LIFE CLINOMICS

LIFE15 CCA/ES/000102
"This project has been funded with support from the European Commission"

GUIDE TO LOCAL RESILIENCE

OPPORTUNITIES AND CHALLENGES FACING LOCAL ECONOMIES AND SOCIETY IN ADAPTING TO CLIMATE CHANGE

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Diputació Barcelona
Cambra de Comerç de Barcelona
UGT
Consell Comercial Alt Penedès
CCOO
Oficina Catalana del Canvi Climàtic
COPATE
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C O N T E N T

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INTRODUCTION

New Models of Local Governance in the New Climate Scenario

Climate change is a planet-wide phenomenon that, as well as affecting the dynamics of natural systems and the water cycle, threatens the wellbeing of people and economic and production activities, especially in the most vulnerable regions. It is thus necessary to pay attention to the scientific evidence and forecasts regarding these effects, and to make a joint effort in all sectors and at all regional scales to prevent new emissions (i.e., mitigate) and to take active measures to adapt and improve resilience.

This means taking action to minimize vulnerability to risks and negative impacts and to identify positive impacts and turn them into opportunities in the new climate scenario. Furthermore, given that mitigation policies will bear fruit in the medium and long term, adaptation policies must be put in place urgently, especially in the most vulnerable areas.

The effects of climate change, despite its global reach, are beginning to be visible at the local scale. Therefore, a significant part of these policies and measures must be designed and implemented based on the characteristics of each of the regions and in accordance with their biogeographic, ecosystemic, social, and economic reality.

Planning and management at the local scale does play an important role in moving forward with this challenge and minimizing vulnerability in the face of climate change, but actions with a general scope must also be taken that respond to the heterogeneous distribution of the population and of natural resources. This will require coordinated networking at all regional levels, creating synergies consistent with the provisions of European directives and the laws of the Spanish state and of Catalonia.

This means improving the resilience of the regions and of economic activities and sectors against the impact of climate change, with a comprehensive, participative, and transparent approach that contributes to rolling out local and sectoral action plans,

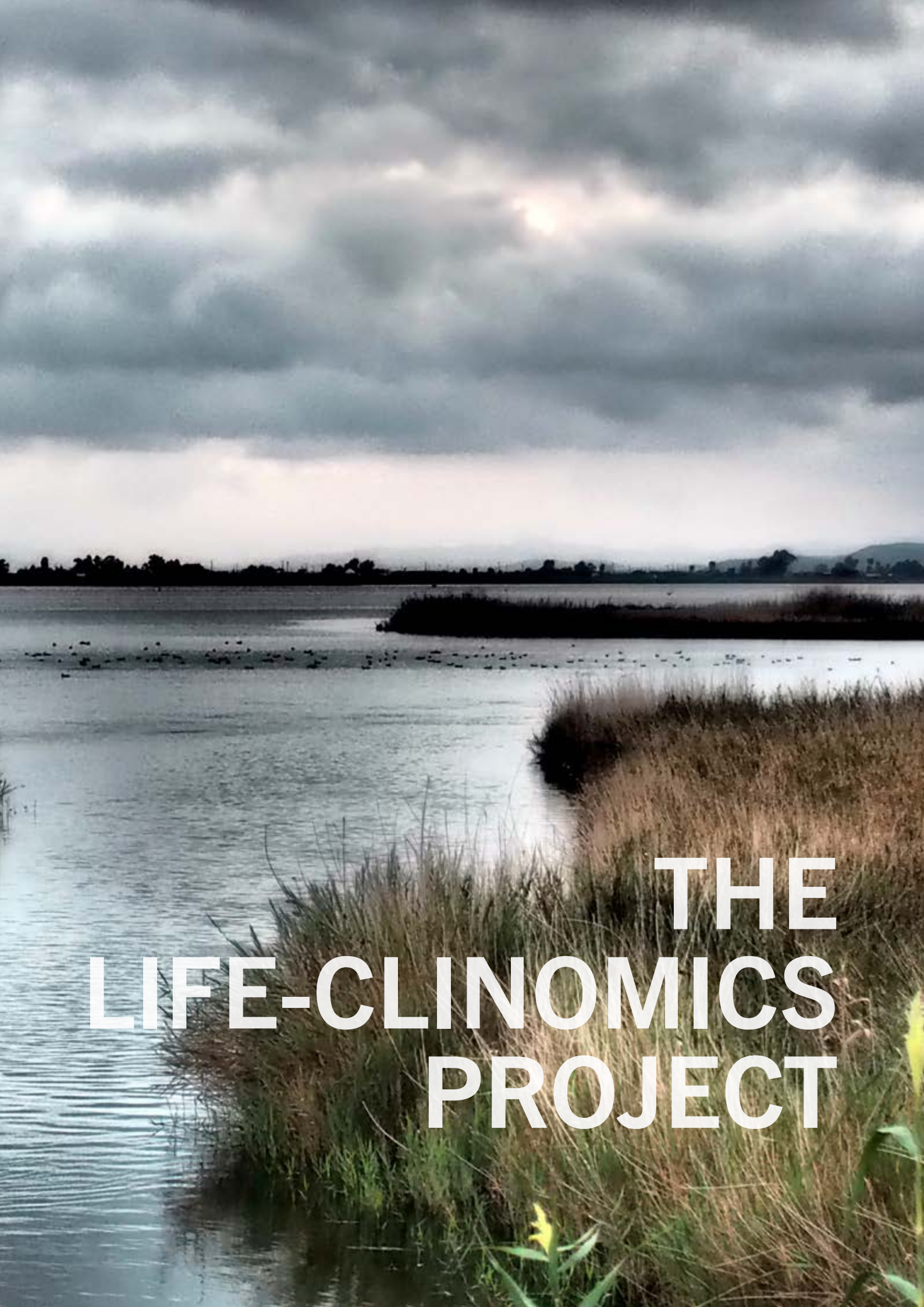
promoting new models of governance, promoting innovative fiscal tools, and defining urban and socioeconomic development based on the sustainable management of the natural resources available in each area.

Thus, in the framework of the **European project LIFE-CLINOMICS**, new mechanisms and processes of investment and governance have been developed—for public bodies, private companies from representative sectors, and social organizations—in order to increase the resilience and economic development of the regions and to improve the competitiveness of the different production sectors. In this process, the support of public bodies and institutions (especially at the municipal level), business, trade unions, and the farmers has been essential.

The project has involved the implementation of participatory bodies, the development of studies and technical documents with diagnoses and proposals, such as action plans and adaptation strategies, the design of new methodologic tools and the execution of pilot and showcase studies that generate knowledge, and of training courses to upskill the socioeconomic agents in the region and to raise the awareness of the society as a whole to act to the benefit of adaptation.

One of the main contributions of LIFE-CLINOMICS is the approach of a new model of governance that hinges on the Regional Climate Change Adaptation Boards (MeTACC), participatory bodies that bring together the business associations, public authorities, and social and economic agents of each region and sector. The role of the RCCAB is supplemented by the Sectoral Climate Change Adaptation Boards (MeSACC), or by more specific working groups, in order to promote specific actions in each economic sector.

The information gathered and the progress made with the implementation of the project have contributed to agreement on local socioeconomic policies and actions that must be promoted in order to deal with the coming new climate scenario and serve as a model that can be replicated in other Mediterranean areas in southern Europe with similar biogeographic and socioeconomic characteristics, especially the methodology used.



THE LIFE-CLINOMICS PROJECT

RETOS Y OBJETIVOS

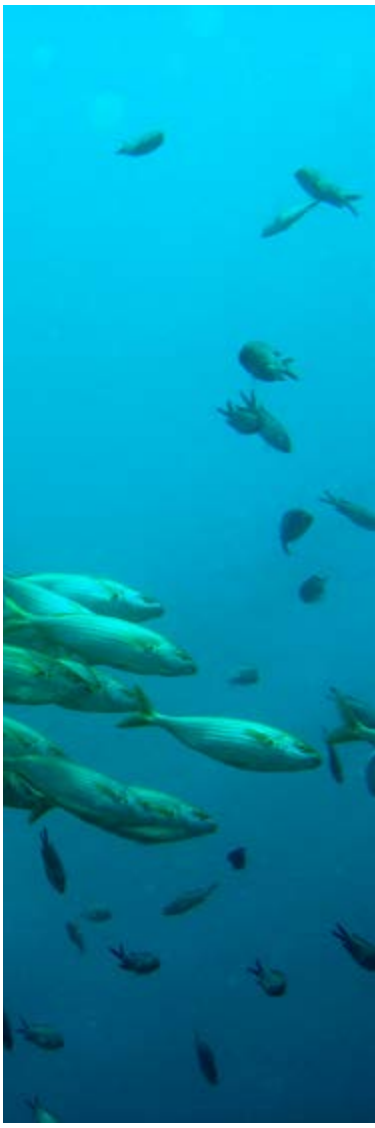
LIFE-CLINOMICS was implemented with the aim of putting climate change adaptation policies on the agenda at all levels of government, in a priority position that would put them on an equal footing with the mitigation efforts that are already being implemented.

LIFE-CLINOMICS has proposed new models of governance, participation, and funding to improve the ability to adapt and resilience at the local level and of socioeconomic sectors in the new climate scenario.

This has made it possible to drive, from the local, county, and supra-municipal level, new public and private investment strategies aimed at advancing with the modernization and transition of local economies, improving competitiveness and opening up new employment niches. It has put the strategy of adapting to climate change on the agenda and in the action plans of the different social and economic agents in the region

These challenges coincide with the **goals of the LIFE Programme**, which include the following:

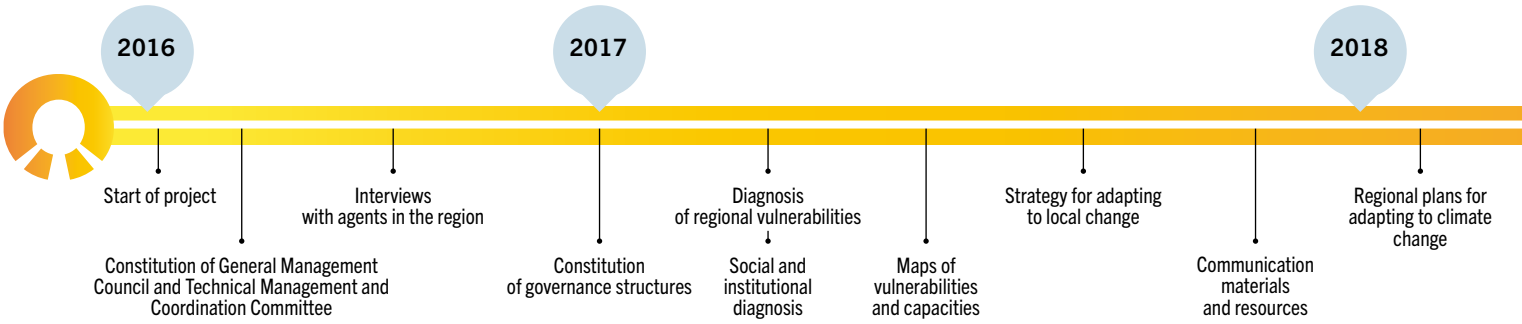
- Develop, with social participation, action plans for adaptation, creating the conditions to allow them to be materially and financially implemented in the medium term.
- Include climate adaptation in the agenda of local authorities and providing municipal governments with the necessary tools (extending participation in Mayors Adapt to Catalonia).
- Define a local planning model for adaptation to climate change, with governance included, which can be replicated in similar climatic regions.



- Create an appropriate framework that favours investment, public-private cooperation, competitiveness, and job creation.
- Promote actions that demonstrate adaptation with a cost-benefit analysis.
- Generate, gather, and transfer knowledge by applying and repeating methodologies of adaptation to change.
- Train the different agents so that they can apply the most economically and socially viable adaptation actions to their activities.
- Educate and raise awareness on the effects and risks associated with climate change. In particular, on the economic consequences of not adopting adaptive measures.

And, at a more local scale, the **objectives of the Catalan Strategy for Adaptation to Climate Change (ESCACC, in the Catalan acronym)**:

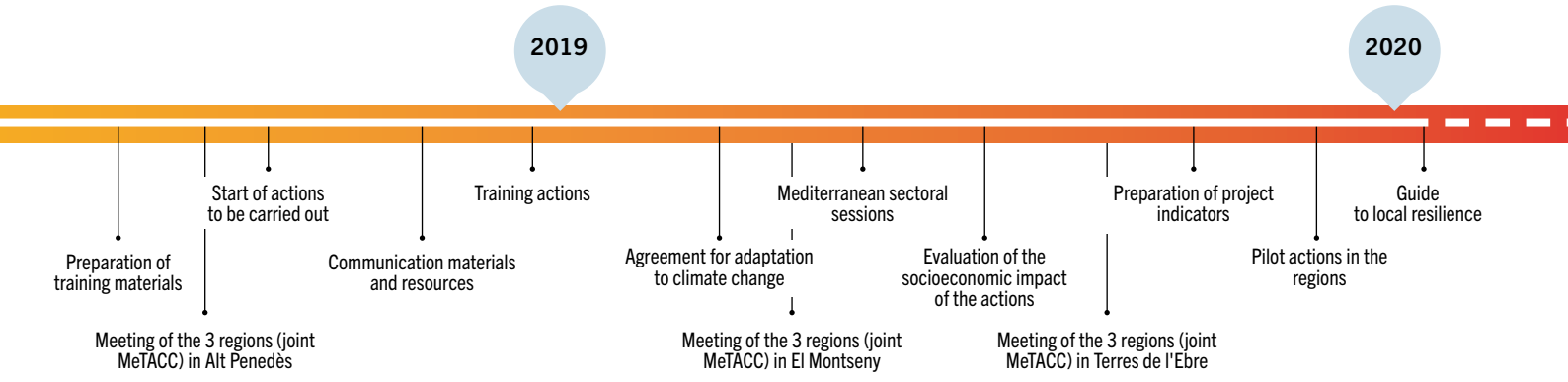
- Generate and transfer all existing knowledge on adaptation to climate change.
- Increase the potential for adaptation of the different sectors and/or systems by reinforcing resilience and reducing their exposure based on premises of social, environmental, and economic sustainability.



CLINOMICS AND THE LIFE PROGRAMME

The LIFE programme is the financial instrument of the European Union devoted to the environment, nature conservation, and climate action, and its goal is to apply policies for contributing solutions and promoting best practices and technological innovations to meet current environmental and climate challenges.

CLINOMICS falls within the LIFE *Climate Change Adaptation* programme and has the title of "Promoting resilience. Opportunities and challenges for the economy and local society in adapting to climate change" (LIFE15 CCA/ES/000102 LIFE CLINOMICS). Its final duration was four-and-a-half years (from June 2016 to December 2020), with a total budget of €1,392,349, 60% of which came from EU subsidies (€835,278). The rest was a contribution of the promoting partner, the Barcelona Provincial Government, and the beneficiary partners.



PARTNERS AND AGENTS

LIFE-CLINOMICS is a project based on participation and consensus. The partners were three entities of the regions where the projects actions were developed, one institution that provided knowledge on climate change, and four socioeconomic organizations that promoted actions in the different production sectors.

LIFE-CLINOMICS had the following partners, under the coordination of the **Barcelona Provincial Government**, which promoted the project and provided technical, financial, and technological support in the participating regions:

- The three **regional organizations** where the project actions were carried out:
  - Terres de l'Ebre Environmental Policies Consortium (COPATE) for the Terres de l'Ebre Biosphere Reserve.
  - Alt Penedès County Council (CCAP), for the Alt Penedès County.
  - Montseny Natural Park, for the Montseny Biosphere Reserve.

- One **knowledge institution**: the Catalan Climate Change Office (OCCC), which provided technical support in terms of climate change.

- Four **socioeconomic organizations** that promoted the different actions in the local production sectors:
  - Barcelona Chamber of Commerce (CCB).
  - Comissions Obreres de Catalunya (CONC).
  - Unió General de Treballadors de Catalunya (UGTCAT).
  - Unió de Pagesos de Catalunya (UPCAT).

Cambra de Comerç de Barcelona

Official Chamber of Commerce, Industry, Services and Shipping of Barcelona

The chamber promotes economic activities in Catalonia, specifically in the Barcelona region. It provides support for companies in terms of promoting sustainability in their production and business activities as an element of competitiveness, as well as on matters of the environment, climate change, and energy. In 2007, it promoted the creation of the Enterprise and Climate Foundation to collaborate with companies on the responsibility of dealing with climate change.

