

# LAYMAN REPORT

LIFE14 CCM / ES / 001271

*Assessment of forest-carbon sinks and  
promotion of compensationsystems as tools  
for climate change mitigation*





# CONIFER FORESTS: AN ECOSYSTEM OF VITAL IMPORTANCE, THREATENED BY CLIMATE CHANGE

Forests constitute a fundamental piece of the territorial mosaic, they unite and embellish our landscapes, and they represent the main green infrastructure for the rural and urban population. These surfaces, whose main function in the Mediterranean environment is protection, are positioned as the main generators of ecosystem services with which both the rural environment and the cities are sustained. Among these are the supply of raw materials, protection of settlements and infrastructures, the regulation of the hydrological cycle and the purification of water for human supply, or its role as a source of employment and fixation of the population in rural areas. It stands out for its special relevance in the context of the climate crisis that humanity is facing, the role that forests play in mitigating climate change, as they are the main terrestrial carbon sink in the land use sector, changes in land use and forestry (LULUCF).

But for us to enjoy these services, the mere existence of forest masses is not enough. The forests must be in optimal quality conditions so that these benefits that they offer us are maximum, and that they are maintained in the long term, especially with the threat posed by climate change in the Mediterranean. In this geographical context, it is expected that, in the predicted climatic scenarios, atmospheric conditions, especially droughts, will notably affect the forest masses, increasing their vulnerability to climatic inferences and other associated risks such as the dreaded forest fires.

The tool that makes it possible to adapt these ecosystems and reduce vulnerability to climate change is Forest Management. But for this, the contribution that forest owners make through forestry is essential, something increasingly difficult in the environment, with an important part of the forests in the Mediterranean basin without proper management. This situation is clearly representative in the south of France and the east and south of Spain, where forests have a protective function and little productive purpose.

The main reason is purely economic, since the low profitability of products, or in the case of protective forests, the large investment necessary to carry out actions with little return on income, leads to owners and managers abandoning management programs for financing problems.

