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Final Report
Covering the project activities from 01/07/2018 to 30/06/2023

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LIFE PROJECT NAME or Acronym
LIFE GREENCHANGE

Data Project

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2. List of key-words and abbreviations

Key words

- Land Stewardship, Land stewardship agreements
- Windbreak trees, rubble walls, wildflowers strips, fasce ripariali
- Common Agricultural policy, Rural Development Program, Greening
- Ecosystem services
- Green Infrastructures
- Agro ecosystems

Abbreviations

- AGEA: *Agenzia per le erogazioni in agricoltura*, National Rural Network, Lazio Region
- AF: Application Form
- CAP: EU's common agricultural policy
- CB: Coordinating beneficiary
- CIRF: **Italian Centre for River Restoration (Beneficiary)**
- CONFAGRICOLTURA: Confagricoltura UPA Latina (**Beneficiary**)
- EARDF: European Agricultural Fund for Rural Development
- EC: European Commission
- ES: Ecosystem Services
- GA: Grant Agreement
- GI: Green Infrastructure
- LB: lead beneficiary
- LS: Land stewardship
- MIEMA: Malta Intelligent Energy Management Agency (**Beneficiary**)
- PL: Province of Latina (**Coordinating Beneficiary**)
- PM: Project manager
- POLIEDRA (**Beneficiary**)
- PP: Pilot project
- RDP: Rural Development Programme
- RL: Region of Lazio
- RUP: Unique Responsible for the Procedure (Responsabile Unico del Procedimento)
- SC: Steering committee
- TB: Technical Board
- US: U-Space s.r.l (**Beneficiary**)

3. Executive Summary

In line with the objectives of the EU Biodiversity Strategy to 2020 and with the Communication from the Commission on Green Infrastructure, LIFE GREENCHANGE has implemented environmental improvement interventions aimed at increasing the ecological quality of the Agro Pontino, of Northern Malta and of Gozo, increasing the availability of sites of naturalistic value in the rural matrix to help mitigate the effects of the fragmentation due to infrastructure, urban sprawl and intensive agriculture. The main macro-activities of the project are: 1) Mapping and assessing Ecosystem Services (ES); 2) Promoting a collaborative governance process; 3) Farmers engagement; 4) Demonstration interventions; 5) Monitoring results; 6) Communication and networking.

MAPPING AND ASSESSING ECOSYSTEM SERVICES - One of the key activities regards the mapping of ecosystems and the assessment of ES in the Agro Pontino and in Malta. This activity was finalized in line with the work plan, applying a shared, common methodology in both project areas. Outcomes consisted of a report describing the methodology and results of the agro-ecosystems analysis, the results of the assessment of 5 ES, and a collection of geographic datasets.

PROMOTING A COLLABORATIVE GOVERNANCE PROCESS - The project comprised the promotion and establishment of governance systems - "Pacts for Biodiversity" - in the Agro Pontino and in Gozo (MT), aimed at increasing the ecological functionality and connectivity of the target agricultural areas. This will hopefully result in a permanent working table aimed at steering the Rural Development policies under the reformed CAP, to build up opportunities for green infrastructure and land stewardship agreements. The Pact for the Pontine plain was signed on 03/09/2020 by representatives of the Province, the Region/Agriculture Department, the Agro Pontino Land reclamation Authority, the Circeo National Park, the farmers' associations Confagricoltura and Coldiretti, the XIII Comunità Montana Monti Lepini Ausoni, and the Roffredo Caetani Foundation. The Pact for Gozo was signed on 26/10/2021 by Ministry for Gozo - Eco-Gozo Directorate, the national Environment and Resources Authority (ERA) and 8 Gozitan local councils. Within the Pacts (Actions C1 and C2), 8 tools and guidelines were issued to support a better management of rural areas. Within the framework of the Pacts, the project also promoted Land Stewardship Agreements (Action A3) to implement its strategies and measures through the active involvement of farmers.

FARMERS ENGAGEMENT - The project implemented a set of awareness-raising, communication and advisory activities, able to stimulate the active involvement of farmers (and their associations) in the mitigation of the environmental impacts of the farming sector and in the enhancement of the services provided by agro-ecosystems. This activity was successfully implemented in the Agro Pontino by Confagricoltura, and the information desk (that will be operational also after the end of the project) helped identifying several farm holdings interested in signing Land Stewardship Agreements. A territorial database was created to assess the feasibility of interventions and the availability of state-owned areas to transfer to the farmers to manage. Some criticalities were linked to the delays in the definition of the new RDP, causing uncertainties about the future strategy and the resources that will be allocated to agro-environmental measures. In Malta, the lack of relevant farmers associations/organizations and the excessive fragmentation of land property caused significant delays in the identification of the actors to involve. To overcome these problems, MIEMA extended the target area to the island of Gozo - where more structured farm holdings exist - and contacted single farmers one by one, also through non-institutional channels.

DEMONSTRATIVE INTERVENTIONS - Implementation of interventions started in summer 2020 and ended in summer 2023. In the Agro Pontino, wetlands and temporary flooded areas were created, restoring strips of hygrophilous vegetation and habitats of conservation interest such as temporary Mediterranean ponds (habitat 3170*) and mixed riparian forests (habitat 91F0), in order to recreate ecological systems once widespread and then disappeared due to land reclamation and intensive agriculture. The new sites helped improve the territorial connectivity, favouring functional exchanges between the large natural areas along the littoral - the Circeo promontory and the coastal lakes - and the Lepini Mountains in the hinterland. Many fauna species have quickly demonstrated their appreciation of the environmental improvements generated by the interventions. In the area of the

Ufente River diversion, the project created a highly heterogeneous system to be used for reproduction, resting, refuge and feeding. The ex-post monitoring confirmed the importance of this site for wildlife conservation. New wooded areas have significantly increased the suitability for bats, as demonstrated by the observation of no less than 11 species. In Malta, demonstration interventions focused on the restoration of more than 3km of dry-stone walls and on the planting of around 5.5km of wildflower strips. This allowed increasing ecological connectivity and naturalness in the agricultural matrix (in particular by recreating suitable habitats for pollinating insects and reptiles), reduced the presence of alien species and encouraged farmers to apply for CAP funds to extend the areas of intervention.

MONITORING RESULTS - Ex-ante monitoring was finalized slightly later than was expected - spring 2020 instead of summer 2019 - to allow a better understanding of the ecological state of some components. Due to the delays with which the demonstration interventions were concluded, ex-post monitoring began in autumn 2022 and ended at the beginning of summer 2023. In the Agro Pontino, more than 90 species of birds have been observed - compared to the 57 contacted before the intervention - some of which are of community interest or in an unfavourable state of conservation at a national level, such as *Saxicola torquatus*, *Lanius senator* and *Acrocephalus melanopogon*. The area is regularly frequented by eight species of Ardeidae, including *Ardea purpurea* and *Ixobrychus minutus*. The environmental improvements have also had a very positive effect on bats, for which both the number of species and the abundance indices have more than doubled. Within the Caetani farm, the rehabilitation of the Epitaffio canal and the creation of a new wetland have greatly enriched the environmental heterogeneity and ecological value. This rural area is now frequented by 12 species of Odonata and 47 species of birds, including species of aquatic environments such as *Alcedo atthis*, and birds of prey such as *Falco subbuteo* and *Falco peregrinus*. In the Pantanello Park, the implemented interventions aimed at increasing the environmental suitability for *Emys orbicularis*. In Malta, newly planted wildflower strips have already proved their ecological suitability for pollinators.

COMMUNICATION AND NETWORKING – These activities were carried out through diversified channels, tools, methods and contents, which allowed to widely disseminate objectives and results, raise citizens' and stakeholders' awareness, and foster mutual exchange with similar initiatives throughout Europe. The events organized included an initial conference in Sezze (Latina) on 28/03/2019, attended by more than 110 participants; a launch event in Malta on 15/04/2019; a final conference in Latina on 27/06/2023, and a final event in Malta on 14/06/2023.

A web portal at <http://www.lifegreenchange.eu> is operational since February 2019 (with around 2-3000 contacts per year). A total of 120 news in Italian and 80 news in English were published on the website. 7 project Newsletters were produced in Italian and English and sent to a mailing list of around 8.000 Italian and Maltese contacts provided by the project partners. The Facebook profile LIFE-Greenchange has 1207 followers and provides news on project activities and other relevant topics. 297 posts were uploaded on the Instagram profile, reaching around 800 followers. 22 videos were published on the YouTube channel dedicated to the project. The channel also includes several playlists, some of which are dedicated to the series of meetings and seminars organized by the project. 3 roll-ups in Italian and in English were produced for the events, as well as posters placed at the partners' headquarters. 2 brochures in Italian and in English, briefly describing the project, were produced and printed in 200 copies on recycled paper and distributed in the two launch events in Italy and in Malta. The layman's report for a generic public was produced in Italian and English, and printed in 150 copies that were distributed during the final conference. 2 initiatives with schools were carried out in Agro Pontino for a total of over 300 students involved, while in Malta an Open Day was organized on 30/03/2023, to involve around 30 primary school pupils in the planting of wildflower strips in one of the pilot sites. 10 notice boards were installed in the pilot areas, with photos and texts containing information on the project. A short film with English subtitles was shot to illustrate project results. 1 Virtual Tour was produced, as an online software that allows the exploration of the LIFE GREENCHANGE sites, with 360° photos and videos.

Introduction

The general objective of the project was to preserve biodiversity and enhance the ecological value of the agro-ecosystems of the Pontine plain and the Maltese rural areas, by supporting the establishment of decision-making processes and governance mechanisms based on the assessment of ecosystem services and realizing demonstration actions aimed at implementing green infrastructures and restoring ecosystems of high ecological value.

Specific objectives of the conservation action are:

- 1) Integrating ecological functionality and connectivity goals for agro-ecosystems - based on the acknowledgement and assessment of ecosystem services - into public and private decision-making processes, through the involvement of public entities, management bodies and farmers in the implementation and management of green infrastructures;
- 2) Enhancing ecological functionality and connectivity by implementing demonstrative projects of green infrastructure in pilot agricultural areas, so to create new core and buffer areas and ecological corridors thus contributing also to Habitat and Birds Directives;
- 3) Mitigating the environmental impact of farming activities, especially in areas of high ecological value, and increasing their contribution to the maintenance and enhancement of ecosystem services, through actions of dissemination, training and direct involvement of farmers, and the improvement of the social awareness on this issue.

The Italian target area is represented by the Pontine Plain, an area of approximately 158.000 ha, strongly devoted to agriculture and food production, with some leading sectors of regional and national relevance (horticulture, production of kiwis, table olives and buffalo milk). Agriculture is intensive and specialized, with a growing share of greenhouse crops. The rural territory appears to be deeply compromised in terms of biodiversity and ecosystem services but the dense network of canal and watercourses and the diffused system of windbreaks – inheritance of the great reclamation of '30s – provide with a high potential for restoration and rehabilitation. In these context, the main conservation issues addressed were:

- the increase in the heterogeneity and ecological quality of rural territories, through the restoration of ecosystems - such as wetlands and lowland forests - which once characterized the entire Agro Pontino and have now disappeared due to the pressure of intensive agriculture;
- the increase in ecological connectivity, through the restoration of linear green infrastructures, the definition of governance mechanisms for their lasting management, the typology and location of some demonstration interventions, specifically aimed at the functional connection between the hinterland and the coast;
- the restoration of the ecological functionality of the rivers and drainage canals, which in this area can play a fundamental role in the protection biodiversity conservation.

The Pontine Plain is interested by 2 parks/protected areas and several Natura2000 sites, in particular 6 SACs and 3 SPAs partially overlapping. Even if only 2 Natura2000 sites were directly involved in a conservation action (C3 was realised inside the SPA IT6030043 Monti Lepini and bordering the SAC IT6040003 Laghi Gricilli), all of them will indirectly benefit from the increase in nesting, feeding and reproductive resources offered to different local populations by the creation of the new biotopes.

The target habitats of conservation actions in the Pontine plain are:

- habitat 6420 Mediterranean tall humid grasslands [...]
- habitat 91F0 Riparian mixed forests [...]
- habitat 3170* Mediterranean temporary ponds

While the target species are represented by Amphibians and Reptiles such as *Emys orbicularis* (KPI); Birds, especially Anseriformes, Pelacaniformes and Charadriiformes such as the *Vanellus vanellus* (KPI); Chiropters, such as *Nyctalus noctule* (KPI).

The Maltese target area is represented by the northern Malta and the island of Gozo, an area of approximately 15.700 ha.

The Maltese archipelago, due to its limited extension, is prone to land use conflicts among agriculture, tourism, and urban development. However, around 60% of the territory of Malta and Gozo is covered by agricultural ecosystems, mainly annual cultures, with high naturalness and environmental heterogeneity. The most relevant feature of the Maltese rural context is the extreme fragmentation of land property and the very small size of farms, as well as the ageing of farmers. Abandonment of agricultural land is common, as well as its loss due to urbanization and infrastructure development. In this context, the main conservation issues addressed were:

- increasing the natural elements within the agricultural matrix, in particular by recreating suitable habitats for amphibians, reptiles and pollinating insects
- enhancing connectivity between core areas working on a very characteristic element of the traditional maltese rural landscape such as the system of rubble walls, by restoring them and improving its capacity to act as ecological connection and to provide ecosystem services by joining wildflower strips and tree strips.

The Maltese target area is interested by 8 SACs and 5 SPAs Natura2000 sites, representing all the terrestrial Natura2000 sites in Gozo and 1 SPA on the main island.

