

MEDACC: innovative methodologies for adaptation to climate change in the Mediterranean area ^[1]

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The objective of the LIFE MEDACC project is to develop innovative solutions aimed at adapting our agroforestry and urban systems to the impacts of climate change in the Mediterranean area. A series of adaptation measures have been put into practice in the fields of agriculture, forest management and water management. The results of the project contribute to quantifying how adaptation can reduce the vulnerability of natural systems and human activities to climate change and assessing the economic and environmental costs associated with the application

(or not) of these adaptation measures.

The project is carried out in three representative basins of Catalonia: the Muga, the Ter and the Segre. The goal is to ensure that results and the methodology are applicable to the design of similar experiences throughout the Mediterranean area.

Case Study Description

Challenges:

Both forests and crops in the Mediterranean area are going to be - in fact, are already - seriously affected by climate change, in particular due to episodes of severe water scarcity and drought, combined with extended periods of very high temperatures. In the case of forests, this will aggravate the water deficit and the risk of fires and, in the case of crops, will generate increases in water demand that are unlikely to be addressed in a generalized context of water scarcity in the basins.

MEDACC takes the watershed as a frame of reference. The three selected basins - those of the Muga, Ter and Segre Rivers - represent a great diversity of topographic, climatic and environmental conditions, as well as different land uses and water demands. In addition, they are subject to different stress levels impacting the water resource, which may worsen in the future. As an example, whereas in the Segre agriculture accounts for 95% of the water demand, in the Ter, urban consumption reaches 74%. In the last six decades, there are concerns over the reduction of circulating flows in the headwaters of the rivers analyzed as a consequence of the increase in temperature, the reduction of precipitation (especially in summer) and the increase in evapotranspiration. Thus, in the Segre basin, the reduction in headwater volumes is 28%, and 49% and 42-57% in the Muga and Ter Rivers, respectively.

In the forestry sphere, the project has revealed the need to intervene in Mediterranean forests that, after being subjected to a strong secular exploitation, have been abandoned in recent decades due to rural depopulation and the widespread use of fossil fuels. This has conformed very dense and immature forest masses that are, consequently, very sensitive to water stress and with a high risk of fires.

Objectives:

Different pilot initiatives have been designed, implemented and monitored to help quantify the effects (positive and negative) of the application of adaptation measures in the following sectors:

- Domestic and urban water use: the project has researched the most optimal water management processes to achieve savings efficiently from the environmental, energy and social point of view;
- Agriculture: the project sought to demonstrate the effectiveness of measures to reduce water stress linked to agricultural consumption. This includes working with different crop varieties, irrigation systems and sustainable soil management techniques;
- Forests: pilot actions have helped to quantify the effects of forest management on forest health, water availability and fire risk.

In addition, the impacts of climate and changes in land use and the vulnerability of the selected watersheds have been evaluated in detail.

Adaptation measures implemented in the case study:

[Structural/physical: Technology options](#) [3]

[Structural/physical: Ecosystemic options](#) [4]

Solutions:

- Overall, those areas, systems and economic sectors most sensitive to climate change were identified.
- A diagnosis was made to determine what adaptation measures had been previously applied to the study basins and their effects. Based on the results obtained in the modeling of socio-economic and climatic scenarios in the three watersheds studied for the 2030-2050 horizon, we have proposed which adaptation measures should be implemented in the sphere of water management. New adaptation measures have been defined and some of them have been implemented as pilot tests (agricultural and forestry).
- The effects of the pilot tests have been monitored in the three basins.
- The results have been shared in different networks and platforms.

The project is conducting field tests of the different adaptation strategies aimed at reducing the vulnerability of Mediterranean forests and crops to climate change. And, it also seeks to assess the economic and environmental costs associated with the application (or not) of the various measures.

In the forestry sphere, the project has revealed the need to intervene in Mediterranean forests which, after being subjected to a strong secular exploitation, have been abandoned in recent decades due to rural depopulation and the widespread use of fossil fuels. This has conformed very dense and immature forest masses that are, consequently, very sensitive to water deficits and with a high risk of fires. The proposal brought forward by LIFE MEDACC is to reduce the density of trees to accelerate the natural process of succession towards more mature forests. To do this, different treatments have been applied - clearing and thinning fundamentally - in different environmental conditions, slopes, depths of soil, etc. Thus, it has been possible to check which treatments work best in each situation and also know their costs, so as to specify afterward the appropriate management recommendations in each case.

Together with these specific forest management practices, evidence also exists of the need to reinforce extensive livestock farming and maintain and recover the traditional mosaic agroforestry landscapes, which are home to greater biodiversity and are less vulnerable to different impacts.