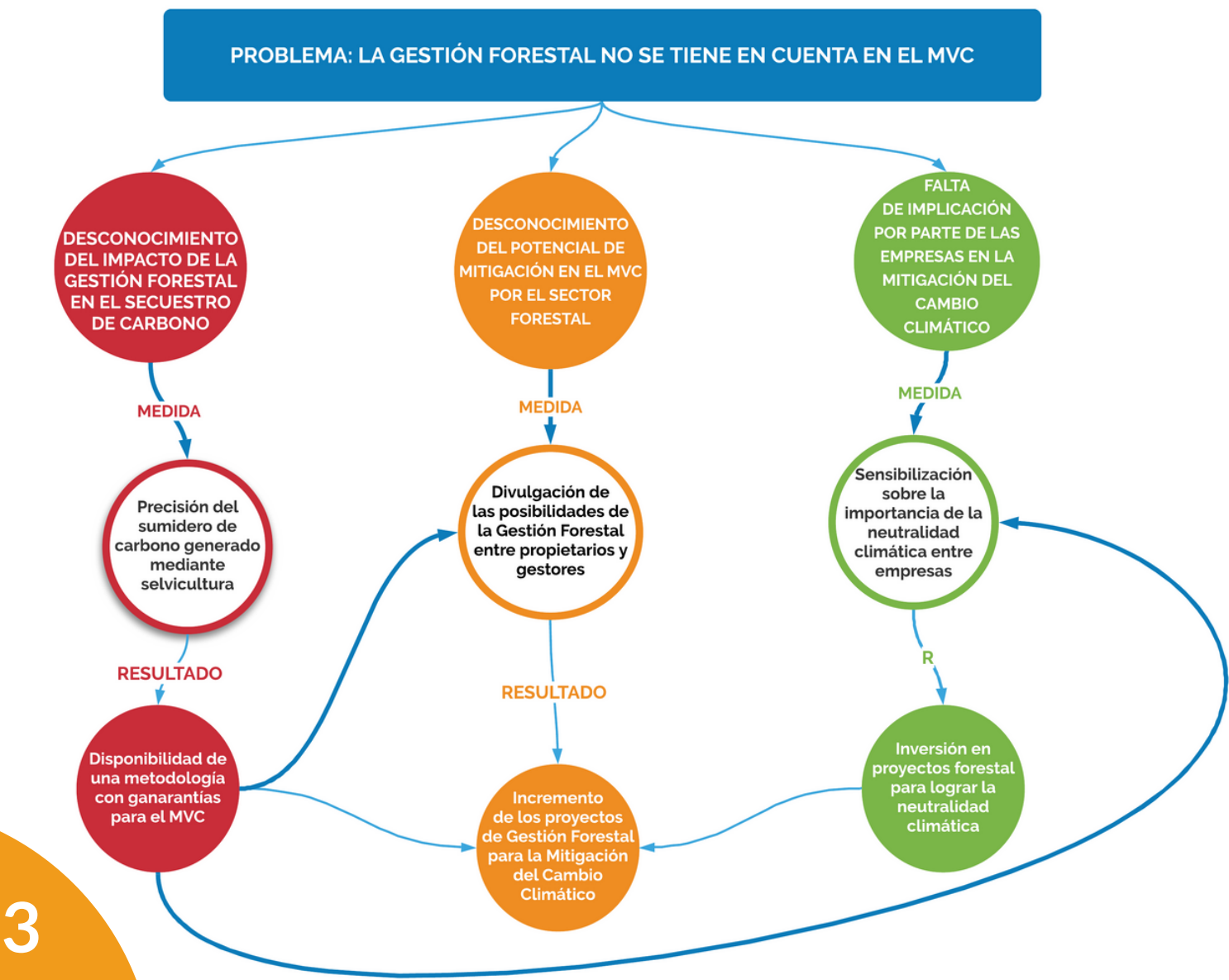
For this reason, given the urgency that the protection of forest masses implies, the opportunity that their management supposes in the fight against climate change, and as a form of recognition for the role that forest owners play, it is essential to integrate this work in the increasingly growing demands of a Payment for Environmental Services. The Voluntary Carbon Markets (MVC) are postulated as the most interesting option for this, since the commitment to these tools among companies, especially those in sectors whose greenhouse gas emissions are not regulated, is every more powerful within the framework of Corporate Social Responsibility. In this way, the forestry sector would serve as a springboard to promote the achievement of emission reduction objectives, at the same time that it fosters the potential for removals through the use of land, and especially forestry, to achieve the proposed climate neutrality. as a goal for the year 2050 in the European Union.



STARTING POINT: LACK OF KNOWLEDGE AS A CATALYST OF THE PROBLEM

Under this context, and with the premise of promoting forest management as a climate change mitigation tool, rewarding forest owners and involving companies and organizations to attract private investment to the forest sector, the LIFE FOREST CO2 project - LIFE14 arises. CCM / ES / 001271 - Quantification of forest carbon sinks and promotion of compensation systems as tools for mitigating climate change. To achieve these objectives, the analysis of the problems to be addressed leads to a problem with a common factor: the lack of knowledge. This limitation affects both internally and externally the project approach, as it is presented as a challenge from the technical point of view and the involvement of stakeholders.

At the beginning of the project, payment for the environmental service involved in forest management is expected to be a challenge, since despite the fact that there is already a voluntary market for carbon, forestry and forest management are marginalized with respect to more popular options, such as reforestation. This lack of integration displaces forestry as a quality alternative that it deserves in the fight against climate change, with the examples of Forest Management projects in the MVC being scarce, and, therefore, exclusive for forest owners. This shortage of demand and supply of CO2 credits in the market is hampered by three main reasons:



UNKNOWNLEDGMENT OF THE IMPACT OF FOREST MANAGEMENT ON CO2 SEQUESTING

To date, studies related to the mitigation potential of forestry were focused on the development of mathematical models for estimating wood production. The absorption of CO2 from the atmosphere as a consequence of forest management interventions until then is limited to that related to the production of biomass, and therefore, to the part of the air system. Forest soils and their capacity to store carbon sequestration had also been extensively studied, but the complexity of the methodologies made it difficult to integrate them in a simplified way in the calculations.