Only the Gozitan SAC MT0000020 L-Inħawi tax-Xlendi u tal-Wied tal-Kantra is directly interested by the works implemented under C9, nevertheless all can be considered to take benefit from the conservation action and were explicitly mentioned in the Pact for Biodiversity upon explicit request of ERA, the Government Authority responsible for managing Natura 2000.

The target habitat in Malta/Gozo is:

- habitat 5330 Thermo-Mediterranean and pre-desert scrub

Target groups of species are: insects - mainly pollinators – and birds, in particular *Calandrella brachydactyla*; Herpetofauna: *Podarcis filfolensis maltensis*, *Tarentola mauritanica*, *Hemidactylus turcicus turcicus*, *Chalcides ocellatus*, *Chamaeleo chamaeleon*, *Telescopus fallax fallax*, *Coluber viridiflavus carbonarius*, *Elaphe situla*; Mammals: *Suncus etruscus*; *Pipistrellus pipistrellus*, *P. kuhlii*, *P. pygmaeus*, *Plecotus austriacus*.

Conservation actions have already led - both in Malta and in Agro Pontino – to an increase in the area occupied by habitats of Community Interest and, above all, to an increase in the suitability of habitats for the species of Habitat Directive and Red List.

In the Pontine plain, Greenchange's demonstration interventions have already led to an increase in the surface area of protected habitats 6420, 91F0, 3170* which are expected to approximately double by 5 years. In particular the area occupied by habitats 6420 and 3170* will benefit from the start of natural dynamics of vegetation succession and the establishment of a better ecological balance than that found at the end of the project actions.

We expect that in the long term the effects of the demonstration interventions can lead to a further increase in the area occupied by habitats 6420 and 3170*, which will benefit from the start of natural dynamics of vegetation succession and the establishment of a better ecological balance than that found at the end of the project actions.

In Gozo, demonstration interventions have led to an increase in the surface covered by protected habitat lower than the expectation, however ex post monitoring has highlighted benefits especially for pollinators. The effects on habitats and species will be consolidated in the long term through the planting of other nectariferous species in the hedgerows and the replication of Greenchange demonstration projects thanks to an important agreement achieved with the Ministry of Gozo for the use of CAP funds to support this kind of projects and the extension of the Greenchange approach to all Natura 2000 sites and the entire territory of Gozo.

4. Technical part

4.1. Technical progress, per Action

Action A1 – Mapping and assessment of ecosystem services

Involved partners: POLIEDRA – U-SPACE – MIEMA

The identification, mapping and classification of ecosystems was done by aggregating land use classes, implementing a sort of downscaling of the MAES method.

For the Pontine area, the work was performed both on a territorial scale (1: 25,000) and on the scale of the demonstration projects (1: 5,000). For the Maltese area it was carried out at a scale of 1: 10,000 and covered the northern part of the main island and the entire Gozo. Due to shortcomings in the geographic information available and to the enlargement of the Maltese study area (following 1st project amendment approved in 17/6/2020), the implementation of the action required some additional work compared to what originally planned.

The ecosystem mapping led to the identification of 6 terrestrial natural and semi-natural ecosystems (1 of them in Malta only), 2 wetland ecosystems (both in the Pontine plain only), 5 agro-ecosystems and 3 artificial systems, while in the Maltese area to the identification of: 6 terrestrial natural and semi-natural ecosystems, 2 wetland ecosystems, 5 agro-ecosystems and 3 artificial systems.

The evaluation of Ecosystem services focused on 5 of those defined by CICES 5.1 classification (EEA, 2018), selected as significant at local level, potentially impacted by the project actions and "quantifiable" through accessible and easily updated indicators. They are:

- Cultivated terrestrial plants grown for nutritional purposes (1.1.1.1),
 - Pollination (2.2.2.1) – *Maltese case study only*,
 - Maintaining nursery populations and habitats (2.2.2.3),
 - Regulation of the chemical condition of freshwaters by living processes (2.2.5.1), focusing on the phyto-purification capacity offered by the riparian systems – *Pontine case study only*,
 - Regulation of chemical composition of atmosphere and oceans (2.2.6.1) focusing on the carbon storage
 - Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting (3.1), focusing on the opportunities to enjoy the rural landscape and its values.
- The analysis of such ES was carried out quantitatively and/or qualitatively, at territorial and/or demonstrative project scale according to the information available, 3 out of 6 SEs was evaluated through the software "InVEST".

The geographic datasets produced or collected to the purpose of action A1 were collected in the deliverable num.1: *Database per il monitoraggio e la valutazione dei servizi ecosistemici* [EN=Database for the monitoring and assessment of the ecosystem services] (delivered: June 2019 as v.1 and as v.2 integrated with some Maltese data on December 2020).

The methodology implemented and the results of elaborations were described in the deliverable n.2: *Report contenente la mappatura e la valutazione dei servizi ecosistemici nelle aree naturali, agricole e agricolo/forestali nell'Agro Pontino e di Malta* [EN=Report on monitoring and assessment of ecosystem and ecosystem services] (delivered: June 2019 as v.1 and as v.2 integrated with the assessment of the ecosystem services at the demonstrative project scale in the Maltese areas on December 2020).

Action A.2 Design and permitting of demonstration actions – tendering procedures

Involved partners: PL-US –MIEMA-CONFAGRICOLTURA-CIRF

Action “A2 – Planning and authorization of demonstration interventions – tendering procedures” includes all the preliminary activities that are necessary for the implementation of the interventions, and for the detailed definition of all the technical and economic aspects of the operations that are essential to achieve their objectives. This Action regarded the demonstration interventions implemented both in the Agro Pontino (Actions C3, C4, C5, C6, C7 and C8) and in Malta and Gozo (C9).

As regards the interventions in the Agro Pontino, it is necessary to underline that the permitting procedure was longer and more complex than expected.

The interventions had different passages and timings of approval, as described below:

- The site of intervention C3.1 was modified (amendment) and the permitting procedure was finalized only in the first quarter of 2023. The final design was developed by the US between February and April 2023. The works were awarded at the beginning of June 2023 and completed within the end of the project.
- Interventions C3.3, C4, C5 and C6 were authorized through a single procedure that occurred between August and December 2019. The final design was developed by US and Confagricoltura between January and March 2020. The tendering procedure for interventions C3.3, C4, C5 e C6 was launched in June 2020 and the works were awarded in September of the same year.
- Intervention C7, being a small-size operation not subject to authorization, did not require final design.
- Intervention C8 involved the securing and maintenance of windbreak strips and, since excavation works were not envisaged, a permit was not required. The final design of intervention C8 was developed in 2023, after a budget shift for the securing of windbreak strips and the restoration of the green infrastructure and was finalized by US in May 2023. The works for intervention C8 were awarded at the beginning of June 2023.
- The interventions of Action C9 were designed after the approval of the amendment that allowed the involvement of farm holdings in Gozo. Following the signature of the Land stewardship agreements by the site owners during the last quarter of 2020, MIEMA proceeded with the pilot projects design in relation to the rubble walls’ restoration. Drawings for all sites were issued with the tender for the restoration of rubble walls in June 2021. The works for intervention C9 were awarded in July 2021.

For further details please see also the Action A2 deliverables Blueprint of the works, Authorisation of the works, Assignment of the works (n. 3, 4 and 5).

Action A3 – Land Stewardship Agreement

Involved partner: PL-US-MIEMA

Started in September 2018 and ended in January 2020, the action developed in two main cores concerning: (i) the draft of the Land Stewardship (LS) agreement models, constituting the deliverables finalized in November 2018 (Deliverables A3 n.6, n.7, n.8); (ii) the actual Land Stewardship agreements subscribed by the farms involved in the maintenance of the Green Infrastructures realized by the project's demonstrative actions (See Deliverable 9) "Accordi di custodia del territorio per gli interventi dimostrativi". This part of the action required more time than planned since it was necessary to contract a specialized and sectorial legal consultancy through Confagricoltura, thus transferring resources from the Province of Latina to Confagricoltura. This transfer required an integration of the partnership agreement. Although the subscription of the agreements for the demonstrative actions was a project milestone (deadline March 2019), this delay did not affect the project.

The models of LS Agreements have been studied to apply the innovative formula developed by GREENCHANGE, where a public authority who owns windbreaks, riparian strips or rubble walls transfers portion of those areas through a loan for use to a LS organisation or farmer.

The models served as a base to finalize LS agreements with partner farms in charge to ensure the maintenance of the demonstrative interventions. Indeed, the contracted lawyer properly adapted the models into formal contracts, taking into account local regulations and public/private right, for each pilot site and pilot intervention. By signing the agreements farms agreed to manage, in accordance with shared rules, the green infrastructures built with LIFE funds partly on their property and partly on public property, provided that LIFE beneficiary playing the role of "enabler" received the authorization to work on the public property.

In the Pontine plain 5 LSA have been signed between the Province of Latina acting as land stewardship organization and 5 farms involved in the demonstrative interventions; in Malta 3 Agreements have been signed between MIEMA, acting as land stewardship organization, and 3 farms involved in the demonstrative interventions developed (Please see Del.9)

Multiple benefits derive from land stewardship within the formula developed by GREENCHANGE. Regarding the Pontine Plain: farmers earn the opportunity to devote the transferred areas (outside their productive land), which contribute to expanding the respective farm area, to comply with the criteria imposed by the CAP regarding greening and to have easier access to agri-environmental measures; the Lazio Region, by externalizing the responsibility of the secondary network's maintenance can allocate the economic resources saved to the more substantial maintenance and priority requalification of the primary network; the Province of Latina accomplish to promote the implementation of its planning and programming tools and to allocate resources on governance and monitoring activities. Regarding Malta, the benefits for farmers are rooted in the enhanced possibility to access funding or incentives.

C1 - The Biodiversity Pact: increasing the functionality and ecological connectivity of rural areas

Involved partners: PL, POLI, CONF, CIRF, MIEMA, US

The Biodiversity Pact for the Pontine area was presented to public and stakeholders during the first Greenchange event held in Sezze on 28/3/2019, subsequently (from July to November) some meetings - both internal and broadened to other institutions in particular with land reclamation authority - were organized by PL to discuss about the contents and the implementation of the Pact. The first version of its text was prepared by POLI in September 2019. The first meeting with the regional authority was held in February 2020, afterwards Covid restrictions prevented further meetings. A revised version of the text, structured as a Declaration of Intents was sent to institutional actors in July 2020, which subscribed one by one during summer, without it was possible to organize any event dedicated to the Pact signature. The Pact was signed by representatives of the Province, the Region/Agriculture Department, the Ago Pontino Land reclamation Authority, the Circeo National Park, the farmers' association Confagricoltura and Coldiretti, the XIII Comunità Montana Monti Lepini Ausoni, Roffredo Caetano Foundation (the official document is dated 3/9/2020, milestone delayed approximately 19 months).

The consortium did not succeed in activating an actual permanent working group with representatives of other institutions. Several problems were encountered in carrying on this activity in the way and with the planned tools, mainly due to difficulties in building a stable and profitable dialogue with the different regional departments involved, it initially depended to the turnover of the managerial staff within the PL, then to COVID restrictions finally to the delay in the publication of the CAP related documents on which base the Pact should have been built: the EU regulation, the Italian strategy and the regional Rural Development Complement (RDC).

Consequently, in order to readdress the action PL and US worked on the stakeholders' involvement trying to activate synergies with other collaborative governance initiatives in progress in particular with the River Contracts. Three are those activated in the Province of Latina: Ufente, Amaseno and Cavata – Linea Pio, one more is a “Coast Contract” promoted by the Lazio Region through the MED project COASTING. It meant presenting goals and tools developed by the consortium under the Pact in different public occasions to local stakeholders.

The biodiversity pact for Malta was presented to the public and stakeholders during the first Greenchange event held in Cirkewwa on 15/04/2019. Subsequently, some meetings took place with public and private stakeholders: the Ministry for Gozo (ECO-Gozo Directorate), the Environment and Resources Authority ERA, representatives of farmers. The text of the Pact for Malta was elaborated in English adapting the first Italian version. The Pact for Agrobiodiversity for Gozo was signed by the ECOGozo Directorate and 6 Municipalities on 27/8/2021, on 31/05/2022 these were joined by 2 Gozitan local Councils and the Environment and Resources Authority (ERA). The process was delayed partly by the need to wait for the approval of the Amendment request concerning the relocation of target areas.

The action includes 6 deliverables in the form of technical reports aimed at supporting the implementation of the Pact for Biodiversity by providing guidelines on different aspects and to different target groups. Three were prepared by POLI and aimed at supporting the identification and implementation of the rural development measures most suitable to contribute to project objectives, focusing first on the opportunities offered by the PAC 2014-2022, then on criteria to address the PAC 2023-27.

- N.10 - *Quadro per la sistematizzazione degli interventi in ambito agricolo (I e II pilastro della PAC) per incrementare la funzionalità e la connettività ecologica del territorio agricolo* was focused [EN= Reference framework for the systematization of interventions to increase the functionality and ecological connectivity of rural areas.] – This includes 2 sections dedicated

respectively to the Italian and the Maltese context (delivered: IT section July 2019/ MT section October 2019)

- N.14 - *Linee guida sulla razionalizzazione delle prescrizioni ambientali negli interventi produttivi in azienda agricola* [EN=Guidelines about prescriptions on productive interventions in farms] (delivered: October 2019)
- N.12 - *Criteri da integrare nei bandi PSR (localizzativi per gli investimenti non produttivi e premianti per gli investimenti produttivi)* [EN=Localization and Selection Criteria for RDP implementation] (delivered: February 2023).

