Deliverable for Action F.3

After LIFE conservation plan

LIFE PRIMED (LIFE17 NAT/GR/000511)

Restoration, management and valorisation of PRIority habitats of MEDiterranean coastal areas

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Summary

The After-LIFE Plan for the LIFE PRIMED project outlines a strategic framework to ensure the long-term sustainability and resilience of restored Mediterranean habitats and the conservation of target species. Building on the achievements of the LIFE PRIMED initiative, this plan establishes objectives and actions to maintain restored ecosystems, enhance climate resilience, engage stakeholders, and secure sustainable funding.

Key objectives include the sustained management and monitoring of restored habitats, such as Mediterranean temporary ponds, oak-sessile forests, and alluvial woodlands, with adaptive measures to respond to evolving climate challenges. The plan also emphasizes the importance of ongoing operation and maintenance of climate resilience tools, such as forest nurseries, hydraulic systems, and meteorological stations, to safeguard project outcomes over the long term.

The After-LIFE strategy includes targeted actions for expanding conservation knowledge and good practices through the distribution of manuals, scientific publications, and workshops. By fostering continued stakeholder engagement and local community awareness, the plan aims to build a foundation of support for habitat conservation at the local and regional levels. Additionally, efforts to advocate for supportive policies and secure diverse funding sources ensure the project's objectives are embedded within broader environmental and land management frameworks.

Through collaborative partnerships, technical expertise, and a commitment to adaptive management, the After-LIFE Plan serves as a roadmap for maintaining and building on the LIFE PRIMED project's conservation successes, ensuring the ongoing protection and resilience of these critical Mediterranean ecosystems.

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1 Introduction

1.1 Project overview

Background

Transitional small wetlands and coastal forests are some of the EU's most degraded and threatened ecosystems, leading to numerous habitats and species in Mediterranean coastal areas being classified with "unfavourable," "vulnerable," or "near-threatened" conservation status under the Habitats Directive. Restoration actions are urgently required in critical areas along the Greek and Italian coasts, as identified in preparatory project assessments. In Italy, the 50-ha Palo Laziale forest, which anchors the "Bosco di Palo Laziale" Natura 2000 site, comprises predominantly "Pannonian-Balkanic turkey oak-sessile oak forests." In Greece, the "Delta Nestou" Natura 2000 site safeguards the region's largest remaining Mediterranean riparian forest, a habitat of high ornithological importance, yet one that has dramatically decreased in size over past decades. Historical conservation efforts include a 60-ha reforestation initiative under the LIFE02 NAT/GR/008489 project. Both Natura 2000 sites face persistent threats, such as shrub encroachment, eutrophication, mismanagement of water resources, and invasive species.

Objectives

LIFE PRIMED presents a unique opportunity to implement and evaluate restoration and management actions designed to halt the decline of Mediterranean coastal ecosystems under stress, especially from climate change. The project aims to improve the conservation status of habitats and species within the Nestos Delta and Palo Laziale Natura 2000 sites in Greece and Italy. Key habitats targeted include "Mediterranean temporary ponds," "Alluvial forests with Alnus glutinosa and Fraxinus excelsior," "Arborescent matorral with Laurus nobilis," and "Pannonian-Balkanic turkey oak-sessile oak forests," all listed in Annex I of the Habitats Directive (92/43/EC). Additionally, the project focuses on enhancing populations of species such as Hermann's Tortoise (*Eurotestudo hermanni*), the European Pond Turtle (Emys orbicularis), and the Jersey Tiger Moth (*Euplagia quadripunctaria*), which are protected under Annex II of the Habitats Directive. Target species also include those listed under Annex II and III of the Birds Directive (2009/147/EC), such as the common pheasant (*Phasianus colchicus colchicus*). The project includes direct conservation actions at both sites, such as expanding temporary ponds and rehabilitating forest areas. Additionally, LIFE PRIMED will assess the factors causing the "unfavourable" conservation status of these habitats and species and develop post-project mechanisms to sustain management actions, encouraging local engagement, particularly through eco-tourism.

Expected Results

- Expansion of "Mediterranean temporary ponds" by 0.8 ha in Palo Laziale (Italy) and by 0.02 ha in Nestos Delta (Greece);
- Recovery of 40 ha of "Pannonian-Balkanic turkey oak-sessile oak forests" in Palo Laziale;
- Reversal of forest decline through improved soil conditions in "Pannonian-Balkanic turkey oak-sessile oak forests" (Italy) and "Alluvial forests with Alnus glutinosa and Fraxinus excelsior" habitats, facilitated by a self-sustaining hydraulic system providing water during dry periods;
- Increased population sizes of *Eurotestudo hermanni*, *Emys orbicularis*, *Euplagia quadripunctaria*, and *Phasianus colchicus*;
- Creation and dissemination of best practices for floodplain and riparian ecosystem restoration and integration into the Sustainable Forest Management Strategic Plan (SFMSP);
- Engagement of at least 400 conservation professionals through international workshops, with at least 200 individuals trained on topics such as conservation engineering, restoration ecology, and EU funding programs;

- Active involvement of at least 2,500 tourists and local residents in tourism and recreational events, alongside an additional 2,500 residents in environmental awareness activities, such as guided tours, school programs, and citizen science initiatives.

