LIFE4FIR – Project LIFE18 NAT/IT/000164

"Decisive in situ and ex situ conservation strategies to secure the critically endangered Sicilian fir, *Abies nebrodensis*"

"REPLICATION PLAN" - Action C7

Istituto per la Protezione Sostenibile delle Piante
Consiglio Nazionale delle Ricerche

Consiglio Nazionale delle Ricerche
Istituto per la BioEconomia
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REPUBBLICA ITALIANA
REGIONE SICILIANA
ASSESSORATO REGIONALE
DELL'AGRICOLTURA, DELLO SVILUPPO RURALE
E DELLA PESCA MEDITERRANEA

Parco delle Madonie

UNIVERSITÀ
DEGLI STUDI
DI PALERMO

SAAF
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AGRARIE
ALIMENTARI
FORESTALI

UNIVERSIDAD DE SEVILLA

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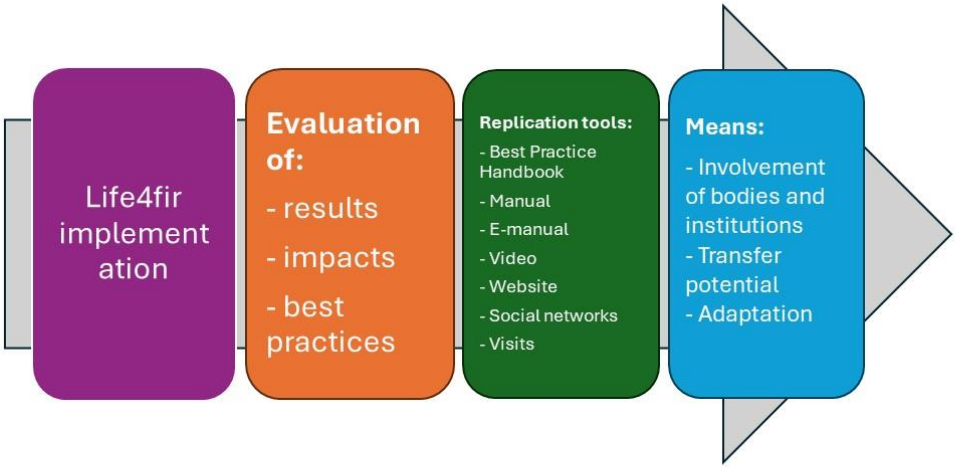
1. Introduction

Replicability and transferability is the potential of a Life project to be replicated by other actors and stakeholders and transferred to other regions or countries during and after its implementation. Replicability and transferability were identified to be connected to two interlinked goals: 1) to learn from the existing best practice and 2) to the lessons learned to be fed back to Europe.

The basic aim of the Replication Plan is to make the LIFE4FIR project better known, and above all to highlight and promote the instruments created, tested and evaluated as effective and worth replicating both by the project itself and by a series of social partners and stakeholders involved. Replication is aimed at highlighting the main features of the actions implemented in the Life4fir project, the innovative tools used and extrapolate the potential to implement and replicate them in similar context. The aim is to make the knowledge and experience accumulated in the project activities available to bodies and institutions that intend to protect endangered firs and conifers species in the Mediterranean area.



2. Life4fir: outcomes and potential

The Madonie fir, Abies nebrodensisis, is the most representative and well-known endemism of Sicily with a natural population made of only 30 relic trees. Due to its critically endangered status, acknowledged by IUCN, this species plays a symbolic role, because it fully represents the effects of the loss of biodiversity and habitat fragmentation caused by the past overexploitation of natural resources. Abies nebrodensis is also affected by a series of threats that are common to other Mediterranean firs: genetic erosion, long summer drought, grazing, wildfires, along with the effect