Other three deliverables were prepared respectively by Confagricoltura, CIRF and MIEMA and were conceived as guidelines to improve the interventions on water network, windbreak strips and dry-stone walls and to be annexed to the LSC.

- N.11-*Linee guida per la gestione ecologica delle fasce frangivento* - This only refers to the Pontine Areas [EN=Guidelines for the management of windbreaks strips] (delivered: May 2020),
- N.13- *Linee guida per la gestione ambientale dei canali irrigui* [EN=Guidelines for the environmental management of the minor canal network] (delivered: May 2020),
- N15- *Linee guida per la gestione ecologica di muri a secco e fasce arborate* [EN=Guidelines for the ecologic management of rubble walls and tree belts] - This only refers to the Maltese Areas (delivered May 2020).

Most of the deliverables mentioned above were delivered with minor delay (up to 6 months), except the n.12, to draft which it was necessary to wait for the publication of the PAC national strategies and the Regional RDC, issued between the end of 2022 and the beginning of 2023, with at least a 3 years delay respect to the timing expected at the proposal stage: as established by the Regulation (UE) 2020/2220 the entry in force of the reformed CAP were in fact officially postponed from 2021 to 2023.

The milestone concerning the subscription of the 10 LSC with farms different from those involved in the conservation actions was failed. On the one hand, this is due to the missed achievement of an agreement with the regional department in charge of the public property, which would have allowed to define the condition for granting loan-for-use on riparian/windbreak strips to farms in return of their management. On the other, it was due to the lack of measures suitable to encourage this kind of initiatives under those activated under the regional RDC, which do not include any incentive for the maintenance (and management) of green infrastructure in farms.

Nevertheless, many farms interested in such agreements have been individuated, in particular among those neighbouring the windbreaks strips involved in the C8 works. The consortium will keep working to finalize their involvement in LSCs. An opportunity for that was set by a call under the RDP 2014-2022 launched in August and open up to December.

C2 - Orienting and training farmers to enhance ES in rural areas

Involved partners: POLIEDRA – MIEMA - CONFAGRICOLTURA

The action was aimed at preparing the ground for the implementation of land stewardship agreements and promoting sustainable farming and solutions to strengthen the ecological network and SE provision, by improving the access of farmers to agro-environmental measures under the CAP. It provided for 5 tools: A. a technical report about the impact from different crops; B. an open source app, to support sustainable farming; C. an information desk; D. a guideline for farmers to improve their access to CAP agro-environmental measures, E. Training modules targeted both to farmers and to students.

In general, the implementation of this action was influenced, especially in its timing, by two main factors: the pandemic, which hindered the organization of meeting and training sessions, and the 3 years delay in the issue of CAP national strategy and the regional RDC measures, which influenced the deliverables based on their contents.

The A tool coincides with the deliverable nr.16 “Catalogo degli impatti delle colture e delle pratiche Agricole” [EN=Catalogue of impacts from crops and agricultural practices], drafted by POLI and structured according to the agroecosystems mapped with action A1 (delivered: June 2020).

The tool B, developed by POLI with the support of an external IT company, was partially modified in content and functionality compared to the initial plans in order to take more benefit from the A1 and C1 deliverables. It was finally developed as a webgis app planned to be used by the Confagricoltura advisors at the information desk, but also to give public access to a range of geographic information datasets.

Its Beta release was issued on July 2021, the second release, integrated with features to allow a preliminary esteem of the funding accessible under a selection of RD measures, has made available on March 2023 (link: <https://greenchange.terraria.com/html/public/dashboard.jsf>).

The B tool coincides with the deliverables:

- Nr.18 App per la pianificazione dell'attività dell'azienda agricola [EN= Farm planning app] (delivered: v.1 July 2021/v.2 March 2023)
- Nr.19 Manuale per l'utilizzo della App [EN= WebGis APP user manual] (delivered: May 2023) available on the same page.

The tool C was implemented through an information desk at the Confagricoltura Latina offices. This was activated on 08/10/2019 (one year earlier than planned) and has been accessible to on every Tuesday from 9:00 to 13:00 up to now, with some limitations due to Covid emergency between March and May 2020. During this period Greenchange staff in Confagricoltura advised approximately 70 farmers.

This activity allowed to observe a great interest about land stewardship contracts from farmers, which, in particular in the first stage, had embraced the opportunities to take on the management of some green infrastructure in return of some reward criterion on the access to rural development measures. Unfortunately, the measures selected by the Region and published in January 2023, do not include such kind of initiatives and, as mentioned about C1, and the regional department in charge of the public property have not yet expressed about the possibility to grant the loan for use of the windbreak strips. In any case the information desk proved to be very useful in terms of awareness raising, especially towards younger and more “up-to-date” farmers. So much, that Confagricoltura decided to extend such service in the after-Life, so to keep on supporting local farmers on these topics despite the poor opportunities currently available.

The tool D coincides with the deliverable nr. 17 “Linee guida per i finanziamenti in ambito agricolo” [EN= Guidelines for rural investments] (delivered: January 2023). It analyses among the RDC measures activated, those of greater interest for the purposes of the LIFE GREENCHANGE project. It includes 2 sections dedicated to the Italian and the Maltese context drafted respectively by POLI and MIEMA (delivered: IT / MT section January 2023).

The tool E included training activities targeted both to farmers and students. Training for farmers in the province of Latina included a cycle of meetings organized by Confagricoltura focused on the opportunities offered by the CAP green architecture and titled: “Strategia PSP: condizionalità rafforzata, ecoschemi e interventi per lo sviluppo rurale” [EN = CAP strategic plan: enhanced conditionalities, ecoschemes and rural development measures]: 5 meetings, targeted to different groups of farmers divided per main crop, took place from 20/3/2023 to 3/4/2023, the participants were approximately 60.

Training module for students, was implemented by Confagricoltura, POLI and US, involved 3 classes of the San Benedetto Agricultural Institute of Latina (46 students). The module included a cycle of lectures on 4 topics (1. Life Programme and the Greenchange project, 2. Biodiversity and agriculture, 3. Landstewardship agreements and the Pact for biodiversity, 4. CAP and agro-environmental measures) and on-field activities. Its implementation was heavily conditioned by the Pandemic restrictions especially for what concern the timing: lectures, partly implemented on a distance learning platform, took place between November 2020 and September 2021; the activities ended in May 2022 with two field lessons on the design and management of windbreaks.

As for Malta, throughout 2019 and the beginning of 2020, MIEMA staff and experts had a series of 9 bilateral information and awareness-raising meetings with individual farmers, to explain to them the benefits of the foreseen interventions to enhance the ecosystem services in the agricultural context, and discuss specific training needs of farmers. Moreover, it prepared an expression of interest to submit to Maltese farmers in order to involve them in the project and in the implementation of interventions.

Action C3 - Environmental Restoration of the wet ecosystem along the Ufente river

Action C3 involves the environmental restoration of wetland systems along the Ufente River, carried out in two sites that are subject to the following sub-actions:

- Sub-action C.3.1 “Restoration of the Ufente sources and of Lake Pani”, aimed at conserving and restoring natural hygrophilous and hydrophilic habitats near the sources of the Ufente, River, thus increasing the environmental heterogeneity and ecological functionality of the entire area.
- Sub-action C.3.3 “Ufente River restoration”, aimed at restoring a lowland environment along the river through the creation of wetlands, hygrophilous and mesophilic woods, stable meadows and structures for the fruition of the area.

The intervention C3.1 had to be amended, because it regarded a natural context (the Ufente River) subject to special restrictions, where no modification of riverbanks is allowed. For this reason, it was decided to move the intervention 1 km upstream along the river, implementing it with similar objectives and technical characteristics. Furthermore, there were significant delays due to the authorization procedures and to the concession of the area by the "Worship fund". The intervention was approved in February 2023, while the works were entrusted by May 2023 and completed by 30/06/2023, in compliance with the final blueprint. The project area covers an area of approximately 1.4 ha and is located in the municipality of Sezze (LT). The intervention was aimed to: a) conserve and restore natural hygrophilic and hydrophilic habitats, thus increasing the environmental heterogeneity and ecological functionality of the entire area; b) improve the conservation status of the habitats and enhance their function as reproductive sites and refuges for species of conservation interest, by creating a mosaic of ecosystems for the increase of local biodiversity linked to wetlands and traditional rural landscapes.

The intervention C3.3 concerned a portion of the Pontine Plain of approximately 40 hectares, located along the Ufente River in the territory of the Municipality of Pontinia (LT). The final blueprints were developed by U-Space and the main works were carried out between 2020 and 2021. Firstly, two permanent lentic humid environments were created, whose shape and size were dictated by the existing depressions. Besides the naturalistic purposes, their presence supports the function of lamination tank that the intervention area currently performs. The soil resulting from the excavations was moved and shaped as an embankment, creating uplands on which trees and shrubs typical of the lowland mesophilic forest (habitat 91F0) were planted. Two different areas located at the southeast and northwest corners of the site were equipped with perimeter fences to separate the sheep and cattle grazing areas from the meadow environments, thus making the management of the entire area easier for the breeders. The intervention site was made accessible for visitors through the creation of dirt walkways and, in the areas prone to flooding, of raised wooden paths, duly equipped with fences. Two fauna observation huts were built close to the two wetlands. After the end of the works, irrigation was performed in the summer period to help the newly installed plants to overcome the long drought periods.

For further details please see also A2 action deliverables (n. 3, 4, 5) and C3 action deliverables (unique deliverable n. 21, 22, 23).

C4 - Improvement of ecological functionality and increase of biodiversity in the “Giardino di Ninfa” Natural Monument – Pantanello area

The intervention site is located within the Natural Monument (NM) ‘Giardino di Ninfa’ (Municipality of Cisterna di Latina), which includes the SCI/SAC IT6040002, the habitat constituted by the Ninfa River, the lake formed by it and the surrounding areas. The objective was to improve the conservation status of the habitats and to strengthen their function as reproductive and refuge sites for species of conservation interest. To do so, the approach was to create (or enhance, where already present) a mosaic of ecosystems, in order to increase the local biodiversity linked to wetlands and traditional rural landscapes and ensure refuge for avifauna, herpetofauna and bats, also by installing approximately 110 bat boxes (artificial shelters for bats).

Sub-action C.4.1 involved the creation of linear and areal tree-shrub formations in an area of approximately 6,500 m², in the northwestern part of the NM (close to the road S.P. Ninfina), which was the most exposed to disturbance.

Sub-action C.4.2 consisted in the creation of a small wetland in an area of approximately 1,500 m², through limited land re-profiling (aimed to obtain localized depressions of around 20÷30 cm), combined with the planting of hygrophilous species (both herbaceous and shrubby) and the creation of terrestrial shelters for amphibians and reptiles near the area.

Within sub-action C.4.3, five floating islands of approximately 4 m² each were created, and anchored far from the shores, where the water is deeper. The islets, shaped and sized to encourage the resting and reproduction of avifauna, are compliant with the Floating Treatment Wetlands systems, and were built in situ. They have a bamboo cane structure (diam. 8-10 cm) and an anchoring system consisting of a 5-meters-long steel cable (diam. 3-5 mm) fixed to the bamboo structure and anchored to a 20 kg limestone boulder. The islets are planted with species typical of the local humid environment. The implementation of the demonstration interventions began on 17 November 2020 with the delivery of the construction sites and the start of the works. The tenders were awarded in September 2020, and the Province of Latina applied the ‘Urgent delivery’ procedure, pursuant to art. 32 c. 8 of Legislative Decree 50/2016. However, it was not possible to start the works in October, due to intense rain throughout the month. It was also necessary to wait for the land to drain before being able to enter the site with the necessary machinery. The works continued throughout 2021, as foreseen by the project schedule, except for a suspension from 15 March to 1 July to avoid disturbance to the birdlife. Therefore, planting operations were postponed to autumn-winter 2021-2022. In March 2023, the site managers requested to the Province of Latina additional works that were not included in the initial contract but were made necessary by unforeseeable circumstances. This addition did not alter the nature of the contract, as it involved additional works of the same nature as those described in the call for tenders, namely:

- replanting of 250 potted plants (size: 35cm) to replace those that died following the drought of spring-summer 2022 (recognised as natural disaster by the Lazio Region), in spite of the 3 emergency irrigation interventions carried out by the subcontracting company 3 Erre srl;
- 25 ml excavation for water supply from a canal inside the farm to the educational area on amphibians, to ensure the maintenance of the humidity conditions necessary for the balance of the humid environment.

In May 2023 all works were finalized, the works completion certificate was issued, and all the amounts certified in the works accounting register were paid off.

For further details please see also A2 action deliverables (n. 3, 4, 5) and C4 action deliverables (n. 24, 25, 26).

Action C5 - Construction of green infrastructures in the Caetani Foundation farm

The intervention site is located in the Municipality of Latina, along the road S.S. Appia, in the heart of the Agro Pontino. It is a farm holding that extends over approximately 240 hectares of total area and 222 hectares of agricultural area. The action had the aim of demonstrating that it is possible to create and maintain ecological connections and stepping-stones for plant and animal species related to the existing morpho-edaphic heterogeneities, within a productive agricultural company. To do so, the approach was to create (or enhance, where already present) a mosaic of agro-ecosystems, in order to increase the local biodiversity linked to wetlands and traditional rural landscapes and ensure refuge for avifauna, herpetofauna and bats, also by installing around 27 bat boxes (artificial shelters for bats). Sub-action C.5.1 aimed at a functional transformation of the route and section of the Epitaffio canal that crosses the farm, by remodelling and widening the left hydraulic bank and by creating a riparian strip of trees and shrubs. The creation of the vegetated strip affected approximately 5m on the left bank of the canal, allowing the reconstitution of a river continuum (both transversal and longitudinal to the watercourse) capable of fulfilling important naturalistic and landscape functions and of mitigating the percolating pollution load. The remodelling also made it possible to obtain different current speed conditions and morpho-bathymetric heterogeneities, especially useful for amphibian fauna.