1.2 Description of Action F.3 "After-LIFE habitat and species conservation"

The primary goal of Action F.3 is to develop an After-LIFE Conservation Plan aimed at ensuring the long-term conservation and management of the target habitats and species within the project sites. This plan will be finalized during the project's concluding year, detailing a structured approach for ongoing monitoring, management, and protection activities for key habitats and species in the Nestos Delta (Greece) and Palo Laziale (Italy) Natura 2000 sites.

Key Elements of the After-LIFE Conservation Plan

The After-LIFE Conservation Plan integrates findings and outcomes from critical actions conducted throughout the project's lifecycle, including preparatory Actions A.2, A.3, A.4, A.5, and A.6, direct conservation Actions C.1, C.2, C.3, C.4, C.5 and C.6, as well as the ecological monitoring efforts outlined in Actions D.1, D.2, D.3, D.4 and D.5. By synthesizing the results from these actions, the plan will define minimum surveillance standards, operational monitoring protocols, and conservation measures tailored to the specific ecological needs of the targeted habitats and species. It will provide detailed guidelines to maintain and build on the gains achieved during the project, ensuring habitat stability, resilience, and ecological functionality post-project.

After-LIFE Monitoring and Management

Based on the results of the A, C and D Actions, the After-LIFE Conservation Plan will outline minimum monitoring requirements that include:

- **Periodic habitat assessments** for target habitats such as "Mediterranean temporary ponds," "Alluvial forests with Alnus glutinosa and Fraxinus excelsior," "Arborescent matorral with Laurus nobilis," and "Pannonian-Balkanic turkey oak-sessile oak forests" to assess habitat health, vegetation cover, and soil quality.
- **Species population monitoring** for *Eurotestudo hermanni* (Hermann's Tortoise), Emys orbicularis (European Pond Turtle), and *Euplagia quadripunctaria* (Jersey Tiger Moth), as well as avian species listed under the Birds Directive, such as *Phasianus colchicus* (common pheasant).
- **Hydrological and soil condition monitoring** to ensure the hydraulic systems and water management interventions introduced during the project continue to support forest and pond habitats through sustainable water provisions during dry seasons.

After-LIFE Management Specifications

The After-LIFE Conservation Plan will set forth actionable management practices based on the management manuals developed under Actions C.4 to C.5. These practices will include:

- **Forest density and composition management** under the Sustainable Forest Strategic Management Plan (SFSMP) to avoid tree competition, shrub encroachment, invasive species colonization, maintain hydrological balance, and enhance carbon sequestration.
- **Water resources management plan** to regulate water release from hydraulic systems based on real-time climate and soil data, addressing seasonal water needs and reducing drought impact.
- **Weather monitoring** for ongoing climate data collection, supporting adaptive water management and conservation activities.
- **Soil health and enhancement** practices to promote native vegetation growth in reforested areas and temporary ponds, maintaining soil quality and ecosystem resilience.

These actions will help preserve habitat and species stability, ensuring long-term resilience in the target Natura 2000 sites.

Long-Term Management Responsibility and Funding

The primary responsibility for carrying out After-LIFE activities will fall to the Forest Department of Kavala and IMFE for the Nestos Delta and Landowners and ARSIAL for Palo Laziale, given their statutory responsibilities over these Natura 2000 sites. The After-LIFE Plan will specify the responsibilities of each managing authority and outline a coordination structure to ensure alignment of efforts and monitoring consistency across both sites.

The Plan will also include:

- Timeframe for each type of monitoring and management action, specifying the timing, frequency, and personnel requirements for effective implementation.
- Strategy to maintain stakeholder engagement, including local government bodies, environmental organizations, and research institutions, who may contribute to the Plan's goals through advisory, technical, or financial support.
- Funding mechanisms to support the long-term management activities. This may include local and EU funding opportunities, partnerships with conservation organizations, and potential revenue from ecotourism or educational initiatives that promote habitat conservation.

The After-LIFE Conservation Plan will provide a clear roadmap for sustaining the achievements of LIFE PRIMED, safeguarding the ecological integrity of the project sites, and supporting the continued restoration and resilience of Mediterranean coastal ecosystems.

1.3 Project Sites

1.3.1 Nestos Delta

The Nestos River, originating in Bulgaria and flowing into the Thracian Sea, marks the natural boundary between the Macedonian and Thracian Regions in northeastern Greece. Formed from alluvial deposits extending the land into the sea, the fan-shaped Nestos Delta spans approximately 55,000 hectares. The delta begins near the bridge at Toxotes village, extending through to the coastal zone opposite Thassos Island, and reaches eastward to the lagoons of Avdira. The delta includes nine main lagoons—Vassova, Erateino, Agiasma, Kokkala, Haidefto, Keramoti, Gefyraki, Palaias Koitis of Nestos, and Monastiraki—which are surrounded by salt marshes and are some of Greece's most productive fish-farming areas. Xanthi lies 16 km to the east, and Kavala is 25 km to the west.