CCOO comissió obrera nacional de Catalunya

Trade Union Confederation of Commssió Obrera Nacional de Catalunya (CCOO)

The trade union organization responsible for the policies, strategies and instruments for environmental planning and management in the defense of workers' rights and welfare. It has extensive experience in carrying out community and awareness-raising actions on sustainability, climate change and occupational health in order to raise social awareness on these matters.

CONSELL COMARCAL ALT PENEDÈS

Alt Penedès County Council

The CCAP has two sustainability government structures: the county Agenda 21 and the Office of energy and the energy manager, which have driven the knowledge and the ability to manage adaptation to climate change by following a participatory methodology that includes all the agents in the region.

Terres de l'Ebre Environmental Policies Consortium (COPATE)

This entity is made up of the county councils of Baix Ebre, Montsià, Ribera d'Ebre, and Terra Alta. Its competencies are in waste management, sanitation, public hygiene, the natural environment, energy efficiency, and the Terres de l'Ebre Biosphere Reserve, and it collaborates with the region in adapting to the impacts of climate change.

Barcelona Provincial Government

The Barcelona Provincial Government is a local government body: 311 networked municipalities, 24% of the area of Catalonia, and 74.4% of the Catalan population. Essentially, it provides technical, economic, and technological support to the municipal governments so that they can provide quality local services in a more uniform manner throughout the region. It has led and taken part in different projects for preventing and adapting to climate change, including the following: Gesmopoli, Imosmid, Euronet 50-50, SeapPlus, Mayors in action, and Serpente.

Catalan Climate Change Office. Catalan Government (OCCC)

Technical instrument of the Catalan government for promoting and coordinating mitigation plans and climate-change strategies, in accordance with European commitments. It promoted the drafting of Law 16/2017 on climate change and drafted the Catalan strategy for adaptation to climate change (ESCACC, 2013-2020) to reduce the vulnerability of the regions and social and economic sectors most at risk, such as agriculture, health, tourism, forestry, and water management.

Unió General de Treballadors de Catalunya (UGT)

Trade union organization that carries out awareness-raising and environmental-education campaigns for workers to encourage their active participation in the environmental management of companies. It places adaptation to climate change on the path of the transition to an environmentally friendly development model of greater equality and solidarity from a social and economic standpoint.

Unió de Pagesos de Catalunya

This professional agricultural organization defends the professional and social interests of family farms. One of the areas in which it acts is that of climate-change impacts on the sector and the adaptation measures that can be encouraged. It was one of the parties to the participatory process of the Catalan strategy for adaptation to climate change and to the drafting of the Catalan climate-change law.

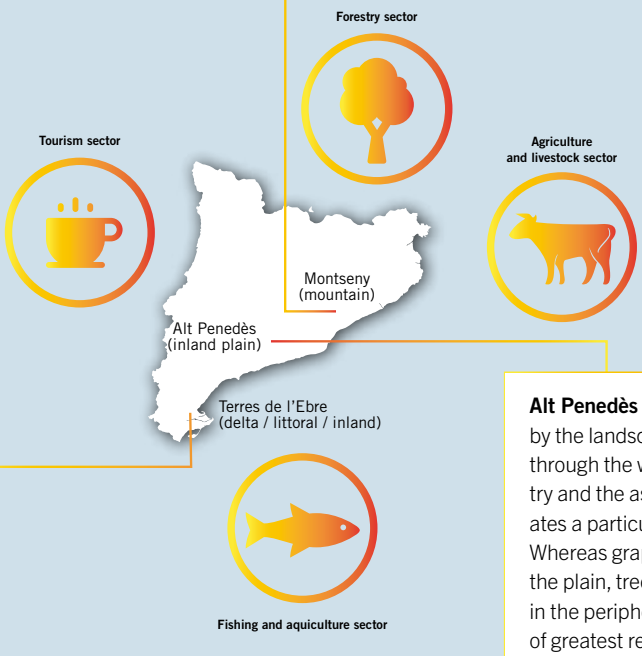
REGIONS AND SECTORS

LIFE-CLINOMICS analysed three regions of Catalonia with different biogeographic characteristics, and three (also different) economic and production sectors, in order to assess the impact of climate change and the capacity for resilience in different situations and conditions.

The three regional areas where LIFE-CLINOMICS took place were the **Montseny Biosphere Reserve, Alt Penedès County, and the Terres de l'Ebre Biosphere Reserve** (Baix Ebre, Montsià, Ribera d'Ebre, and Terra Alta). The three economic sectors assessed were **agroforestry and livestock, fishing and aquiculture, and tourism**.

These three territories provide a broad diversity of biogeographic situations and adaptation problems that are highly representative of the rest of Catalonia and of the Mediterranean geographic environment in general, which favours their applicability and repeatability.

The **Montseny massif** is situated between the Vallès, Osona and La Selva plains. The special relief of the terrain, the differences in altitude, and the distance from the sea in a Mediterranean latitude give rise to notable climate diversity. As we gain height, the climate goes from Mediterranean to cold mountain, with different intermediate stages that vary depending on the orientation of the slopes.



Terres de l'Ebre occupies the four counties of the south of Catalonia, coinciding with the final leg of the Ebro River. It has a total area of 367,000 ha, 80% of which is inland and the rest, maritime. It is a territory with high biodiversity, the result of highly varied relief and its geographic situation. In a relatively small space, one can go from the dunes of the Ebro Delta to the beech forests, some of the southernmost in Europe, on the Ports de Beseit massif.

Alt Penedès County is characterized by the landscape of vineyards, which, through the wine and cava industry and the associated clusters, generates a particular socioeconomic fabric. Whereas grape growing takes up most of the plain, trees and bushes predominate in the periphery of the county, in the areas of greatest relief, where the habitats are associated with fluvial spaces.

THE FORECAST FUTURE CLIMATE SCENARIO

According to the projections of the Third Climate Change Report Catalonia, there will be an increase in temperature over the coming decades, together with a slight reduction in precipitation, which will become more marked toward the middle of the century, with a higher probability of more intense rainfall and number and duration of droughts. According to the Annual Climate Indicator Bulletin of the Catalan Meteorological Service, the following have been observed over the past six decades:

- Air temperature: mean annual increase of +0.25°C/decade for the 1950-2014 period.
- Precipitation: slightly negative trend of -1.2%/decade (not statistically significant, except in the Pyrenees in summer, where it reaches -5%/decade).
- Variations in climate extremes, with an increased number of hot days and nights and a reduced number of cold days and nights.
- Increased duration of precipitation-free periods, mostly in the south of Catalonia.
- Sea level and temperature: increase at a rate of 0.3°C/decade, and of almost 4 cm/decade, with major consequences for the littoral region and marine ecosystems.

1. http://cads.gencat.cat/web/.content/Documents/Publicacions/tercer-informe-sobre-canvi-climatic-catalunya/TERCER_INFORME_CANVI_CLIMATIC_web.pdf

HOW TO INITIATE A PROJECT ON ADAPTATION TO CLIMATE CHANGE

INITIAL QUESTIONS

When starting a process of regional and sectoral adaptation to the effects of climate change, we can begin by asking several questions that will give us an initial framework within which to work.

Knowledge

What do we know about the effects of climate change in our region and/or sector? What are its specific characteristics? What makes it adaptable and what may make it vulnerable?

Training

How can we determine the impacts of climate change that may affect our economic activities? How can we train ourselves to be able to act?

Adaptation and resilience

How can we prepare to be less vulnerable to the effects of climate change? What adaptation measures have priority?

Fomenting action

How do we support the projects of businesses, owners, and authorities? What will the financial viability and yield of the investments be? How can we measure the changes and the success of the actions?

Participation and governance

How should we organize to manage adaptation as effectively and efficiently as possible? What tools will we need to acquire to help us with decision-making?

HOW TO INVOLVE THE DIFFERENT AGENTS OF THE REGION

SAMPLE QUESTIONNAIRES

QUESTIONNAIRE FOR THE MUNICIPAL COUNCILS

1 – Does the municipality have a current Agenda 21 (municipal environmental audit and action plan) or PALS? SI NO

1.1 – Is there an active participatory body associated with the Agenda 21/PALS? SI NO

1.2 – How often does this body meet, if it exists?

1.3 – What is the composition of this body?

2 – Does the municipality have a current action plan for sustainable energy (PAES)? SI NO

2.1 – Is there an active participatory body associated with the PAES? SI NO

2.2 – How often does this body meet, if it exists?

2.3 – What is the composition of this body?

3 – Does the municipality have a current action plan for adaptation to climate change (PACE)? SI NO

3.1 – Is there an active participatory body associated with the PACE? SI NO

3.2 – How often does this body meet, if it exists?

3.3 – What is the composition of this body?

4 – What are the main participatory experiences that have been carried out in recent years in the municipality (citizen participation in the areas of agriculture, forestry, tourism, or others)?

YEAR	PARTICIPATORY PROCESS	PARTICIPATION BODY/ MECHANISM	CURRENT (YES/NO)

QUESTIONNAIRE FOR THE SOCIAL AND ECONOMIC AGENTS OF THE REGION

1 – What is your level of knowledge on climate change and its effects? HIGH MODERTATE LOW

2 – Do you think that climate change may affect your activity in the region? POSITIVE NONE NEGATIVE DON'T KNOW

3 – Do you think that it is possible to adapt to climate change to reduce its negative effects? YES NO DON'T KNOW

4 – Do you think that your organization can provide valuable information and collaborate to implement actions for adapting to climate change? YES NO DON'T KNOW

5 – What is your level of interest in adapting to climate change?

6 – Do you form part of a regional or sectoral participatory body/structure? YES NO

7 – If yes, what participatory body or structure and how often does it meet?

8 – If a regional and/or sectoral board is created in your region as a body for participation and debate on adaptation to climate change for the benefit of the sector to which you belong (agriculture, livestock, forestry, tourism, etc.), would you be interested in taking part? YES NO DEPENDS

9 – What do you think your level of availability might be to participate in this board? HIGH MODERTATE LOW

10 – What type of participation ? IN PERSON ON-LINE MONTHLY QUARTERLY TWICE-YEARLY

11 – Do you think that participation in the project should be articulated by using the participatory bodies that already exist in the region ? YES NO DEPENDS

12 – Which body should it be?

13 – With which socioeconomic agents in the region do you have a relationship that you think may implement actions for adapting to climate change?

14 – Which agent in the region should be included in the project?

REGIONAL AND SECTOR DIAGNOSIS

SUPPORTING STUDIES AND INFORMATION

Scientific and technical knowledge makes it possible to promote more solid actions based on rigorous information. The environmental and socioeconomic diagnoses carried out in each CLINOMICS region were essential for proposing the most effective measures and action plans for adapting to the new climate scenario.

At the start of the work, different studies were carried out to provide a more thorough knowledge of the local and supra-municipal environmental, social, and economic situation. The goal was to have thorough, up-to-date information on which to base the most appropriate action plans and adaptation measures in terms of both the different regions and the economic and production sectors considered.

A diagnosis was therefore carried out of vulnerability and the effects of climate change in each area, taking into account climatic and biogeographic variables, the state of the natural systems and habitats, the planning and management tools available, existing protection figures in the main sectors of activity, and the potential natural risks, and cartography and accompanying graphic resources were drawn up.

The socioeconomic and institutional context was also analysed based on the information provided by the project partners in each region. This made it possible to identify and interview the key agents in each sector; that is, the people with a more strategic overall vision at the county and local level, and this, in turn made it possible to complete the knowledge available and promote participatory processes to involve the citizens and different sectors.

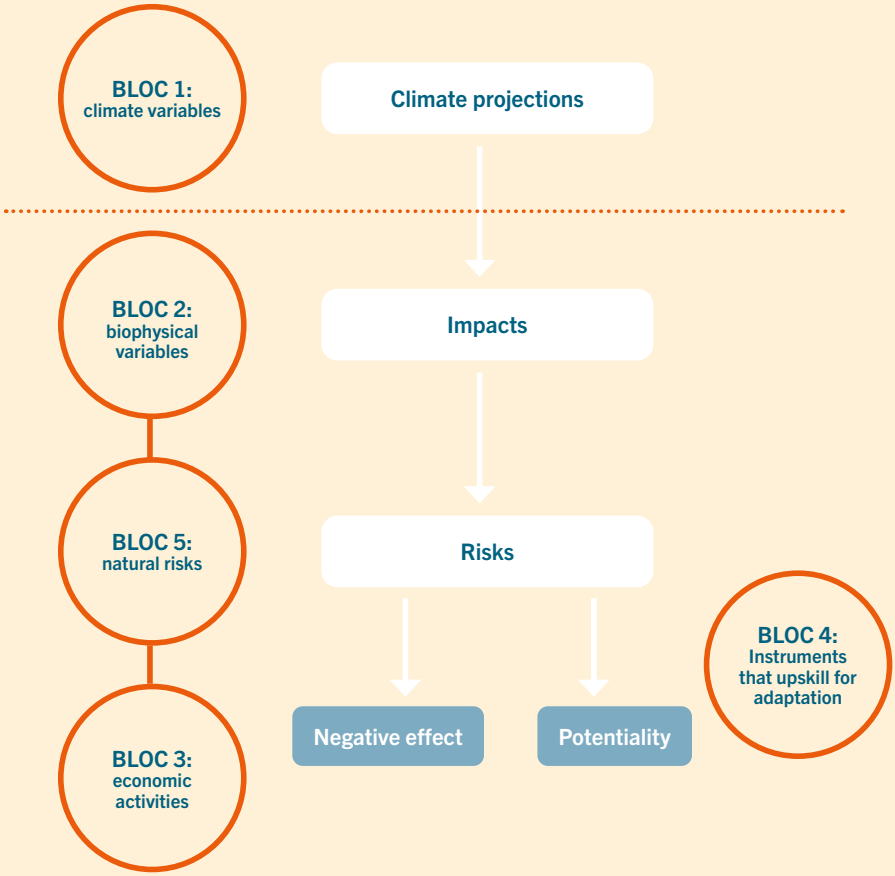
DIAGNOSTIC STUDIES AND REPORTS: http://lifeclinomics.eu/es/informes/

HOW TO PERFORM A REGIONAL DIAGNOSIS

THE STUDY APPROACH

The diagnostic documents drawn up in the framework of LIFE-CLINOMICS followed a similar structure, which is repeatable in the study of other regions.

The collection of the information comprised a total of five blocs:



HOW TO PROMOTE COLLECTIVE PARTICIPATION IN THE PROCESS

MAP OF AGENTS IN THE REGION

One of the purposes of the diagnostic effort is determining the social and institutional situation of the region, how existing structures fit with the dynamics of the project, and the best way to organize governance in the region.

The aim of this process is to facilitate participation and effective involvement of all local actors (linked to the region and its economic activities) who can play a major role in defining a strategy and an action plan for adapting to climate change.

When talking about mechanisms, bodies, and participation structures, it should be remembered that they are concepts that take a wide variety of forms, from not-for-profit associations and entities to public or public-private bodies, but they all share a common thread: using the participation of agents in decision-making.

MAP OF AGENTS IN THE REGION

AREAS	SUBAREAS	NUMBER OF AGENTS IDENTIFIED
Public sector	Local government County government Catalan government regional services Other public bodies	
Economic sector	Production sectors Service sectors Trade unions and employer sector	
Social sector	Neighbour sector Environmental sector	
Expert sector	Universities Research centres Observatories ...	
TOTAL		

ASSESSMENT OF RISKS AND VULNERABILITY

When assessing the vulnerability and adaptive capacity of the regions to climate risk, both quantitative and qualitative criteria have been taken into account, as well as the perception of the matter by the different sectoral agents.

The diagnosis of the level of risk of the three regions analysed in light of the effects of climate change at a local scale was carried out using different sources of information: the technical studies on the vulnerabilities of the public services and economic activities in each area, a review of the available literature, calculation of indicators of the risks for each sector and region, and the perception and knowledge of the different social and economic agents.

The vulnerability associated with each risk was calculated based on the three variables defined in the Catalan Strategy for Adaptation to Climate Change[2]:

VULNERABILITY

- **EXPOSURE**: presence of people, means of subsistence, environmental goods and services, infrastructure, and economic, social, or cultural assets in places that may be negatively impacted by climate change.
- **SENSITIVITY**: degree to which a system or sector is affected, whether adversely or beneficially, by stimuli linked to the climate.
- **ADAPTIVE CAPACITY**: inherent capability of a system or socioeconomic sector to adapt to the impacts of climate change, moderate potential damage, make use of opportunities, and deal with the consequences. Building adaptive capacity means developing the institutional ability to respond effectively to climate change.