Sub-action C.5.2 involves the restoration of smaller drainage canals within the farm. The hydraulic "vascular system" is formed by a network of canals with decreasing hydraulic section. Small drainage canals represent significant minor ecological corridors and separate the areas of the farm intended for different crops. The intervention essentially created a strip of helophytic vegetation, corresponding to the uncultivated area close to the drains. Multi-row formations of herbaceous/shrub species were planted. The planting spacing of 1x1.5 m resulted in the creation of continuous vegetated lines along a part of the minor hydraulic network.

For sub-action C.5.3, a wetland area with a total surface area of approximately 3 hectares was created in the central portion of the farm, to replace a poplar grove for biomass production. Thinning operations and planting of native tree species and local ecotypes (*Quercus robur*, *Fraxinus oxycarpa*, *Ulmus minor*, *Cornus sanguinea*, etc.) were conducted, along with the planting of species typical of habitat 91F0, in order to create a significant strip of mesophilic forest. Major earthworks lowered the elevation and shaped a basin that was subsequently flooded to create a pond. The flooded area extends for approximately 10,000 m², and at its boundaries, the forest takes on more purely hygrophilous characteristics. The thinning of the poplar grove was aimed at creating clearings in which to plant tree species in small groups, such as willows, poplars, alders and oaks. In the areas surrounding the pond, the action tried to recreate habitat 3170 - Mediterranean temporary ponds, by inserting the following species acquired in nature: *Isoetes histrix*, *Mentha pulegium*, *Ranunculus muricatus*, *Juncus bufonius*, *Serapias lingua*, *Peplis portula*, *Ranunculus sardous*, etc. were planted as well.

Works included:

- Selective thinning of poplar trees;
- Earthworks for pond construction (max depth: 30–40 cm);
- Building of a pond supply system, consisting of an intake on the Epitaffio canal, a photovoltaic-powered lifting system, and an underground pipeline;
- Creation of a pond drainage system, consisting of a stone threshold and channels, which deliver the excess water back into the Epitaffio canal via an existing drain;
- Creation of islets and perimetral banks with the material removed to shape the pond reservoir (all excavated material was reused on site);
- Diversified vegetal plantings on the riparian strip, the islets and the higher perimetral embankments.

The intervention is located in the portion of the C5 area that is richest in reptological species. In particular, tree frogs find shelter on the trunks of poplars and in the undergrowth, and the latter is widely used by Green whip snakes (*Hierophis viridiflavus*), Italian wall lizards (*Podarcis siculus*) and Western green lizards (*Lacerta bilineata*). For this reason, piles of wood and/or stone were created as

a temporary refuge for species during the works. Furthermore, some artificial shelters will be set up, both in the wetland area and on its edges, to encourage the permanence and refuge of the amphibian and reptile species of this portion of the area.

Sub-Action C.5.4 involves the completion of a linear tree formation close to the road that crosses the property. The tree strip created is 8 m wide and 400 m long, for a total area of 3,200 m², which also marginally involved the areas currently used for agriculture.

The implementation of the demonstration interventions began on 17 November 2020 with the delivery of the construction sites and the start of the works. The tenders were awarded in September 2020, and the Province of Latina applied the 'Urgent delivery' procedure, pursuant to art. 32 c. 8 of Legislative Decree 50/2016. However, it was not possible to start the works in October, due to intense rain throughout the month. It was also necessary to wait for the land to drain before being able to enter the site with the necessary machinery. The works continued throughout 2021, as foreseen by the project schedule, except for a suspension from 15 March to 1 July to avoid disturbance to the birdlife. Therefore, planting operations were postponed to autumn-winter 2021-2022, with three emergency irrigation interventions carried out by the subcontracting company during summer 2022. In March 2023, the site managers requested to the Province of Latina additional works that were not included in the initial contract but were made necessary by unforeseeable circumstances. This addition did not alter the nature of the contract, as it involved additional works of the same nature as those described in the call for tenders, namely:

- Creation of 1,000 m of fence made of wooden poles and wire mesh around the intervention C.5.3, in order to avoid hunting in the area.

In May 2023 all works were finalized, the works completion certificate was issued, and all the amounts certified in the works accounting register were paid off.

For further details please see also A2 action deliverables (n. 3, 4, 5) and C5 action deliverables (n. 27, 28, 29).

Action C6 - Restoration of the Cicerchia and Allacciante channels

The intervention site is located in the Municipality of Latina. It consists of two close but not contiguous areas situated on the left and right side of the coastal road near the village of Fogliano.

The first intervention regards the Cicerchia Canal, which borders the Ganci farm, an organic vine-growing company owning approximately 70 hectares. The company has diversified the activity by opening the area to the citizens of Latina through the creation of a cycling and pedestrian path along the canal, connected to the pedestrian and cycle paths of the neighbouring Circeo National Park, along the Lake of Fogliano. The second intervention was carried out on the state-owned strip adjacent to the Allacciante canal, which crosses the entire length of the Agrilatina farm, an important mixed production holding (fruit and vegetables, livestock, cereals) that has been applying biodynamic cultivation methods since 1992 and is located within the perimeter of the Park on an area of approximately 75 hectares. The action is particularly important because the intervention sites are located within and near the Circeo National Park. The Cicerchia river and the Allacciante canal constitute an important green infrastructure connecting the urban centre of Latina and the coastal lakes system. Furthermore, the pedestrian and cycle path that runs along the Cicerchia canal and across the Ganci farm plays an important recreational function.

The action C.6 is divided into 3 sub-actions. Sub-action C.6.1.A consisted in the removal of the most invasive alien species (*Aurundo donax*, *Rubus ulmifolius*) and in the creation of a 10-metres-wide herbaceous–shrubby–arboreal strip. It also included the maintenance of an area of herbaceous vegetation (necessary to allow the ordinary activities of the Reclamation Consortium for the maintenance of the hydraulic functionality of the Cicerchia Canal), as well as the creation of a 8-meters-wide strip with shrubs and trees, to reconstruct the typical vegetation sequence: shrubby willow trees, riparian arboreal formations with *Salix* spp and *Populus* spp, and formations with *Ulmus minor*, *Fraxinus oxycarpa* and *Quercus robur*.

Sub-action C.6.1.B involved the artificial lake inside the Ganci farm, which was created inside a disused sand quarry. The area is characterized by the presence of spontaneous vegetation born on the aggregates from sand processing. It was necessary to fell the dry trees on the banks, but the necromass was left in the field, playing an important role for the saproxylic organisms. Subsequently, the same planting interventions carried out for C.6.1.A were implemented.

Sub-action C.6.2 consisted of the reconstruction of the right bank of the Allacciante canal by creating two overlapping bank rollers: a lower one in galvanized metal mesh, containing pebbles, gravel and aggregates, and an upper one in coconut fibres retained by a natural fibre mesh. Hygrophilous species such as phragmites and *thypa* were planted in a strip 1,500 meters long and 5 meters wide.

namely:

- replanting of 500 potted plants (size: 35cm) to replace those that died following the drought of spring-summer 2022 (recognised as natural disaster by the Lazio Region), in spite of the 3 emergency irrigation interventions carried out by the company 3 Erre srl;
- replacement of the restoration intervention carried out along the bank of the Cicerchia canal that was seriously compromised by the abovementioned drought. In the forecast of a 2023 season that could be even worse than 2022 in terms of drought, it was decided to redesign the intervention by creating a pilot habitat for pollinators near the company building. This location will ensure the creation of an irrigation system capable of supporting the establishment of the transplanted plants in the first 3 years, thus guaranteeing the success of the intervention.

In May 2023 all works were finalized, the works completion certificate was issued, and all the amounts certified in the works accounting register were paid off.

For further details please see also A2 action deliverables (n. 3, 4, 5) and C6 action deliverables (n 30, 31, 32).

Action C7 - Environmental requalification in livestock farms

Action C7 involves interventions aimed at the environmental restoration of the minor drainage network within a livestock fodder farm holding in the Municipality of Sezze. In particular, the objective was to evaluate the effectiveness, also from a phytoremediation point of view, of the planting of hygrophilous vegetation along the banks of the drainage canals.

The intervention did not require any permit, as it simply consisted of the planting of herbaceous vegetation (*Phragmites australis* and *Typha latifolia*) for a total of 5,000 plants.

The intervention was finalized in February 2023. For its implementation, the Province of Latina signed a partnership agreement with Confagricoltura Latina, transferring the necessary sums. Confagricoltura purchased the plants, which were then delivered to the ownership of the farm and planted by the farm workers under the supervision of agronomist Simonetta Dario and engineer Luciano Landolfi.

The profound transformations due to climate change that are occurring in recent years, with the concentration of rainfall in two months only (generally November and December) and very long droughts (to date we are already in a situation of water shortage), made it necessary to review the project approach. It was decided to concentrate the plantings almost at the base of the network, in order to ensure to the hygrophilous plants water supply for a longer period, taking into account that the plants were intended to display a water phytoremediation effect in a livestock farm that uses company sewage to fertilize crops.

The contribution of the intervention to the improvement of water quality in terms of nitrogen load will be monitored in the coming years by Confagricoltura, with the aim to verify the actual effectiveness of phytoremediation and, in a long-term perspective, to promote this management method of the minor hydrographic network in the other livestock farms across the Province of Latina.

For further details please see also A2 action deliverables (n. 3, 4, 5) and C7 action deliverables (n 33, 34, 35).

Action C8 - Renewal and management of linear ecological connections: windbreaks

Involved partners: U- SPACE, PROVINCIA DI LATINA

U-Space was responsible for *Sub-action C.8.1. Update of windbreak strips database*. The geographic database is organized on a cadastral basis and was implemented by integrating different existing data sources: datasets owned by the Province of Latina, datasets owned by the regional State Property Office, geodatabase of the Land Cadastre, historical maps regarding the reclamation of Pontine Marshes. The result achieved is a geo-referenced census of the Region's and Province's public property of windbreak strips. The geographical database was implemented by integrating data from the ecological network of the Province of Latina, from the Landscape Systems of the Regional Coordination Plan and from the ecosystems dataset created for LIFE Greenchange. The analysis of the different information layers allowed integrating the geodatabase with data on the quality of windbreak strips, meant as their potential to contribute to the enhancement of biodiversity and of the ecological connections of agro-ecosystems. Moreover, windbreak strips were classified into the categories "inter-farm" and "road", and this information allowed for the identification of those (the inter-farm ones) that are more suitable to be restored and managed by farm holdings.

The database was useful to elaborate the information system transferred to CONFAGRICOLTURA for the information desk (Action C2). In addition, the geographic database was used to prepare the guidelines for the management and maintenance of windbreak strips (Action C1).

The design of demonstration interventions required several site visits, and the support from CONFAGRICOLTURA allowed for the involvement of various farm holdings, with the purpose of planning the restoration of 8 km of windbreak strips. The windbreak strips considered in the design were accurately surveyed using the VTA (Visual Tree Assessment) methodology.

During the design phase, it was necessary to modify the interventions described in the application form, because the windbreaks, having not been maintained for a long time, were too high and consequently unsafe. Farmers with windbreaks frontage declared their unavailability to take charge of them or to pay for the extraordinary pruning intervention that would be appropriate. The C8 budget was increased to secure the windbreaks (including cutting at the base the trees in the worst conditions) before starting the ecological improvement works, in order to put farmers in the proper conditions to sign the Land stewardship agreements and ensure they willingly take charge of the green infrastructure maintenance in the future.

The activities performed to engage the farm holdings and to modify the project for securing the green infrastructure, along with the need to obtain the permits for the interventions, caused significant delays in the launch of the works, which started only towards the end of the project in June 2023.

The interventions implemented exclusively concerned the cutting of damaged plants and the thinning of the windbreak strip.

In total, three companies were involved, 266 plants were pruned and 136 were cut. The overall length of the intervention was 3 km. The Province of Latina, in coordination with the Lazio Region, intends to use the resources of the new CAP to enhance the biodiversity of windbreaks. In fact, one of the measures that CONFAGRICOLTURA is promoting as part of the project LIFE BEEadapt is the use of eco-scheme 5 to create bands of shrubs and wildflower strips along the riparian and windbreak strips.

For further details please see also A2 action deliverables (n. 3, 4, 5) and C8 action deliverables (unique deliverable for n. 36, 37, 38, 39).