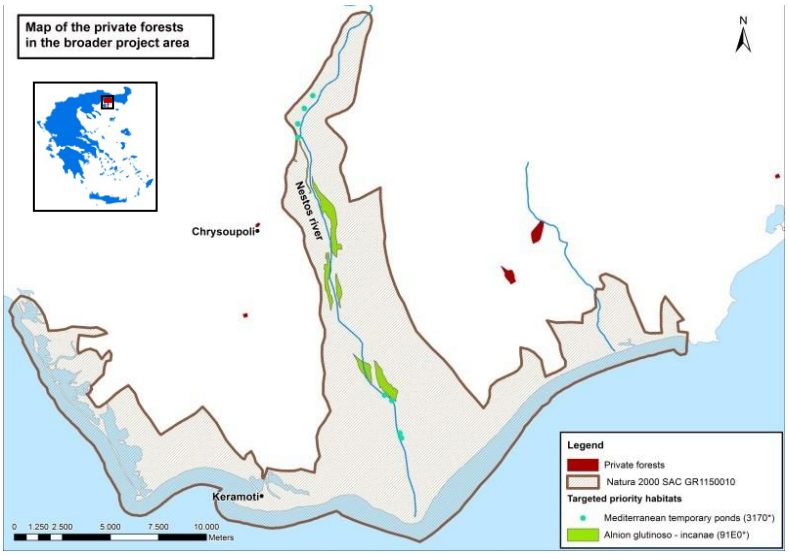

Figure 1. The Nestos Delta

The Nestos Delta is renowned for its ornithological importance, as its vast and diverse habitats are crucial to the wetland chain in northern Greece, connecting with sites from the Aliakmonas-Axios complex to the Evros Delta. It provides breeding, overwintering, and migratory habitats for approximately 280 bird species, many protected by national, European, and international legislation. Notably, it hosts the critically endangered Black-necked Pheasant (*Phasianus colchicus colchicus*), Europe's last wild population of this species, closely related to its central Asian counterparts.

The delta is also home to a rich diversity of herpetofauna, with 11 amphibian species and 22 reptile species, including those protected under Annex II of Directive 92/43/EEC, such as *Testudo graeca, Eurotestudo hermanni, Emys orbicularis, Elaphe quatuorlineata, Elaphe situla*, and *Bombina bombina*. Of these, *E. orbicularis* and *E. hermanni* are classified as near threatened and vulnerable, respectively, in the Red Data Book of Threatened Vertebrates of Greece. Freshwater fish biodiversity is substantial, with 21 riverine fish species (14 of which are native and six endemic) and an additional 36 euryhaline and marine species in the estuary and lagoons.

A small temporary pond known as "Lazaros" lies near a livestock area within the delta. While relatively undisturbed, recent pressures from grazing animals and shrub encroachment by *Amorpha fruticosa*, along with climate change, pose potential threats. Project observations show extreme oscillations in water availability during winter and summer, with generally lower ground-level water retention (sometimes lasting only 2 months compared to the usual 6), impacting the pond's specialized vegetation cycles. Continued meteorological monitoring, supported by the Project-installed weather station (Action C.5), will be essential to adaptively manage these climate-driven changes to protect this ecologically significant habitat.

Figure 2. Temporary ponds in the eastern bank of Nestos River (photo of June 2019)

Figure 3. Dense tree cover near the Nestos river (left). A temporary pond in the Lazaros site, Nestos (right*).*

1.3.2 Bosco di Palo Laziale

The Palo Laziale wood, located along the Lazio Region coastline in the Ladispoli Municipality, lies approximately 40 km northwest of Rome. This 129-hectare site, enclosed within the SAC IT6030022 "Bosco di Palo Laziale," is situated within a flat, privately owned area at an altitude ranging from 3 to 10 meters above sea level and about 100 meters from the coast.