of climate change. The LIFE4FIR project has taken the results and knowledge acquired by previous projects targeting this species to implement a thorough, multidisciplinary and integrated strategy, based on the use of innovative techniques, to respond to the main threats affecting Abies nebrodensis and improve its conservation status. The joint work of the institutions involved (Istituto per la Protezione Sostenibile delle Piante e Istituto per la BioEconomia del CNR; UNIPA-SAAF; Ente Parco delle Madonie; Departamento de Biologia Vegetal y Ecologia Universidad de Sevilla, and the Dipartimento per lo Sviluppo Rurale e Territoriale delle Regione Sicilia) has led to significant progresses in the five key actions of the project: 1. Sustain to the residual trees of Abies nebrodensis in their natural habitat (in situ conservation). 2. Maintaining the purity of the population and increasing biodiversity in the progenies. 3. Nursery production and selection of pure, outbred and vigorous seedlings. 4. Establishing new reforested plots through replanting interventions in suitable areas of the Madonie park using genetically selected seedlings to promote the rediffusion of the species. 5. Ex situ conservation with traditional and innovative methods through implementation of a seed bank and a cryobank.

These thorough and synergic pool of actions provides a model of procedures for the long-term conservation of this species, that could be effectively replicated and transferred to other regions for the protection of other endangered fir and conifer species. It's therefore useful to promote and spread the effective and sustainable guidelines developed and implemented by Life4fir that have produced good results on the conservation of Abies nebrodensis that can represent a useful reference for entities committed to safeguarding the biodiversity of threatened and endangered tree species in the Mediterranean area.

This document is addressed to entities showing their interest in the LIFE4FIR project and other companies/entities, potentially interested in replicating the schemes and solutions experimented in the project. The main challenges will be in proposing the solutions applied for A. nebrodensis to various and different species with their own ecology, threats, population size, management, country etc.

3. Objectives of the Replication activities

As stated, the core target of the dissemination activity of the LIFE4FIR project is to raise awareness, communicate and spread the theme of why protecting biodiversity through safeguarding and improving the state of conservation of endangered species, and the effective tools and measures to face it. This can be achieved through a shared approach, involving Park Authorities, Public Administrations, Scientific community, local communities, thanks to a dissemination plan, events and meetings organized in function of the targeted audience. The main points of replication are:

- Identify the full potential of replication at region/species level
- Identify and select actions worth replicating the LIFE4FIR experience.
- Provide a scheme to understand the concept, approaches, applications, opportunities, needs of knowledge transfer for endangered tree species
- Support the political and technical capacity development process through knowledge transfer.

4. Identification of species and sites

Replicability of LIFE4FIR results to other Mediterranean regions where there are threatened fir and conifer species characterized by small and fragmented populations can be actually conceived for:

Abies numidica (Algeria), IUCN: **CR critically endangered**	Reference: **-** Yasmina Tlili Ait Kaki Laboratoire de Botanique, Faculté de Médecine, Université Badji Mokhtar d'Annaba, Algérie. E-mail: tliliyasmina@yahoo.fr
Abies cilicica (Turkey, Siria, Lebanon), IUCN: **NT (vulnerable)**, but the populations of Syria and Lebanon are critically endangered.	Reference: - Mustafa Yilmaz, KSU Faculty of Forestry, Department of Silviculture, K.Maraş, Turkey, 46100, mustafayilmaz@ksu.edu.tr - Tefide Yüksel, Forestry General Directorate, Çankaya, Ankara, Turkey, tefideyuksel@ogm.gov.tr
Abies pinsapo (Spain), IUCN: **EN - endangered;**	Reference: - Jose López Quintanilla. Coordinador regional del plan de recuperación del Abies pinsapo. Junta de Andalucía, Consejería de Sostenibilidad y Medio Ambiente - Rafael Haro Ramos, Director Espacio Natural de Sierra de las Nieves
Abies marocana (Morocco), IUCN: **EN - endangered;**	Reference: - Parc National Talassemtane, 4WJ9+6PV, Adeldal, Marocco - Mariem Ben-Said, Abdelmalek Essaâdi University, Tetouan, Morocco - Lahcen Taiqui, Department of Biology, Faculty of Sciences of Tetouan University Abdelmalek Essaâdi, Tetouan, Morocco
Picea omorika (Serbia and Bosnia-Herzegovina), IUCN: **EN – endangered**	Reference: - Tara Mountains National Park - Vladan Ivetić, University of Belgrade – Faculty of Forestry, Belgrade, Serbia

