LIFE 15/CCA/ES/125

Deliverable Name: Relevant stakeholders' post-project maintenance

Action C2: "Replication of trials by external stakeholders"

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with support of: Van Leijen, CERTH

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1. Summary

The Green Link project included a strategy for the monitoring and maintenance of the trees planted during its replication activities with third parties organizations to enhance its benefits and positive impacts in the long-term.

The Consortium supported third parties (i.e., external stakeholders) for the project replication. Project partners provided their expertise and a number of Cocoons for each replication site. In exchange, replication agents cooperated with machinery, human labour, water and saplings. These replication agents, moreover, abided themselves to a commitment (verbal or signed), by which they agreed to carry out monitoring and maintenance actions. Post-project maintenance actions (i.e., activities and/or measures) are aimed at ensuring the long-term survival and optimum health status of the trees planted within the framework of The Green Link project and that **secure tree survival until at least 30-40 years** after the projects ends, both with and without Cocoons.

Finally, it was envisaged to replicate with 6.000 thousand cocoons but due to the success of implementation actions, we provided more than 7.500 Cocoons. In total we have replicated the project's strategy in 50 locations including assessment of each planting area, a training course to each replication agent team and a plantation event as explained in the deliverable C2 Report with pictures. The replication areas are distributed in four countries: 23 in Spain, 9 in Greece, 2 in Portugal and 16 in Italy. We have received 31 signed commitments letters of which 6 in Spain, 8 in Greece, 1 in Portugal and 16 in Italy, the others were committed verbally. Particularly 5 locations in Spain were classified as **large-scale replication sites** because replication agents received more than 500 cocoons each. Therefore, the long-term post project maintenance of more than 4.500 Cocoons is guaranteed under a signed commitment letter.

2. Introduction

In order to ensure the **long-term maintenance of the trees planted** during the project implementation, each of the **external replication agents** (i.e., associations, NGOs, local and regional governments, or individual landowners) agreed to do **maintenance of the plantation**, **monitoring the tree health and communicate about the plantation state** with the projects partners. The agreement was established through a signed commitment letter to those replication agents that received more than 500 Cocoons. Some smaller projects also obtained these written commitments and many local operators committed by verbal agreement. In several cases, trees were planted in protected areas (Natura2000 sites and natural reserves) in the framework of the managing bodies' institutional tasks and objectives, contributing to restoration measures. As such the long-term conservation is guaranteed by these institutional frameworks. In some other cases, planting took place in the framework of other LIFE projects that already provided commitments on future conservation in their own project proposals.

In the agreement letter/verbal, all actions and activities needed for appropriate post-project maintenance of plantations are detailed. Each letter was signed by two interested parties. On the one side, a representative person from the replication agent carrying out the replication and, on the other side, the project partner responsible for such replication.

Replication agents are bound to a number of commitments. **During the tree-planting** with Cocoons, they must follow the instructions of the Manual (Annex I. Planting Guide) prepared by Land Life Company. They also should provide planted trees with all resources required such as soil, water (except for trees planted with Cocoons), human labour, and possibly mycorrhiza.

For **monitoring purposes**, and in line with the Monitoring Protocol (Annex II) prepared by CREAF, replication agents must provide to the responsible project partner the required data relative to the young trees planted. This includes the state of the Cocoon and the status of plant vigour after the first past summer as well as every following year, and whether the control group was watered regularly or not. The replication agents were asked to provide information on the planted trees and on the results of the plantation over time. All agents provided their feedback on the results achieved, although many used more easy ways of communicating their data. The results were suitable to complete the picture on the added value of the use of cocoons in determined contexts and to increase our knowledge on best practices.

For **communication purposes**, replication agents committed to giving visibility to the initiative through their usual communication channels. That is, website, Facebook or other online platforms as well as local activities, brochures, or other dissemination events and materials. They were asked to continuously communicate and/or upload the evolution of their activity at their replication sites and the main outcomes to broaden the project reach. In all communication and dissemination activities, replication agents were instructed to always refer to the project and the Cocoon Technology using the official names, references, and links (e.g., LIFE15 CCA/ES/000125 The Green Link project, www.thegreenlink.eu, Cocoon©). Moreover, replication agents committed to always inform the representatives from The Green Link project on the communication activities carried out or scheduled. This enabled them to monitor the real impact of the project in terms of planted trees (with and without Cocoons), events organised, people involved (i.e., project reach), and lessons learnt.

Regarding **post-project maintenance activities**, these include, in general terms, tree thinning and pruning when necessary, regular watering according to plant needs, replacement of dead trees with new ones, and yearly (or every 2 years) **monitoring of tree growth and plant vigour** fluctuations. Replication agents of the 4 big projects (Fundación Naturaleza y Hombre in Salamanca, Junta de

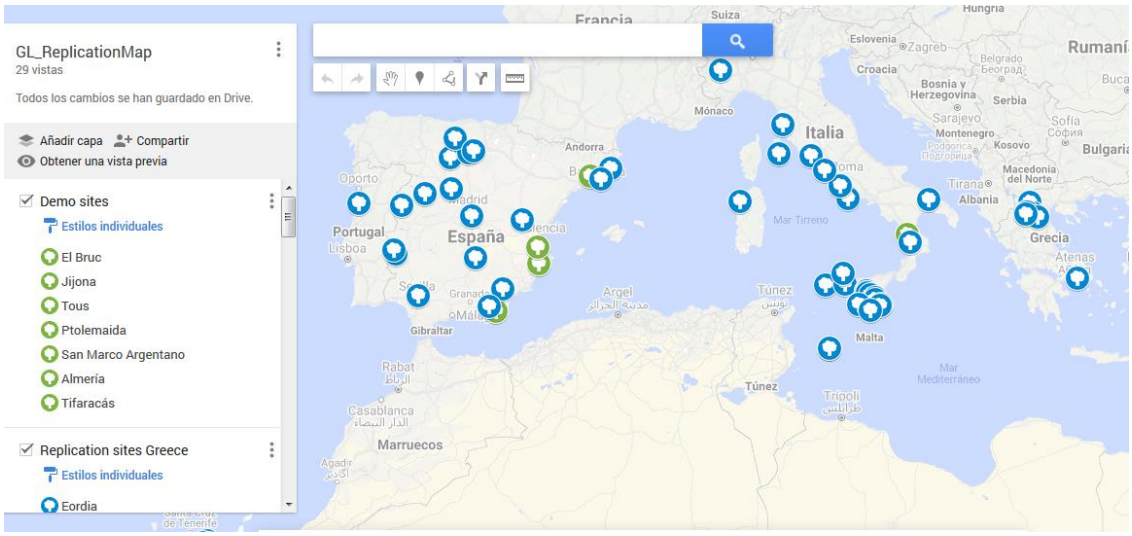
Castilla y León in Segovia and the 2 large projects with local municipalities in Matamorisca-Palencia and Fresno de Rodilla-Burgos) abide themselves to not cutting the threes during the following 30-40 years after planting and to provide them with long-term maintenance after the project's end.