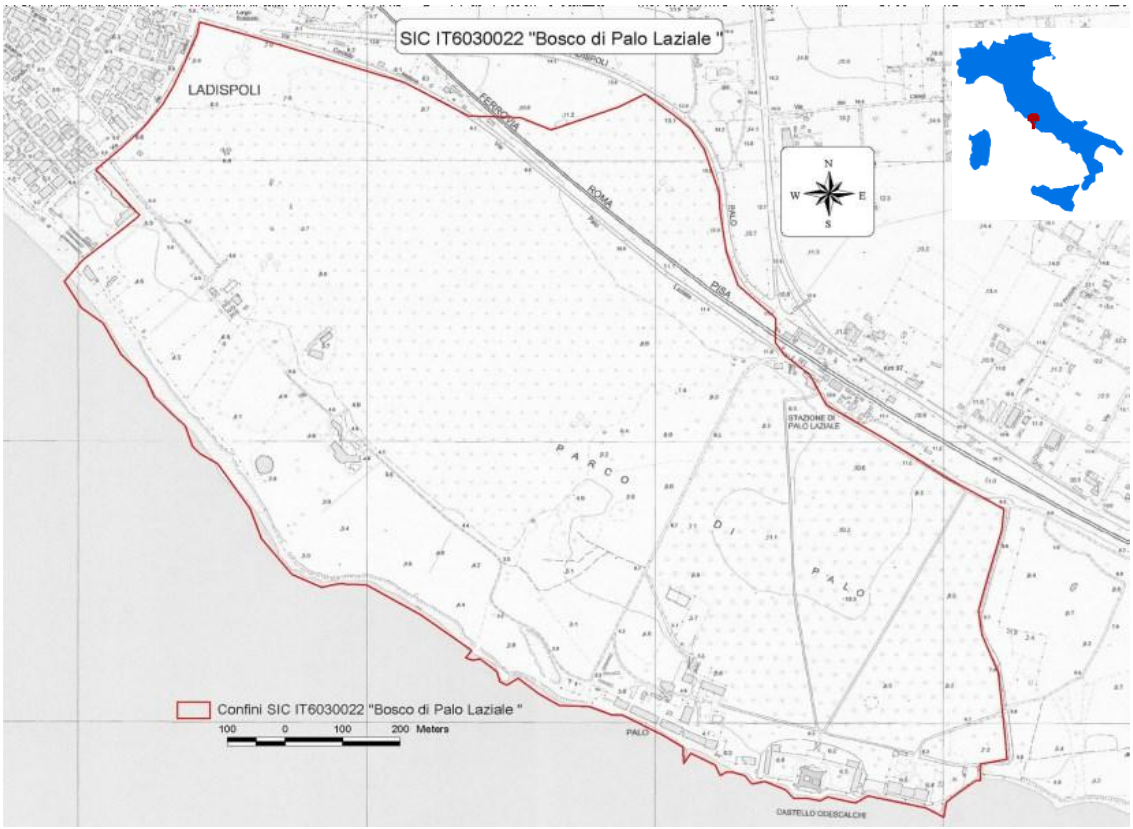

Figure 4. The Natura 2000 site "Bosco di Palo Laziale.

Characterized by Mediterranean bioclimatic conditions, the area experiences high temperatures and limited rainfall during summer, creating a dry period with negative soil water balance due to high evapotranspiration. The geological composition is a mix of permeable sands and biocalcarenites from the Pliocene, alternating with less permeable quaternary deposits of clay and silt. This lithological diversity results in variable soil permeability, impacting water retention and habitat conditions.

In the Natura 2000 site of Palo Laziale, the temporary ponds (covering 0.40 ha) are ecologically interwoven with the floodplain oak wood (habitat 91M0), creating a unique ecosystem along the Tyrrhenian coastline, similar to those found in Circeo National Park and Castelporziano Estate. Before project restoration efforts (Actions C), the forest was heavily encroached by thorny shrubs, limiting new sapling growth and reducing crown cover by up to 80%. Forest dieback, exacerbated by competition for resources, abandonment of silviculture, and rising aridity, allowed a severe fungal infection (*B. mediterranea, D. quercina, D. corticola*) to affect the trees, killing 40% of the mature trees and reducing canopy cover substantially.

Figure 5. A view of the habitat 91M0 in Palo Laziale, Rome.

This forest decline has significantly impacted the temporary ponds (3170*), where shrub encroachment (e.g., *Rubus spp*.) from declining canopy cover has led to pond burial, water eutrophication, and reduced gas exchange, harming pond ecology. Climate change further threatens this ecosystem by altering seasonal precipitation and drought patterns, affecting water availability. Meanwhile, the "Arborescent matorral with Laurus nobilis" (habitat 5230*) has been relatively stable due to an adjacent water channel, though its long-term conservation depends on overall forest and wetland restoration efforts, as outlined in the Forest Management Plan (Action C.4).

Figure 6. An aerial view of the habitat 3170 with a detail on *Isoetes histrix*, one the habitat keystone species.