C9 - Linear ecological connections, rubble walls and wildflower strips in the rural areas of Ghadira and Chadwick Lakes

Involved partner: MIEMA

The implementation of the Action was strictly linked to the amendment procedure, which modified the extension of the total target area to include the island of Gozo. The procedure was the same applied in the Agro Pontino (i.e. in C8): identification of interested farmers; signature of Land Stewardship Agreements (A3); ex-ante survey of land parcels, detailed planning, application for permits, tendering and subcontracting of works (A2), and implementation of the interventions. The Action was carried out in the following pilot sites in northern Malta and in Gozo (total area: around 12 ha): Manikata (0.67 ha), in Mellieha (Malta), owned partly by a single farmer and partly by the Koperattiva Rurali Manikata; Xlendi (0.7 ha), located in Gozo; Ta' Mena Estates in Xaghra, Gozo (10.4 ha): In-Nuffara (7.3 ha); Ta' Fardala (0.6 ha); Ta' Canti (1.7 ha); Ghajn Damma (0.8 ha). The need to optimize the timing of works, synchronizing them with the appointed company's schedule and with the agricultural activities in target farms, led to the decision of dividing the action into two phases: 1) rubble walls restoration, and 2) planting of the wildflower strips. Rubble wall restoration works started in Manikata, in the area owned by the single farmer, and were carried out in November-December 2021. 126m of walls were excavated and rebuilt. In the area owned by the Koperattiva Rurali Manikata, 136 sqm of rubble walls were restored in January-March 2022, with a slight delay due to the adverse weather conditions. Additional works were later undertaken in collaboration with the Cooperative, for a total of 141.6 sqm of rubble walls restored. In Xlendi, the proximity of the area to the Natura 2000 site L-Inhawi tax-Xlendi u tal-Wied tal-Kantra lengthened the permitting procedure. The restoration involved 477m of rubble walls, with heights ranging from 1.2 to 2m, and was completed by June 2022. However, heavy rainstorms twice caused sections of the walls to collapse. Indeed, this site proved to be the most difficult to tackle, due to its very small size and slope, and to the retention function of the walls. In Xaghra, works were completed in the first half of 2022 and involved 3,049m of rubble walls, with heights varying from 0.6 to more than 2m. Ultimately, more than 3 km of rubble walls were restored, well above the 1.5km initially foreseen. Farmers and landowners expressed their satisfaction, and are now inclined to consider other similar interventions, also exploiting the measures of the CAP SP 2021-2027. As for the wildflower strips, the procedures for plants selection and procurement and the scheduling of planting activities were agreed with the Ministry of Agriculture, but the inadequacy of the plant production chain in Malta made the local supply of the plants extremely difficult. In the end, 4.000 plants of *Rosmarinus officinalis* were bought from private nurseries and planted alongside the rubble walls for an overall length of 5.5km (3.8km at Ta' Mena sites, and 850m at Manikata and Xlendi). Planting continued throughout the first half of 2023, including Open days with local schools (see E1). The area occupied by the alien species *Oxalis pes caprae* was reduced in all sites. The interventions have already proved their ecological suitability for pollinators. Despite these species' resistance to water scarcity, recent droughts have provided a challenge for farmers to maintain the plants. MIEMA agreed with them to ensure they replace dead plants at least for five years beyond the end of the project, and they supplement the strips with species such as *Punica granatum*, typical of Malta. It was also agreed with the EcoGozo Directorate to plant other species characteristic of the scrub formations of the thermo-Mediterranean zone, such as *Euphorbia melitensis*, at Ta' Sopus, an area managed by the Ministry for Gozo with recently restored rubble walls. This will result in additional 0.5 ha of habitat 5330 that will be maintained for at least five years. The Starting reports are not common procedure in Malta, and they were not produced.

Action D1 – Analysis and monitoring of the effectiveness of the interventions and of their impacts on ecosystems

Involved partners: CIRF – MIEMA - U-SPACE

The monitoring aimed at knowing the conservation status of species and habitats in the pilot areas were started with the expected timing.

The ex-ante monitoring concluded with a slight delay compared to what was expected - spring 2020 instead of summer 2019 - to allow a better understanding of the ecological state of some components (detailed explanations are contained in the midterm report).

Due to the delays with which the environmental improvement demonstration interventions were concluded, ex post monitoring began in autumn 2022 and concluded at the beginning of summer 2023.

The ex-post monitoring was not carried out in the C3.1 area as the intervention was not completed within the expected time frame and thus the field investigations would have returned a partial and inadequate situation. In all other areas of intervention in Agro Pontino the action was completed correctly. The same methodologies already used in the period prior to the interventions were applied, so as to allow a scientifically rigorous comparison.

Unfortunately, the monitoring was carried out only a few months after the conclusion of the interventions, a time not sufficient for the new ecosystems to reach an adequate ecological balance and too short to allow colonization by some species of fauna.

Nonetheless, the results of the field investigations demonstrate the achievement of the project objectives and provide useful information on the presence and state of conservation of species and habitats protected by the Habitats Directive, in areas never previously investigated in detail.

In Malta, MIEMA identified a local expert to perform the monitoring of flora, and drafted a tendering document aimed at selecting a group of experts who will be in charge of monitoring the different types of fauna. The Action started later than scheduled, because its implementation depended on the exact definition of the intervention areas, and, therefore, on the positive outcome of the amendment procedure. In the meanwhile, Maltese experts contributed to the quantification of the KPIs regarding environmental and naturalistic aspects, also through several meetings with the partners CIRF and POLIEDRA.

After the approval of the amendment request in June 2020, the local flora expert performed the ex-ante monitoring of vegetation and submitted the related ex-ante report. As for the fauna monitoring, MIEMA published a first call for tenders on 11/09/2020, but no compliant offers were received, so the call had to be modified and published a second time. The second call was published on 03/11/2020, with deadline on 24/11/2020, and the contract was finally awarded in January 2021. The appointed experts carried out the ex-ante on-site surveys of birds, reptiles and butterflies between May and June 2021, in all the pilot sites in Malta and Gozo. The ex-ante fauna monitoring report was delivered in 2021 and was shared and discussed with ERA – Environment and Resources Authority. Due to the delays in the planting of wildflower strips (Action C9), and in connection with the decision of asking for an extension of the project duration, the ex-post monitoring activities had to be postponed, and took place (both for flora and fauna) between May and June 2023.

The detailed description of the monitoring carried out (study areas, methods, results, evaluations) is contained in Report D1 – Report ex post (n.44).

Action D2 – Monitoring of the socioeconomic and territorial effects and of the project performance

Involved partners: POLIEDRA

The monitoring programme for socio-economic impacts was delivered by 31/07/2019, as planned in the first progress report. The provided methodological framework led to strictly linked monitored impact to the effectiveness of the Pact for Biodiversity and the land stewardship agreements, implying farmers' behavioral transformation.

For this reason, the programme foresees three main areas:

- Farmers' attitude
- Effectiveness of the Pact for Biodiversity
- Transferability and replicability of GREENCHANGE

Furthermore, D1 and D2 monitoring programmes were harmonized to have a common structure and to provide consideration on the contribution of selected indicators to KPI exercise. D2 KPI Report – baseline was delivered on 30th of July 2019, preparing all relevant data to be uploaded to the KPI platform.

In December 2021 the intermediary D2 report was delivered. Delays in the implementation of Greenchange demonstrative actions as well as in the Common Agricultural Policy 21/27 operationalization let the intermediate monitoring partially report about the three monitoring domains identified in the monitoring programme.

The D2 Final report delivered on 30th of June 2023 provided a complete picture of both LIFE Greenchange achieved objectives and Life KPI contribution, although data gaps persisted.

Consequently, the final D2 KPI report was delivered in June 2023, providing data and information to be uploaded to the KPI platform.

The project faced data gaps and lack of available information which could not be foreseen at the beginning. Despite such difficulties, solutions were adopted in order to fully achieve the objective of the action, as well as its deliverables.

For further details please see also D2 action deliverables (n. 47,48, 49, 50 and 51).

E1 – Communication plan

Involved partners: all partners

The dissemination of the project, carried out through diversified channels, tools, methods and contents, achieved a wide spreading of objectives and results, raise awareness in citizens and stakeholders, and fostered mutual exchange with similar initiatives throughout Europe.

The project launch occurred with an initial conference in Sezze (Latina) on 28/03/2019, attended by more than 110 participants. A second launch event was organized in Malta on 15/04/2019. A final conference was held in Latina on 27/06/2023, with the participation of around 40 stakeholders. A final event was organized in Malta as well, on 14/06/2023.

A dissemination plan, defining objectives, targets, methods, tools and expected results was drafted and shared with the partners during the first year. The plan was gradually updated, evaluating the results through a constant monitoring activity.

A coordinated graphic identity was designed. The GREENCHANGE logo was conceived according to specific communication objectives concerning the environmental and rural focus of the project. A web portal at <http://www.lifegreenchange.eu> is operational since February 2019. Its contents are available in both Italian and English. It is structured in sections and sub-sections that are easily accessible through a navigation menu that is always well visible. On the website have been published a total of 120 news in Italian language and 80 news in English language. 7 project Newsletters were produced in Italian and English and sent to the Italian and Maltese mailing lists provided by the project partners.

Communication was also carried out through the Facebook profile LIFE-Greenchange. The page has 1207 followers and provides news on project activities and other relevant topics. 297 posts were uploaded on the Instagram profile <https://www.instagram.com/lifegreenchange.eu/>, with pictures and videos regarding the landscapes, flora and fauna in involved areas, reaching around 800 followers. Special attention was paid to the use of hashtags dedicated to environmental themes.

22 videos have been published on the YouTube channel dedicated to the project. The channel also includes several playlists, some of which are dedicated to the series of meetings and seminars organized by the project. 3 roll-ups in Italian and in English were produced for the events, as well as posters placed at the partners' headquarters. 2 brochures in Italian and in English, briefly describing the project, were produced and printed in 200 copies (100 in Italian and 100 in English) on recycled paper and distributed in the two launch events in Italy and in Malta (deliverable 53). The layman's report for a generic public was produced in Italian and English (deliverable 59). 150 printed copies have been distributed during the final conference. 2 initiatives with schools ("At school on the Sisto" and "The sea in class") were carried out in the schools of the Agro Pontino for a total of over 300 students involved, while in Malta an Open Day was organized on 30/03/2023, to involve primary school pupils in the planting of wildflower strips in one of the pilot sites. 10 notice boards were created, with photos and texts containing information on the project installed in the pilot areas (deliverable 54). 1 project short film (deliverable 58) with English subtitles was shot to explain the results and the main tools implemented through the voices of the partners. 1 Virtual Tour was produced as an online software application connected to a web portal, which allows the exploration of the places where the project interventions were carried out, with 360° photos and videos. For a more exhaustive description of the press release, the events organized and the communication results, please refer to the 1st and 2nd Monitoring reports on the communication activities (Del. n.64 and 65).

E2 – Networking

Involved partners: all

In order to ensure the transferring of project results at institutional and academic level, project partners presented the project in several local, national and international events and seminars. Below the most relevant events:

- 8-9/11/2018. Brussels, Kick off meeting of LIFE 17 projects (partner: US).
- 14/02/2019. Event “Politiche di sviluppo rurale e programma LIFE” organized by the Italian Rural Network in collaboration with the Ministry for the Environment, CREA and the Ministry for Agricultural Policies (partners: US and Poliedra).
- 7/03/2019. KOM Interreg Italy-Croatia project CREW in Venice (IT) (partners: CIRF-US)
- June 2019. Summer School of MED WETNET (focusing on land stewardship agreements and collaborative governance of wetlands) (partners: CIRF and US).
- May 2019. No. 3 Roadshows of the MED COASTING in Latina (partner: U-Space)
- 12/04/2019. MED COASTING meeting in Dubrovnik (HR) (partner: U-Space)
- 21/06/2019. Final conference of the LIFE Nature “Zone Umide Sipontine”.
- 1-3/10/2019. Final conference of the MED WETNET in Venice (IT) (partner: CIRF).
- 5-6/11/2019. 24th edition of ECOMONDO (partner: CIRF).
- 17/01/2020. Technical workshop at the University of Salerno (partner: CIRF).
- 19/06/2020. Networking event organized by LIFE Orchids (Partner: Poliedra)
- 9/10/2020. Webinar on naturalistic engineering for the redevelopment of waterways (partner: CIRF)
- 3/11/2020. “Opportunità di transizione ecologica in agricoltura” with LIFE Perdix (partner POLIEDRA)
- 10/11/2020. “La Governance collaborativa nel territorio pontino” ENI CBC MED Co-Evolve4BG
- 1/12/2020. Symposium with LIFE Eremita “Verso la complessità della natura”
- 2-4/3/2021 -Virtual LIFE Platform meeting - networking LIFE programme and Rete Natura2000.
- 11/3/2021 webinar “Verso una nuova governance dei servizi agro-ambientali-climatici”, organizzato da Life agriCOLture (partner Poliedra)
- 19/3/2021. LIFE Greenchange networking event with LIFE Terracescape (partner Poliedra)
- March-April 2021- on line cycle seminars (4 meetings) on river restoration - Università di Salerno (partner: CIRF)
- 6/5/2021 – River contracts meeting of the Pontine plain and river Amaseno (partner US)
- 16/9/2021 –MIEMA at the final conference of LIFE ADAPTATE (partner MIEMA)
- 30/11/2021 - workshop “Linee guida per la gestione dei corsi d’acqua nei sistemi agro – ambientali dell’ Agro Pontino” Partners: Province of Latina and CIRF
- 16/3/2022 – Meeting “Mettiamoci in riga” with the Italian Ministero della transizione ecologica
- 10/6/2023 - Workshop for the promotion of the area MAB UNESCO Circeo (partner US)
- 18/7/2023 - Final event of the NAWAMED project in Latina (partner: US)
- 20/5/2023 - GREENCHANGE at the launch event of the LIFE BEEadapt (partner US-CIRF)
- 10/5/2023 - Seminar “Towards a pact for biodiversity in the mediterranean” (partner Poliedra – US)

For a complete overview of the networking events please see also the 1st and 2nd monitoring report of the communication activities. (deliverables 64 and 65).