All the data gathered will be used by partner Land Life Company (LLC) through its dedicated **tree monitoring App** to carry out **long-term monitoring of The Green Link project outcomes** in terms of its contribution to CO_2 absorption. Tree biomass is related to the ability of trees to absorb atmospheric CO_2. Therefore, biomass data from the planted trees will be converted into the **total atmospheric CO_2 (in kg or tonnes) absorbed**. This allows LLC to give the local landowners an estimation of the total contribution of the project to the decarbonisation of the atmosphere and, thus, to its contribution to climate change mitigation.

These commitments from replication agents will ensure that the trees planted within the framework of the LIFE The Green Link project survive, thrive, and remain healthy in the long term, providing ecosystem services and contributing to atmospheric decarbonisation and mitigation of the negative effects of climate change.

LOCATION OF REPLICATION SITES INTERACTIVE GOOGLE MAP

https://www.google.com/maps/d/u/1/edit?mid=1lKRXRG2lrLkmX6My36AnjvjziegYwfug&ll=36.162178594581825%2C4.04926445000001&z=5



3. Large-scale replication sites

This action has demonstrated the success in expanding and transferring the knowledge gained in this project to civil society as well as to accelerate market uptake of the Cocoon and serve to enhance dissemination efforts. It was envisaged to replicate with 6,000 Cocoons in 3 countries, but due to the success of implementation actions and high demand from society, partners provided **7.541 Cocoons through 4 european countries (Spain, Portugal, Italy and Greece**).

Already in the first year of the project the Consortium started contacting different organizations in each demonstration area in order to agree a particular reforestation activity that would benefit the local region as a strategy for implementing adaptive measures in order to reduce the vulnerability of these ecosystems.

Particularly in Spain, Land Life Company and Volterra Ecosystems have reached agreements to plant trees using **4.000 Cocoons** in areas that needed restoration actions given the fact that these were large, ambitious reforestation projects with solid organisations behind with high potential for future replication and market take-up.

Relevant information about the commitments and agreements signed by replication agents and the responsible project partners is provided below. This includes the location where the replication activities took place, the number of trees planted with and without cocoon, the challenges pursued and type of problems to be faced, the date of signature of each agreement and the main commitments for the post-project maintenance and conservation of planted trees. See Annex III for details of the 6 Spanish, 1 Portuguese, 8 Greek and 16 Italian replication sites and agreements.

Spain

1.
Replication agent/s: Fundación Naturaleza y Hombre.
Project partner: Volterra
Location: Campanarios de Azaba, Municipality of Espeja (Salamanca), Castilla y León, Spain.
Number of trees: 1.000 trees with Cocoon + 500 trees without Cocoon.
Date of signature: January 2018
Challenge: Reforest a very difficult area where the Fundación Naturaleza Y Hombre (FNYH) had no success in the last few years due to climatic and soil conditions. Part of overall habitat restoration activities in the internationally acclaimed Campanarios de Azaba natural park.
Commitments: They will not cut any tree for at least 30 years but in principle they consider the trees to be present here for a "perpetual time" as they are part of a much larger conservation project.

2.
Replication agent/s: Dirección General del Patrimonio Natural y Política Forestal de la Consejería de Fomento y Medio Ambiente de la Junta de Castilla y León.
Project partner: Volterra
Location: Nava de la Asunción (Segovia) and Villanueva de Duero (Valladolid), Castilla y León, Spain.
Number of trees: 1.000 trees with Cocoon + 1.000 trees without Cocoon.
Date of signature: February 2019
Challenge: In Segovia the summer is typically extreme with 3 or 4 months without rain. The Junta had tried to restore the respective areas for a number of years without any result. The tree variety provides important products for local economic activities.
Commitments: They will not cut any tree in 30 years but in principle these trees will never be removed as they are part of the Junta's overall reforestation efforts.

3.
Replication agent/s: Municipality of Matamorisca, part of the larger municipality of Aguilar de Campoo (agreement seconded by the Consejería de Fomento y Medio Ambiente de la Junta de Castilla y León).
Project partner: LLC
Location: Las Matas forest, in Matamorisca, Municipality of Aguilar de Campoo (Palencia), Castilla y León, Spain.
Number of trees: 1.000 trees with Cocoon + 25.000 trees without cocoon, 20 ha divided in 3 plots.
Date of signature: April 2018
Challenge: In northern Palencia "normal" summers are ever less regular, adding high costs for watering in summer to help trees survive. The Cocoons were considered very interesting by the municipality as an "insurance" in case of another very dry summer.
Commitments: They will not cut any tree in 30 years but in principle these trees will never be removed and be maintained long term by the Junta.

4.
Replication agent/s: Ayuntamiento de Fresno de Rodilla (agreement seconded by the Consejería de Fomento y Medio Ambiente de la Junta de Castilla y León).