5. Mediterranean firs: common threats

According to the 'Technical guidelines for genetic conservation and use of Mediterranean firs' reported by EUFORGEN, overharvesting, grazing, prolonged drought and wildfires are major threats to Mediterranean firs. The conservation status of the firs ranges from critically endangered to least concerned according to the IUCN Red List of Threatened species.

Climate change is also predicted to intensify summer droughts in the Mediterranean. It represents a serious threat for fir forests and is also likely to increase the frequency and extent of wildfires, with devastating effects on survival, reproduction and regeneration of the firs. Furthermore, climate change may decrease winter hardening and cause earlier bud burst, thus increasing the risk of frost damage. This can jeopardize the development of seedlings and young trees especially in open areas, and cause fir forests to disappear from their low altitude sites. Temperature rise during summer combined with water stress can result in extensive crown defoliation and tree mortality. The fir forests growing at low elevation, superficial soils or on southern slopes are those currently facing the greatest threats. Due to these threats, endemism and geographically scattered distribution, the conservation of Mediterranean firs and their genetic resources is a major challenge.

The implemented measures and the tools used in the Life4fir project for the protection of A. nebrodensis represent resources potentially able to respond to the common threats affecting Mediterranean firs. The genetic resources of the firs are currently conserved in various protected areas. At present, several species and their genetic resources are protected either *in situ* in national or regional parks, nature reserves and gene conservation units or *ex situ* in conservation seed orchards and stands. The Life4fir Project has developed tools to improve the conservation of endangered species through both *in situ* and *ex situ* measures.

6. Project materials and activities supporting replication

Transferability will be achieved with the creation of a "replicable model" by means of a Best Practice Handbook and a Replication plan.

These tools will be also described and disseminated in a website, dedicated to LIFE4FIR, that will run even after the end of the project. Interested people will find here all the information needed to replicate the safeguard actions carried out with *A. nebrodensis*. Scientists involved in the project will continue to periodically update the site and respond to the questions that have arisen.

In addition, the visitors of the website will have the possibility to submit questions and clarifications directly to the scientists/technicians which have been involved in LIFE4FIR.

Best Practice Handbook

A “Manual of good practices for the in situ and ex situ conservation of the threatened Mediterranean Abies species” has been published by the Life4fir project. The manual reports and describes the activities that have provided effective results for the conservation of *A. nebrodensis*, through the identification of the main threats, the implementation of countermeasures capable of reducing the vulnerability of the species and safeguarding it from the risk of extinction.

The Best Practice Handbook was distributed during two replication events organized in the course of the project, one in Seville and one in Sicily. The two replication events were held in November 2021 and May 2023, respectively and were attended by managers involved in the conservation of nature and biodiversity.

Video

A LIFE4FIR video produced in 2024 is another tool that will be utilized in the After-LIFE phase to promote and spread project objectives and outcomes. The video introduce the objectives and the activities carried out, the results obtained, and the effectiveness of the measures adopted for the protection of *A. nebrodensis*, giving space to all the actors who contributed to the project implementation. The video will be played during events such as workshops, seminars, round tables, conferences and on various other occasions organized within the framework of Life Nature and Biodiversity projects and other projects aimed at the safeguard of endangered tree species to which will be invited.

Website

The dissemination materials produced in the course of the project such as, video, footages, Best Practice Handbook, Manual, E-manual, scientific publications produced during the project are available on the project websitewww.life4fir.com.

The website will remain operational for at least 5 years after the project end. Videos and other footage produced in the course of project are also available in the Youtube channel and on X and Facebook profiles.