1.4 Project Structure

LIFE PRIMED was structured on a set of Preparatory (A), Conservation (C), Monitoring (D) and Dissemination (E) Actions:

Action	Title
	Preparatory Actions
A1	Agreements among partners and setting up of the action plan
A2	Topographic survey
A3	Preliminary soil analysis
A4	Climatic and weather analysis
A5	Structure and Dynamics of Wood Ecosystem
A6	Determination of vegetation structure and of flora and fauna composition and phenology in the Mediterranean temporary ponds (3170*)
	Conservation Actions
C1	Forestry nursery and reforestation
C2	Habitat recovery: bush trimming and realisation of temporary ponds
C3	Hydraulic interventions for habitat recovery and conservation
C4	Sustainable Forest Strategic Management Plan (SFSMP)
C5	Management Plan for Water Resources and weather monitoring
C6	Ex situ conservation and propagation of keystone species of target habitats
	Monitoring Actions
D1	Wildlife Monitoring
D2	Monitoring of the ecosystem decline and of parasites and pathogens impact
D3	Monitoring of the temporary ponds' plant species
D4	Monitoring of the Structure and Dynamics of Wood Ecosystem
D5	Soil monitoring
D6	Monitoring of the project Socio-Economic Impact
D7	Monitoring of the project Ecosystem Services Impact
	Dissemination Actions
E1	Realisation of the project web site
E2	Project communication
E3	Organization of Scientific Workshops on Mediterranean Coastal Ecosystems and final guidelines production
E4	Information Panels
E5	Layman's Report
E6	Networking with LIFE and non-LIFE projects

2 Assessment of the situation at the end of the project

2.1 Project Outcomes

At the conclusion of the LIFE PRIMED project, all initially targeted outcomes were successfully achieved, delivering significant conservation and restoration benefits across the project sites. Below is a summary of the main expected results and their successful realization:

- **Reversal of Forest Decline through Improved Soil and Hydrological Conditions.** Forest decline was effectively reversed in the "Pannonian-Balkanic turkey oak-sessile oak forests" (91M0) (Italy) and "Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*" (91E0*) habitats. Restoration efforts improved forest density, structure, and health, paving the way for long-term ecological stability within this critical Mediterranean coastal ecosystem.
- **Recovery of Pannonian-Balkanic Turkey Oak-Sessile Oak Forests.** A total of 40 hectares of "Pannonian-Balkanic turkey oak-sessile oak forests" were restored in Palo Laziale through silvicultural treatments and combined ex situ and in situ plant conservation activities. This restoration is supported by a self-sustaining hydraulic system providing water during dry periods, improving soil conditions and enhancing the forest's resilience against droughts and climate change impacts.
- **Invasive Species Control.** In Nestos Delta, invasive species control protocols were implemented to prevent the re-establishment and spread of identified invasive species, such as *Amorpha fruticosa*, across 40 hectares of restored areas. By incorporating alternative grazing regimes along riverbanks, the project improved understanding of the interactions between economic and ecological objectives, providing insights and scalable results for managing invasive species and forest openings through sustainable grazing practices.
- **Expansion of Mediterranean Temporary Ponds.** The area of "Mediterranean temporary ponds" (3170*) was successfully increased by 0.8 hectares in Palo Laziale, Italy, and by 0.6 hectares in the Nestos Delta, Greece. This expansion has strengthened the ecological integrity and resilience of these habitats, providing essential seasonal water resources for diverse flora and fauna. In Nestos, a self-sustaining hydraulic system was installed to provide nebulized water during dry periods, further stabilizing the habitat's resilience against drought and anthropogenic impacts.
- **Tools for Climate Resilience.** One forest nursery, two hydraulic systems, two Sustainable Forest Strategic Management Plans (SFSMPs), two Water Resources Management Plans, and two meteorological weather stations were established—one set for each project area. These tools bolster climate resilience by ensuring adaptive management of water resources and habitat health under changing environmental conditions.
- **Population Increase of Target Species.** Targeted conservation actions led to increased population sizes of key species, including *Eurotestudo hermanni* (Hermann's tortoise), and *Emys orbicularis* (European pond turtle). Habitat restoration and management actions created optimal conditions for these species, aligning with conservation goals under the Habitats Directive.
- **Dissemination of Good Practices**. The project disseminated applied restoration practices for Mediterranean coastal ecosystem restoration through organizing an international conference on Mediterranean temporary ponds and a workshop on the Restoration of Mediterranean Coastal Habitats at SERE2024, along with participation in over 20 national and international events. These good practices were incorporated into scientific articles published in peer-reviewed journals and a good practice manual, which will support the long-term replication of these

practices. This integration supports ongoing conservation efforts by providing a framework for future restoration and management actions in similar Mediterranean habitats.

- **Capacity-Building and Training for Conservation Professionals.** LIFE PRIMED engaged over 1,200 restoration, conservation and nature management experts through a series of international workshops, exceeding the target by fostering knowledge exchange and collaboration. Additionally, at least 200 individuals, including university students and early-career professionals, received training on essential topics such as conservation engineering, restoration ecology, and ecological data collection, helping to build a skilled workforce for Mediterranean habitat conservation.
- **Community Engagement and Environmental Awareness.** The project successfully involved over 30,000 tourists and local residents in eco-tourism and recreational activities, such as guided nature tours and cultural events, and environmental awareness programs, including school-based activities, citizen science projects, fostering a sense of community stewardship for the local ecosystems.

