Department of the Environment and Housing has been making treatments in the affected areas. Nowadays this plague is affecting *Pinus uncinata*, which has never been affected before 1985. The same problem has been observed in other Spanish autonomous regions.

A clearer indicator of climate change is the insect *Kermococcus vermilio*, which affects small branches of *Holm Oak* tree. This plague was in equilibrium until 1987 in Catalonia, but from this year on, populations of this insect began to grow in an alarming way in Tarragona area (Mont-Roig, Cambrils…), and it increased it’s presence in many areas of Catalonia (Vallès Occidental, Alt Empordà, Baix Penedès, Alt Penedès, Garraf, and even to the region of Solsonès (800 metres of altitude). The proliferation of this insect had been extraordinary, affecting forests of 4-5 ha, and many times produced the death of big dimensions Holm Oak trees.

Populations of this insect continued to grow from 1987 to 2002, year in which summer period had unusual meteorological conditions of low temperatures and rainfall. These conditions caused decreases of the populations in all Catalanian regions in which this insect was causing problems, excepting the regions of upper and lower Empordà where weather conditions were not so different from previous years.