This complexity is postulated as a limiting factor, together with the lack of data, as well as a lack of methodology to guarantee requirements such as additionality versus non-intervention, long-term permanence, avoiding double counting and complying with the rules. accountants. In summary, the lack of data and methodologies that provide agile, precise, and with guarantees the CO2 sequestered as part of human intervention in the forest hinders its integration into voluntary markets.

DESCONOCIMIENTO DEL POTENCIAL DE MITIGACIÓN Y LOS MVC ENTRE EL SECTOR FORESTAL

Likewise, among forest project owners and technicians, the so-called carbon forestry, aimed at enhancing the absorption of Greenhouse Gases (GHG from now on) by forest masses, is still an unknown practice in the sector. This is mainly due to the fact that the management and maintenance of forest lands focuses on uses such as logging, hunting, or the prevention of fires and maintenance of habitats, with the capture or sequestration of carbon being a non-priority objective to when tackling silvicultural work, which means missing an opportunity both for mitigation and for providing added value to sustainably managed forest lands. This, together with the under-financing suffered by the protective forests due to their low profitability, limits the potential for mitigating climate change of the forest masses and the development of interventions.

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LACK OF INVOLVEMENT OF THE BUSINESS SECTOR IN THE MITIGATION OF CLIMATE CHANGE

This last factor is conceived as a necessity, since within the business sector, especially the activities of the diffuse sector, initiative is required to offset emissions on a voluntary basis. Carbon forestry projects will need a demand that makes them economically and commercially viable compared to other types of land use and management in which these aspects are secondary.