2.2 Deviations and Challenges

- **Restoration of Target Habitats.** Delays in implementing direct conservation actions were caused by Covid-19 restrictions, limited field operations, and increased construction material costs. In Palo Laziale, the original hydraulic system plan was modified to provide a more cost-effective and sustainable solution, benefiting both environmental and landscape perspectives. In the Nestos Delta, the expansion of temporary ponds faced delays due to Covid-related restrictions on fieldwork and administrative processes. Despite these challenges, the pond expansion was completed with the addition of nebulized water systems to enhance resilience against drought and human impacts.
- **Infrastructure for Climate Resilience.** Rising costs and supply chain issues delayed the procurement and installation of hydraulic systems, weather stations, and other infrastructure. Careful budget modifications and the use of alternative suppliers enabled the project to complete these installations, ensuring that the infrastructure supports climate resilience as intended.
- **Population Increase of Target Species.** The targeted increase in populations of key species was slightly delayed due to interruptions in field monitoring and management activities, especially during the pandemic. However, as field activities resumed, habitat restoration provided the necessary conditions to support population growth.
- **Dissemination of Good Practices.** The dissemination of good practices was initially hindered by limited opportunities for in-person workshops and networking due to Covid-19 restrictions. The project adapted by utilizing virtual sessions and later resumed in-person workshops and international events, achieving remarkable participation and successfully sharing best practices for ecosystem restoration.
- **Capacity-Building and Training for Conservation Professionals.** Covid-19 restrictions affected the scheduling of training sessions and workshops, necessitating adjustments to a hybrid format to reach international participants. Despite these adaptations, the project exceeded its engagement targets, providing valuable training on Mediterranean habitat conservation.
- **Community Engagement and Environmental Awareness.** Public outreach efforts, especially those requiring in-person activities, were initially hindered by the pandemic. The project adapted by using virtual platforms and resuming on-site events when possible, ultimately achieving its engagement targets for local residents and tourists.

2.3 Analysis of Results

The results of the LIFE PRIMED can be summarized as follows:

STRENGTHS	WEAKNESSES
Innovative Restoration Techniques: LIFE PRIMED pioneered the use of carbon-neutral water distribution networks and modular underground water tanks to counter aridity, enhancing ecosystem resilience against drought and climate change impacts. **Biodiversity and Habitat Recovery**: The project successfully expanded Mediterranean temporary ponds and restored critical forest habitats, creating improved conditions for species like *Eurotestudo hermanni* and *Emys orbicularis*. **Community and Stakeholder Engagement**: Workshops, field trips, and interactions over 1,200 restoration, conservation and nature management experts fostered local stewardship and knowledge exchange, contributing to long-term sustainability. **Capacity Building and Knowledge Dissemination**: Through participation in international conferences, workshops, and public engagement, the project disseminated best practices and enhanced broader restoration applications. **Improved Capacities and Awareness**: Local actors gained heightened awareness of legal and institutional challenges, enhancing their capacity to address conservation needs. **Enhanced Transnational Cooperation**: Strengthened relations and cooperation between Greek and Italian stakeholders and relevant authorities fostered transnational collaboration for habitat restoration.	**Bureaucratic Hurdles**: Complex authorisation processes due to overlapping conservation, archaeological, and hydrogeological regulations delayed critical actions and increased administrative burdens. Limited dialogue between various authorising bodies (e.g., civil engineering, military, and superintendencies) further contributed to project delays. **Cost Overruns**: Escalating material and transport costs, particularly from Covid-19 restrictions and the Ukraine crisis, led to budgetary challenges, requiring significant resource reallocation. **Time Constraints**: Pandemic-related restrictions and increased regulatory requirements contributed to delays in restoration actions, resulting in an extended project timeline. **Limited Restoration-Specific Procurement Codes**: Public procurement codes were often ill-suited to restoration project needs, complicating project delivery and requiring additional adaptations. **Skills and Training Gaps**: Limited availability of professionals trained in natural and biological sciences for works management roles, alongside a lack of university and postgraduate programs focused on restoration ecology, reduced capacity for executing and overseeing specialized conservation actions. **Resource and Capacity Constraints**: Management authorities faced limited financial and human resources, which hindered their ability to support project implementation effectively. Political changes and economic constraints further restricted capacity-building efforts. **Strict LIFE Regulation Requirements**: The LIFE Regulation's strict guidelines limited flexibility in adapting activities and budgets, posing challenges in response to unforeseen needs. **Inconsistent National Engagement**: Limited political support and insufficient involvement of national authorities and institutions in some areas affected coordination, stakeholder engagement, and national-level backing for long-term sustainability. **Lack of Standardized Methods Across Countries**: Variability in conditions and lack of standardized methods between countries posed challenges in creating uniform monitoring and management practices for transnational habitats.