Project partner: LLC
Location: La Brújula forest, Fresno de Rodilla (Burgos), Castilla y León, Spain.
Number of trees: 1.000 trees with Cocoon + 45.000 trees without Cocoon (90 ha divided in 10 plots).
Challenge: In the Burgos area climate change is adding every year to the challenge of reforestation, some summers have no rain making survival of the young trees difficult. Added difficulty in this project was the forest fire that destroyed everything and led to strong erosion. Cocoons were placed in the most challenging areas (against hills for example).
Date of signature: October 2018
Commitments: They will not cut any tree in 40 years but in principle these trees will never be removed and be maintained long term by the Junta.

5.
Replication agent/s: Fundación Patrimonio Natural, Biodiversidad y Cambio Global and Ayuntamiento de Almócita.
Project partner: UAL-CAESCG
Location: "Paraje Los Corrales", Municipality of Almócita, Almería, Spain.
Number of trees: 500 trees with Cocoon.
Challenge: Local administration is interested in protecting and preserving the environmental values of the municipality in order to increase environmental services, in particular improving the soil, preventing erosion, preventing the risk of fires, restoring biodiversity and balancing flora and fauna.
Date of signature: March 2019
Commitments: Not cutting the trees at least until 2050 and be maintained in the long term by the municipality and the Fundación.

4. Other replication sites

Spain

6.
Replication agent/s: Fundación Patrimonio Natural, Biodiversidad y Cambio Global and Antonio Maurandi López (landowner).
Project partner: UAL-CAESCG
Location: "Finca Cortijo Nuevo", Fuente Grande, Municipality of Chirivel, Almería, Spain.
Number of trees: 100 trees with Cocoon (in 5 ha).
Challenge: It is an area that is at risk of fires with erosion problems due to over-agricultural exploitation. The landowner seeks to reestablish the natural balance in the area, increase environmental services at the local level, protect and conserve the area as well as to increase the socio-economic effects.
Date of signature: February 2019
Commitments: Not cutting the trees at least until 2025 and be maintained in the long term by the landowner.

Greece

1.
Replication agent/s: School of Agia Paraskeui.
Project partner: CERTH
Location: Agia Paraskeui, Kozani, Greece.
Number of trees: 10 trees with Cocoon.
Challenge: Enhancement and promotion of environmental education and students' awareness raising. During The Green Link project, children/students were motivated to participate in reforestation events at their local community. Moreover, the maintenance of trees could be

involved in environmental education programs/lessons related to ecosystem services. Finally, those students who took care of the trees could consume the collected fruits as a praise for them.
Date of signature: March 2019
Commitments: Continuous monitoring and maintenance of the growing trees in the long term.

2.
Replication agent/s: Municipality of Voio.
Project partner: CERTH
Location: Voio, Kozani, Greece.
Number of trees: 100 trees with Cocoon.
Challenge: Enhancement of ecosystem services (soil erosion control, climate regulation) and landscape renovation of local communities abandoned areas.
Date of signature: March 2020
Commitments: Continuous monitoring and maintenance of the growing trees in the long term.

3-4.
Replication agent/s: Public Power Corporation.
Project partner: CERTH
Location: Exhausted lignite mines in Municipality of Eordaia and in Municipality of Amyntaio.
Number of trees: 350 trees with Cocoon in Eordaia and 450 trees with Cocoon in Amyntaio.
Challenge: After the closure of mining activities, the overburden land and thus the "new area", cannot perform some of its provisioning and regulation functions (e.g. soil erosion control, air quality regulation, soil fertility, biodiversity conservation etc). In addition to these challenges, the low accessibility in irrigation water and the lack of a stable road network, the use of cocoon technology is a specific tool for land reclamation and management plans. Finally, PPC wanted to test a variety of tree species with the Cocoon technology.
Date of signature: May 2019 (Eordaia), February 2020 (Amyntaio)
Commitments: Continuous monitoring and maintenance of the growing trees in long term and parallel assessment of the utilization of trees or tree products for other purposes. For instance, black locust and oak can be used for bees feeding or for the production of wood products.

5.
Replication agent/s: Agronomist/farmer in Kozani.
Project partner: CERTH
Location: Kozani, Greece.
Number of trees: 15 trees with Cocoon.
Challenge: Enhancement of ecosystem services (soil erosion control, climate regulation) and landscape renovation of local communities abandoned areas.
Date of signature: March 2019
Commitments: Continuous monitoring and maintenance of the growing trees in the long term.

6-7.
Replication agent/s: Cooperation of foresters in Eratyra & Farmers in Mikrokastro.
Project partner: CERTH
Location: Eratyra & Mikrokastro, Kozani, Greece.
Number of trees: 10 trees with Cocoon in Eratyra & 10 trees with Cocoon in Mikrokastro.
Challenge: Enhancement of ecosystem services (soil erosion control, climate regulation) and landscape renovation of local communities abandoned areas.
Date of signature: March 2019
Commitments: Continuous monitoring and maintenance of the growing trees in the long term.

8.

Replication agent/s: Cooperation of foresters in Kozani.
Project partner: CERTH
Location: Kozani/Servia, Greece.
Number of trees: 20 trees with Cocoon.
Challenge: Enhancement of ecosystem services (soil erosion control, climate regulation) and landscape renovation of local communities abandoned areas.
Date of signature: May 2019
Commitments: Continuous monitoring and maintenance of the growing trees in the long term.

Portugal

1.
Replication agent/s: Laboratory of Experimental and Applied Phytotechnologies (LEAPH), Department of Geosciences of University of Aveiro.
Project partner: CREAF
Location: Aljustrel, Portugal.
Number of trees: 10 trees planted with Cocoon.
Challenge: This site was selected due to its low precipitation and poor soil quality to past mining activities. LEAPH will investigate the ability of the cocoon to promote the growth of *Quercus ilex* and *Quercus suber*.
Date of signature: December 2018
Commitments: Monitoring biometric and ecophysiological parameters and upkeeping the plantation after the project's lifetime.