E3 – Promuovere un green change nei territori agricoli: replicabilità della strategia e degli strumenti di intervento del progetto

Involved partners: CIRF – POLI - PL – US - MIEMA

According to the proposal, the action included 3 sub-actions: a workshop dedicated to the management and environmental restoration of rivers (E3.1), a “summer school” on the Greenchange approach and tools (E3.2), and an international event for the drafting of the so called AgriMED Pact (E3.3). Some of these activities were influenced by the delays in conservation actions, by the postponement of the CAP, as well as by some “post-Covid factors” and had to be partly reprogrammed and reoriented in the forms and in contents.

CIRF and PL organized the E3.1 workshop in collaboration with ANBI, the national association of land reclamation authorities, together with its regional branch ANBI Lazio and the L.C. Authority operating in the Province of Latina (Consorzio di Bonifica Agro Pontino). The event took place on 30/11/2021 on a web-conference platform, participants were approximately 25 in presence and 60 online. It allowed to exchange experiences about the most effective and convenient solutions, under the economic and environmental profile, to be applied in the management of the watercourses of the Agro Pontino and in other territories of the region, some best practices from other regions were illustrated and the Greenchange guidelines (deliverable n.13) were presented. See deliverable n.62 (“*Rapporto sulle attività e gli esiti dei workshop sulla riqualificazione dei canali irrigui*”).

The E3.2 event originally described as a Summer School had to be postponed and reorganized as a 3 cycle of one-and-a-half day meetings, accessible both at distance and in person (renamed as Autumn school and titled “*Per un modello di Greenchange*”) organized by PL with the collaboration of all beneficiaries, in particular CIRF, POLI and Confagricoltura. The first event titled “*Gestione integrata del reticolo idrografico minore*” and took place on 18/11/2022; the second titled “*Metodi e applicazioni per la mappatura e la valutazione dei servizi ecosistemici*” on 25/11/2022 and the last titled “*Opportunità e criticità per una governance delle aree rurali*” on 16/12/2022. All the events included presentations from the Greenchange staff and contributions from external experts, representing 24 different entities. All the agendas scheduled visits on the pilot projects for the subsequent day but weather conditions allowed just one. The number of participants (accounting for both in presence and online) was approximately 140 to the first, 100 to the second and 80 to the last event. Presentations were published on the web site and the recording of the sessions on You-tube channel. See deliverable nr.60 “*Rapporto sulle attività e gli esiti della summer school*” for details.

The E3.3 was implemented as an online workshop titled “*AGRIMED SEMINAR: Towards a pact for Biodiversity in the Mediterranean - the way ahead*” held on 10/5/2023. This event allowed to network institutional actors, organizations and farmer networks, to design directions for enabling a Pact for Biodiversity in the Mediterranean, as well as to promote interaction with LIFE projects that have worked on the LS so to pave the path for further joint efforts and planning on Land Stewardship and Private Land Conservation. Participants were approximately 30, representing 10 initiatives/organizations. This activity was reported on the deliverable nr.61 “*AgriMED Pact and attached policy paper*”, which includes a document titled “*Enabling a Pact for biodiversity in the Mediterranean*”, shared with the participants on 10/24/2023. MIEMA participated in the 2nd meeting of the LIFE GREENCHANGE autumn school (25-26 November 2022) with a presentation on the Greenchange experience in Malta and Gozo. MIEMA attended online the 3rd meeting of the Life Greenchange autumn school (16-17 December 2022).

F1 – Management

Involved partners: all

Coordination activities under Action F1 were strictly linked with the monitoring activities (Action F2), and the partners' project managers and administrative staff collaborated to synergically manage both types of tasks. The project managers of the project have been three: Nicoletta Valle (from 25/09/2018), Fabio Zaccarelli (from 26/06/2019), and Marina Chiota (from 26/05/2023 to the end of the project). The steering committee and the technical board of the project were formed by the partners' project managers, who periodically met (both in presence and online) to assess the progress.

Throughout the project, on a regular basis, the Province of Latina (PL), in collaboration with U-Space (coordinator of Action F2), prepared the monitoring reports and the progress reports, updated the work plan and the list of deliverables and assessed the progress of expenditures, checking also the correct delivery of the supporting documents. These have been made available during the project at the Province's headquarters and will remain so for 5 years after the end of the project.

The Province of Latina (also through the U-Space monitoring team) always checked criticalities and delays, and regularly informed the other partners and the external monitors of NEEMO Timesis and ELMEN EEIG Ms Dall'Olio and Ms Spagnoletti. Communications with the project officers Silvia Donato and Joseph Van Der Stegen were always managed with punctuality, providing timely answers to the requests received. It is worth noticing that the Province of Latina had to change more than once the organization of the project team, the project manager and the heads of relevant departments. This caused some problems in the day-to-day management of project activities. Due to the political and administrative alternation within the Province of Latina, and the consequent difficulty in performing the role of Lead beneficiary, U-Space S.r.l. provided support in several activities for project-level management and coordination.

Some of the project criticalities depended on the problems encountered by the Province of Latina in the management of external assistance assignments for the implementation of specialized studies. In order to address these delays and complete the project team with expert staff already familiar with the project, it was decided to transfer some resources from PL to other partners. These transfers required a review of the partnership agreement. The staff thus provided by the other partners succeeded to implement the assigned activities in a short time, thus recovering (at least partly) the previous delays.

For further details, please see also Section 8.3 "Partnership arrangements" of this Final report. Overall, managing LIFE Greenchange was very challenging and during the 5 years of the project duration, the lead beneficiary, supported by the partners, had to face multiple critical issues. For more details, please also see Section 6.3 of this Final report.

F2 - Monitoring of the project and communication activities

Involved partners: U-Space srl

The monitoring of the project was carried out throughout the whole project duration by an internal monitoring team appointed by US, in order to evaluate the technical and administrative progress, with particular attention to the achievement of the objectives, the problems encountered, and the discrepancies with the initial forecasts, also in respect to the foreseen budget.

U-Space prepared a model monitoring report and summarized the contributions received from project partners, drafting with the collaboration of the entire consortium:

- n. 20 Monitoring Reports;

- Reports upon completion of activities: 1st (Deliverable 67), 2nd (Deliverable 69) and 3rd progress report (Deliverable 70), one Midterm report (Deliverable 68) and one Final report. These last two reports included the financial statements for the request of EU co-financing.

The delivery of quarterly reports to the project monitor was an important occasion to assess the activities progress under the technical and financial point of view. When preparing these reports, the Province of Latina, in collaboration with U-Space (coordinator of Action F2), also updated the work plan and the list of deliverables and assessed the progress of expenditure.

For the final report, the internal monitor assisted the Province of Latina to face the final financial audit with the external auditor appointed by the same Province in order to ensure a correct financial statement of the total expenditures of the project in line with the rules of the LIFE Programme and with the national laws.

The result of this activity is summarized in the Deliverable “Final monitoring report” (n. 66).

F3 – After-LIFE Plan

Involved partners: All partners

The AFTER-Life Plan is a compulsory document to be attached to the final report of each LIFE project. It is a 12 pages document, available in English and Italian. The table of content includes the main project information, an overview of the conservation actions and the swot analysis referred to the target areas after the project implementation, the list of After-LIFE actions indicates the commitments assumed by partners and the other subjects involved, it is organized per the three original project goals and per target areas.

The document was approved by the LIFE GREENCHANGE consortium during the last steering committee meeting, and it can be consulted on the LIFE GREENCHANGE web site. The After-LIFE plan is available online at the project website. Please see also deliverable 71 for the Italian and English versions.

6.1 Main deviations, problems and corrective actions implemented

The main deviations and delays suffered by the project are due to two main factors. Firstly, the COVID restrictions, which affected the smooth implementation of many actions, including the running of the governance process related to the implementation of the Pact for Biodiversity and the management of the permitting procedures related to the conservation actions. Secondly, the postponement of the entry into force of the reformed CAP from 2021 to 2023, which altered the timing of the whole governance process focused on the PAC II pillar as one of its strongest drivers, and delayed many deliverables and training activities.

To overcome most of the problems due to these two factors, PL asked CINEA for a second amendment to the Grant agreement to request a 1-year extension of the project duration. The deadline extension allowed completing the planned activities, in particular to complete some of the works (C3, C8, C9) and to finalize some deliverables under C1 and C2.

Looking more in detail to the preparatory actions, A1 encountered some problems because the geographic information available resulted to be insufficiently detailed, and required an additional effort to update the land cover datasets and complete the planned elaborations. This particularly affected the Maltese case, which required also an extension of the study area because of the relocation of Action C9 pilot areas. A3 also suffered some minor delay, because the preparation of land stewardship agreements required specialized legal advice, provided by CONFAGRICOLTURA, which was not initially planned.

Among the preparatory actions, A2 was especially critical: the permitting procedure of the Pontine plain actions revealed to be more complex than expected, especially in the case of action C3, while in the Maltese case, problems were due to the difficulty in identifying farmers to be actively involved in the project. These circumstances motivated the first request of amendment, submitted to CINEA in March 2020 and approved in June 2020, which allowed to expand C9 target areas to Gozo, so to match with the presence of farmers willing to host the demonstrative interventions, and to modify Action C3 – Sub-action C3.3 (the environmental restoration of the area formerly occupied by the hydraulic diversion of the Ufente River).

As regards governance actions, C1 and C2 suffered the major problems, especially in the Italian case. These were mainly due to difficulties in building a stable and profitable dialogue with the different regional departments involved, which were exacerbated by COVID restrictions to meetings. To overcome the limited involvement of the Region in the Pact for Biodiversity, the activities moved to a bottom-up approach and tried to activate synergies with other ongoing collaborative governance initiatives, in particular with the so-called “River contracts”. This contributed to present the Pact to local stakeholders but did not compensate the missed opportunity to provide a contribution to the drafting of the Regional rural development complement, which, once published, revealed to be quite poor in terms of resources for the enhancement of green infrastructure.

As mentioned before, the late issue of the CAP regulation, the CAP National Strategy (12/2022) and the Regional rural development complement (1/2023), delayed the preparation of the guidance tools planned as C1 and C2 deliverables, as well as the organization of training activities which should have focused on the new funding opportunities. In any case, all the planned activities have been completed thanks to the extension of the project duration.

Although the limited opportunities for green infrastructure offered by the rural development measures activated by the Region is jeopardizing the replication of land stewardship agreements, this kind of contracts are being promoted in the Pontine plain through other initiatives - such as the LIFE project Bee Adapt - under different funding schemes, in particular with the Pollinator eco-scheme 5.

In the Maltese case, the Pact for Biodiversity was implemented with some delay with respect to the plans, but all the major actors could be effectively involved.

Concerning demonstration projects, those implemented in the Pontine plain (C3, C4, C5, C6, C7, C8) were delayed as a consequence of the late conclusion of the permitting procedures. Nevertheless, the project 1-year extension allowed completing all the planned activities, although with some changes from the original plans or from the expectations, in particular as regards actions C3, C5 and C6.

C3 was modified with the first project amendment: sub-action C3.1 was relocated to the area of the Pani Lake (Ufente Sources), C3.2 was cancelled and the related resources moved to C3.3, which could thus incorporate some visitor facilities such as paths and birdwatching huts and resulted in a very relevant ecosystem restoration initiative. C8, firstly delayed because of the late approval of the project by the regional department responsible for the public property, then to wait the proper season for the works, had to be modified to move the limited resources available to urgent safety measures of windbreaks “hard pruning” and cutting, preliminary to any other planting and necessary to allow the involvement of farms in the subsequent management of the windbreaks.

Actions C5 and C6, despite the emergency irrigation, suffered the prolonged drought in summer 2022, which damaged the hygrophilous vegetation and, especially in C6, compromised the effectiveness of the attempt to replace the alien species (in particular *Arundo donax*) along the watercourses with autochthonous riparian species. Action C5 was integrated, using tender savings, to realize a fence around the project area, necessary to avoid the access of hunters to the new wetland and protect the recently arrived birdlife.

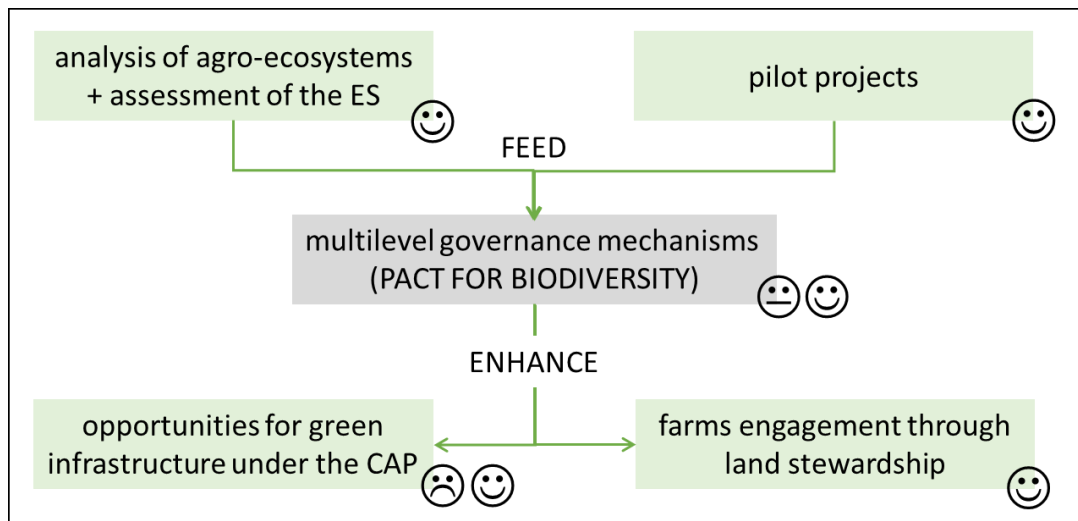
Concerning the Maltese Action, C9, which had been relocated from Chadwick lakes area to Northern Malta and Gozo with the first project amendment, changes respect to the plans concerned the increase in the total amount of rubble walls restored (approximately from 1 to 3,5 km) and the decrease in the wildflower strips planted (approximately from 10 to 5,5 km).