These three variables form part of the following formula:

Vulnerability = [Exposure X Sensitivity] - Adaptive capacity

The greater the exposure and sensitivity to a specific risk (⬆),
the greater the vulnerability (⬆).
The greater the adaptive capacity (⬆), the lesser the vulnerability (⬇).

2. *Catalan Strategy for Adaptation to Climate Change (ESCAC).* Catalan Climate Change Office. Catalan Government. 2012 http://canviclimatic.gencat.cat/web/.content/home/actualitat/docs/escacc.pdf

HOW TO ASSESS THE LEVEL OF VULNERABILITY OF A REGION

THE RELATIONSHIP MATRIX

Climate Change How is the climate changing and how will it change?

Risks How will the changes affect the region and the sector?

Vulnerability Is it prepared to adapt to the changes?

To assess the degree of vulnerability, a matrix was developed that establishes the relationship between the expected impacts, the associated risks, and the effects on the local economic sectors. This matrix provides a summary of the situation in each of the regions analysed. The following information was recorded for each risk:

- **Change factors (impacts): temperature, precipitation/drought, sea level.**
- **Economic sectors in the region: agriculture/ livestock, forestry, fishing/aquaculture, tourism.**
- **Description of the risk.**

The matrix also facilitated defining the vulnerability indicators and the most appropriate sub-indicators of exposure, sensitivity, and response in each case .

This multicriteria methodology has proven to be extremely sensitive to the scale used to quantify the different parameters and indicators. The regional area of the intervention aimed for a balance between the geographic unit (though diverse or complex) and the availability of appropriate institutional frameworks for putting the action strategy into practice. That is, balance between the region as a natural space for the intervention and the regional scope of the administrative figure or entity that facilitates the intervention.

CRITERIA FOR ASSESSING THE VULNERABILITY OF THE SECTOR

SCORE	ASSESSMENT	
4	Very high	
3	Quite high	
2	Quite low	
1	Very low	

3. Description of indicators::
Study analysing the degree of vulnerability and resilience of the municipalities of Catalonia to climate change. Catalan Climate Change Office, 2018.
Study of the effects of climate change in El Montseny: diagnosis, impacts and vulnerabilities. Life-Clinomics project.
LIFE MEDACC project, adapting the Mediterranean to climate change. Cantos et al., 2016

AN EXAMPLE OF A REGIONAL VULNERABILITY MATRIX

RISKS		CHANGE FACTORS (IMPACTS)			ECONOMIC SECTORS				DESCRIPTION OF RISKS
		Temp.	Precip./ Drought	Sea level	Agriculture/ livestock	Forestry	Fishing/ aquac.	Tourism	
1	Changes in the type of crops								
2	Changes in plant productivity								
3	Changes in irrigation requirements								
4	Changes in crop distribution								
5	Changes in livestock farms								
6	Increased risk of forest fires								
7	-								
8	-								
9	-								

HOW TO MEASURE THE IMPACTS OF CLIMATE CHANGE ON THE REGION

EXAMPLE OF LIFE-CLINOMICS VULNERABILITY INDICATORS

Generic indicators

- Increased need for irrigation in agriculture (AGR01).
- Changes in crops (AGR03).
- Increased risk of fires in the agricultural sector (AGR02).
- Increased risk of fires in forest management (FOR01).
- Reduced availability of water in forest management (climate impact: increase in temperature) (FOR02).
- Reduced availability of water in forest management (climate impact: drought) (FOR03).
- Changes in the pattern of demand due to tourism in water management (AIG01).
- Changes in the pattern of demand due to tourism (TUR01).
- Increased mortality associated with heat (SAL01).
- Reduced climate comfort (accentuation of the heat island phenomenon) on health.

Indicators specific to El Montseny

- Changes in the type of livestock farms (CLINram).
- Changes in the distribution of species of interest to forestry (CLINbosc).
- Reduction of pasture areas (CLINpast).
- Risk of loss of biodiversity (CLINbio).
- Risk of increased number of invasive species (CLINexo).

Indicators specific to Alt Penedès

- Loss of scenic landscape quality (CLINqual).
- Reduction in the quantity of underground water (CLINquai).

Indicators specific to Terres de l'Ebre

- Rainfed crops affected (CLINsec).
- Effect on rainfed crops analysed (CLINsec1).
- Rise in sea level: Delta and littoral region (CLINmar).
- Rise in sea level: fishing ports (CLINmar1).
- Loss of beaches (CLINplat).
- Health affected by heatwaves (CLINsal).
- Effect on aquaculture (CLINaqüi).

THE SITUATION BY TERRITORY

TERRES DE L'EBRE BIOSPHERE RESERVE

The degree of vulnerability of Terres de l'Ebre to climate change is high in the agriculture and livestock sector, low in forestry, and moderate in the fishing and tourism sectors; in terms of public health, vulnerability is also moderate. The social and institutional potential to increase resilience exists but strategies and mechanisms are required that can maintain motivation and involvement throughout the entire project and attract new, important agents.

The region and the expected climate impacts

Terres de l'Ebre consists of the four southernmost counties of Catalonia: Baix Ebre, Montsià, Ribera d'Ebre, and Terra Alta. Together, they cover an area of 3308 km^2, distributed over a total of 52 municipalities. It falls within The climate is Mediterranean and most of the region is characterized by a semiarid climate (littoral and inland). In the mountains of Tivissa, Cardó, and the area in contact with the Ports massif, there is a dry-subhumid climate, a subhumid climate in the Serra de Llaberia mountains and in the lower areas of the Ports massif, and a humid climate in the higher parts of Els Ports.

The variation in the mean annual temperature at the Ebro Observatory in the period from 1905 to 2015 shows a similar pattern to that of Catalonia as a whole, with an increase in temperature, especially from the 1970s.

Climate forecasts indicate that the temperature will increase significantly, which will lead to an increase in evaporation/transpiration, whereas precipitation will fall, leading to a reduced availability of water in the soil. More frequent and more intense extreme weather events, such as droughts and torrential rains are also expected, which may affect soil coverage, especially on cultivated land.

This new climate situation will change the landscape, especially where there is a large presence of natural plant coverage. In some cases, the change may involve a loss of scenic landscape value.

THE AGRICULTURE AND LIVESTOCK SECTOR

Context

The area of cropland is more than 40%, most of which is found in the Baix Ebre-Montsià plain and in the Baix Ebre littoral region. Olives are the main crop, accounting for 40% of cultivated land, but there are also citrus trees in the southern counties, following the course of the Ebro River, grapevines, and non-citrus rainfed fruit trees (almonds) in Terra Alta, olives and irrigation non-citrus fruit trees (soft fruits) in Ribera d'Ebre, and rice in the delta region.

The number of farms has fallen over the past 30 years, although the mean area of cultivated land has increased. Thirteen percent of the active population works in agriculture, well above the mean for Catalonia as a whole.

Livestock farms have seen a drop of 86% since the 1980s. Poultry and, especially, pigs are the main sectors.

Risks and vulnerabilities

The overall vulnerability of the **agricultural sector** is high due to the involvement of rainfed crops, the reduction in availability of water for irrigation crops, and the water demand from new support irrigation. The most fragile crops are those in the Ebro Delta, such as rice, due to the retreat of this area caused by rising sea levels and subsidence, which has been exacerbated by the lack of new river sediments.

The rainfed crops in Terra Alta (grapevines and almond trees) present another vulnerability due to the reduction and irregular distribution of rainfall, although this can be reduced by the implementation of more efficient irrigation techniques or the introduction of species and varieties better adapted to the new climate scenario.

With regard to **extensive livestock farming** and despite the expected alteration of the rainfall regimen, vulnerability is low, as it is not an economic activity of major importance. Potentiating this activity may contribute to reducing the risk of forest fires, as it would reduce the volume of undergrowth.

It should be mentioned, however, that an increase in mortality, miscarriages, and stress in the animals due to the increase in temperatures is being detected; this will mean having to make considerable investment in more efficient cooling and water-use systems and techniques.

THE FORESTRY SECTOR

Context

Forested land accounts for almost 50% of the total surface area, with a predominance of Aleppo pine and matorral. More than 80% of public lands have approved instruments for forest management, although most forested land is privately owned and generally does not have management plans.

Risks and vulnerabilities

Overall, the sector has a low vulnerability, as the activity is not of major importance. Nevertheless, it is deemed to be moderate-to-high in terms of risk of forest fire and loss of biodiversity, especially in the case of species that are more sensitive to increased temperatures and reduced rainfall, such as pines, beech, Portuguese oak, and riverside plants. Improved management of habitats and the development of forestry plans would contribute to reduce this vulnerability.

Of note is the potential use of biomass as an energy resource, which would minimize the risk of fires and contribute to mitigating emissions of greenhouse gases.

THE FISHING AND AQUACULTURE SECTOR

Context

In the littoral zone of Terres de l'Ebre, there is intensive fishing and aquaculture activity. There are 5 fishing ports and 6 fishing guilds. The fishing vessels account for one-quarter of the Catalan fleet and one-fifth of the total catch.

The aquaculture facilities are concentrated offshore of Sant Carles de la Ràpita and El Montsià. The mussel farms are found in the bays created by the Punta del Fangar and Punta de la Banya points.

Risks and vulnerabilities

This is a moderately vulnerable sector, especially in the case of aquaculture in the Ebro Delta, as it may be affected by the morphological changes of the shoreline. This would lead to heating and eutrophication of the water, phenomena that will affect species mortality and the size of individuals. Unfortunately, the adaptive capacity of the sector will not be able to reduce its vulnerability, as the measures that would need to be taken are beyond its scope and potential for action.

In the open sea, fishing has moderate-to-low vulnerability, as the species have a greater capacity to adapt, although it is a sector that is also subject to other impacts, such as water pollution and overfishing.

THE TOURISM SECTOR

Context

Sun-and-sand tourism is a major part of the economic activity of Terres de l'Ebre. A large part of the accommodation is concentrated on the coast and there is also rural accommodation in the Ports and Delta natural parks. Since 2013, the number of overnight stays has stabilized at around 1.35 million per year.

Risks and vulnerabilities

The sector has moderate vulnerability thanks to its adaptive capacity: variations in the seasonality of visits, improvements in the efficient use of water, environmental certification of companies, rethinking of tourist products, and changes in promotion strategies.

Sun-and-sand tourism, however, will be affected by the rise in sea level and heatwaves, and the adaptation measures to be taken will only be palliative (regeneration of beaches, investment in cooling systems in establishments, etc.), but the activities that take place in the delta will be especially affected due to the reduction of the area, subsidence, and rising sea levels.

The greater presence of insect pests such as mosquitos and black fly may also affect the comfort of visitors.

Summary of challenges and opportunities in Terres de l'Ebre

SECTOR	CHALLENGES	OPPORTUNITIES
Agriculture and Livestock	Avoid the effects on crops and other activities due to the morphologic changes in the Ebro Delta	Implementation of more efficient irrigation techniques
	Improve management of the water cycle - ensure quality water resources	Changes in the type of crops/varieties
	Manage and improve the conditions of intensive livestock - more efficient farms	
Forestry	Manage the risk of fire - forest management	Potential use of forest biomass
	Prevent loss of biodiversity	
Fishing and aquiculture	Avoid the effects on fishing due to due to the morphologic changes in the Ebro Delta, the increase in water temperature, and other impacts deriving from climate change	
Tourism	Minimize impacts due to rising sea levels - loss of coastline - morphological changes to the shoreline	Possible change in seasonality
	Control of invasive and/or pest species	Sector sensitive to environmental certifications
	Improve management of the water cycle - ensure quality water resources	Redefinition of tourist products
	Maintain quality and richness of landscape	
	Minimize the impacts on people's health	

EL MONTSENY

The degree of vulnerability of El Montseny (Biosphere Reserve) is moderate-to-high in the forestry and tourism sectors, and moderate-to-low in the agriculture and livestock sector, thus requiring a major adaptation effort. The social and institutional potential for improving resilience is notable, as there is interest, motivation, and important public and private agents prepared to work on it.

The region and the expected climate impacts

El Montseny has been a UNESCO Biosphere Reserve since 1978. In 2014, approval was given to expand the range of the reserve, together with zoning and the management plan. It occupies a total area of 50,166 hectares (core, buffer, and transition zones) and has nearly 52,000 people in 18 municipalities. The park has been accredited since 2011 with the European Charter for Sustainable Tourism.

In the littoral/pre-littoral region of Catalonia where El Montseny is located, a mean annual temperature increase of 0.7°C is expected for the current ten-year period (2012-2021), whereas in the middle of the century (2031-2050) the mean annual increase will be 1.4°C. The increase in temperature is expected to be more notable in summer and more moderate in winter and spring.

As a result of climate change, a loss of the cover associated with agricultural and livestock activities is expected, which will evolve toward forest cover. A retreat of deciduous forest is already being observed, together with an increase in the higher limits in the distribution of Mediterranean forests. A reduction in the area of subalpine meadows is expected. The expected changes in soil cover may affect species of flora and fauna of interest to conservation in the Montseny Natural Park, some of which are endemic.

THE AGRICULTURE AND LIVESTOCK SECTOR

Context

The usable agricultural area is made up of 62% cultivated land and 38% pasture, although the amount of land dedicated to crops has fallen in recent years. The main crops are currently rainfed cereals (71%), although there are also irrigation cereal crops (17%) and small areas of grapevine, fruit trees and olive trees.

Livestock has intensified, especially pigs and poultry, and more than 40% of pasture is used by cattle.

Risks and vulnerabilities

The main risk of the sector is abandonment of activities due to the loss of economic viability of farms, which will mean the gradual replacement of the cover associated with agriculture and livestock by forest. Other risks are a higher incidence of diseases and pests, and the increased cost of feed due to the loss of summer pastures.

Nevertheless, it is possible to promote livestock practices that contribute to mitigating the effects of climate change and favouring adaptation, with a more comprehensive vision of the agricultural-forest-pastoral system and the production-distribution-consumption cycle. Also, given that ruminants (cows, goats, and sheep) have a better tolerance for the increase in temperatures than pigs and poultry, this may favour livestock farming adapted to these species, which would also be more environmentally sustainable.

THE FORESTRY SECTOR

Context

Silviculture is one of the most important activities in El Montseny. Some 70% of the natural park is occupied by forest, which has remained very stable over recent decades and is not expected to vary much in the future. The main forests consist of Portuguese oak, beech, oak, and cork oak.

Risks and vulnerabilities

The increase in temperature and reduction in rainfall will exacerbate the risk of fire and the effect of pests and disease, risks that may be potentiated by the abandonment of forest management due to its poor economic viability and the lack of recognition of the value of forestry products and services.

A reduction is expected in the areas occupied by deciduous forest (beech, oak, chestnut, and riverside forest) and by silver fir forest, the upper limit of beech forest is expected to increase and there will be a loss of subalpine meadows. The areas where beech will not be able to survive will be occupied by Portuguese oak.

Improved forest management may favour the resistance of certain species to drought, and the fact that the Portuguese oak and cork oak will climb higher up the mountain opens up the possibility of maintaining the cultivation of both species. Certain secondary forestry products (such as cork, pasture, and pine nuts) may continue to contribute significantly to income in the rural setting where these species survive. Forest managers also indicate that, depending on how the forests are managed, it may even be possible to improve the water cycle and have greater availability of water.

THE TOURISM SECTOR

Context

Tourism in the park is essentially linked to the values of nature, landscape diversity and the associated biological wealth.

Risks and vulnerabilities

The increase in temperature and the reduction in water resources are the main factors that will affect the sector and associated values, as they will have a negative effect on the quality of the landscape, the risk of fire, biodiversity, and agricultural and livestock activity.

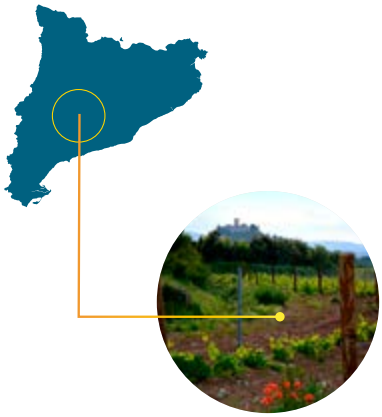
Nevertheless, the loss of climate comfort may be an opportunity for breaking with the seasonality of visits and the consolidated existence of associations in the sector may favour adopting adaptation measures. The European Charter for Sustainable Tourism also lists El Montseny as an optimum site for promoting this type of action.