Italy

1.
Replication agents: Allasia Plant Magna Grecia & Comune di Cosenza.
Project partner: Biopoplar
Location: Città dei ragazzi di Cosenza (Calabria), Italy.
Number of trees: 40 trees with Cocoon.
Challenge: Local awareness raising activity for young people and national dissemination by the nationally broadcasted TV programme Linea Verde. Providing shadow and beauty to the park (http://thegreenlink.eu/it/2018/10/).
Date of signature: verbal agreement
Commitments: the planted trees are part of the extensive green spaces of this important stable resource of the City of Cosenza, integrated in the social system, and characterised by a high variety of functions, that constitute the flagship of the social-cultural offer of the city in the framework of its policies for children and active citizenship. Their maintenance is embedded in the ordinary management of the Città dei ragazzi and the aim is to conserve the long-term healthy presence of the trees.

2.
Replication agent: CREA - Consiglio per la Ricerca in agricoltura e l'analisi dell'Economia Agraria, with support of Ufficio Territoriale Carabinieri per la biodiversità di Cecina.
Project partner: Biopoplar/Van Leijen
Location: Cecina (Tuscany), alongside the Natural Reserve Tomboli di Cecina, Via Pineta Cecina (LI), Italy. [Geographic coordinates: 43°17'22.12''N; 10°30'30.09''E].
Number of trees: 120 trees, 60 with and 60 without cocoons.
Challenge: Restore natural vegetation in an area with sandy and alluvial soils accompanied by a shallow water table and remarkable summer drought. Complications to growth are constituted by salinity of groundwater, 2 levels of fertility, difficulty of regular irrigation and dry summers.

Date of signature: 12/11/2018
Commitments: The activity was authorised by the competent body Ufficio Territoriale Carabinieri per la biodiversità di Cecina, in charge of the maintenance of the area on behalf of the Demanio (State Property) and Municipality of Cecina. It was performed in the framework of a broader restoration of an abandoned area previously used as parking, near the natural reserve, and performed with support of CREA to test best practices for the continuation of this restoration. The authority commits to the long-term conservation of the trees, although at the moment it is unable to sign a declaration. CREA will perform further monitoring activities on growth parameters.

3.
Replication agent/s: IPLA S.p.A. - Istituto per le Piante da Legno e l'Ambiente.
Project partner: Biopoplar
Location: Basse di Stura, Torino (Piedmont), area along the Stura creek, Italy.
Number of trees: 120 trees, 60 with Cocoon and 60 without.
Challenge: Restore natural river vegetation in an area where the sandy soil is shallow (5-25 cm), resting directly on a gravelly substrate, and thus showing high drainage and low available water capacity (AWC). Climate change provides a further pressure, showing lower and irregular rainfall values and dryer summers. The activity is performed within the urban reforestation project di Basse di Stura, aimed at the requalification of an abandoned area into an urban park. Funded by the company FPT Industrial, it is part of the regional Urban Forestry project, that aims to develop guidelines for the enhancement and valorisation of ecosystem services provided by urban green. It includes the study of carbon credits.
Date of signature: 15/10/2018
Commitments: The City of Torino owns the area and is a partner in the Regional Project Urban Forestry. Within the framework of this project, the environmental performance of the Parco Stura will be monitored and evaluated by CREA, with particular focus on carbon, ozone and particulate absorption and mitigation of heath islands of the city. Moreover, the certification of ecosystem services is foreseen. The City of Turin committed to opening the park to citizens while conserving its natural characteristics. The area is now subject to the Regolamento N. 317 - Verde pubblico e privato, which regulates the maintenance and conservation of urban green spaces.

4.
Replication agent: Azienda Agricola Guaceto.
Project partner: Biopoplar
Location: Brindisi (Apulia), Località Apani, Italy.
Number of trees: 100 trees, 50 with Cocoon and 50 without.
Challenge: Restore natural vegetation: afforestation of a wooded area mainly of Mediterranean scrub on the seafront of about 1,5 ha. The area is affected by high summer drought; partial exposure to strong winds, and occasional water stagnation in the autumn - winter months. The activity is part of a wider plantation of 1.500 trees.
Date of signature: 18/07/2018
Commitments: Trees will be conserved during the full duration of their lifetime and their management falls under the Azienda.

5.
Replication agent: Sempre Verde Pro Natura Latina #REFOREST.
Project partner: Van Leijen
Location: Island of Ventotene (Lazio), Italy.
In collaboration with: Riserva Naturale Statale Isole di Ventotene e S. Stefano - Comune di Ventotene, according to the Convention approved by D.G.C. N. 27 of 26.02.2019.
Number of trees: 86 trees, 70 with Cocoon and 16 without.

Challenge: Re-establishment of traditional Ilex groves. The Island is composed of volcanic soil, recognizable by yellow tuffs, trachites and basalts that characterize the coasts of the whole island. Soils are of small thickness with poor water retention capacity. Climate conditions show long periods of drought and water for irrigation is not available as the Island itself has no fresh water sources and is sourced by a desalinator. This situation makes any restoration activity a harsh adventure. The area is part of the SPA Isole di Ponza, Palmarola, Zannone, Ventotene e S. Stefano (IT6040019), and thus ruled by the Birds Directive. It is considered (SDF) an insular environment of particular importance due to the presence of nesting seabirds (in Lazio only on this site): *Calonectris diomedea, Puffinus puffinus,* and *Phalacrocorax aristotelis*. It comprises habitats like 5330 (termomediterranean scrub) and 9340 (*Quercus ilex* and *Quercus rotundifolia* forests), the latter being enforced by the plantation.
Date of signature: 06/03/2019
Commitments: The planting sites are located within the Riserva Naturale Statale Isole di Ventotene e Santo Stefano, and are thus ruled by its institution act (Decrete 11/05/1999). The Council Resolution approving the Convention explicitly declared that the activity contributes to the Reserve's institutional tasks to conserve the ecological, flora, fauna, geomorphological and naturalistic-environmental characteristics of the SPA, and to restore degraded ecosystems, amongst others. In the Reserve, it is forbidden to cut or damage arboreal and shrub vegetation with the exception of the interventions necessary to prevent fires or damage to public safety and those strictly necessary to guarantee the conservation of the historical-archaeological and natural heritage, if authorized (art. 6 Decrete 11/05/1999). Thus, in principle the newly planted trees will be conserved during the full duration of their lifetime and their management falls under the institutional tasks of the reserve's management body of the Municipality of Ventotene.