As regards monitoring actions D1 and D2, the modification of the monitoring provisions set by the LIFE programme and the introduction of the KPI webtool, aroused some problems because of the mismatch of indicators with those planned at the proposal stage, but consequences were limited to the late upload of KPIs. D1 was affected also by the late conclusion of some of the works, which constrained the timing of the ex-post surveys and indirectly altered the possibility to appreciate the actual results of some conservation actions. After-LIFE monitoring will allow to verify the results presented. D2 suffered from the unavailability of detailed data about the access to RDP measures, which the organization in charge of their management (AGEA) does not either publish or share with the sufficient geographic detail, not even upon direct request. Provided the difficulties in promoting the Pact for Biodiversity as a permanent working table, the sharing of the monitoring programme could no more be considered as a milestone.

As regards communication actions E1, E2 and E3, most of activities were strongly affected by the COVID emergency, which prevented many dissemination and networking events in 2020 and 2021, but influenced "communication habits" even once restrictions ceased. To overcome this problem, additional effort was dedicated to strengthen communication via social media and to reorganize the planned events to ensure remote access. In particular, replicability activities had to be rescheduled and redesigned in different format to encourage participation.

6.2 Evaluation of Project Implementation

The methodology set by the project meant to benefit from the analysis of agro-ecosystems, the assessment of the related Ecosystem Services (ES) and the implementation of pilot green infrastructure to trigger multilevel governance mechanisms aimed at improving the use of CAP resources for agro-climate-environmental measures and at fostering a land stewardship approach.



The analysis of agro-ecosystem and ES was implemented successfully (besides some difficulties, which highlighted the importance of having access to detailed and updated geographic information), and the analysis methods have been already replicated to other contexts. Nevertheless, the project experience demonstrated that the “ecosystem services” concept is still difficult to communicate and very hard to operationalize, as it still needs to be tested in terms of PES (Payments for ES).

The pilot green infrastructure, apart from some critical issues due to very complex permitting procedures, provided encouraging results in terms of environmental impacts, and proved to be cost-effective if well designed. Although the farms involved in pilot projects can be considered as virtuous exceptions rather than fully representative of the local agricultural practices, many other farmers expressed interest towards land stewardship and the agreements prefigured by Greenchange, and declared their availability to take charge of the maintenance of some green infrastructure at the proper conditions. How to reward such engagement is worth to be further explored, in order to find alternative ways, even beyond the rural development measures.

The two components of the projects succeeded in providing an actual contribution to the governance process in the Maltese case: the Pact was subscribed by all the main institutional actors and rubble walls restoration accompanied by wildflower strips planting is being replicated within other national initiatives and supported by rural development funding 2023-27. In the Italian case, though, they resulted less effective for different reasons: a larger number of actors, high competition on resources, weak engagement of the Region on the topic and, above all, because funding opportunities from the reformed CAP, especially as disclosed by the regional rural development measures, do not support significant investments on green infrastructure.

The following table summarizes action by action the results achieved against the objectives and expected results foreseen in the proposal, highlighting major variations.

Actions	Objectives/Foreseen results	Achieved results	Evaluation
A1 - Mapping and assessment of ecosystem services	Downscaling of the MAES process, mapping of agro-ecosystem in the two target areas and assessment of 5 ES	A methodological report was issued accompanied by maps and graphics, all relevant data were collected	Fully implemented, deliverables completed
A2 - Design and permitting of demonstration actions – tendering procedures	Detailed design of pilot projects and acquisition of all the necessary permits	The design and the authorization procedures were finalized for all the demonstrative actions	Fully implemented with some delay, deliverables completed and milestone achieved
A3 - Land Stewardship Agreements	Defining the land stewardship agreements with the farms and public bodies hosting the pilot projects	5 LSA with farms were signed in the Pontine plain and 3 in Malta/Gozo	Fully implemented, deliverables completed and milestone achieved
C1 - The Biodiversity Pact: increasing the functionality and ecological connectivity of rural areas	Activation of a permanent working table, drafting of 6 guidance documents	The 2 Pacts for biodiversity were signed, the Italian one by 8 entities, the Maltese one by 10 entities	Implemented with some drawbacks, deliverables completed, 2 out of 3 milestones achieved
C2 - Orienting and training farmers to enhance ES in rural areas	Implementation of 5 orientation and training tools	Report about impact of agricultural practices, Guidelines for investments, Web-GIS app + user manual (https://greenchange.terraria.com/html/public/info.jsf), info desk run by CONF, educational activities (6 topics x 3 classes, 46 high school students), training sessions with farmers about the CAP 23-27 (60 participants)	Implemented with some differences, deliverable completed, milestones achieved
C3 - Environmental Restoration of the wet ecosystem along the Ufente river	Implementation of 2 subactions	Restoration ecology works on a 40 ha area: including creation of a new permanent/temporary wetland, planting of trees and shrubs typical of the lowland mesophilic forest (habitat 91F0), realization of visitor facilities (path and birdwatching hut), installation of a perimeter	Successfully implemented (according to the amendment) with additional improving works, deliverables completed

Actions	Objectives/Foreseen results	Achieved results	Evaluation
		fence to limit grazing, restoration of the hygrophilous and hydrophilous habitats at the Ufente Sources (Pani lake)	
C4 - Improvement of ecological functionality and increase of biodiversity in the “Giardino di Ninfa” Natural Monument – Pantanello area	Implementation of 3 sub-actions, including several works	Planting of linear and areal tree-shrub formations (approx 6.500 m2), realization of a small wetland (approx 1.500 m2) + shelters for amphibians and reptiles, installation of 5 floating basking islets and 110 bat boxes	Successfully implemented, deliverables completed
C5 - Construction of green infrastructures in the Caetani Foundation farm	Implementation of 4 sub-actions	Remodelling and widening the left hydraulic bank of the Epitaffio canal + 5 mt wide riparian strip of trees and shrubs; restoration of the smaller drainage canals + planting of herbaceous/shrub species, transformation of a former abandoned poplar grove into a wetland (approx. 3 ha) surrounded by a 1 km fence to prevent hunters' access, planting of a tree strip 8 mt wide and 400 mt long, installation of 27 bat boxes	Successfully implemented, with additional improving works, deliverables completed
C6 - Restoration of the Cicerchia and Allacciante channels	Implementation of 3 sub-actions	Removal of invasive alien species along the Cicerchia canal and along the banks of an artificial basin + creation of a 10-mt-wide herbaceous–shrubby–arboreal strip (partially failed due to drought despite 3 emergency irrigations during summer 2022 and replaced with own resources with a new pilot habitat for pollinators),	Implemented but less effective as for the replacement of alien species due to extreme weather conditions, partially replaced with own resources, deliverables completed.

Actions	Objectives/Foreseen results	Achieved results	Evaluation
		reshaping of the right bank of the Allacciante canal with bio-engineering techniques.	
C7 - Environmental requalification in livestock farms	Implementation of a single sub-action	Environmental restoration of the minor drainage network (tot.2km) within a livestock farm with planting of herbaceous vegetation with phytoremediation properties (approx. 5000 plants)	Fully implemented, deliverable completed
C8 - Renewal and management of linear ecological connections: windbreaks	Vegetational restoration of 8 km of windbreak strips	Detailed design for the restoration of 8 km of windbreaks in collaboration with 8 neighbouring farms, implementation of safety measure along 3 km of very damaged windbreaks, including pruning on 266 trees and cutting works on 167.	Implemented with some difference, works focused on safety measures, planting to be completed with own resources, deliverables completed
C9 - Linear ecological connections, rubble walls and wildflower strips in the rural areas in Malta and Gozo	Restoration of 1.5km of rubble walls and planting of 10km of wildflower strips in the target areas of Ghadira and Chadwick Lakes	Restoration of 3.5km of rubble walls and planting of 5.5km of wildflower strips in Mellieha (Northern Malta) and in Gozo	Implemented according to the amendment, with some difference in quantitative results, deliverable completed assembling the 3 reports initially foreseen in a single report.
D1 – Analysis and monitoring of the effectiveness of the interventions and of their impacts on ecosystems	Measuring the changes in the quality of ecosystems caused by the project actions	Specific field surveys were carried out in the project areas before and after the implementation of the interventions. The two planned reports (ex-ante and ex-post) were delivered	Fully implemented, deliverable completed, milestone achieved.
D2 – Monitoring of the socioeconomic and territorial effects and of the project performance	Evaluating the effects produced on the agricultural system in terms of transformation of agricultural practices and	Monitoring plan and monitoring reports were carried out, KPIs uploaded on the platform	Fully implemented, deliverables completed, milestones not achieved due to the

Actions	Objectives/Foreseen results	Achieved results	Evaluation
	ability to influence the behaviour of farmers		failed activation of a permanent working table
E1 - Communication plan	Implementation of the dissemination pack, according to the dissemination plan.	Communication products included: web site, newsletters, social media profile (on IG, FB, YouTube); brochure, roll up and posters, notice boards and layman's report; short video and virtual tour; two Greenchange conferences (launch and final) and activities with schools	Successfully implemented with some differences and additional efforts on social media, deliverables completed, milestone achieved.
E2 - Networking	Exchanging good practices with other EU initiatives on the project topics, at least 5 projects	Project was presented on several occasions within events organized by other EU funded projects as well as national initiatives	Implemented with some differences in timing and tools, mainly due to COVID restrictions and post-COVID consequences (most costs for travel were reallocated as the prevalent mode has been the remote participation), the initiatives to network with varied significantly from those indicated in the proposal, but the total number resulted higher than the expected.
E3 – Promoting a “green change” in rural areas: replicability of project strategies and intervention tools	Implementation of 3 sub-actions: an event dedicated to sustainable river management, a 5-days summer school open to 50 participants, an international event for the replicability of the Greenchange model at EU level	Event in collaboration with the national association of drainage authorities (30/11/2021, approx. 85 participants); Cycle of 3 seminars titled "Per un modello di Greenchange" (on 18/11, 25/11 and 16/12/2022, to replace the summer school, av.> 100 participants each); online workshop titled	Implemented with some differences in timing and tools, deliverable completed, milestone achieved as informal approval

Actions	Objectives/Foreseen results	Achieved results	Evaluation
		“AGRIMED SEMINAR: Towards a pact for Biodiversity in the Mediterranean - the way ahead” (10/5/2023, 25 participants)	
F1 - Management	Coordination and proper implementation of planned activities	Reports upon completion of activities: 1st, 2nd and 3rd progress report, one Midterm report and one Final report. These last two reports included the financial statements for the request of EU co-financing.	Fully implemented, deliverable completed
F2 - Monitoring of the project and communication activities	Ensuring the monitoring of project progresses and the proper communication among beneficiaries and outwards	20 periodical monitoring reports, 2 monitoring reports on communication activities, 1 monitoring report on the results of the action.	Fully implemented, deliverables completed
F3 – After LIFE Plan	Defining commitments for the After-LIFE phase	Double language After-LIFE plan delivered in EN and IT	Fully implemented, deliverable completed

Concerning the visibility of results, and especially the project results quantified in the KPIs table, it is important to mention that the difference between the mid-term estimated values and the final ones is due to the short time between the completion of the interventions and the field surveys, which did not favour the colonization of the new biotopes by many fauna species (in particular those with poor movement capacity such as *Emys orbicularis*) and did not allow the new ecosystems to fully develop and provide optimal trophic and reproductive conditions. For example, for *Nyctalus noctula*, closely linked to wooded environments, the benefits will probably be seen in 5 years, when the planted trees reach adequate dimensions. Many literature studies say that many species require longer time to adapt to significant environmental changes and therefore we believe that in the coming years the populations of these species will show a good increase, following the trend already recorded in these first months.

Concerning project amendments, the project got two. The first one (June 2020) concerned the relocation of target areas for the conservation actions C3 and C9, without the amendment the two actions could not have been implemented. The second amendment (June 2022) concerned an extension of the project deadline and was essential to finalize the works for actions C3, C8, C9, to perform the environmental monitoring campaigns, and to finalize the C1 and C2 deliverables having links with the CAP national strategy and with the Regional Rural development measures, which were issued between December 2022 and January 2023.

Concerning replication efforts, besides the activities performed under Action E3, the cooperation with the ongoing collaborative governance initiatives, in particular with the so-called “River contracts”, contributed to raise awareness of local policy makers about the

Greenchange leading concepts, such as green infrastructure, land stewardship, ecosystem services, and to prepare the ground for similar initiatives.

In the Province of Latina, several initiatives developed under the River Contracts and inspired by Greenchange pilot projects are being implemented with funds from two different calls for proposals dedicated to climate adaptation and urban forestry, launched by the Italian Ministry of Environment in 2020 and 2021. In particular, it is worth mentioning: the environmental restoration interventions along the Cavata River in the Municipality of Sermoneta (covering an area of approx. 1.5 ha), along the Amaseno river in the Municipality of Priverno (3,5 ha), and the intervention in Sezze involving the area of Mole Muti, neighbouring the site of Greenchange Action C3.1 Pani Lake (1.5 ha).