Summary of challenges and opportunities in el Montseny

SECTOR	CHALLENGES	OPPORTUNITIES
Agriculture and Livestock	Prevent abandonment of agricultural and livestock activities	Promote livestock practices that favour adaptation
	Prevent increased damage due to the greater incidence of disease and pests - pest effect	The role of RBM-PN in regulating small activities
	Prevent the loss of summer pastures	Comprehensive vision of the agricultural-forest-pastoral system and the production-distribution-consumption cycle
	Manage the risk of fire	Promote agricultural and livestock practices that reduce the risk of forest fires
Forestry	Prevent the abandonment of forest management—valuation of products and services	Promote the drought resistance of some species - forest management
	Manage the risk of fire	The LIFE Newt project to improve riverside habitats
	Foresee and reduce the effect of pests	Secondary forestry products to maintain incomes in the rural setting
		Associations in the forestry world
Tourism	Maintain quality and richness of the landscape	Promote agricultural and livestock activity
	Improve management of the water cycle - ensure water resources	The LIFE Newt project
	Manage the risk of fire	The loss of climate comfort in coastal areas, breaking of the seasonal pattern of visits to El Montseny
	Prevent reduction of biodiversity	European Charter for Sustainable Tourism to drive the adaptation of tourist activity
		Associations in the tourism sector

ALT PENEDÈS

The degree of vulnerability of Alt Penedès iis high in the forestry sector, moderate in agriculture, and low in livestock farming and tourism. The social and institutional potential for improving resilience in the region is high and consolidated, and the different public and private agents are prepared to work on it.



The region and the expected climate impacts

The Alt Penedès county is bordered by Anoia, Baix Llobregat, El Garraf, Baix Penedès, and Alt Camp. It has an area of 592.41 km^2 and a mean elevation of 216 metres above sea level. The population is approximately 106,000 inhabitants, distributed in 27 municipalities. The climate is southern littoral Mediterranean in a large part of the country and southern and central pre-littoral in the northern mountains.

Since 1950, an increase in temperature of 0.26°C per decade has been observed at the Vilafranca del Penedès weather station, which is higher than the overall increase for Catalonia (0.23°C). The number of hot days has also increased.

In the littoral/pre-littoral zone, an increase in the mean annual temperature of 0.7°C is expected by 2050 compared to the 1970-2000 period. A reduction of 1.5% per decade in precipitation has been detected, which is the same as the overall value for Catalonia.

THE AGRICULTURAL SECTOR

Context

The usable agricultural area is made up of 95% cultivated land, almost all rainfed crops, and 5% pasture. The county's landscape is dominated by grape growing, which occupies 81% of cultivated land. The wine and cava industry and the associated clusters generate a particularly important socioeconomic fabric. Most crops in the country are rainfed (99%) and grapevines occupy most of the plain.

Over the past 30 years, the number of operations has fallen by 44% but the cultivated area has fallen by only 5%.

Risks and vulnerabilities

The overall vulnerability of the sector is moderate. While it is high in terms of the amount of water and the reduction in the number of vineyards, the adaptive capacity of the sector is good, especially regarding the results obtained in indicators such as changes in the productivity of this crop.

New agronomic and enological techniques, reintroduction of old varietals, and the promotion of varietals that are adapted to warm climates may palliate the effects on wine production and quality due to drought.

THE LIVESTOCK SECTOR

Context

The livestock sector has a very small presence in the county, in comparison with agriculture. Some 95% of usable agricultural area corresponds to cultivated land and only 5% is pasture. Of the 232 livestock farms, a large part are poultry farms.

There have been experiments with livestock practices linked to forest management (cleaning undergrowth and prevention of fires using herds of goats).

Risks and vulnerabilities

The overall vulnerability of the sector is low due to the reduced presence of this activity in the county, especially in comparison to agriculture. It is also low due to its adaptive capacity, as breeding of *gall negre* chickens, which has become consolidated as a quality livestock operation, may also increase recovery of practices linked to forest management.

THE FORESTRY SECTOR

Context

More than 94% of forest area is privately owned, which makes comprehensive management difficult. The most biodiverse areas of trees and bushes predominate in the periphery of the county, and in the areas of greatest relief, they are associated with fluvial spaces, although the variety of species is generally low. Approximately 21% of the area is under the protection of the Plan for Spaces of Natural Interest or the Nature 2000 Network (mainly the Ordal mountains and the Foix, Olèrdola and Garraf parks).

There are 41 forest management plans in force in 14 of the 27 municipalities, which cover some 5000 hectares—18% of the forested area.

Risks and vulnerabilities

This sector is considered to be the most vulnerable of the four sectors analysed, especially due to the risk of fire and the reduction in the flow of water courses. It will therefore be necessary to manage forest areas with a view to the long term in order to facilitate the regeneration of the forests and reduce their vulnerability to fire and drought. Cleaning undergrowth and using the biomass, combining forestry products and vine waste, would also contribute to achieving these goals.

THE TOURISM SECTOR

Context

The tourism sector is promoting different tourist projects and products based around sustainability, like circular walking or cycling routes, and wine tourism. The Enoturisme Penedès companies are associated with the Biosphere mark, which provides new production and consumption models that promote the respectful use of the region and its patrimony. Rural tourism places in the county have doubled in the past 10 years.

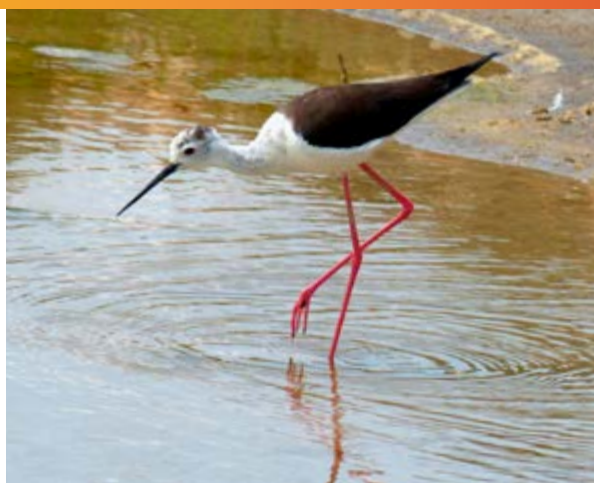
Risks and vulnerabilities

The overall vulnerability of the sector is low. The change in seasonality of visits, the proximity of the cities of Barcelona and Tarragona, the tourism products linked to the sustainable development of the region, and the potential of wine-tourism routes give the sector good adaptive capacity.

Summary of challenges and opportunities in Alt Penedès

SECTOR	CHALLENGES	OPPORTUNITIES
Agriculture and Livestock	Manage changes in the distribution of arable areas	Changes in the type of crops
	Improve management of the water cycle - ensure quality water resources	Changes in grapevine productivity (and in other crops)
	Prevent loss of biodiversity	Changes in management and in growing techniques due to climate change
	Prevent the disappearance of extensive livestock farming	Traditional agricultural-pastoral practices
Forestry	Reduce the risk of depletion of water flows in rivers and seasonal rivers	Potential use of forest biomass and grapevine waste
	Longer duration of summer minimum levels	
	Manage forested areas - risk of fire	
	Prevent loss of biodiversity	
Tourism	Maintain quality and richness of the landscape	The loss of climate comfort in coastal areas, breaking of the seasonal pattern of visits to the county
	Manage the variation in the tourism load	Tourist products: wine tourism, culture, sport, animal migrations, seasonal variation
	Manage the risk of fire	
	Prevent loss of biodiversity	
	Underestimating risks, which may be a risk in and of itself	

LOCAL ACTION FOR ADAPTATION



GOVERNANCE AND PARTICIPATION

To meet the challenge of adapting to climate change, a new model of participatory and inclusive governance has been promoted, in order to give more voice and decision-making capacity to the different regional and sectoral agents in terms of defining and applying measures. It is essential to train the people involved in the different regional areas and sectors so that they can act in accordance with the priorities, strategies and measures agreed in the action plans.

One of the main contributions of LIFE-CLINOMICS is a new model of governance that hinges on the **Regional Climate Change Adaptation Boards (MeTACC)**. These are participatory bodies that bring together the business associations, public authorities, and social agents of each region in order to collectively move forward on improving resilience and ability to adapt from an operative and executive perspective. Guaranteeing its continuity over time and promoting the repeatability of the model in Catalonia as a whole and in other Mediterranean regions is one of the challenges of this process.

The role of the RCCAB is supplemented by the **Sectoral Climate Change Adaptation Boards (MeSACC)**, or by more specific working groups, in order to promote specific actions in each economic sector. The MeSACC, therefore, operate in parallel to the MeTACC, which is why forums and working groups must include periodically matters relating to adaptation to climate change and pass on the conclusions to the corresponding regional board. In the other direction, the MeTACC can also bring different elements of discussion or analysis to the sectoral boards.

As the action plans implemented in each region contribute new knowledge, the role of both boards is redefined, transcending the participatory bodies and in collaboration with a supra-municipal (and even supra-county) authority, which becomes the **managing body**. The organization chart of each managing body will have to acknowledge and provide resources for its functions as a technical and

management office of the MeTACC, favouring the participation of as many agents from the region as possible. At the same time, they reinforce the links between the MeTACC and regional action to ensure the greatest success of the measures adopted.

As well as being the principal participatory and governance bodies, the MeTACC and MeSACC carry out a role in training the different agents involved in the project, bringing them the knowledge generated by national and supranational experts and institutions. This process of knowledge-transfer and training, which showcases networked action, is carried out through training sessions and activities in the different regions.

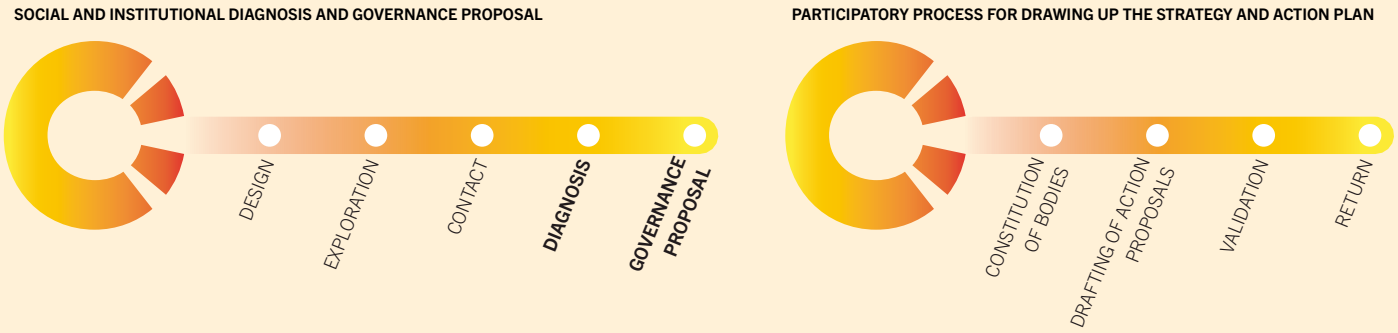
The MeTACC and its working groups will be linked to the **Agreement of Mayors for Energy and the Climate**, as the replicability of the MeTACCs is a driver for reinforcing actions on mitigating emissions of greenhouse gases and adapting to the new climate context. The current figure of the local development agent (LDA) provides the opportunity to reinforce this ability to act by making use of the resources already available.

THE ROLE OF THE EXPERT GROUP

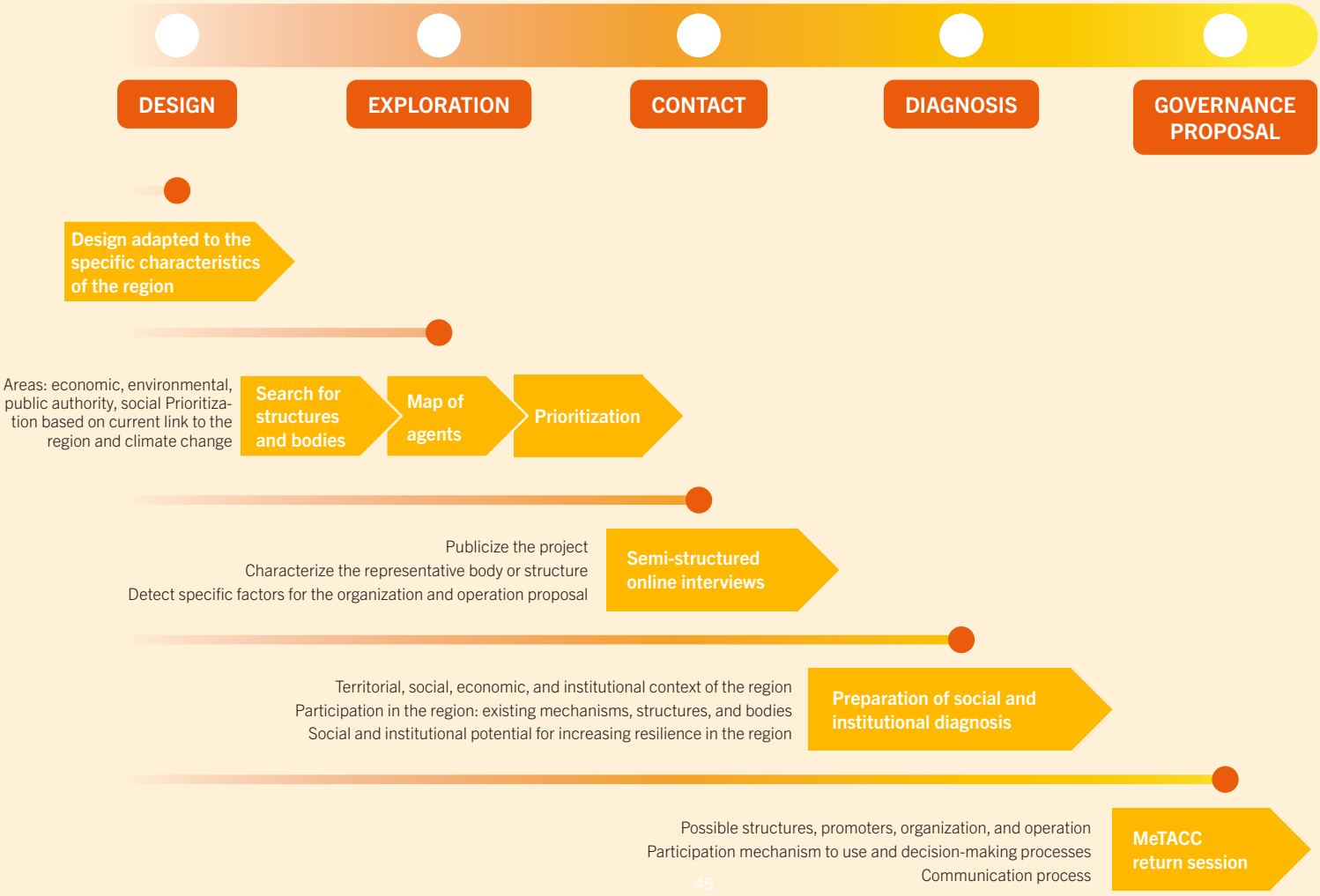
The Expert Group created in the framework of the LIFE-CLINOMICS project is one of the instruments for providing quality and scientific assurance for the processes of adapting to climate change. It periodically assesses the degree of resilience achieved in the different regions and sectors.