6.
Replication agents: LIFE Desert-Adapt (LIFE16 CCA/IT/000011) project: local coordinator Università degli Studi di Palermo, implementation Municipality of Lampedusa e Linosa.
Project partner: Van Leijen
Location: Lampedusa, località Taccio Vecchio (Sicily), Italy.
In collaboration with: Dipartimento Regionale Sviluppo Territoriale Sicilia.
Number of trees: 100 trees, 80 with Cocoon and 20 without.
Challenge: Restoration natural vegetation on limestone soils, rich in skeleton, under very arid climate conditions; comparison with other growth aids.
Date of signature: 19/04/2019
Commitments: Municipality of Lampedusa e Linosa is the owner of the lands and assures that the trees will be kept in place for at least the next 40 years. To this end, the Municipality will provide the needed maintenance activities, eventually by subcontracting to local agents. The activity is part of the aforementioned LIFE Desert-Adapt project in which framework this engagement has been given. The area is located in the SCI/SAC Isola di Lampedusa e Lampione (ITA040002) and in the SPA Arcipelago delle Pelagie - area marina e terrestre (ITA040013). As such, the management of the area is subject to the management plan of the SAC and SPA.

7.
Replication agents: LIFE Desert-Adapt (LIFE16 CCA/IT/000011) project: local coordinator Università degli Studi di Palermo, implementation REAM Srl.
Project partner: Van Leijen
Location: Caltanissetta, contrada Misteci (Sicily), Italy.
Number of trees: 187 trees, 80 with Cocoon and 107 without.
Challenge: restoration of an agro-forestry ecosystem on eroded and dry soils with low content of organic matter and in climatic conditions characterised by very dry summers. Comparison with other growth aids.
Date of signature: 19/04/2019

Commitments: REAM commits to keep the trees in place for at least 40 years and to perform the necessary maintenance activities. REAM will also monitor the growth and the vigour of the plants in forthcoming years and aims at the permanent conservation of the plantation that is part of a wider environmental restoration. The activity is part of the aforementioned LIFE Desert-Adapt project in which framework this engagement has been given.

8.
Replication agent: Istituto d'Istruzione Superiore "Vincenzo Cardarelli".
Project partner: Van Leijen
Location: Tarquinia (Lazio), Strada Provinciale Porto Clementino 75, Italy.
Number of trees: 20, 10 with Cocoon, 10 without.
Challenge: High school education on climate change and desertification. Planting combined with classroom sessions, monitoring and analyses, in an area with long periods of drought.
Date of signature: 21/02/2019
Commitments: None. The activity was performed in the garden of the school, dedicated to experiments by the students, especially those involved in the courses on agriculture and forestry. Under the guidance of environmental engineer Federico Boccalaro and the teachers, the students performed the monitoring protocol and at the end of the experiments, the trees that survived were dug out and studied. The initiative was preceded by 2 half days of teaching on the topics of climate change and reforestation, offered to students of the agrarian as well as the scientific section. Teaching staff of the institute as well as the Forest Police of the Saline di Tarquinia participated in the activity.

9.
Replication agents: Biocity Engineering srl and LIPU/Birdlife Italia.
Project partner: Van Leijen
Location: Isola delle Femmine (Sicily), Italy.
Number of trees: 42 trees, 20 with Cocoon, 22 without.
Challenge: Restore natural vegetation. The plantation is located at the Riserva Naturale Orientata Isola delle Femmine, instituted in 1997 by the Sicilian Region and managed by Lipu since 1998. It is also recognised as SAC Isola delle Femmine (ITA020005). Prevalent vegetation is Thermo-Mediterranean and pre-desert scrub (5330) and the island has a particular importance for the protection of migratory birds. The species *Chamaerops humilis* L. was characteristic of the island but its presence is currently rare, and the project aims to contribute to its increase. Since there are no fresh water sources on the island, supporting irrigation can only be offered by bringing water from the mainland. The use of Cocoon would save energy to be allocated to the planting of a greater number of plant individuals and could increase the percentage of engraftment. The average annual rainfall amounts to 632 mm and is mainly concentrated in the autumn-winter period while the average annual temperature is 19.6 °C. The bioclimatic indices calculated on the thermopluviometric data of the weather station show a macrobioclimate of the Mediterranean type, with an oceanic pluvistagional climate.
Date of signature: 28/03/2019
Commitments: The plantation activity falls within the institutional scope of the regional Reserve that was created to protect the local floristic heritage and to facilitate the resting of bird species that rest at the island during their migratory movements (D.A. 584/44, 01.09.97). Since its origin, the management of the reserve has provided for increasing the vegetation cover with species typical of the Mediterranean maquis, amongst which dwarf palms. The project contributes to this strategy, and as such the long-term conservation of the planted trees is key part of the conservation activities of LIPU.

10.
Replication agents: Biocity Engineering srl and Associazione Trasversale Sicula.

Project partner: Biopoplar, in collaboration with Van Leijen
Location: Antica Trasversale Sicula (Sicily), Italy.
Number of trees: 86 trees, 40 with Cocoons, 46 without.
Challenge: Enhancement of the ancient landscape on a naturalistic archaeological path running across Sicily, with hikers. Environmental engineering interventions to reduce risk of desertification and to valorise archaeological and natural heritage. This initiative gives visibility to the participatory restoration of cultural and natural heritage, using trees that were part of original landscapes and are represented in archaeological artefacts and involving local authorities, associations, volunteers, children, etc.
Date of signature: 20/01/2019 and 24/08/2019
Commitments: No formal commitments can be given as in each of the 12 localities few trees were planted in collaboration with local actors of various kinds (volunteers, hikers, etc.) Each of those actors have a key interest in greening the track with native and historical flora species to enhance its local heritage and attractiveness. The volunteers and Biocity Engineering will monitor survival and maintain the trees according to their possibilities of revisiting the sites.