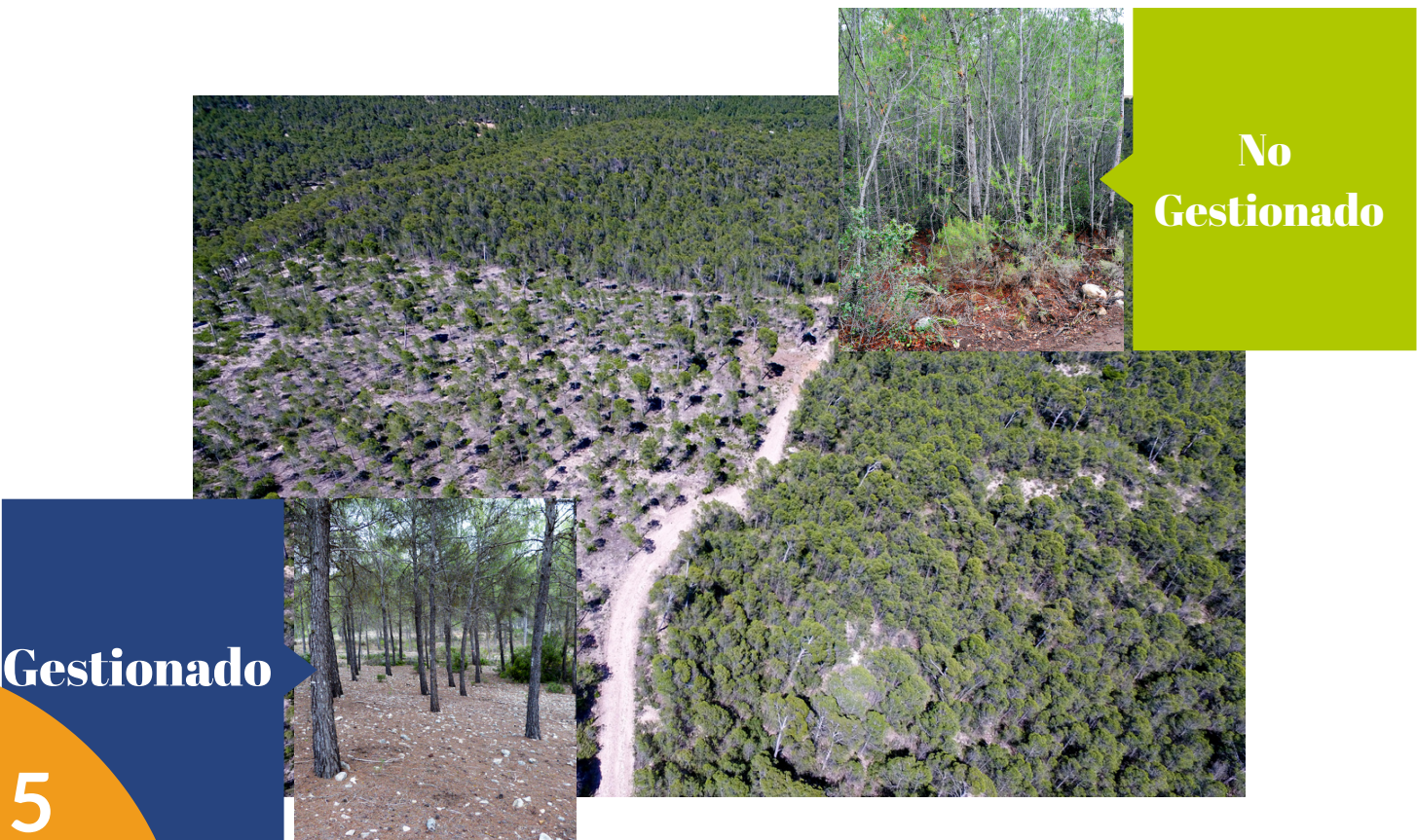
At the time of project start-up, most of the voluntary offsets are tied to the LULUCF sector and it is estimated that numerous emission rights from forestry projects remain annually. Achieving an efficient and low-carbon economy requires reducing the carbon footprint, which implies carrying out a complete management, consisting of calculating, reducing and compensating for that residual that cannot be reduced.



MODELING THE SINK EFFECT OF CARBON IN THE DIFFERENT FOREST WAREHOUSES

Through the LIFE FOREST CO2 project, it has been possible to quantify and model the absorption of CO2 that takes place in forest masses when sustainable forest management interventions are carried out. These models, developed taking into account all the forest carbon stores (living, aerial and root biomass, litter and dead matter on the ground and Organic Carbon in soils) and their interrelationships, have been synthesized for their application in a simple way by the owners. and forestry technicians. To date, it has been possible to carry out two species of conifers widely distributed in the protective forests in the Mediterranean basin: Aleppo pine (Pinus halepensis) and maritime pine (Pinus pinaster).

This task has been accomplished through three phases of work; a first phase of data collection in the field, followed by a phase of data integration and modeling using computer software, and finally, a phase of parameterization and data synthesis in an easily understood output. The first phase, data collection in the field, was carried out taking into account the criterion of Additionality, in order to be able to account for the carbon sink generated by forest management. This means that, in order to be considered an action as a sink, it is necessary to demonstrate that, with intervention of anthropic origin, there is a greater absorption of CO2 than without non-intervention. To do this, geographical areas where unmanaged plots were found, and managed plots were identified as work zones. Thus, under identical geographical, climatic and soil conditions, the explanation for the differences between the accumulated CO2 in both sites would be the intervention.



MODELING THE SINK EFFECT OF CARBON IN THE DIFFERENT FOREST WAREHOUSES

Once the basic criterion was defined, we worked in 4 areas of the Spanish and French territory in which the target species are found: Region of Murcia, Soria, Andalusia and Occitania. In these areas, a total of 48 plots were worked in which soil samples were extracted to analyze the Soil Organic Carbon, litter samples and dead matter on the soil, and the carbon in living biomass was measured using LIDAR. .