OPPORTUNITIES

Replicability of Restoration Models: The success of LIFE PRIMED's ecosystem-based restoration and invasive species control offers application potential across other Mediterranean regions and Natura 2000 sites, fostering conservation at a broader scale.
Extended Impact of Best Practices: The project's restoration methods and best practices can be extended to both national and EU levels, supporting further policy alignment and restoration efforts through initiatives like the EU Restoration Law.
Legislative Advancements: Project outcomes and insights provide an opportunity to advocate for improved legislation and standardized frameworks for priority species and habitat protection.
Further Training and Knowledge Transfer: Continued training programs on conservation of priority species and habitats, alongside transfer of experience between project partners, can bolster capacity and cross-border knowledge exchange.
Understanding Population Trends: Enhanced capacity for monitoring allows for more comprehensive understanding of population trends at national and transboundary levels, improving conservation management for key species.
Awareness Building Among Educators and Students: Project initiatives increase awareness among students and teachers, promoting environmental stewardship and engagement in habitat conservation.
Enhanced Networking and Stakeholder Engagement: Building on established networks, the project can facilitate more active participation of stakeholders and local authorities in conservation efforts, leading to stronger regional and national support.
Improved Decision-Making Through Participation: The use of participatory approaches in conservation decisions can improve local buy-in and enable more effective, community-supported outcomes for biodiversity protection.

THREATS

Climate Change Impacts: Increasingly extreme weather events, such as droughts, fire and intense rainfall, threaten the stability of conservation achievements, requiring adaptable management strategies.
Inappropriate Forest and Water Management Practices: The threat of habitat degradation due to inappropriate forest and water management and exploitation practices remains unavoidable without improvements in political will and decision-making at forest authorities and protected area management levels.
Political Instability and Policy Changes: Shifts in political priorities and changes in government can reduce focus on environmental conservation, potentially affecting long-term support for habitat and species protection.
Economic Recession: Economic downturns can limit available funding for conservation and reduce prioritization of environmental issues within policy agendas.
Strictness of EU Regulations: Rigid EU regulations for LIFE funding and project adaptations can restrict flexibility, creating challenges when responding to evolving conservation needs on the ground.
Declining Public Support for Conservation: Socioeconomic pressures and political shifts may lead to decreased public tolerance for conservation initiatives, especially if perceived as conflicting with local economic interests.
Insufficient Planning and Coordination: Lack of unified planning and coordination across conservation, monitoring, and management actions can lead to fragmented efforts, particularly in transnational contexts.
Delayed Institutional Responses: Slow responses from institutions in adapting to new legal requirements and addressing conservation needs can impede timely habitat protection.
Funding Gaps for Long-Term Conservation: Limited continuity in funding for long-term implementation of conservation activities threatens the sustainability of restored habitats and species populations beyond project completion.
Environmental Threats: Risks such as forest fires and unsuitable grazing regimes, alongside limited forest surveillance, pose ongoing challenges to habitat stability and species conservation.

3 After-LIFE objectives

The After-LIFE activities of the LIFE PRIMED project aim to ensure the long-term sustainability and resilience of restored habitats, as well as the continued conservation of target species. The primary objectives can be summarized as follows:

- **Sustained Habitat Restoration and Management**

  Continue the maintenance and management of restored habitats, including Mediterranean temporary ponds, Pannonian-Balkanic turkey oak-sessile oak forests, and alluvial forests, to preserve biodiversity, enhance ecological resilience, and support adaptive management in response to climate change impacts.

- **Maintenance of Climate Resilience Tools**

  Ensure the ongoing operation and maintenance of essential tools for climate resilience, including one forest nursery, two hydraulic systems, two Sustainable Forest Strategic Management Plans (SFSMPs), two Water Resources Management Plans, and two meteorological weather stations.

- **Continued Monitoring and Adaptive Management**

  Implement regular monitoring protocols to track the health of habitats and species, including soil, water, climate, pathogens, and biodiversity indicators. This monitoring will support adaptive management efforts, helping maintain ecological balance and proactively address environmental changes.

- **Expansion of Conservation Knowledge and Good Practices**

  Broaden the dissemination of restoration practices developed during the project by distributing the good practice manual and engaging in knowledge-sharing platforms, publications, and workshops to support restoration efforts at both national and EU levels.

- **Strengthened Stakeholder Engagement and Awareness**

  Keep local communities, stakeholders, and authorities engaged in conservation efforts, fostering ongoing awareness, knowledge sharing, and community involvement in the stewardship of local ecosystems.

- **Enhanced Resilience through Climate Adaptation Measures**

  Replicate and expand climate-resilient measures, such as water distribution and soil management systems, to address the ongoing effects of climate change on the project sites, ensuring the sustainability of restoration outcomes.

- **Capacity Building for Long-Term Conservation**

  Strengthen capacity building by providing sustained training for forestry personnel, local forestry service departments, and protected area management authorities. Support training on human-wildlife coexistence and habitat management techniques, focusing on conflict resolution and local community involvement.

- **Policy and Institutional Support for Long-Term Conservation**

  Collaborate with local, regional, and national authorities to advocate for supportive policies, resource allocation, and integration of project findings into broader conservation and land management frameworks. This includes influencing forest management standards, addressing legal improvements, and enhancing institutional frameworks to better protect priority habitats and species.