10.1
Replication agent: Biocity Engineering srl.
Location: Pietraperzia, Contrada Le Rocche.
In collaboration with: Gruppo Scout AGESCI, nursery Vivai Emmanuele, Municipality Pietraperzia.
Number of trees: 14 trees, 7 with Cocoon, 7 without.
Date of signature: 20/01/2019
Commitments: The scouting group will take care of the long-term conservation of the trees, planted at their headquarter.

10.2
Replication agents: Associazione Trasversale Sicula and Biocity Engineering srl.
Location: Marsala, Museo Lilibeo.
In collaboration with: Museo Lilibeo, Parco Archeologico Lilibeo.
Number of trees: 10 trees, 5 with Cocoon, 5 without.
Date of signature: 24/08/2019
Commitments: The archeological park Lilibeo will take care of the long-term conservation of the trees, characteristic of the archeological heritage, represented on coins emitted by Camarina in the antiquity.

10.3
Replication agents: Associazione Trasversale Sicula and Biocity Engineering srl.
Location: Corleone, Cascata due Rocche.
In collaboration with: Comune di Corleone.
Number of trees: 9 trees, 3 with Cocoon, 6 without.
Date of signature: 24/08/2019
Commitments: The planted trees fall under the responsibility of the municipality of Corleone that will take care of their long-term conservation.

10.4
Replication agents: Associazione Trasversale Sicula and Biocity Engineering srl.
Location: Calascibetta, Villaggio Bizantino archaeological site.
In collaboration with: Hisn al-Giran associazione culturale
Number of trees: 6 trees, 3 with Cocoon, 3 without
Challenge: Withstand infestation by species that bring harm to archeological artefacts and trial of several kinds of growth support.
Date of signature: 24/08/2019
Commitments: Villaggio Bizantino archaeological site manager Hisn al-Giran is responsible for the trees long-term conservation and is particularly eager to preserve them as symbol of the territory and to contrast infestation with less suitable plants. The site management will also closely monitor the success of the different growth aids applied: two dwarf palms have been planted with worm compost and two with prickly pear cladodes, a traditional insular growing aid based on the use of an invasive species that didn't exist here in ancient history.

10.5
Replication agents: Associazione Trasversale Sicula and Biocity Engineering srl.
Location: Pergusa, Villa Geracello di Zagaria (Enna).
In collaboration with: Legambiente, Rocca di Cerere UNESCO Global Geopark, Ordine dei dottori Agronomi e Forestali, Ente Gestore della Riserva naturale del Lago di Pergusa.
Number of trees: 10 trees, 5 with Cocoon, 5 without.
Date of signature: 24/08/2019
Commitments: The elderly centre where 2 pomegranates were planted with conserve their long-term survival and enjoy their fruits; while Rocca di Cerere engages in the long-term conservation of the other trees - pomegranates and dwarf palms - planted in its premises, typical for the ecosystem it represents and aims to conserve.

10.6
Replication agents: Associazione Trasversale Sicula and Biocity Engineering srl.
Location: Morgantina archaeological site.
In collaboration with: Proloco Aidone Morgantina.
Number of trees: 4 trees, 2 with Cocoon, 2 without.
Date of signature: 24/08/2019
Commitments: The Morgantina archaeological site with support of Proloco Aidone will engage to conserve the trees, which are so much related to the history the site represents - pomegranates representing the myth of Kore and dwarf palms the period in which Morgantina was very affiliated to Camarina.

10.7
Replication agents: Associazione Trasversale Sicula and Biocity Engineering srl.
Location: Palikè archaeological site.
Number of trees: 3 trees, 1 with Cocoon, 2 without.
Date of signature: 24/08/2019

Commitments: The plantation is a first step (due to lack of time and money) of a broader restoration of traditional vegetation in which besides the now planted holm oak and dwarf palms also common oak and cork trees are aimed to be planted. The archeological site of Paliké will engage in the long-term conservation of the trees.

10.8
Replication agents: Associazione Trasversale Sicula and Biocity Engineering srl.
Location: Cassaro.
In collaboration with: Protezione Civile and Municipality of Cassaro.
Number of trees: 4 trees, 2 with Cocoon, 2 without.
Date of signature: 24/08/2019
Commitments: The dwarf palms have been planted at the premises of the civil protection of Cassaro and their long-term maintenance will be assured by this body.

10.9
Replication agents: Associazione Trasversale Sicula and Biocity Engineering srl.
Location: Licata, Contrada Caduta.
Number of trees: 4 trees, 2 with Cocoon, 2 without.
Date of signature: 24/08/2019
Commitments: Citizens of Contrada Caduta will provide for the long-term maintenance of the planted trees.

10.10
Replication agents: Associazione Trasversale Sicula and Biocity Engineering srl.
Location: Medieval castle at Palazzolo Acreide.
In collaboration with: Municipality of Palazzolo Acreide.
Number of trees: 6 trees, 3 with Cocoon, 3 without.
Date of signature: 24/08/2019
Commitments: The municipality of Palazzolo Acreide will assure the long-term maintenance of the dwarf palms planted at its castle.
10.11
Replication agents: Associazione Trasversale Sicula and Biocity Engineering srl.
Location: Scoglitti, in the archeological site of Camarina.
Number of trees: 8 trees, 4 with Cocoon, 4 without.
Challenge: The dwarf palms were planted replacing the invasive and allochthonous species *Carpobrotus*, beard of San Giuseppe, which devastates the area of the Ippari, at the base of the acropolis, in landslide due to the imbalance caused by the construction of the extension of the pier in Scoglitti.
Date of signature: 24/08/2019
Commitments: The municipality of Ragusa, to which the archeological site belongs, will engage in the trees' long-term conservation, in support of the conservation of this archeological site.