These data fed into the CO2FIX program, in which other variables such as precipitation, site index and final destination of the extracted forest products were introduced, offering a series of results that indicated the difference between the CO2 stored in managed systems and systems not managed. This difference is what was considered as CO2 credits, and they are calculated for two complete management shifts. These results were simplified as guidance tables that allow to quantify CO2 quickly and easily, knowing the variables of the terrain of the forest mass.

CO2 / HA SEQUESTRATION TABLES FOR P. HALEPENSIS (LEFT) AND P. PINASTER (RIGHT)

Precipitación (mm)	Calidad estación	Productos - Créditos CO <sub>2</sub> /ha			Media
		Bioenergía	Suelo	Tablero	
200	20	227.77	181.76	62.19	157.24
	17	128.70	88.73	6.23	74.56
	14	91.23	65.16	12.14	56.17
	11	-29.66	-43.38	-75.90	-49.65
350	20	227.19	146.73	45.37	139.76
	17	131.76	72.84	2.15	68.91
	14	92.59	54.68	9.01	52.06
	11	-19.26	-36.78	-66.19	-40.74
550	20	226.42	100.03	22.95	116.47
	17	135.85	51.66	-3.30	61.40
	14	94.23	40.70	4.84	46.59
	11	-5.39	-27.98	-53.25	-28.87

Calidad estación	Contabiliza bioenergía	Productos - Créditos CO <sub>2</sub> /ha			Medias	Media
		100% tablero 25 años	50% tablero 50% sierra	100% sierra		
12	No	164.93	173.43	181.94	173.43	200.49
	50% tronco y 50% ramas	223.30	227.55	231.81	227.55	
15	No	93.39	104.87	116.31	104.85	99.28
	50% tronco y 50% ramas	87.96	93.68	99.44	93.70	
18	No	58.59	74.47	90.35	74.47	64.27
	50% tronco y 50% ramas	46.13	54.08	62.00	54.07	
21	No	-6.07	29.41	50.34	24.56	14.48
	50% tronco y 50% ramas	-10.92	6.83	17.27	4.39	
24	No	-44.04	-17.82	8.36	-17.83	27.76
	50% tronco y 50% ramas	60.24	73.33	86.46	73.35	

RELEASE OF CO2 CREDITS TO THE VOLUNTARY CARBON MARKET

The availability of these results was a great milestone for the project, but the final step was still lacking; the elaboration of a methodology that would allow the integration of Forest Management in the MVC with guarantees. For this reason, a Methodological Guide was developed in which the conditions and requirements to consider as valid the application of the methodology, as well as for the ex ante release of credits, their ex post monitoring or the creation of a stock exchange or fund of guarantee that covers possible deviations or external phenomena..



# VOLUNTARY CARBON MARKET: WORKING WITH AGENTS OF THE DIFFUSE SECTOR

The availability of CO2 quantification models has catalyzed a change of opinion in the forestry sector, the main result of which has been the acceptance of climate change mitigation among their objectives as land owners and managers.

Proof of this are the 186 Sustainable Forest Management projects for the mitigation of climate change that have been obtained as a result of the approach to the more than 900 stakeholders of the forestry sector throughout the Spanish and French territory during the implementation of the project.

The territory that includes the area managed by these owners and professionals covers more than 26,000 hectares, which, thanks to the lessons of the project, have a long-term sustainable forest management planning. Of the totality of this ordered area, more than 5,000 hectares have been managed with interventions already carried out aimed at improving CO2 sequestration. The result is the absorption, throughout the management shift, of more than 120,000 tons of CO2 in response to silvicultural treatments.

Part of these projects have already been included in the MVC; 12 projects, which bring together almost 32,000 credits or CO2 bonds, of which 23,800 are available for sale to companies, and 8,000 in a guarantee exchange.