HOW TO APPROACH A GOVERNANCE PROCESS

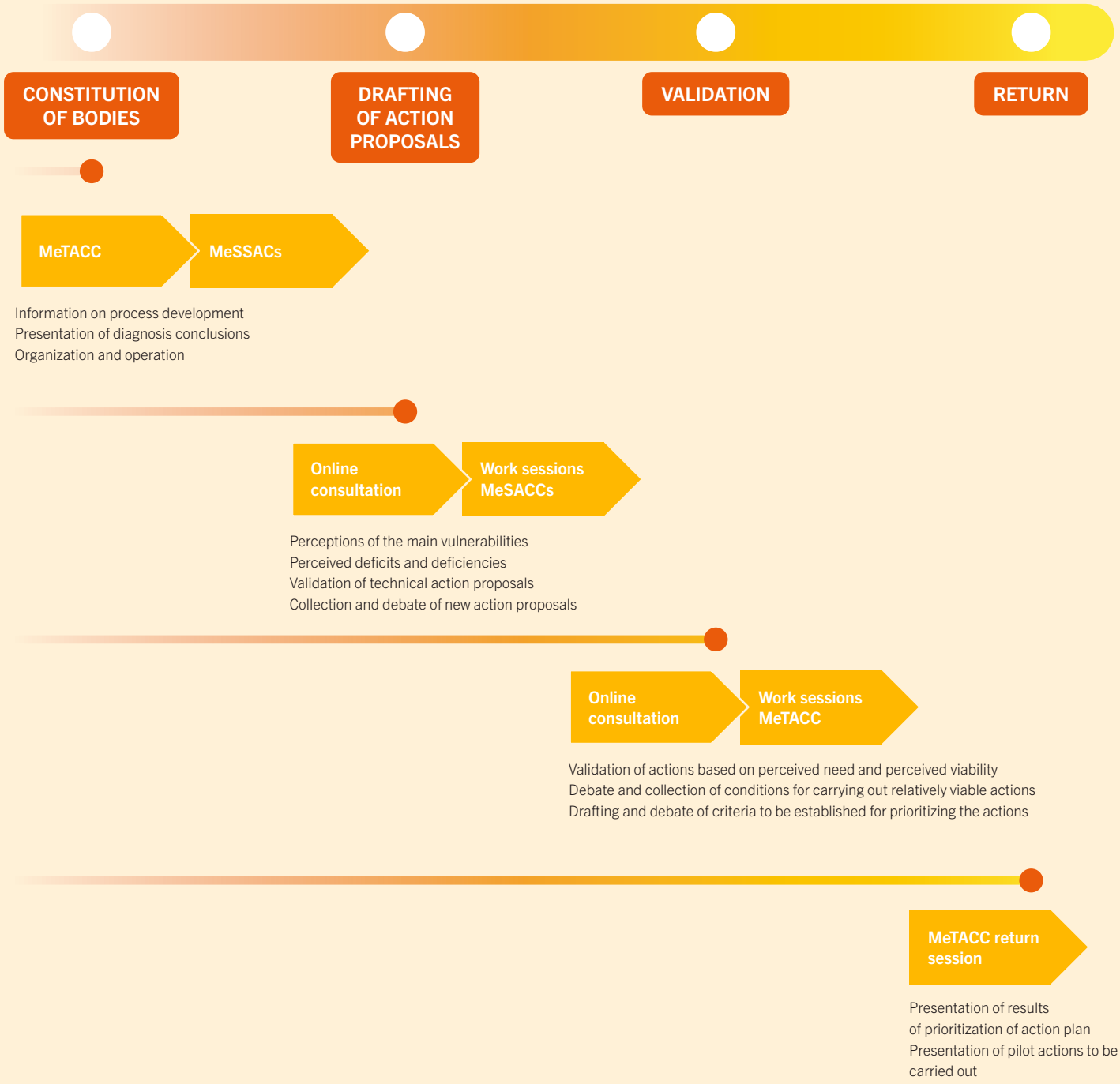
The governance process can be designed in two phases: the first phase involving designing the proposal and the second phase in which the participatory process is constituted through the MeTACCs. The general outline may be as follows:



SOCIAL AND INSTITUTIONAL DIAGNOSIS AND GOVERNANCE PROPOSAL



PARTICIPATORY PROCESS FOR DRAWING UP THE STRATEGY AND ACTION PLAN



HOW THE TERRITORIAL BOARDS WORK

The Regional Climate Change Adaptation Boards (MeTACC) are...

To ensure that the decisions of the MeTACC are carried out, they are given sufficient institutional capacity to become a valid interlocutor for the local governments and for competent higher-level governments or those that have the resources to implement the proposed actions.

In terms of organization and operation, they use a mixed model with a stable core or driving group, and an open and flexible structure. There is a formal group of members who have stated their commitment to belong to the MeTACC, either in representation of the different social or regional agents, or in an individual capacity, although different participants are called to each meeting, depending on the topic.

The number of sessions and actions are established by the schedule for implementing the planned actions and their follow-up and evaluation. A predetermined annual schedule with two or three plenary sessions is considered to be sufficient.

PUBLIC-PRIVATE COOPERATION

In the current climate of uncertainty and long-term unpredictability, actions for adapting to climate change must follow a new logic of political decisions and decisions based on cooperation between public and private institutions and organizations.

The strategies and measures for mitigating emissions of greenhouse gases already form part of the agenda of businesses and institutions, often because they are linked to savings and efficiency measures, with an economic yield and rapid amortization of the investments made.

In the case of climate adaptation actions, however, the return on investment tends more toward the long term, which means that the interest of the private sector is less. The challenge, therefore, is to overcome the barrier of the perception of uncertain results compared to the immediate cost of implementing certain measures.

The conditions of the current economic climate also do not facilitate a drive to take necessary adaptation actions, so that awareness must be raised among the different local agents regarding the opportunities that derive from them by stimulating their complicity and a proactive attitude, especially among those with the ability to invest—businesses and public authorities.

Public authorities must see as strategic the promotion of agreements to develop financial instruments aimed expressly at climate adaptation: from specific insurance policies for the different economic sectors for predicting or reducing the economic impact of the risks, to financing formulas for private activity aimed at making investments and carrying out actions to reduce their vulnerability.

Corporate social responsibility actions or commitments to sustainability are, in many companies and organizations, an opportunity to incorporate this type of action, provided that the calculation of the return

THE INVOLVEMENT OF ETHICAL BANKING AND THE INSURANCE SECTOR

Having the proactive accompaniment of the ethical banking and insurance sectors makes it possible to ensure that the plans and investments are carried out, and to build a climate of trust between these sectors and the promotors of the adaptation actions, whether public or private.

While the insurance sector has begun to include the climate change variable, it requires a more structural focus and one that is less context-driven or based on the risk to be covered. This is especially important in the agricultural sector, where climate risks will become a regular factor to be taken into account. At present, insurance companies do not have premiums that take into account adaptation to climate change as such.

on investment includes the concept of the externalities and other methodological instruments of the environmental economy, as well as new models of economic returns and cost-benefit analyses, risk-benefit analyses or similar instruments.

Local government must play an energizing role in order to work together with the economic and social agents to build a framework of action that generates new investment, promotes economic development, and facilitates increased employment, triggering a long-term investment process that ensures the resilience of the different sectors.

REGULATORY AND FISCAL TOOLS

Environmental legislation and tax regulations, also driven by local government, are essential tools when building a climate more favourable to adopting long-term action strategies like those needed to adapt to climate change.

Local government has, as part of its competencies, the capacity to explore and promote new administrative regulatory and fiscal instruments for creating a context that is as favourable as possible for adopting local strategies for adapting to climate change. Examples include the tax status of activities that favour this adaptation and establishing tax credits where possible or introducing new public contracting criteria that favour green purchasing and the reduction of the environmental footprint.

Also important are tools for urban planning and organization, procedures for authorization and administrative intervention in economic activities, construction and services projects and mobility management, as these are other areas in which adaptation criteria can be incorporated and added to the already more internalized mitigation criteria.

The application of some of these instruments, however, also requires financial resources that help to keep the regional and sectoral participatory bodies functioning and that also facilitate having people who can ensure this collaborative and cooperative activity between the different agents involved.

The main current laws and reference documents in relation to climate change and the development of regulatory, fiscal, and economic-support instruments are the following:

- Catalan law on climate change (Law 16 of 1 August 2017).
  https://canviclimatic.gencat.cat/ca/ambits/Llei_canvi_climatic/
- National Integrated Energy and Climate Plan, 2021-2030 (PNIEC).
  https://www.idae.es/informacion-y-publicaciones/plan-nacional-integrado-de-energia-y-clima-pniec-2021-2030
- Agreement of Mayors for Energy and the Climate.
  https://www.diba.cat/web/alcaldespelclima
- Catalan Strategy for Adaptation to Climate Change, 2013-2020 (ESCACC).
  https://canviclimatic.gencat.cat/ca/ambits/adaptacio/escacc/
- National Plan for Adaptation to Climate Change, 2021-2030 (PNACC).
  https://www.miteco.gob.es/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/plan-nacional-adaptacion-cambio-climatico/default.aspx

THE REGIONAL AND SECTORAL BOARDS AND THE CLIMATE CHANGE LAW

A benchmark legal instrument for the LIFE-CLINOMICS project is the Catalan law on climate change (Law 16 of 1 August 2017) and the strategies and programmes promoted by the Catalan Government through the Catalan Climate Change Office, such as the Catalan Strategy for Adaptation to Climate Change, 2013-2020 (ESCACC). In the medium term, within this legal and regulatory context, the figures of the MeTACC and MeSACC must be considered as essential governance instruments for climate adaptation at the local scale.

In this context, Article 31 of the law provides for "the creation of the Social Board, a registered body attached to the competent department in matters of climate change, which channels participation, information and consultation to the entities and organizations most representative of the social, economic and environmental fabric of Catalonia on climate policy." In Article 54, it adds that "the government must facilitate the appropriate information and encourage the participation of the citizens in all climate policies by means of the Social Board on Climate Change or a decentralized process throughout the region."

These strategies and action plans (PAACC) must also contribute to creating synergies with the current regulatory framework, especially the European framework, by internalizing the goals of the different European policies: agricultural, fishing, forestry, tourism, business, infrastructure, etc.

PLANS FOR ACTION AND ADAPTATION TO CLIMATE CHANGE

Each regional board (MeTACC), based on the priorities and actions identified in the participatory processes of its region, has studied and validated an action plan for adapting to climate change (PAACC), which is based on criteria of social, economic, and environmental viability and sustainability.

The plans for action and adaptation to climate change (PAACC) are the instruments that incorporate and contextualize the initiatives and actions relating to the resilience and ability to adapt to climate change of each region.

The plans are in line with the outline of operative goals and measures proposed by the Catalan Strategy for Adaptation to Climate Change (ESCACC), according to the main environmental vectors and the major sectors of economic and production activity (water, biodiversity, energy, forestry, fishing and marine ecosystems, agriculture and livestock, tourism, industry and services, urban planning, mobility, and health), although there is an emphasis on the areas of action of LIFE-CLINOMICS (agroforestry, tourism and fishing), always with a transversal perspective reinforced by the active participation of all the sectors and agents involved.

Al the actions in the plans are based on criteria of social, economic, and environmental viability and sustainability, prioritizing them in accordance with their transversality, replicability, implementation period, and innovation in technical terms and in terms of governance or impact on the business model and labour market. These criteria include the transversality of the actions, as many of the proposed measures affect different areas and therefore have the ability to create synergies.

The action plans bring specific measures for developing new business models that make it possible to advance in the transition to a new production and consumption paradigm aligned and consistent with adaptation to climate change. The challenge is to show that this strategic framework, as well as being desirable, is viable and has a positive cost-benefit balance in the medium and long term. The plans also consider measures for generating new knowledge (reinforcing scientific research, technological research, and innovation) on the impacts of climate change at the local level and in the different sectors being studied.

ACTION PLANS FOR TERRES DE L'EBRE, ALT PENEDÈS AND EL MONTSENY: http://lifeclinomics.eu/ca/informes/

HOW TO APPROACH AN ACTION PLAN FOR ADAPTING TO CLIMATE CHANGE

STRATEGIC LINES AND ACTION FACTSHEETS

The action plan can be structured along the strategic lines/areas proposed based on the regional diagnosis and in accordance with the priorities established by the MeTACCs. Each action must be fully defined and specified and must contain at least the following information:

- Justification for its implementation due to the climate challenges and risks that it aims to prevent or reduce.
- Identification of the coordinator of its execution and of the agents involved.
- Calculation of economic yield.
- Estimate of potential for quality employment and, where possible, specified by groups: young people, women, level of qualification or type of contract.
- Approximate schedule and execution period.
- Funding

The adaptation actions are later prioritized based on different objective criteria, such as the following:

1. Viability: probability that the action with prosper and can be put into practice.
2. Implementation period: period in which the action is implemented.
3. Transversality: action that may affect a single sector, different sectors or transversally.
4. Replicability: in other regions.
5. Innovation: introduction of something new by the action.
6. Level of cost-benefit: potential employment, budget, majority benefits.

EXAMPLE OF STRATEGIC LINES/AREAS OF AN ACTION PLAN

1	Governance structures and bodies and administrative actions.
2	Forest management: improving the structure and quality of forests.
3	Water management: sustainable management of water resources.
4	Grapevine management: defining, testing, and promoting best practices in cultivation.
5	Energy management: promoting local energy management.
6	Management of the tourist sector: encouraging environmental responsibility.
7	Regional management: instruments for regional planning and landscape management.

EXAMPLE OF AN ACTION FACTSHEET

X.X – TITLE OF THE ACTION	
Sector	Agriculture, forestry, tourism, fishing, transversal, etc.
Description	-
Objectives	
Beneficiaries	
Difficulties	
Timeline	Short term (<2 years), medium term (2-5 years), long term (>years)
Leadership	Promoting and/or coordinating groups for implementation of the action (public authority, agents, citizens, etc.)
Agents involved	
Funding sources	
Budget	Studies, diagnosis, pilot actions, projects, etc.
Follow-up indicators	Qualitative and quantitative

PILOT ACTIONS

The uncertainties that accompany climate change and the processes of adaptation require the action plans to have demonstrative tools that put into practice the commitment of the regional and sectoral agents and that make it possible to promote the proposed actions.

When the participatory planning stage has finished, we move on to the stage demonstrating that the action for adapting to climate change is possible, profitable, and efficacious in the long term for protecting people, regions, and production activity.

A general strategy has been developed that establishes criteria and principles for adapting regions and production sectors and which has provided the necessary guidance for all the agents involved. It is a reference framework that facilitates and clarifies the action.

Three specific action plans have been promoted, which propose and detail the execution of more than 100 actions (103), adapted to the particular conditions of each region and sector. Six of them have been carried out as demonstration and pilot actions. The resources for implementing them were provided by LIFE-CLINOMICS and were distributed between the regional authorities and the European Union, in accordance with the project's co-financing coefficient.

TERRES DE L'EBRE

Actions promoted:

1. Local bivalve hatchery (oyster hatchery).
2. Terres de l'Ebre drought observatory.

ACTION 1

LOCAL BIVALVE HATCHERY (OYSTER HATCHERY)

Sector

Aquaculture in the Ebro Delta.

Actors

COPATE (leader), La Ràpita School of Aquaculture, Ebro Delta Federation of Mollusc Producers (FEPROMODEL).

Description

Diploid oysters are a good alternative to marine farming in the current climate scenario, given their greater resistance to water temperature.

The project defines the technical and economic viability of an oyster hatchery to supply local seeds to the producers in the Ebro Delta, which would increase the sectors value chain, as the seeds are currently purchased from French producers.

Objectives

- Ensure the supply of oyster seeds during episodes of mortality and with full sanitary guarantees.
- Increase the regional value chain.
- Drive innovation and knowledge transfer between research centres and the production sector.
- Encourage the training of experts and employment in the medium/long term.

Budget

€24,900

Final Assessment

The project was completed and showed the technical and economic viability of obtaining local oyster seeds, as well as its contribution to improving the value chain of the aquaculture sector in the Ebro Delta and to the creation of new jobs. It should be noted that, as a result of the project, the potential was identified to growing the seeds to a size of between 3 and 5 cm, which would increase the producers' margins considerably. FEPROMODEL (federation of producers) is currently looking for funding to implement this action and will be assisted by the technical advice of the La Ràpita School of Aquaculture.

ACTION 2

TERRES DE L'EBRE DROUGHT OBSERVATORY

Sector

Agriculture.

Agents

COPATE (leader), Ebro Observatory, Gandesa School of Agriculture.

Description

Support irrigation in the Terra Alta county has contributed to improving the socioeconomic expectations of the population, although it is based on a moderate use of water, which, in the context of climate change, will have to be gradually reduced.

The project introduces the use of ICT and climate knowledge to determine the quantity and most appropriate times to irrigate, to save both the water and the energy required to transport the water. This is achieved by means of a network of sensors that measure the soil humidity—readings that are correlated with the data supplied by the public weather stations and satellites.

Communication channels were also created to get this information to the end users in the agricultural sector.

Objectives

- Improve water management and crop production and quality.
- Bring innovation to the agricultural sector and develop the concept of precision agriculture in an unprepared rural setting.
- Create a cooperative culture among the different agents.
- Fix the population in the region and maintain the agroforestry pattern of Terra Alta.

Budget

€24,700

Final Assessment

The project was completed and is currently operative in the grape-growing sector in Terra Alta county, where it has shown its technical viability and its positive impact on the agricultural sector. The Ebro Observatory, the principal partner, has found the resources to ensure its continuity until at least 2021, and it aims to extend the initiative in a second phase to olive growing in the same county. This expansion phase, and successive phases, will involve the participation of the Gandesa School of Agriculture, which will strengthen its role.