Regarding agriculture, various methods have been tried in corn and apple crops that have - at very low costs - resulted in water savings of between 20% and 30%, while maintaining production. The methodology is based on applying simple technologies to determine, as accurately as possible, the environmental conditions and weather forecasts in the different farming plots and, with these data, calculate precisely the weekly water inputs that each plot requires. This information is transmitted to farmers who can then significantly increase the efficiency of irrigation, reduce costs and contribute to improving the availability of water in the basin at the same time.

Additional Details

Stakeholder engagement:

The Catalan Office of Climate Change has coordinated the development of the project and the work of the different participants, focusing particularly on institutional relationship tasks, liaising with the different actors of

the territory and the impact of the project on Catalonia's environmental policies.

The Center for Ecological Research and Forest Applications (CREAF) has carried out the technical coordination of the project, placing special emphasis on the assessment of vulnerability to climate change in the study basins, the compilation and analysis of already-applied adaptation measures, the definition of new adaptation measures and the implementation of forestry pilot tests.

The Pyrenean Institute of Ecology (IPE) has been involved in the hydro-climatic modeling of the study basins and has coordinated the integration of the data collected in the project and associated results in an information platform.

The Institute of Agri-Food Research and Technology (IRTA) has contributed its knowledge and experience in the agricultural field and has coordinated the implementation of the pilot tests.

Different actors of the territory - administration, academic, environmental, services and tourism, etc. - have participated in different phases of the project, contributing their knowledge and experience.

The results are shared in different networks and platforms, as well as in conferences, international workshops, technical seminars and agricultural tradeshow, among others.

The Life Shara project – *Awareness-raising and knowledge for adaptation to climate change* has showcased the initiative and actions related to adaptation to climate change of the Life Medacc project in three different formats (video interview-report, written report and panel exhibit).

Project interest:

The project is conducting field tests of the different adaptation strategies aimed at reducing the vulnerability of Mediterranean forests and crops to climate change. The results of the project contribute to quantifying the extent to which adaptation can reduce the vulnerability of natural systems and human activities to climate change and assess the economic and environmental costs associated with the application (or not) of these adaptation measures. Thus, it is possible to check which treatments work best in each situation and also know their costs, so as to specify afterward the appropriate management recommendations in each case.

Success and limiting factors:

The MEDACC project is highlighting the need to strengthen efforts to preserve and improve the forests, especially in the headwaters of the rivers, given the enormous environmental services they provide to us in terms not only of aesthetics and recreation, but also in terms of the availability and quality of water, air quality, maintenance of biodiversity, etc.

It also reveals the urgency of implementing public policies of adaptation for agroforestry systems, which require essential improvements in the urban-rural dialogue so that society as a whole assumes the costs of keeping the rural environment alive.

Budget, funding and additional benefits:

The project budget amounts to 2,548,841€ and has a contribution from the European Commission of 1,266,208€.

The combination of hydrological simulations and three scenarios of soil cover have revealed a strong influence of the forested surface on the generation of water flow. In some pilot tests, a seasonal increase in soil moisture has been observed where forest management activities have taken place. During spring and summer, increased soil moisture correlates favorably with the growth of trees and their health condition, as well as lower flammability and combustibility of vegetation during periods of high fire risk, and in some cases, a reduction in the rate of decay.

Regarding agriculture, various methods have been tried in corn and apple crops that have - at very low costs - resulted in water savings of between 20% and 30% while maintaining production. In the case of apple trees, the value of the production of the plot that has followed this method has been € 32,850 / ha, representing an increase of 4.2% with respect to the control plot.

On the other hand, a study that is part of the project proposes allocating half of the current useful agricultural area (where crops destined for animal feed predominate) in the Alt Pirineu area (Segre River basin) to crops destined for human food, which are much better adapted to the climate change scenarios for the 2030-2050 horizon and with a greater economic return. This measure would be offset by an increase in extensive grazing, which over time has been losing ground in favor of ranching. This study concludes that the gross income of the agricultural sector in this future scenario could reach € 181.1 million, compared to the current € 84.3 million or € 76.7 million expected in the same 2030-50 scenario if the current management practices are maintained.

Legal aspects:

MEDACC contributes to the design and development of adaptation strategies and policies that are being carried out at the regional and national level in the Euro-Mediterranean area. In Catalonia, MEDACC will be a very valuable tool in the deployment of the Catalan Strategy for Adaptation to Climate Change (ESCACC 2013-2020).

Implementation time:

5 years (July 1st, 2013-June 30, 2018)

Reference Information

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