At the same time, this credit market has managed to penetrate among companies in diffuse sectors. Thanks to the project, they have been able to learn what comprehensive management of the carbon footprint is and how it is possible to orient emissions neutrality by relying on the forestry sector to make effective offsets for non-reducible emissions. Thus, there are 121 companies that have committed within the framework of the project, to calculate, reduce and offset their carbon footprint, which have received a certification from the project.

In this way, it has been possible to integrate carbon sinks into corporate social responsibility policies in companies and public bodies in Spain and France. Thus, it has been possible to offset 19,420 tons with Reforestation / Land Use Change projects and 167 tons through Forest Management projects launched on the Voluntary Carbon Market.

The most important milestone is the positive feedback in the LULUCF sector, since the development of forest management aimed at absorbing emissions will be strengthened by the demand for carbon credits from jobs in which the sequestered carbon is known exactly. In this way, forest owners have been rewarded for their work through payment for the environmental service of capturing atmospheric CO2, while companies will benefit in various aspects from being linked to environmental social responsibility initiatives.



**SIGNATURE D'UN ACCORD AVEC LES DIRIGEANTS DE LA SOCIÉTÉ DE TRANSPORT DISFRIMUR**



**ACTE DE TRANSFERT DES CRÉDITS D'AMÉNAGEMENT FORESTIER DE MONTE PUNTAL DE PRIEGO À LA SOCIÉTÉ NAVANTIA**



**ACTE DE CESSION DES CRÉDITS D'AMÉNAGEMENT FORESTIER DE MONTE LOS VILLARES À LA SOCIÉTÉ EVERSIA**



SOCIAL PARTICIPATION AND IMPACT

Among the main impacts at the level of dissemination and communication of the project's lessons among the main stakeholders, the following milestones stand out:

MORE THAN 900 FOREST OWNERS INFORMED



MORE THAN 700 AGENTS  
OF THE BUSINESS  
SECTOR INFORMED



MORE THAN 1,600  
STUDENTS



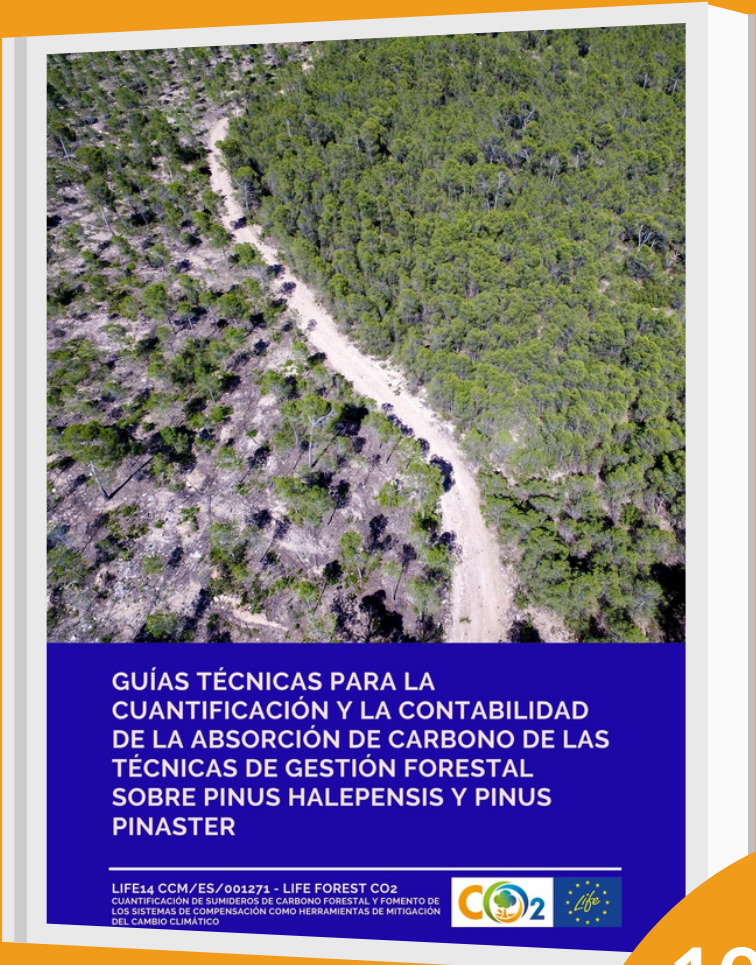
1,400 EXPERTS FROM  
THE FOREST SECTOR  
AND CLIMATE  
CHANGE

2,000 FOLLOWERS IN RRSS  
  
25,000 VISITORS TO THE  
WEBSITE

22 ITEMS

1,000 PROFESSIONALS  
IN THE FOREST  
SECTOR TRAINED

4 MANUALS / GUIDES AND  
NUMEROUS AUDIOVISUAL  
RESOURCES





# FUTURE PERSPECTIVES AND CHALLENGES

The methodologies and results developed are of high interest at the level of replication in other geographic contexts and forest species. That is why it is considered necessary to face the main challenges that arise in order to continue the lessons learned and the lines of work started with the project, once it is finished.

## WHAT HAS BEEN DONE TO GUARANTEE THE POST LIFE PERIOD?

The work carried out within the framework of the project to guarantee its life beyond LIFE has been especially related to maintaining the MVC for Forest Management. Therefore, the following milestones have been achieved:

Regulations and competencies have been developed for the certification of forest management projects and responsible companies, for their application by the relevant regional administrations and CO2 credit certification companies

A non-profit platform has been set up to manage the sale and purchase between the supply and demand of CO2 credits. This platform has set up all the tools necessary for its operation, such as certification protocols, accounting updates or project monitoring.

A meeting point has been created to put in contact supply and demand of the MVC that to date did not exist for FOREST MANAGEMENT in the form of an APP for forest owners and companies, which can be accessed through the following link: <https://murciaforestal.es/lifeforestco2/visor/>. In it, the owners can calculate, using a simulator, the CO2 credits that would be generated with an intervention in their forest territories.

Companies can also consult the projects carried out and the availability of credits to offset emissions and contact these forest owners.

# NEXT CHALLENGES

The main objective of demonstrating the role of forest management as a climate change mitigation tool has been successfully achieved through the project. However, limiting it to two forest species clearly limits the potential of the project's lessons. Although during the final phase the application has been extended to forest stands with the presence of chestnut (*Castanea sativa*) in France, it is necessary to specify the impact on the carbon sink in the same way.

For this reason, the support received from research centers and forestry associations in terms of replicability commitments is essential, since they will allow the methodologies to be extended to other forest species. Contributing to the development of new methodologies and transferring the agents of the forestry sector with the project will be the main challenge in the short and medium term.

Likewise, the fact that forest management and carbon sinks for voluntary markets are only contemplated in their own market, reduces the potential for developing sink projects. The rationale is that the support of national administrations for this carbon footprint offset option would be a great catalyst to generate greater confidence among companies in diffuse sectors. The medium-term challenge for the post-LIFE period will be to achieve the integration of the methodologies in the national registers and markets of Spain and France.

Finally, the great challenge facing the forestry sector, especially in the Mediterranean environment, is to integrate payment for environmental services into the forestry economy. Only by guaranteeing a minimum profitability for the forest owner will the quality of the forest stands be guaranteed through long-term management. CO2 credits can be the spearhead that opens the door to monetary compensation for other environmental services such as biodiversity, or the generation of water resources, thus benefiting the conservation of forest masses in the face of anticipated climate scenarios.



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The project is coordinated by the General Directorate of the Natural Environment of the Region of Murcia. As associated beneficiaries, the project has AGRESTA, CESEFOR, Center National de la Propriété Forestière (CNPf), the University of Córdoba, Engineering of the Natural Environment and the Xunta de Galicia.

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