ALT PENEDÈS

Actions promoted:

1. Forest grazing.
2. Penedès drought observatory.

ACTION 1

FOREST GRAZING

Sector

Livestock and forestry.

Agents

Alt Penedès County Council, Santa Margarida i els Monjos Municipal Council, Parc del Foix-Barcelona Provincial Government, Catalan Forestry Technological Centre (CTFC), Mancomunitat Penedès-Garraf, and Penedès-Garraf Forestry Defence Group.

Private forest owners and shepherds in Parc del Foix.

Description

Grazing by sheep or goats in the forests and vineyards contributes to reducing forest undergrowth and, as a result, the risk of fires. This project assesses the potential for placing herds at the service of forest management.

Objectives

- Reduce the risk of forest fires.
- Encourage the entry of grazing herds into forests and vineyards.
- Placing herds at the service of forest management to clear undergrowth and boost the sector, which is in a vulnerable situation.

Budget

€23,000

Final Assessment

The CTFC study makes it clear that the forests in the region are insufficient for the self-sufficiency of a herd, as additional nutrition is required. This means that the area of forest to be used for grazing must be analysed carefully, as it is not easy to determine the area that requires action to prevent fire risk and, at the same time, is suitable for allowing the entry of a herd (in this case, of sheep). Once this area has been determined, crop fields need to be set out around it in order to be able to plant crops that ensure the correct feeding of the herd. Another important aspect is the state of the forest so that the herd can enter it, and this requires prior clearing using machinery.

Finally, it is also necessary to analyse the level of competency of the different authorities in terms of forested area. Given that the objectives are different, it is difficult to find the necessary consensus. In the case of this action, the coexistence of the Barcelona biodiversity and natural environment section of the Department of Territory and Sustainability, the park managers, and the fire-prevention service was not easy, although it was possible to reach an agreement that allowed the pilot action to be carried out successfully.

ACTION 2

PENEDÈS DROUGHT OBSERVATORY

Sector

Wine production (agriculture).

Agents

Alt Penedès County Council, IRTA, Mercè Rosell i Domènech Agricultural School of Grape Growing and Enology, Ebro Observatory, Sant Sadurní d'Anoia Municipal Council. Private participants: Can Feixes winery, Torres Family, Piñol winery, Raventós i Blanch winery, and the La Granada cooperative winery.

Description

Predictions regarding the future climate suggest an increase in temperature a reduction in mean precipitation, and an increase in the frequency and intensity of droughts, which would increase the water stress on vines and change their phenology.

This action consists of obtaining data using moisture sensors to understand the dynamics of water in the soil and apply this knowledge to adapt agricultural practices to the new climate conditions, thus reducing the vulnerability of the crop and of the sector as a whole.

Objectives

- Supplement the available agroclimatic data with observations of the evolution of water content in rainfed grapevines.
- Analyse the state of water in the vineyard soil and the water requirements of the crops.
- Carry out a diagnostic of the evolution of drought in the region and issue generic recommendations for grape-growers.

Budget

€23,000

Final Assessment

The sensors were installed strategically and with the help of the stations of the Catalan Meteorologic Service distributed throughout the region, thus covering the different grape-growing areas of Alt Penedès and taking into account the main grape varieties. Thus, the final execution of the project was in line with the expected results and their potential extrapolation.

A key element was the involvement of the landowners, as it is they who must ensure the correct maintenance of the devices, as well as being the liaison with the technical team for the collection of the property's agronomic data. A system was thus established for collecting field data and another for collecting the data from the sensors, which was centralized with a technical management and processing team.

In terms of information return, a newsletter was drawn up containing all the data from the sensors and providing agronomic recommendations. It is published monthly and is being distributed, in the pilot phase, among the grape growers and agents involved in the pilot action.

EL MONTSENY

Actions promoted:

1. Detailed study of the effect of climate change and identification of the most vulnerable forest areas in the Montseny Biosphere Reserve, and definition of management models that make it possible to adapt the forests to climate change.
2. Characterization and definition of environmental improvements in all sectors and execution of a pilot action.

ACTION 1

DETAILED STUDY OF THE AFFECT OF CLIMATE CHANGE AND IDENTIFICATION OF THE MOST VULNERABLE FOREST AREAS IN THE MONTSENY BIOSPHERE RESERVE. DEFINITION OF MANAGEMENT MODELS THAT MAKE IT POSSIBLE TO ADAPT THE FORESTS TO CLIMATE CHANGE.

Sector

Forestry.

Actors

Montseny Biosphere Reserve - Barcelona Provincial Government, Montseny Municipal Council, Montseny forestry owners, Montseny Property-Owners' Association, Forest Defence Groups, Montseny-Ponent Forest Management Association.

Description

The action consists of two phases:

1: Mapping and characterization of the forests most vulnerable to climate change in the Montseny Biosphere Reserve

This action was carried out by CREAF, with the collaboration of CREAF researchers, technical staff from the Montseny Park, and the Barcelona Provincial Government.

The analysis includes an historical analysis of the past 25 years based on data from the three national forest inventories, a collection of existing thematic cartography on the suitability and vulnerability of the species present on the massif, and the results of the participatory cartography study with technical personnel and experts on the sensitivity of the species.

The vulnerability of the forests of El Montseny was calculated using the Map of vulnerability of the forests of Catalonia (Vulnemap). The results are shown for different drought scenarios:

- In a **moderate drought**, the expected vulnerability is low or very low, except in the highest regions, and the most vulnerable species is the beech, followed by the maritime pine and the stone pine.
- In a **severe drought**, vulnerability is moderate and high all over the massif, except in the lowest regions and on the southern, eastern, and western periphery. Considering the area involved, the Portuguese oak is the most vulnerable species, followed by the beech. On the other hand, pine species and cork oak prove to be quite resistant to severe drought.

The technical information was used to develop participatory cartography with the region's experts. Few hectares were identified as vulnerable both now and in the future (about 2000 ha now and 4500 ha in the future). The most vulnerable areas are those with the thinnest soils (crests) and/or stony soil, and those on steep slopes, with southern exposure or crests. The analysis by species showed the greatest effect by area on the Portuguese oak, followed by the cork oak, while 80% of stands of scots pine have been identified as currently affected. The beech forests are also highly vulnerable but little area is currently affected, although this is expected to increase in the future. Some groups also highlight the elevated vulnerability of the chestnut, an emblematic species of El Montseny, although only a small area is currently affected, and the expected increase is not large.

2: Definition of gold-standard management models for the forests most vulnerable to climate change in the Montseny Biosphere Reserve.

The analysis carried out made it possible to define specific management models for the main formations: Portuguese oak, beech, chestnut, Aleppo pine and cork oak. Gold-standard management is described for planning forestry actions that will increase the resistance and resilience of the forests to the negative impacts of climate change. The proposed management is based on reducing competition, promoting structural heterogeneity and mixed masses, and improving the vitality and intrinsic adaptation capacity of the forest by means of forestry practices close to nature. First, a general management framework is described, based on the forest structure, for general application to all forest formations on the massif. Then, for each type of forest (pure masses and mixed masses dominated by the species in question), the particular conditions necessary for each species are detailed, while defining the general lines of management, the long-term goals, forest indicators for defining forestry actions more closely adapted to the conditions of each stand, and a set of associated best forestry practices for planning and executing forestry actions. The ORGEST models are considered as a management basis in all cases.

- Portuguese oak: The treatments to achieve and maintain a heterogenous vertical and horizontal structure are selective cutting and reserving, including individual-tree silviculture criteria to en sure development of specific stems of accompanying leafy species. Management focuses first on competition from the stems of the same trunk, then between stems of different trunks and other species.
- Beech: In general, with the exception of the mixed stands of beech and chestnut, management of beech stands in the long term seeks to achieve a heterogeneous structure in copses, with the presence of other species, in order to generate a more horizontally and vertically diverse structure that increases the ability to adapt to climate change. To achieve this, selective thinning is proposed, with the selection of future trees where, as well as selecting the best-shaped beech trees, it is also necessary to maintain and encourage all the other species present.
- Cork oak: The desired structure in cork oak stands to meet climate change is a mix of sizes, in copses with low density and continuous regeneration, which is achieved by selective thinning by patches, using cork-production criteria if the cork is harvested or diversity criteria if not.
- Aleppo pine: To increase adaptation to climate change of Aleppo pine stands, the long-term aim is to generate a mixed mass with flat-leaf trees, which can even become dominant. The actions to achieve this are selective thinning to encourage the best stems of all the species present, forming mixtures of species and sizes in copses and avoiding as far as possible bistratified structures, which are highly vulnerable to high-intensity fires.
- Chestnut: The goal of management is to direct a gradual change of species, from single-species chestnut, which is in general decline, to mixed forests of other flat-leaf trees, in order to increase diversity and adaptation capacity in the long term. The approach involves the combined application of mixed or selective thinning and selective felling, depending on the temperament and structure of the species, including individual-tree silviculture criteria to ensure the development of specific stems of the accompanying leafy species.

Moreover, to extend dissemination of these new management models, a pilot study was carried out that consisted of modifying forestry management and improvement technical plans (PTGMF) selected because they are representative of the forest formations analysed. Specifically, the management proposed in each case was analysed and the necessary changes to reflect the management orientations drawn up were proposed. This more clearly showed the difference between the type of management proposed now and that which had been planned until recently.

Objectives

- Identify the forest masses most vulnerable to climate change.
- Define management models for the forest masses identified as most vulnerable in order to deal with climate change.

Budget

€24,799.30

Final Assessment

The action carried out will make it possible to better adapt the forests of El Montseny to climate change because it provides greater knowledge of the forest areas and species of the massif that are most vulnerable to climate change and it proposes specific management models for adapting five key species of the Montseny Biosphere Reserve to climate change. The action incorporated the knowledge of technical personnel and forest owners, who can benefit from the results of the action with the assessments carried out. The information and the guidelines obtained from this action will be disseminated among all the agents of the forestry sector and will serve to improve forest management of this region from now on. This action can also serve as a best practice for other regions that can implement similar management models, where they have similar characteristics and suffer similar effects to those of the Montseny forests, or they may serve as a template for starting similar processes in other forestry regions.

ACTION 2

CHARACTERIZATION AND DEFINITION OF ENVIRONMENTAL IMPROVEMENTS IN ALL SECTORS AND EXECUTION OF A PILOT ACTION

Sector

Agriculture and tourism.

Agents in the region

Montseny Biosphere Reserve - Barcelona Provincial Government, Montseny municipal councils, agents of the European Charter for Sustainable Tourism in El Montseny, Montseny Property Owner's Association, agents of the agriculture and tourism sector in El Montseny.

Description

The action consists of two phases:

1: Development of a tool for adaptation to climate change for companies in the agriculture and tourism sector of the Montseny Biosphere Reserve.

The objective of this adaptation tool is to provide criteria and create guidelines for advising and facilitating adaptation to climate change for different businesses, and entities in the agriculture, livestock, and tourism sector. The guidelines are structured in the form of factsheets with adaptation actions to be taken in the short, medium, and long term, which are based on a prior diagnosis of the risks and vulnerabilities to climate change of each of the sectors. Summary of the actions proposed in the adaptation tool:

- Management of the water cycle: efficient irrigation systems for crops, support irrigation for specific rainfed crops, using alternative water resources, water-saving systems.
- Energy management: improved heat comfort for livestock operations and tourist establishments, alternative energy sources to deal with cuts in power supply.
- Management of food resources: establish an association or entity in the agricultural sector, new crop varieties that are resistant to the new climate conditions, pilot studies in precision agriculture, adaptive and regenerative agricultural activity, and promoting proximity and seasonal products, reinforcing sanitary control of animals to detect new diseases, preventing and controlling pests.
- Biodiversity conservation: stewardship agreements that favour adaptation to climate change, encouraging agroforest mosaic landscapes, favouring pollinators, preventing and monitoring invasive species.
- Risk management: improving the response to extreme climate phenomena, preventing forest fires, adapting outdoor activities to temperature increases, diversifying and breaking the seasonal pattern of tourist products.
- Generating added value: joining the Montseny Biosphere Reserve brand, joining the European Charter for Sustainable Tourism, taking part in joint adaptation actions.
- Environmental awareness-raising: including the climate emergency in educational activities, decalogue of best practices for workers and visitors, calculating the carbon footprint of the visitors.

The tool also incorporates communication materials for transferring knowledge and ideas on adapting to climate change to the different agents in the agriculture and tourism sector: leaflets, infographics, information on best practices that can be personalized for each establishment, and communication elements for visitors.

2: Evaluation of adaptation to climate change in companies in the agriculture and tourism sector in the Montseny Biosphere Reserve.

The evaluation consisted of identifying 10 establishments and facilities in the agriculture and tourism sector of the Montseny Biosphere Reserve, with which a collaborative process of evaluation has been carried out to identify climate-driven environmental risks (current and future), and to define actions to minimize or mitigate these risks, prioritize the actions, and study their technical and economic viability.

The evaluation of the different establishments and facilities focused on the following aspects:

- Energy: Includes evaluation of energy use and emissions of pollutant gases, evaluation of the mobility generated by the company, evaluation of the material used in the facilities. Types of actions proposed: reduction of consumption, energy efficiency, use of renewable energy sources, reduction of mobility, use of collective modes of transport, improvement of construction criteria, expansion or rehabilitation of future facilities to reduce their physical, landscape and environmental impact, improvement and more efficient use of spaces and encouragement of the use of local materials, improvements in heat comfort in indoor and outdoor spaces.
- Water: Includes evaluation of the water cycle (both in the company and in its regional relationship with the river basin in which it is located). Types of actions proposed: water saving and efficiency measures, incorporation of own water collection systems and encouragement of its local treatment (using systems with a low energy impact) and subsequent return to the environment.
- Organic matter: Evaluation of the organic-matter cycle of foods, organic waste, management of forestry biomass or agricultural production waste. Types of actions proposed: improvement towards food resilience (traceability, organic and local food), encouraging consumption of locally produced food that contributes to better management of the landscape of the Montseny Biosphere Reserve and its surroundings, measures to reduce waste production (reduction of packaging, re-use), comprehensive management at a local scale of organic waste to produce compost and encourage controlled forest management (biomass from undergrowth, selective felling of biomass, animal grazing) to reduce the risk of fire.

Objectives

- Provide guidelines for adapting to climate change for companies in the agriculture and tourism sector.
- Carry out a specific evaluation of adaptation to climate change in different establishments and facilities of the agriculture and tourism sector in the Montseny Biosphere Reserve.

Budget

€22,917.40

Final Assessment

This action provides knowledge and best practices for the agriculture and tourism sector so that actions for adapting to climate change can be implemented, thus increasing the resilience of these economic activities. The tool for adapting to climate change facilitates a wide variety of adaptation actions for companies in the agriculture and tourism sector. At the same time, the tool's communication materials help to disseminate these actions and make both the companies and visitors to El Montseny participants in the adaptation to climate change.

The evaluation of 10 agricultural and/or tourist establishments and facilities in El Montseny is another step toward a detailed analysis of how adaptation actions materialize in different businesses. From this point on, these 10 establishments can invest in improving their buildings and facilities to make them less vulnerable and more resilient. This evaluation also acts as a precedent for providing support to other companies in El Montseny in the process of adapting to climate change.

The results of the tool and of the evaluation will also be disseminated among the agriculture and tourism agents of El Montseny so that they can implement specific adaptation actions and will, at the same time, serve as a reference for other regions, as many of the actions proposed can be replicated outside El Montseny.