The website will act as a place for easy reference for people interested in any contact regarding the topic. The contact information of the project partners will be maintained so that direct contact with the project staff is possible.

The project materials will function after the project end, so that they can still be utilized to communicate about biodiversity conservation in various other occasions. The website will act as a place for easy reference for the partners in any contacts regarding the topic.

These materials will support replication by providing information about the project topics for anyone interested.

Replication events within Life4fir

Transferability of the best practices have also been based on two replication events to which international stakeholders participated. During the project, a network of potential direct users/stakeholders interested to the experiences and outcomes of the project have started. Such figures working with parks, protected sites and Natura 2000 network (e.g. authorities and technicians of Parks, scientists, researchers, foresters, institutions responsible for Parks protection) where endangered tree species grow, with particular reference to Mediterranean conifers, actively participated at demonstration meetings in the course of the project.

The two replication events organized during the Life4fir project have allowed us to involve and draw the attention of figures already involved in the conservation of endangered species in protected areas. In Spain were involved the coordinator of the regional plan for the safeguard of Abies pinsapo, Junta de Andalucía; the Director of Parque Nacional Sierra de las Nieves; and the Director of Jardín Botánico “El Castillejo”. In Sicily a replication event 'Conservation strategies for Abies nebrodensis' was held in Polizzi Generosa in May 2023. It was attended by park managers, policy makers representing the Regional Government and local entities, stakeholders, Park and Natura 2000 site managers and head schools.

These two events allowed us to establish contacts with some figures designated to transfer the tools developed in Life4fir., who showed direct interest in the project results. Through these figures, the Life4fir beneficiaries visited some protected areas dedicated to the conservation of A. pinsapo in Spain and it was possible to exchange experiences and knowledge on safeguard and conservation measures, as well as find common issues on which set up transfer and replication.

Visits to the sites targeted by Life4fir

Guided visits and open days were organized during the Life4fir project to the targeted sites to promote knowledge and awareness by involving administrators of protected areas, politicians, representatives of institutions and school children towards the issues of biodiversity conservation and the relationship with ecosystem services. The visits will continue during the after-life phase to allow people directly involved in the transfer and replication to come into contact with the issues related to the protection of endangered species, with the assessment of threats, the development of adequate tools for their control and mitigation, in light of the results achieved.

7. After-life replication activities

In the After-Life phase, results and tools developed in the Project as 'replicable model' can be shared and discussed with interested people during round tables, workshops, conferences. Special visits to the natural site of *A. nebrodensis* will also be organized to show directly on site the measures adopted in relation to the prevailing threats and the ecology of the territory. The final results and above all the maintenance strategies of the activities beyond the end of the project will be shared among these institutional and technical subjects. The goal is to get active participation of other Institutions and groups facing issues of biodiversity conservation, making suggestions, recommendations, and maturing, together with the stakeholders, experiences that will be useful for adaptation and replication in their own situations. The involvement of park managers and stakeholders in evaluating the Life4fir results is pivotal, playing all these actors a key role in the replication of the project. Being directly implicated, they could give feedback, comments, criticism and suggest useful directions in order to adjust project implementation to other species, ecosystems and territories. Indeed, LIFE4FIR aims to become a model for future actions with other conifer species in similar conditions of high genetic erosion. Transferability of the expertise gained with LIFE4FIR is realistic and plausible, with high chances of success for some endangered Mediterranean conifers.

The project has an important transfer potential. Indeed, although *A. nebrodensis* is localized in a small area within the Madonie Regional Park, the strategy developed in the frame of the project can have a broader value and can represent a "replicable model approach" that could be replicated in the presence of similar situations of endangered conifer species. Results of this project will promote cooperation and regional development among Mediterranean regions by a joint approach to the conservation and regeneration of endangered Mediterranean species. The involvement of Spanish partner in the Life4fir project has been aimed at promoting the effective sharing and transfer of experience and results acquired during the LIFE4FIR project to *Abies pinsapo* species.

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