10.12
Replication agents: Associazione Trasversale Sicula and Biocity Engineering srl.
Location: Castle Ducezio, Mineo.
With the collaboration of: Comune di Mineo
Number of trees: 6 trees, 3 with Cocoon, 3 without
Date of signature: 24/08/2019
Commitments: The municipality of Mineo will take care of the long-term conservation of the planted dwarf palms.

<u>The following sites will be completed in autumn 2020, as described below</u>:

11.
Replication agent: Ente Parco Nazionale del Circeo.
Project partner: Van Leijen
Location: Sabaudia, Loc. Caterattino (Lazio), Italy.
Number of trees: 200 trees, 150 with cocoon, 50 without.
To be planted: As soon as possible, subject to COVID19 restrictions.
Plantation was foreseen in autumn 2019. In august and September 2019, two tenders for the selection of the executing party, inviting 25 companies, did not receive any offer. EPNC thereupon decided to split the different parts of the works. Our team proposed to consult Eng. Boccalaro, who was invited to present an offer for the executive design. The offer was received in January 2020 and the executive design prepared in February. The execution, with support of the Carabinieri Forestali, was planned for March-April 2020, but had to be postponed due to the lock down ruled nation-wide to combat the COVID19 pandemia.
Challenge: Restoration of dune ecosystem, damaged due to anthropic crossing and runoff of rainwater from a pending street nearby, by environmental engineering and reforestation. 200 Specimen of *Juniperus oxycedrus* supsp. macrocarpa, *Pistacia lentiscus* e *Phillyrea angustifolia* to be planted. It is expected that use of the cocoon can offer support to water retention problems especially during dry summers.
Date of signature: 14/02/2018
Commitments: Ente Parco Nazionale del Circeo will assure the long-term conservation of the trees that will form an integral part of its institutional activities to preserve the natural ecosystems of this protected area, as foreseen by its institutional act and laid down in the management plan approved by the Ministry of Environment (02/08/2017) with the designation of all SCIs as SACs. The activity proposed is based upon the management plan for the Dunes of Circeo (IT6040018), that comprises objectives to contrast coastal erosion (OS 2) and to regenerate the dune vegetation (OS 6). It is the first implementation of the foreseen Active Interventions with high priority aimed to "reduce the degradation of dune habitats through effective erosion control actions aimed at recovering the original morphology and the typical vegetation series" (IA_02).

12.
Replication agents: Sempre Verde Pro Natura Latina.
Project partner: Van Leijen
Location: Island of Ventotene or Santo Stefano (Lazio), Italy.
In collaboration with: Riserva Naturale Statale Isole di Ventotene e Santo Stefano - Comune di Ventotene, Italy.
Number of trees: 10 Cocoons, planned in April 2019.
To be planted: As soon as possible, subject to COVID19 restrictions.
Most of the cocoons were planted in April 2019 at Ventotene (project n° 5) and a small amount was planned to be used at the island of Santo Stefano. However, extreme rainfall in April-May 2019 brought significant damage to the plantation at Ventotene, and it was questioned if under these conditions planting with cocoons would make sense. Later on, the survival results were unexpectedly good though. But the volunteer group was not capable so far to complete the works.
Challenge: Re-establishment of traditional Ilex groves. Both islands have no water, only from desalinator.
Date of signature: 06/03/2019
Commitments: Riserva Naturale Statale Isole di Ventotene e Santo Stefano will provide for long-term conservation in the framework of its institutional tasks, see project n° 5.

13.
Replication agents: LIFE Desert-Adapt (LIFE16 CCA/IT/000011) project: local coordinator Università degli Studi di Palermo, implementation Municipality of Lampedusa e Linosa.

Project partner: Van Leijen
Location: Lampedusa Island, località Ponente (Sicily), Italy.
Number of trees: 260 trees, 130 with Cocoon and 130 without.
To be planted: As soon as possible, subject to COVID19 restrictions and regional permit.
Planting was foreseen within November 2019. However, the Environmental Impact Assessment at the technical commission of the Regional Territorial and Environment Department is still pending by end of March, although the request and all required documentation was presented in October 2019. Without authorization, the Municipality of Lampedusa cannot proceed with the calls for tenders for the purchase of plants and for the workforce. The lock down ruled nation-wide to combat the COVID19 pandemia may further delay the procedures.
Challenge: Restoration of natural vegetation, comparison with other growing aids. Arid climate, calcareous soils.
Date of signature: 05/08/2019
Commitments: Municipality of Lampedusa e Linosa is the owner of the lands and assures that the trees will be kept in place for at least the next 40 years. See project site n° 6 above and commitments from the LIFE Desert-Adapt project.

14.
Replication agent: University of Florence, Dep. Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali (DAGRI).
Project partner: Van Leijen
Location: Montecristo Island, area of Villa Reale, Porto Ferraio (Tuscany), Italy.
Number of trees: 50 trees, 30 with Cocoon and 20 without.
To be planted: As soon as possible, subject to COVID19 restrictions.
Plantation was planned for end of November-beginning December 2019, but delays due to bureaucracy led to a postponement.
Challenge: degraded soil, reforestation activity in an Island where traditional holm oak is threatened. Montecristo is a granitic island with vegetation degraded by previous fires and goat pasture. Extension of efforts previously performed in other areas within the LIFE projects LIFE Montecristo 2010 and RESTO con LIFE, that however required expensive drop irrigation. It is expected that the possibility of timely and widespread reforestation, without the need for planting irrigation can give a decisive input to the restoration work of the habitat.
Date of signature: 12/11/2019
Commitments: The area falls under the management of the Ufficio Biodiversità dei Carabinieri Forestali di Folonica that authorised the plantation and commits to the long-term conservation of the trees in function of its competences. The area is protected as SAC Isola di Montecristo e Formica di Montecristo (IT5160014) under the responsibility of the Region of Tuscany and since 1999 it is included in the Parco Nazionale dell'Arcipelago Toscano.