HOW TO EVALUATE AND FOLLOW UP THE ACTION PLANS

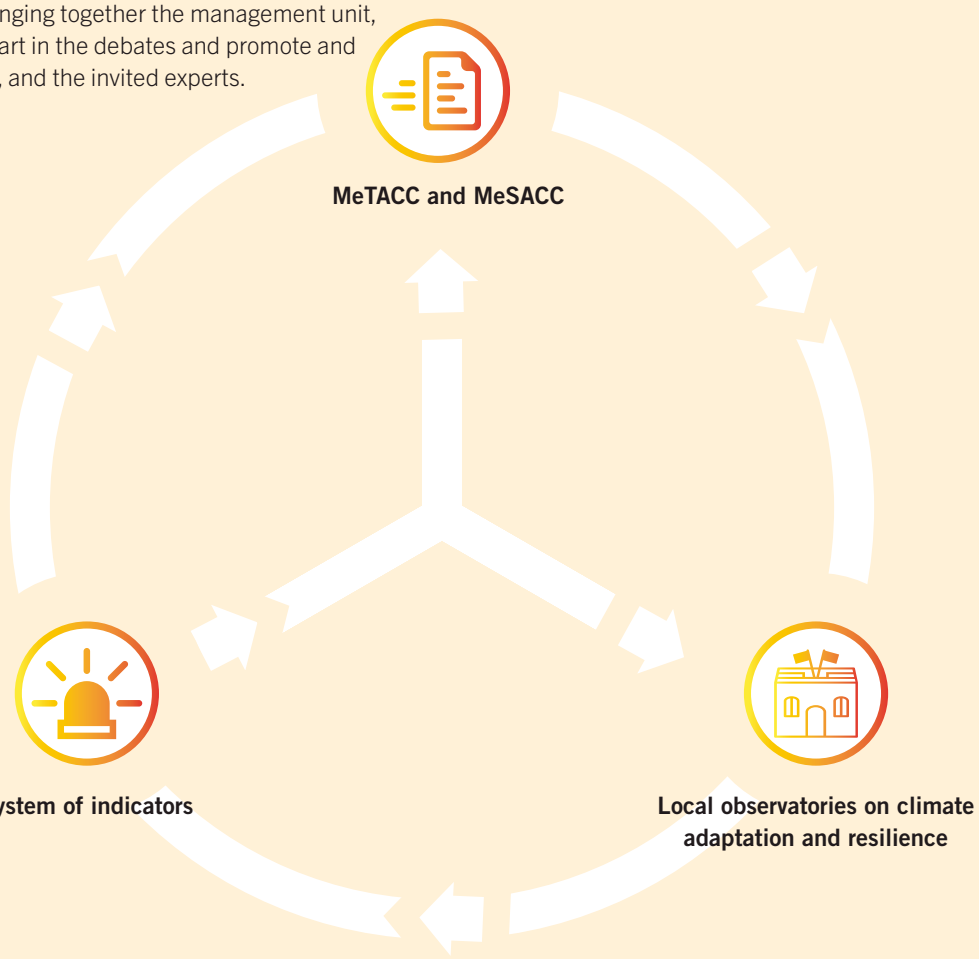
OBSERVATORIES AND INDICATORS

To advance in the process of adapting the regions to the impacts of climate change, it is necessary to have instruments that make it possible to monitor and evaluate the measures adopted by means of a continuous review and improvement of the action plans (PAACC).

This ongoing monitoring or follow-up of the evolution of the degree of vulnerability and of the risks of the different sectors facilitates the adoption of the most appropriate decisions at all times by the MeTACC and MeSACC. The continuity of the boards over time is an opportunity for becoming **local observatories on adaptation and resilience to climate change**, which require the ongoing support of the public and private regional agents in order to be more effective.

The observatories should be seen more as a function than as a body. Thus, the responsibilities of management, support and continuity can be channelled through an administrative unit integrated in the most suitable organization or institution in each case. They are designed to be heterogeneous bodies with different levels of responsibility, bringing together the management unit, the agents that will take part in the debates and promote and carry out the investments, and the invited experts.

The action plans are based on the **system of indicators** developed in the framework of the Clinomics project, characterized by easily identifiable and measurable elements, which are extremely useful in the operational and functional context of all the agents involved in adapting to climate change. The review of this system of indicators shared by the MeTACC and the local observatories is carried out jointly, thus reinforcing networking in order to move forward in the transformation and adaptation of the regions. The actions implemented also provide knowledge to the population as a whole and influence their behaviour, which means that this degree of influence must be assessed.



COMMUNICATION AND TRAINING

COMMUNICATION CHANNELS AND RESOURCES

The information available on climate change, its impacts, and the vulnerability of the regions and sectors is extensive, but the collective level of knowledge and awareness is still insufficient. The communication actions promoted in the project have the aim of disseminating this knowledge and getting it to all the agents involved.

Scientific research currently provides a large array of information on climate change and the relationship between vulnerability, impact, and adaptive response, but this has not yet reached the population and the main socioeconomic agents in a sufficiently solid manner.

This makes it a priority to plan and encourage measures aimed at increasing collective awareness of the matter in order to introduce actions aimed at adapting agendas and action strategies to climate change into personal behaviours and into corporate and institutional strategies.

However, as well as providing a detailed and open explanation of the risks and threats for each production activity, the opportunities that also arise should be explored and disseminated. There is, as yet no clear perception that some impacts of climate change can become opportunities to modernize local economies, improve competitiveness, improve the market position of companies, and increase quality employment, as well as for the renovation, modernization and environmental adaptation of public policies and their infrastructure.

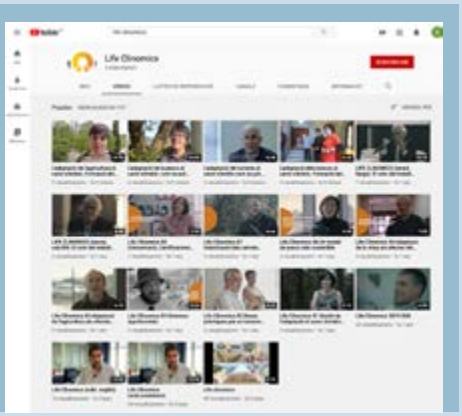
One of the challenges, therefore, is to find the right channels for each target audience: small farmers, fishermen and women, forest owners, tourism business owners, people working in any of these sectors and in local government, experts in adaptation

to climate change, and the public in general. The use of new technologies and social media has played a notable role, not forgetting traditional media, communication campaigns, and regional proximity sessions. The best communication tool, however, is always networking and collaboration to share experiences and results.

COMMUNICATION RESOURCES AND THE ACTIVITIES PROMOTED

Website containing all the documentation, news, and activities: **http://lifeclinomics.eu/ca/**

Presence on social media: Twitter @ClinomicsLife and YouTube: **www.youtube.com/channel/UC0ng5IMDfbSTdvWWsZBPEmw** (18 videos on the channel).



Outreach material: regional and sectoral leaflets, exhibition with rollups of two guides (resilience guide and occupational guide), together with different infographics.

THE IMPACT OF COMMUNICATION

+ 25,000 website contents visited

+ 100,000 users have received information on the project through social media (Facebook, Telegram, Instagram...)

+ 194,000 people have received online documentation on the project

+ 700 people have visited the permanent information point

+ 9000 people have received inputs on the project at different in-person events

+ 2000 people have received printed documentation on the project

+ 8700 visits to the website (+ 6000 different people)

+ 700 followers on Twitter (+ 110,000 users retweeted) (+ 99,900 users received Clinomics tweets)

Data from October 2020

Dissemination in the press: different local media outlets have published comic strips, a banner, advertisements, and articles. A radio spot was broadcast in each region and a video was broadcast on a public television channel available throughout Catalonia.

Newsletter: three eight-page newsletters have been published with information on the progress and results of the project.

Clinomics permanent information points: 10 stands in the different organizations where LifeClinomics information or material is provided.

Distribution of material on Clinomics: design and distribution of a compostable pencil with seeds; folders and ballpoint pens made from biodegradable material for training sessions, etc.

Discovery walks: leisure, cultural and environmental activities to raise awareness on the values of the region and on the impacts of climate change on natural ecosystems.

Awareness-raising workshops: meetings with representatives of workers to raise awareness on the need to adapt to climate change.

Production of LifeClinomics awareness-raising videos and/or training capsules.

TRAINING ACTIONS

The actions initially planned by the LIFE-CLINOMICS project included creating a training programme that arose from the studies carried out on the impacts of climate change and the requirements relating to education and training resulting from the meetings of the sectoral and regional boards.

As part of the project, nearly 30 in-person courses have been held, supplemented in most cases with practical visits. These training actions were promoted by different partners and carried out in the three regions of the project, and in neighbouring counties.

Although the format and content of the training sessions was designed at the start of the action, as the MeTACC were organized and new training needs arose in the regions, new sessions were debated and included. Each partner was responsible for developing the content of their course, adapted to the schedule training sessions. The design of the training was coordinated by the Barcelona Chamber of Commerce, which , together with Unió de Pagesos de Catalunya, UGT, and CCOO, developed specific training for the agents of the agriculture, forestry, tourism, and fishing sectors. The contents developed by the partners were, in most cases, the same because the regions share common needs and problems.

The Barcelona Provincial Government (DIBA) was responsible for training the representatives of local authorities within their territorial reach, and for the training of the manager/outreach person responsible for adaptation to climate change. COPATE and CCAP organized the training of the technical personnel of the local councils of Catalonia in Terres de l'Ebre and El Penedès.

The courses organized respected the objective of replicability set out by the project. It is thus hoped that other agents in the Mediterranean can replicated them in training actions in their countries, as the biogeographical characteristics, potentialities, and limitations are very similar. With the courses developed, Life Clinomics has already raised general awareness on the impacts of climate change and its adaptation requirements in the three regions and sectors covered.

THE VALUE OF TRAINING

The training calendar consisted of two cycles: from March to July 2018, and from October 2018 to May 2019.

One course was held for each sector and region. Each course consisted of an in-person 5-hour programme plus a practical visit to illustrate the theoretical content. At the end of the project, in June, 22 sectoral courses had been organized, together with 4 courses for public authorities, 1 course for local councils of Catalonia, and 1 course for the manager/outreach person responsible for the adaptation to climate change. The courses organized by each partner were the following:

- Unió de Pagesos: 6
- Barcelona Chamber of Commerce: 6
- Comissions Obreres: 5
- Unió General de Treballadors: 5
- Provincial Government of Barcelona: 5

TRAINING ACTIVITY FACTSHEETS: See Appendix

CONCLUSIONS

CONCLUSIONS

The LIFE programme, of which CLINOMICS forms part, is the instrument of the European Union devoted to the environment, nature conservation, and climate action, and its goal is to apply policies for finding solutions and promoting best practices and technological innovations to meet current environmental and climate challenges. In this regard, the project has made it possible to learn from knowledge and from sharing best practices and demonstrative actions, thus advancing in the adaptation and resilience of the regions to climate change.

THE VALUE OF REGIONAL AND SECTORAL COOPERATION

LIFE-CLINOMICS has become consolidated as a major collective initiative for adaptation to climate change by the local entities of Catalonia and also as the most notable initiative in terms of scope and representativity of its partners. The methodology used has made it possible to build synergies between the different agents and the public authorities, while promoting the adaptation capacity of the local sphere and generating more sustainable economic activity.

One of the main milestones of the project was, therefore, implementing strategies and creating mechanisms for ongoing action on adapting to climate change, with the aim of continuing in the future where action has been taken, and also making the action replicable in any other region. It is thus essential to maintain the political will and the social complicity generated over time.

PRACTICAL EXPERIENCE IN THE REGION WITH THE PILOT ACTIONS

After the diagnostic stage, with the active participation of all the agents involved, action plans were drawn up that propose and detail the execution of a total of 103 actions, adapted to the particular conditions of each region and sector. Six of them have been carried out as demonstration and pilot actions.

While the implementation of the state of alarm due to the health care emergency caused by COVID-19 has meant that some of the tasks have taken longer to carry out in comparison with those carried out in person, and fieldwork requiring visits to properties or buildings has been postponed, an effective online communication system has been established between the service providers, the property managers and the establishments and partners of the project, and questionnaires have been drawn up and sent to progress in all aspects of the fieldwork that could be resolved remotely, so that it was possible to carry out the characterization and analysis visits much faster and more easily.

NEW INDICATORS FOR MEASURING CHANGES AND ADAPTATION

To advance in the process of adapting the regions to the impacts of climate change, it is necessary to have instruments that make it possible to monitor and evaluate the measures adopted by means of a continuous review and improvement of the action plans (PAACC).

A system of indicators has therefore been developed that is characterized by easily identifiable and measurable elements, review of which reinforces networking to advance in the transformation and adaptation of the regions.

Given the volume of information that often needs to be collected to calculate certain indicators, it is a good idea to begin working with a small number, which can be increased as the project advances. Thus, the initial battery of indicators should consist of those with greater significance in terms of adaptation of the region to climate change.

COMMUNICATION ACTIONS FOR SHARING KNOWLEDGE AND BEST PRACTICES

The communication strategy was a key factor in disseminating the knowledge, best practices and results attained over time. Many dissemination activities have therefore been carried out in all the regions and sectors involved, such as the publication of informational and outreach material (leaflets, rollup display stands, newsletters), regional proximity sessions (some of which have had to be cancelled due to the state of alarm), and publication in the press and online media.

The use of new technologies and social media has also played a notable role, while not forgetting traditional media, although the best communication tool is always networking and collaboration to share experiences and results.

PROJECT SUMMARY GUIDE

A project the size of LIFE-CLINOMICS, in terms of duration and of the regions involved, contributes to generating knowledge and, above all, creating synergies between the wide range of agents involved, while making it possible to carry out practical actions with which to try out everything that has been learned.

Drawing up a summary guide to the project provides any other regions that want to replicate the project with all the accumulated experience in terms of the diagnostic and analysis methodologies applied and the instruments and resources developed *ad hoc*.

APPENDIX

TRAINING ACTIONS

The multimedia of the Clinomics website (http://lifeclinomics.eu/ca/multimedia/) includes a range of didactic videos on the interventions carried out within these courses. Factsheets have also been drawn up that contain the most notable elements of the materials in question, which allows for a good approximation of how the training carried out was developed and is the reason it was deemed appropriate to include a summary in this guide.

TOURISM SECTOR

Action **Adaptation of tourism to climate change: how can it be promoted by local authorities? Involving society in adapting to climate change in the Tordera River delta.**

Agents Centre for Ecological Research and Forestry Applications (CREAF)/Delta and Lower Tordera Board/ Biodiversity Foundation (Spanish Ministry for Agriculture, Fisheries, Food, and the Environment)

Description The Tordera delta is home to a large number of economic activities from different sectors (primary, industry, tourism, etc.), with natural spaces and habitats with a high ecosystemic value, which leads to complex situations in terms of coexistence of private interests and leisure uses, and environmental protection.
This is particularly significant in the case of the tourism sector, as the impacts expected due to climate change will have a major effect on it: erosion of beaches, flooding and torrential rains, degradation of ecosystems and landscape, degradation of bodies of water and their quality.
As part of the project, a participatory process took place in different phases: economic and socioenvironmental diagnosis, interactive seminars, and specific workshops. The results were made available on a blog that also contained other reference documents.

Conclusions
- Climate change presents an opportunity to reduce mass tourism and commit to a more sustainable model of tourism that is balanced with other uses of the region, thereby improving the quality of the range of options available and communication of the values of the delta.
- It is necessary to create a permanent space for dialogue where matters affecting the region and the different sectors can be discussed, thus creating synergies and collaborations between all the agents and the citizens.
- The project aims to be an example of how improved governance can have positive effects in vulnerable regions.

TOURISM SECTOR

Action **Adaptation of tourism to climate change: how can it be promoted by local authorities? Sustainable tourism and the Biosphere project.**

Agents Institute for Responsible Tourism (ITR)/Global Sustainable Tourism Council/Official Chamber of Commerce, Industry, Services and Shipping of Barcelona

Description The Biosphere certification rests on standards that are based on the United Nations Sustainable Development Goals, included in the 2030 Agenda. In 2015, the Barcelona Provincial Government began the procedures to for this certification, which it finally obtained in May 2017.
This action is part of the strategy of the provincial government to promote more sustainable management of tourism in the companies and services of the province's counties through the Commitment to Sustainability programme.
The programme represents the continuity of the work carried out jointly since 2003 by companies, county management bodies, and the chamber of commerce to improve competitiveness.
The provincial government also takes part in other European initiatives to promote sustainable tourism, such as the European Tourism Indicator System (ETIS), the indicator group of the NECSTour network, and the management of the project to create a sustainable-tourism community in the Mediterranean through the programme Interreg MED.

Communication and participation The Commitment to Sustainability programme has developed manuals of best practices for businesses aligned with the Biosphere certification, supplemented with inter-sector training sessions and workshops for county tourism management and promotion bodies.

Action **Best practices for sustainable tourism.**

Agents COPATE, Universitat de Barcelona

Description Sustainability in tourism and the instruments for evaluating the impact of tourism. The main vectors affected in the practice of tourism. The importance of efficient resource management. The benefits of environmental best practices. Real example of development of best practices.