- **Securing Long-Term Funding and Resources**

  Identify and pursue funding opportunities, both public and private, including EU funding tools like the LIFE Programme, Regional Operational Programmes, and INTERREG, to ensure continuous support for conservation activities, especially during times of economic constraint.

These objectives establish a comprehensive framework for maintaining the LIFE PRIMED project's impact, supporting long-term habitat resilience, and enhancing the conservation of Mediterranean ecosystems.

4 After-LIFE methodology and source of fundings

ACTION	METHODOLOGY/TECHNIQUES	WHO? (organization, personnel, etc.)	FUNDING	TIMING	COMMENTS
C1. Forestry nursery and reforestation	• Maintenance of the infrastructure • Awareness and education / training	• ARSIAL	National funds (Region's budget)	2025-2030	
C2. Habitat recovery: bush trimming and realisation of temporary ponds	• *Ex situ* conservation: maintenance of the seedbank of the plant with seed stock replenishment during population peak years • Maintenance of fences • Invasive species management • Periodic shrub control and trimming	• Ministry of Environment and Energy • Forest Authorities • Management Body • IMFE • ARSIAL	• Special programmes • Green Fund • LIFE • HORIZON EUROPE • BIODIVERSA+ • Landowners (Palo Laziale)	At least during next 12 years	In fact the maintenance of the plant seedbank is a continuous process, requiring low funding once every 1- 6 years. The effort for plant introduction at new temporary ponds should be re-evaluated after 6 years. Biannual or triennial monitoring of shrub encroachment is regulated by the SFSMP (Action C.4).
C3. Hydraulic interventions for habitat recovery and conservation	• Maintenance the two hydraulic systems	• Ministry of Environment and Energy • IMFE • ARSIAL	• GreenFund • Regional Funds		

ACTION	METHODOLOGY/TECHNIQUES	WHO? (organization, personnel, etc.)	FUNDING	TIMING	COMMENTS
C4. Sustainable Forest Strategic Management Plan (SFSMP)	• Implementation of the SFSMP	• Ministry of Environment and Energy • Forest Authorities • Management Body • IMFE • Landowners	• National funds (Region's budget or Green Fund) • Special programmes • Green Fund • Own funds	At least during next 12 years	Re-evaluation after 6 years
C.5. Management Plan for Water Resources and weather monitoring	• Maintenance of the weather stations • Promotion of changes to institutional and organizational framework. • Awareness and education / training	• Ministry of Environment and Energy • Forest Authorities • IMFE • ARSIAL	• Special programmes • Green Fund	At least during next 5 years	
C6. Ex situ conservation and propagation of keystone species of target habitats	• Maintain the seed banks	• DUTH • Botanical Garden of Rome	• National Funds	At least during next 5 years	
D1 Wildlife Monitoring	• Monitoring of temporary pond wildlife	• HSPN • SAPIENZA	• Special programmes • Green Fund	At least during next 12 years	Re-evaluation after 6 years. Due to extreme fluctuations, long term monitoring is indispensable for evaluating the status of the ponds and estimating the fauna

ACTION	METHODOLOGY/TECHNIQUES	WHO? (organization, personnel, etc.)	FUNDING	TIMING	COMMENTS
					around them.
D2 Monitoring of the ecosystem decline and of parasites and pathogens impact	• Monitoring forest pathogens	• SAPIENZA	• Research funds • Private funds	At least during next 6 years	
D3 Monitoring of the temporary ponds' plant species	• Monitoring of the vegetation	• DUTH • SAPIENZA	• Own resources • Research funds	At least 5 years	DUTH has signed a contract with HSPN for the monitoring of temporary ponds of Nestos for 5 years after the end of the project
D4 Monitoring of the Structure and Dynamics of Wood Ecosystem	• Monitoring of the priority forest habitats	• IMFE • ARSIAL	• Own resources • National Funds (e.g. Green Fund) • Regional Funds	At least 5 years	
D.5 Soil monitoring	• Monitoring the soil conditions and dynamism	• IMFE • SAPIENZA	• Own resources • National Funds (e.g. Green Fund)		
E1 Realisation of the project web site		• HSPN	• No need for extra funding	At least during next 5 years	HSPN will maintain the website and the social accounts of the project at least 5 years after the end of the project

ACTION	METHODOLOGY/TECHNIQUES	WHO? (organization, personnel, etc.)	FUNDING	TIMING	COMMENTS
E.4. Information panels		• HSPN	• No need for extra funding	At least during next 5 years	
E5. Layman's Report		• HSPN, all partners	• No need for extra funding	2025-2030	
E6. Networking with other LIFE Projects	• Further extension of the established network	• HSPN • SAPIENZA • IMFE • IMFE	• Own funds or/and participation in international projects • Already established network (GENMEDA, SERE, Biodiversa+ BiodivRestore Knowledge Hub, ECSA) • New LIFE projects (LIFE PHOENIX, LIFE SEEDFORCE, etc.)	2025-2030	