15.
Replication agent: Nucleo di Ricerca sulla Desertificazione dell'Università degli Studi di Sassari.
Project partner: Volterra/Van Leijen
Location: Long-term Observatory Berchidda-Monti and Experimental Educational company "Mauro Deidda" Sassari (Sardinia), Italy.
Number of trees: 20 cocoons, planting planned in November-December 2019.
To be planted: As soon as possible, subject to COVID19 restrictions.
Planting was foreseen in November-December 2019, but it had to be postponed due to the lack of optimal thermo-pluviometric conditions. It was rescheduled to early March 2020, but could not take place due to the closure of University activities on the 3rd of March, following governmental rulings concerning the COVID19 pandemia.
Challenge: Experimentation of the technology on shallow soils with rocky outcrops, high presence of skeleton and mainly sandy texture. These characteristics determine low water retention capacity

associated with a typically Mediterranean rainfall regime characterized by low rainfall in the spring-summer period. Irrigation is hardly practicable on the land of the Berchidda-Monti site. The project follows from a collaboration with the project LIFE REGENERATE, performed in the same experimental settings.
Date of signature: 10/10/2019
Commitments: The planting of cork and holm oaks forms an extension of the activities performed in the framework of the LIFE REGENERATE project (LIFE 16 ENV/ES/000276) and therewith the same commitments as declared therein are given for the long-term maintenance of the trees. The plantations are aimed to regenerate the agro-pastoral-forestry systems so as to preserve their existence in the long run by proper management approaches (perspective +100 years). The experimentation of new techniques in both the Long-term Observatory Berchidda-Monti and the Experimental Educational company "Mauro Deidda" aim to validate techniques for their use elsewhere in similar ecosystemic situations.

16.
Replication agent: Tenuta presidenziale di Castelporziano.
Project partner: Van Leijen
Location: Presidential Estate of Castelporziano, zone of Ponte Cerasolo, Rome (Lazio), Italy.
Number of trees: 250 trees, 210 with cocoons, 40 without.
To be planted: As soon as possible, subject to COVID19 restrictions.
Administrative procedures related to the approval of the executive design and the hiring of a subcontractor to perform the works, had unfortunately lasted all autumn 2019. Plantation was planned on 10/03. However, due to the mobility restrictions issued the evening before, the hired company could not come to perform the works.
Challenge: Reforestation after forest fires, in an area with mostly sandy soils (ancient Eocene or Pleistocene dunes), recent and not very structured. Pronounced summer dryness with water stress period generally between the beginning of June and the end of September, in constant extension in recent seasons. High soil permeability with contextual average lowering of the water table, also due to pronounced draining in the surrounding areas. The expectation is that this reforestation effort will have better long-term results than previous ones.
Date of signature: 25/10/2019
Commitments: The area is property of the Italian Presidency. The peculiarity of Castelporziano is mainly linked to the interpenetration of the oak forest typical of the Mediterranean climate and of the oak forest typical of the continental climate. They are amongst the most delicate of the ecosystems to be conserved. Although the Property was born as a hunting and agricultural reserve, it has progressively lost these specific destinations and is now subject to progressively intensified measures of nature conservation, being considered of particular naturalistic value and unique green lung of the southern Rome area. Since 1999 the Property is recognised as Riserva Naturale dello Stato and is subject to the conservation regime of Italian protected areas. Moreover, Castel Porziano hosts several Natura2000 sites, amongst which SAC Castel Porziano - querceti igrofili (IT6030028) where the project's interventions will take place. The entire property is recognised as SPA (IT6030084). The interventions are part of restoration activities following forest fires and the long-term conservation and maintenance of the planted trees is assured by the management objectives and the regulations ruling the protected area.

5. Conclusions

Continuous monitoring and long-term maintenance are key aspects to enhance the survival rate and good health status of trees planted in the medium and long term, increasing thus the success of restoration projects.

The Green Link project, through its strategy for post-project maintenance, ensures that replication agents in all countries (Spain, Italy, Greece, and Portugal) commit themselves to carry out monitoring and maintenance activities in their plantations. The commitment from all replication agents through letters of commitment, verbal agreements and institutional responsibilities ensures that all trees planted within the framework of the project remain healthy and well maintained, providing ecosystem services and benefits in the long-term.

This action has demonstrated the success in expanding and transferring the knowledge gained in this project to civil society as well as to accelerate market uptake of the Cocoon and serve to enhance dissemination efforts. It was envisaged to replicate with 6,000 thousand Cocoons but due to the success of implementation actions more then 7.500 Cocoons were delivered by Land Life Company to 60+ areas in 4 countries.

The project has demonstrated its high replication potential: activities are carried out on representative parcels and aimed at showing economically viable solutions for forestry and land restoration management. The project results have offered tangible and applicable solutions for many other landowners and forest managers especially in the south of Europe where the problems to be tackled are widely diffused (soil degradation, desertification, no profitable production etc.).

Implementing the cocoon technology for planting trees in these semi-arid areas may have contributed to reduce the vulnerability of these ecosystems, serving as an adaptation measure to combat the negative effects of climate change. This model can be replicated to other areas classified as arid or semi-arid in Spain as well as other Mediterranean countries that also suffer from dry and excessively hot summers. The adaptation should take into account the type of soil, climate of the region and the crops to which it will be applied. The environmental and economic benefits will vary in absolute terms but should remain below that using conventional planting techniques. The technical field management and maintenance activities are easy to implement and are at reach for any interested party.

6. **Annexes**

Annex I. Planting guide

(PDF available here)

Annex II. Monitoring protocols

(PDF available here)

Annex III. Signed commitment letters (Spain, Greece, Portugal, Italy)

(information censured)