SECTOR DEL TURISME

Action **Communication, certification, and labels for sustainable tourism.**

Agents Club EMAS, Universitat de Barcelona

Description Environmental communication and green or eco-friendly marketing began in the 1990s, coinciding with global concern for the environment. This has made it possible to raise the awareness of the citizens regarding the need to take measures related to the sustainability of the model of production and consumption.
Environmental labels or certifications are voluntary instruments, at different regional scales, that designate products or seer that meet certain requisites and criteria. The certification systems in the tourism sector apply particularly to accommodation and destinations. There are several such certifications: ISO, EMAS, Ecolabels and other international initiatives.

Action **Adaptation of tourism to climate change: how can it be promoted by local authorities? Adapting to climate change in the tourism sector.**

Coordination Universitat Autònoma de Barcelona (UAB)

Description Introduction to the concepts of mitigation and adaptation to climate change, focusing on the tourism sector. With regard to snow tourism, the case of Catalonia shows how the skiable ranges of certain areas of the Pyrenees will be affected, even when producing artificial snow, as the increase in temperature may make it difficult. This suggests a need to develop other activities that can transform ski resorts into mountain resorts.
In terms of sun-and-sand tourism, the main impacts will have to do with the loss of beaches and an increase in droughts. In this case, the adaptive measures will have to do with protection of the shoreline or water desalination to ensure the continuity of tourist destinations.

Action **Adaptation of tourism to climate change: how can it be promoted by local authorities? The European Charter for Sustainable Tourism and its application in natural spaces. The process of the Garraf, Olèrdola and Foix parks.**

Agents UAB, CREAF

Description Presentation of the process for obtaining the European Charter for Sustainable Tourism by the Garraf, Olèrdola and Foix parks, from diagnosis and audit to the Europarc certification. The case of a rural tourism guesthouse in the Montseny Natural Park is presented as a practical case study.

TOURISM SECTOR

Action **Adaptation of tourism to climate change: how can it be promoted by local authorities? Leader natura project - Sustainable development in natural spaces in Catalonia.**

Agents Consortium for the Development of Central Catalonia, CREAF

Description The project is promoted by local Leader Catalonia action groups, which carry out diversification and activation of the economy in rural areas. The project is being implemented since 2004, first by working in areas of natural interest, then in the tourism sector, and finally, in natural spaces in western Catalonia.
The main actions and results are the identification of rural and nature experiences, the creation of proposed ecotourism itineraries, the creation of regional concertation boards, the census of key strategic agents, technical environmental training and knowledge sessions, a programme of activities on natural spaces and the publication of outreach material.

AGRICULTURE AND LIVESTOCK SECTOR

Action **Adapting agriculture to climate change and the key role of municipal councils. Measures for adapting agriculture to climate change**

Agents Agrofood Research and Technology Institute (IRTA) - Plant Production Area

Description Climate and soil characteristics are among the main factors that condition the development of agriculture. In the case of the Mediterranean ecosystem, droughts, high temperatures and differences in sunshine in summer and winter are environmental stress factors that affect the activity of the primary sector.
The growing demand for products requires intensifying this productivity per unit of area and this circumstance coexists with a need to protect the region and the natural systems, which poses a major challenge for the agriculture of this century, as the practices used to date have their limits in terms of the use of nonrenewable resources and of results (production saturation and the associated pollution).
The adhesion of different Catalan research organizations and institutions to the 4x1000 strategy of COP21 and 22 has made it possible to produce the first map of carbon content in Catalan agricultural soils, which provides the basis for planning the addition of organic matter to the soil and, therefore, promoting carbon fixing and contributing to the mitigation strategy.

Action **Adapting agriculture to climate change and the key role of municipal councils. Agriculture and climate change. Environmentally friendly agriculture**

Agents L'Espigall (company in the agricultural sector), IRTA, Catalan Department of Agriculture, Livestock, Fishing, and Food (Catalan Government), ARCA

Description Agricultural planning from a climate perspective is essential in order to adapt to future impacts and changes. Work is being carried out on detecting the optimum potential distributions of different crops in specific parts of the region, and on determining the new irrigation requirements or expected losses in production in order to generate new food-supply scenarios.
This planning process gives rise to different action strategies, one of which is organic agriculture. A large part of its instruments, process and requirements are aimed at increasing the resilience of agricultural systems to make them more self-sufficient—something that is of particular interest in the face of climate change.

Action **pting agriculture to climate change and the key role of municipal councils. GUSTUM project**

Agents Catalan Department of Agriculture, Livestock, and Fishing (Catalan Government)/European Agricultural Rural Development Fund (FEADER)/Ponent Leader Association

Description Project promoted in 2011 to incentivise the creation of economic activity in the region based on the promotion and sale of local, quality craft agri-food produce, in collaboration with other sectors in the region. The project works in four areas: local products and producers, tools, creation of synergies, and cooperative work.

Communication and participation Because the project has grown and the status of the local product is more consolidated, more transversal actions have been proposed to affect other areas and sectors: educational actions in schools to teach about the value of proximity products and promotional campaigns, conferences, and initiatives in different parts of the region.

FISHING SECTOR

Action **Adaptation of fishing to climate change: how can it be promoted by local authorities? CLIFISH project. Effects of climate change on populations of interest for fishing: examples, trends, and possible predictions.**

Agents Barcelona Institute of Marine Sciences (CSIC)
Spanish Oceanographic Institute (IEO)/Universitat de les Illes Balears (UIB)

Description Climate change and overfishing directly affect the loss of biodiversity in marine ecosystems, and the distribution, structure, and population dynamics of their species. It is therefore essential to study and evaluate the effects of these factors of a biotic and anthropogenic nature in order to determine the impacts on marine ecosystems and to be able to preserve their integrity while ensuring the sustainability of fisheries. The goal of the project is to determine and model the impact of environmental variability and fishing on populations and communities of species and resources of interest along the Spanish coast.
The different case studies are defined and considered on the regional scale, which makes it possible to process the data and approach the goals with greater precision and expectations of success.

Action **Adaptation of fishing to climate change: how can it be promoted by local authorities? The Catalan model of participatory fishing management.**

Agents Directorate General of Fishing and Maritime Affairs (Catalan Government),
Low Impact Fishers of Europe platform, Costa Brava Local Fishing Action Group, Sèpia S.C. project

Description Regulation 1967/2006 of the European Commission charges all members of the Mediterranean with the need to draw up multi-year management plans in order to achieve maximum sustainable yield (MSY) in their fishing fleets. The first management plan approved with the granting of exceptions was that of "sonsera" fishing, a form of fishing dedicated to catching small fish.
This and other similar experiences (such as the management plan for the Palamós prawn) led to the passing of Decree 118/2018 on the model of governance of commercial fishing in Catalonia.
The basis of this new model is the transfer by the government of rights and responsibilities to the other agents involved in fishery management: the fishing sector, the scientific community, and environmental organizations. In the framework of the Joint-Management Committee, they are charged with approving the corresponding management plan, performing a scientific follow-up, and developing a socioeconomic programme linked to the plan. The challenge is to achieve adaptive management that ensures sustainable fishing.

FISHING SECTOR

Action **A more sustainable fishing model.**

Agents Directorate General of Fishing and Maritime Affairs (Catalan Government), Catalan Federation of Fishing Guilds, Maritime Sector of CCOO

Description Climate change is having an impact on pelagic ecosystems, for example by altering the life cycle of anchovies. The changes in water temperature in different strata is allowing for the proliferation of non-commercial species such as round sardinella, while other, more commercial species, such as sardines, are in decline. This is also happening with benthic species.
From the perspective of mitigating climate change, fishing can reduce greenhouse gas emissions by reducing or stopping the use of diesel. There are new technical options to consider, although they have different degrees of affordability. These innovations include circle fishing with energy-saving lights, use of rigid sails (with fuel savings of 20%) and the use of double nets.
With regard to adaptation, fishing must be economically sustainable to also be environmentally sustainable.

FORESTRY SECTOR

Action **Management for adapting forests to climate change.**

Agents Centre for Forestry Science and Technology of Catalonia; MixForChange, Suber, Pinassa, Demorgest, and ForClimadapt projects

Description The effects of climate change on forest systems depend on the biogeographic characteristics of the region. In Mediterranean ecosystems, there is the decay and mortality of trees, the effect of pests and disease, changes in the distribution and composition of species, reduction in production, forest fires and others.
Sustainable forest management is the most suitable tool for reducing these impacts, as the criteria applied make it possible to reduce the vulnerability of the forests and improve their adaptation capacity and resilience.
The main management measures that can be applied have to do with silviculture treatments and felling, and the promotion of mixed forests and of biodiversity.

Action **Adapting forests to climate change and the key role of municipal councils. Making use of forest biomass.**

Agents Catalan Department of Agriculture, Livestock, and Fishing (Catalan Government), IRTA, Baix Llobregat Agricultural Park (Barcelona Provincial Government)

Description Presentation of the study "Inventory of the potential demand for biomass in Barcelona Province in public centres or authorities": potential of municipal governments, educational centres, sports facilities, care centres, logistics centres, municipal councils and offices, potential for buildings.
The total final energy consumption is 1234.5 GWh/year, whereas the potential use of biomass is 720.1 GWh/year.

FORESTRY SECTOR

Action **Adapting forests to climate change and the key role of municipal councils. Forests and adaptation to climate change.**

Agents Centre for Ecological Research and Forestry Applications (CREAF), Technical Office for Municipal Prevention of Forest Fires (Barcelona Provincial Government), Catalan Forestry Technological Centre

Description Forests are enormous stores of carbon, both in the soil and in dead wood, and in the aerial and below-ground parts of trees. Using photosynthesis, they sequester and fix carbon from the atmosphere, in greater quantities than they release. In the case of Catalonia, however, the forest area would need to be increased tenfold in order to compensate for human emissions.
The effects of climate change are causing an increase in episodes of mortality among trees and a reduction in their growth, especially in species in areas of Alpine and Atlantic climate and, to a lesser extent, Mediterranean climate.
Given the projections of climate change in terms of increased annual temperature and the availability of water resources, forest management is the best tool for reducing the vulnerability of forests, as simulation models indicate a generalized reduction in carbon-sink capacity for many species, which may even become net emitters.

Action **Adapting forests to climate change and the key role of municipal councils. Initiatives on forests and health in the framework of municipal stewardship.**

Agents CREAF, Natural Spaces Services Management (Barcelona Provincial Government)

Description The Barcelona Provincial Government is carrying out an active policy of protecting and managing natural spaces. Citizens visit the network of parks for reasons that have to do with physical and/or mental health in particular. The actions and improvements carried out are aimed at developing a comprehensive proposal that incorporates aspects linked to human health, especially that of the most vulnerable groups, into planning and management.
In this new phase, the role of the municipal councils and of the different agents involved, such as landowners and the forestry sector as a whole, is essential. Thus, municipal stewardship can be a highly effective and flexible tool for establishing an agreement that makes public benefits and private interests compatible.

Action **Modern agroforestry systems.**

Agents Technological Centre for Forestry Applications (CTFC), Forestry Owners' Centre, Forests of El Vallès Project

Description Agroforestry systems are a combination of woody vegetation in agricultural or livestock production systems with the aim of obtaining benefits resulting from the ecological and agronomic interactions.
These systems make more efficient and integrating use of the available resources (light, water, and soil) throughout the year and encourage positive interactions between the woody component and the agricultural or livestock component.
They are more productive and profitable than pure systems, with increases of between 20% and 30%, and they increase the patrimonial value of the terrain and improve the landscape value of the region.

FORESTRY SECTOR

Action **Valuation of the ecosystemic services of the forests.**

Agents Serra de Llaberia Consortium, School of Shepherds of Catalonia, Centre of Forestry Science and Technology of Catalonia, Poblet Natural Space

Description Ecosystemic services are the benefits obtained by society from natural systems; the direct or indirect contribution of ecosystems to human wellbeing.

The main goods and services of the forests are the supply of wood and other non-wood forestry products (game, mushrooms, cork, grazing land, plants, etc.) regulation and maintenance services (climate, water, air, etc.), and socioeconomic services (work for the rural population, leisure activities, cultural landscapes, etc.).

There are tools that make it possible to prioritize these different uses and make them compatible, such as the Payment for an environmental system (PSA), a transfer of resources between social agents to incentivise more sustainable behaviour by the owners/managers of environmental resources.

THE AGREEMENT TO ADAPT THE REGIONS TO CLIMATE CHANGE

The participating organizations have signed the **Agreement to Adapt the Regions to Climate Change**. This commits them to identifying vulnerability factors and establishing action plans for adapting to climate change in concert with the other agents in the region. The objective of this agreement is to create a network of authorities, businesses, entities, and other organizations committed to implementing actions that help to increase the resilience of the regions and of the economic activities that take place there. But the agreement is open to others beyond the partners of the Clinomics project. The signatories are provided with a proven methodology and a platform for the exchange of ideas and best practices, as well as the materials that have been developed throughout the duration of the project: diagnosis of vulnerability, strategy for adapting to climate change, action plans, pilot actions, showcasing, training, materials for dissemination for different sectors: forestry, tourism, agriculture, fishing, and administration.

Signatories:

- Agroxarxa
- Ajuntament d'Avià (Barcelona)
- Ajuntament de Calaf (Barcelona)
- Ajuntament de Canyelles (Barcelona)
- Ajuntament de Cervelló (Barcelona)
- Ajuntament de Monistrol de Calders (Barcelona)
- Ajuntament de Santa Margarida i els Monjos (Barcelona)
- Associació de Micropobles de Catalunya
- Associació Leader de Ponent
- Associació Leader Ripollès GES Bisaura
- Associació pel Desenvolupament Rural de la Catalunya Central
- Associació per al Desenvolupament Rural Integral de la zona Nord-Oriental de Catalunya (ADRINOC)
- Association of the Mediterranean Chambers of Commerce and Industry (ASCAME)
- Ayuntamiento de Ezprogui (Navarra)
- Ayuntamiento de Talavera de la Reina (Toledo)
- Calengobi SCCL
- Cambra de Comerç de Barcelona
- Centre de la Propietat Forestal de Catalunya
- Climate Alliance
- Coldiretti (Sardegna, Italia)
- Comissions Obreres de Catalunya
- Confederación Sindical de Comisiones Obreras
- Consell Comarcal de la Conca de Barberà
- Consell Comarcal de l'Alt Penedès
- Consell Comarcal de la Terra Alta
- Consell Comarcal de la Ribera de l'Ebre
- Consell Comarcal del Baix Ebre
- Consell Comarcal del Montsià
- Conselleria de Territori, Energia i Mobilitat, Govern Illes Balears
- Consorci Grup d'Acció Local Noguera-Segrià Nord
- Consorci Intercomarcal d'Iniciatives Socioeconòmiques
- Consorci Leader de Desenvolupament Rural del Camp
- Consorci Leader Pirineu Occidental
- Consorci per al Tractament Residus Sòlids Urbans del Maresme
- Consorci de Polítiques Ambientals de les Terres de l'Ebre (COPATE)
- Departament de Territori i Sostenibilitat, Generalitat de Catalunya
- Diputació de Barcelona
- Fédération des Syndicats Démocratiques (FSD, Maroc)
- Fundación CONAMA
- Grup d'Experimentació en Naturisme i Sostenibilitat (Associació GENS)
- IHOBE (Euskadi)
- Mancomunitat Penedès-Garraf
- Oficina Española de Cambio Climático (Carta de suport)
- Red NELS (Navarra)
- Unió de Llauradors i Ramaders del País Valencià
- Unió de Pagesos de Catalunya
- Unió de Pagesos Mallorca
- Unió General de Treballadors de Catalunya
- Unión General de Trabajadores (UGT)
- Unión de Uniones de Agricultores y Ganaderos (Madrid-Andalucía)
- Xarxa de Ciutats i Pobles cap a la Sostenibilitat (Catalunya)

CLIMATE LEADERS AWARD

The Climate Reality Project, an initiative promoted by the ex-president of the United States and winner of the Nobel Peace Prize, Al Gore gives out the Climate Leaders Awards each year in recognition of outstanding people, companies, or entities in the fight against climate change.

The Life Clinomics project, coordinated by the Barcelona Provincial Government, received the award in the category of best project for emission reduction and adaptation to climate change. Martí Domènech, coordinator of the Environment Area of the provincial government, attended the event on behalf of the project.

The jury was presided over by Álvaro Rodríguez, coordinator general of The Climate Reality Project in Spain, and included prestigious figures in the area of the environment.

LIFE CLINOMICS

LIFE15 CCA/ES/000102

"This project has been funded with support from the European Commission"

Diputació Barcelona

Cambra de Comerç de Barcelona

UGT

Consell Comarcal Alt Penedès

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