The impacts of climate change in the Pyrenean forests: the Pyrenean Observatory of Climate Change (CANOPEE)

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The forest occupies more than half of the surface of the Pyrenees and provides many goods and services, both locally and regionally.Climate change can hinder this multifunctionality by causing decline in production or protection of forests, destruction of species or remarkable habitats, deterioration of the forest landscape etc.

Consequently, it is becoming increasingly clear that forest managers in the Pyrenees need to anticipate these changes by developing common tools to improve knowledge and decision-making in the implementation of adaptation actions within the territory.

Against this background, FORESPIR, the National Center for Forest Property, the National Forest Office, the HAZI Fundazioa Foundation, the Center for Forest Sciences and Technologies of Catalonia, the Forest Property Center of Catalonia, the Pyrenean Ecology Institute, the Government of Aragon, the Environmental Management of Navarre public company and the Institute of Andorran Studies launched the "Climate Change and Adaptation of the Pyrenees Forests" CANOPEE project within the framework of the Pyrenees Climate Change Observatory (https://opcc-ctp.org/fr).

This cross-border cooperation project financed by the European Union (FEDER- INTERREG POCTEFA https://www.poctefa.eu/fr/), the French State and the "Pyrénées-Méditerranée" Occitan region aims to:

Strengthen the monitoring of climate change impact indicators on the main species of the Pyrenees.

Dependent exclusively on weather conditions, phenology is a true reflection of the annual climate. As a short-term indicator, it allows for annual comparisons of differences in the biological life cycles of species development. Regular monitoring of bud burst makes it possible to judge the real impact of climatic conditions on trees. Thus, 53 plots in the Pyrénées-Atlantiques, Haute-Garonne, Ariège, Pyrénées-Orientales, Catalonia, Aragon, Navarre, Basque Country and Andorra are monitored each year.

Develop a tool to characterize the vitality of the trees in the forest massif and their vulnerability to decline.

It is the ARCHI method (which aims to diagnose the resilience dynamics of trees by basing its analysis of decline on the integration of the notion of reversibility of a state of stress) which has been deployed in a cooperation framework between France, Spain and Andorra. Four new ARCHI keys (Fagus sylvatica, Pinus sylvestris, Pinus uncinata, Pinus nigra) and a smartphone-tablet application were created. Several training courses for Pyrenean foresters complete this technical aspect.

Map the areas of vigilance (current and future) of the main forest species in the Pyrenees according to different scenarios of climate change.

The studies carried out in France and Spain on the possible effect of climate change on the potential future distribution of species or on their vulnerability generally concern national or regional scales; in this context the Pyrenees are in marginal situation for which the validity of the models is probably less reliable and the results less relevant and difficult to use. Current Climatic Vigilance maps have thus been produced by statistical modeling (link between the current distribution of stands where the species is dominant and climatic averages for 1981-2010, according to the available information). Each Current Climate Watch (VCA) map offers a closer look at where the species is in a warmer or drier climate than in the whole of its Pyrenean range. Future vigilance maps will also be produced based on the data generated by the CLIMPY project https://opcc-ctp.org/fr/climpy (regionalized scenarios).

Develop and implement adaptive management actions to minimize the anticipated impacts.

A series of pilot plots representative of the diversity of the forests of the Pyrenean massif (potentially vulnerable to the effects of climate change and/or showing signs of active decline) were selected. Different types of adaptive forest management actions are currently being implemented to reduce the vulnerability of these stands to climate change. The consequences of these operations on the water resource are modeled and a monitoring protocol is developed in order to evaluate the impact of the treatments on the development of the treated stands in the medium term. Finally, a manual of good forestry practices to reduce the vulnerability of the forests of the Pyrenean massif to climate change will be produced.

Further information: https://opcc-ctp.org/fr/canopee

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