Moreover, following the exchange activities within Action E2, some Greenchange beneficiaries were involved in the replication of the method for Ecosystem mapping and ecosystem services assessment tested under Action A1 within the projects Life BIOSources, Life+A_GreeNet, and Life BEEadapt. The last in particular, includes many activities directly inspired by the Greenchange experience and involves 2 members of the Greenchange consortium. It started in 2022 and is aimed to sign at least 37 land stewardship agreements and to realize approximately 60 ha of green infrastructure in 4 different target areas.

Concerning policy impacts, project ambitions were high, regarding the possibility to collaborate with the regional authority to trigger an innovative governance mechanism suitable to converge the interests of farmers, local and regional administrations. Nonetheless, outcomes were quite different in Italy and in Malta.

In the Italian case, the Rural Development Complement was published in January 2023, without a well-structured prior consultation with stakeholders, and despite the subscription of the Pact for Biodiversity, Greenchange did not succeed in contributing to steer its contents towards the project approach and goals. The Province committed to strive in the after-LIFE to achieve at least a formal agreement with the regional department responsible for public property, so to allow the entrustment of windbreaks to neighbouring farmers in return of their sustainable management/maintenance. Such agreement would favour the dissemination of land stewardship agreements, starting with those arranged but not finalized under Action C8.

In the Maltese case, the focus on rubble walls restoration and wildflower strips matched better with the opportunities offered by the CAP national strategy and in particular with the “pollinator ecoscheme” nr. 5. This allowed MIEMA to cooperate with the Ministry for Gozo, the EcoGozo department, the Gozo Regional Council and most Gozitan Municipalities, offering interesting best practices with the result of strengthening the opportunities for the replication of demonstrative projects and land stewardship agreements.

Concerning the EU added Value, the project was designed to contribute to the EU biodiversity strategy 2020 and its results are fully consistent also with its update to 2030. Major pilot projects, and in particular C3, represent very relevant experiences in the field of restoration ecology and could be considered best practices of implementation of the recently approved Restoration Law.

6.3 Analysis of benefits

Greenchange has implemented environmental improvement interventions aimed at increasing the ecological quality of the Agro Pontino, of Northern Malta and of Gozo, increasing the availability of sites of naturalistic value in the rural matrix to help mitigate the effects of the fragmentation due to infrastructure, urban sprawl and intensive agriculture.

Wetlands and temporary flooded areas were created, restoring strips of hygrophilous vegetation and habitats of conservation interest such as temporary Mediterranean ponds (habitat 3170*) and mixed riparian forests (habitat 91F0), in order to recreate ecological systems once widespread and then disappeared due to land reclamation and intensive agriculture.

In the Pontine plain, the new sites contribute to improving the territorial connectivity, favoring functional exchanges between the large natural areas along the littoral - the Circeo promontory and the coastal lakes – and the Lepini Mountains in the hinterland. Many fauna species have quickly demonstrated their appreciation of the environmental improvements generated by the interventions. In the area of the Ufente river diversion (Action C3), the project has created a highly heterogeneous system to be used for reproduction, resting, refuge and feeding. More than 90 species of birds have been observed - compared to the 57 contacted before the intervention - some of which are of community interest or in an unfavourable state of conservation at a national level, such as the African stonechat *Saxicola torquatus*, the Woodchat shrike *Lanius senator* and the Moustached warbler *Acrocephalus melanopogon*. The area is regularly frequented by eight species of Ardeidae, including the Purple heron *Ardea purpurea* and the Little bittern *Ixobrychus minutus*.

The environmental improvements have also had a very positive effect on bats, for which both the number of species and the abundance indices have more than doubled.

Within the Caetani farm (Action C5), the rehabilitation of the Epitaffio canal and the creation of a new wetland have greatly enriched the environmental heterogeneity and ecological value. This rural area is now frequented by 12 species of Odonata and 47 species of birds, including species of aquatic environments such as the Kingfisher *Alcedo atthis*, and birds of prey such as the Eurasian hobby *Falco subbuteo* and the Peregrine falcon *Falco peregrinus*.

In the Pantanello Park (Action C4), the implemented interventions aimed at increasing the environmental suitability for the European pond turtle *Emys orbicularis*. The ex-post monitoring confirmed the importance of this site for the conservation of one of the most threatened species of our fauna. New wooded areas have significantly increased the suitability for bats, as demonstrated by the observation of no less than 11 species.

In general terms, the increase in environmental heterogeneity and the availability of trophic and reproductive resources determined by the implementation of pilot projects have undoubtedly led to a strong overall increase in biodiversity, as demonstrated by the various indices applied to measure the different monitored components (see the Action D1 Report).

Looking at the different fauna groups monitored:

Odonata species richness and the number of reproductive species has increased. Similarly, the value of the ORI (Odonate River Index) and OHI (Odonate Habitat Index), used as a measure of the ecological conditions of watercourses, has increased. It is important to note that within the project, the ORI index was applied for the first time in central Italy and on a complex of sites also made up of drainage canals, highlighting the possibility of exporting this methodology also to other geographical areas and not only in a strictly fluvial context, but also including artificial elements.

Positive long-term effects can be also figured out for the **Herpetofauna**, due to the creation of new wetlands, the diffusion of methods with low environmental impact in agricultural areas (as foreseen in the Biodiversity Pacts) and the application of biodiversity-friendly methods of maintenance of the riparian vegetation.

The interventions carried out have already resulted in a slight increase in the number of individuals of the target species *Emys orbicularis* (from 6 to 10 adults) and an increase in specific diversity, in particular in the C5 and C3 areas, where species of conservation interest such as *Elaphe quatuorlineata*, not reported for some time, have also been observed in that sector of Agro Pontino. Greater benefits for Amphibians and Reptiles will be seen in a few

years, as these are species with limited movement capacity, which require longer times to colonize new habitats.

Concerning **Birds**, the interventions carried out have significantly expanded the areas suitable for target species *Vanellus vanellus*, and indeed some individuals have begun to frequent the new wetlands (from 0 to 3 individuals). This number, lower than initially expected, is probably due to the short time elapsed between the end of the works and the ex-post monitoring. As known in the literature, for some species there is a temporal shift before they are attracted to new ecosystems.

More generally, however, we have evidence of how the interventions have achieved the initial objectives, increasing environmental heterogeneity and connectivity between the hinterland and the coastal lakes. The before-after comparison highlighted, despite differences between the sites, how the interventions carried out increased some quantitative parameters (such as number of individuals; number of species; diversity; evenness) and qualitative parameters, as demonstrated by the strong increase in species of conservation interest, protected by the Birds Directive. The most notable improvements concerned birds linked to aquatic environments, such as Ardeidae and Anatidae.

The interventions carried out have improved the suitability of the territory for all **Bats**, in line with what was expected. In particular, the new wetlands have increased the extension of foraging areas and the availability of prey. The improvements are demonstrated by the increase in both abundance indices and the number of species. Among the new species that now frequent the project areas there are some of significant conservation interest such as *Myotis capaccinii* and *Rhinolophus ferrumequinum*. The positive effects are less significant on the target species *Nyctalus noctula* (from 1 to 5 individuals), due to the delays with which the reforestation interventions were carried out. For this species, more closely linked to wooded environments, the effectiveness of the interventions could be detectable after a longer time, necessary for the planted trees to reach the appropriate size.

Concerning the demonstrative value of Greenchange actions, the methodology developed with Action A1 of "downscaling" the MAES process to better analyse agro-ecosystems, proved to be effective and relatively easy to operationalize. Since agro-ecosystems were distinguished based on land cover and on the chemical, hydric and mechanical input typically required by the related crop type, their classification resulted to be useful to convey guidelines for reducing the impacts of agricultural practices (deliv.16 and deliv.18). The Greenchange methodology has already been replicated within other initiatives (Life BIOSources, Life+A_GreeNet, Life BEEadapt).

Moreover, within the two Pacts for Biodiversity several guidelines were developed, to support the dissemination of good practices and the sustainable management of green infrastructure. These documents (2 targeted to the Pontine plain and 2 to Malta and Gozo) were used to design the pilot projects and intended as attachments to future Land stewardship agreements.

In particular, the Guidelines for the ecological management of windbreaks strips (deliv.11), drafted to support conservation actions, will be proposed to the regional sector in charge, so to replace the guidance document currently in use, which is considered outdated by most local forestry experts.

The Guidelines for the environmental management of the irrigation canal network (deliv.13), after being discussed during a dedicated event organized with the National Association of Drainage Authorities in 2021, were particularly welcomed during the first of the Autumn school meetings, and requested to be replicated in other two Italian case studies.

The Technical document for rubble walls restoration and the Guidelines for the ecologic management of the rubble walls and tree belts (deliv.15), were drafted to support the design and the maintenance of C9 works. MIEMA will use them in the next years while providing

technical support to the design of future interventions and assisting proponents in the permitting procedures.

Finally, elements of demonstrative value also rely on the land stewardship model developed for the implementation of Action C8. The model proposed is based on the possibility for farmers to fulfil the greening requirements or environmental conditionalities or to implement eco-schemes on state-owned green infrastructure (such as inter-plot windbreaks), having prior subscribed a loan-for-use contract with the Public property office (the Region in the Italian case) and committed to the sustainable management of the asset in compliance with a set of rules. This model was very favourably received by the farmers and also the Regional Authority was receptive, as it contributes to relieve maintenance costs. Even if no formal agreement has been achieved yet, it is worth to keep on working on this model in the after-LIFE to pave the ground for the spreading of land stewardship agreements.

7 Key Project-level Indicators

The correspondence between the ecological KPI values (habitats and species) achieved at the end of the project and those expected is good although not optimal.

For **habitat 3170** the value measured at the end of the project is higher than expected. This habitat was found in the surroundings of the new wetlands created by the project and in particular in the temporary ponds created in area C3. In the new structure generated by the restoration interventions - including the elimination of the disturbance - triggers favorable conditions for a further expansion of the habitat 3170.

For **habitat 6420** the value measured at the end of the project is the same as expected. The interventions carried out and the elimination of some disturbing factors - overgrazing and recurring fires - have determined the conditions for the expected increase in the habitat, although its consolidation is not yet optimal due to the delay in completing the conservation actions. We expect the expansion of this habitat to continue in the coming months, when a better balance of ecological dynamics will be established throughout the area.

For **habitat 91F0** the value measured at the end of the project is lower than expected. The habitat restoration interventions were carried out on all 5 ha planned, distributed across 3 different sites. Currently it occupies a total area of approximately 2 ha. The difficult environmental conditions that occurred in the year in which the interventions were carried out - in particular the severe drought - caused the deterioration of many specimens and slowed down the consolidation of this habitat, which is characterized by a very complex development. The new interventions planned in the after LIFE and the adjustment of ecological dynamics will allow the indicated objective to be achieved 5 years after the end of the project.

For **habitat 5330** the value measured at the end of the project is lower than expected. Within 5 years an area of 0.5 hectares of habitat 5330 will be created within a semi-natural area owned by the Ministry of Gozo. At the moment a better result is not imaginable due to disagreements with farmers, which do not want some species typical of the habitat in Malta on their land as they consider them harmful to crops. Nonetheless, it must be considered that 5.5 km of hedges with nectariferous species have been created, which have brought significant and measured benefits for the pollinator populations.

All the **species indicated as KPI indicators** (*Vanellus vanellus*, *Emys orbicularis*, *Nyctalus noctula*) recorded an increase in the number of individuals, although lower than expected. The main reason for this difference is due to the short time period between the end of the interventions and the field surveys, which did not favor the colonization of the new biotopes by many fauna species (in particular those with poor movement capacity such as *Emys orbicularis*) and did not allow the full development of new ecosystems to provide optimal

trophic and reproductive conditions. For example, for *Nyctalus noctula*, closely linked to wooded environments, the benefits will probably be seen in 5 years, when the planted tree specimens reach adequate dimensions.

Many literature studies say that many species require longer times to adapt to significant environmental changes and therefore we believe that in the coming years the populations of these three species will show a good increase, following the trend already shown in these first months. For all species, however, the increase in the suitability area was as expected.

Similarly, the result of the *Oxalis pes caprae* eradication actions in Malta is in line with what was expected.

Further explanations are contained in the specific D1 KPI report.

Code	I level description	II level description	Base value	Estimated final value	Measured final value	Estimated value in 5 years	unit
7.3	Annex I Habitats Directive	6420	1	2	2	4	ha
7.3	Annex I Habitats Directive	91F0	0	5	2	5	ha
7.3	Annex I Habitats Directive	3170	0	0,5	0,8	1,5	ha
7.3	Annex I Habitats Directive	5330	0	1	0	0,5	ha
7.4	Annex II Birds Directive	<i>Vanellus vanellus</i> /Birds	0	20	3	20	i - number of individuals
7.4	Annex II Birds Directive	<i>Vanellus vanellus</i> /Birds	0	1	4	4	ha
7.4	Annex IV Habitats Directive species	<i>Emys orbicularis</i> /Reptiles	6	12	10	20	number of adults
7.4	Annex IV Habitats Directive species	<i>Emys orbicularis</i> /Reptiles	3	5	6	6	ha
7.4	Annex IV Habitats Directive species	<i>Nyctalus noctula</i> /Mammals	1	15	5	15	number of individuals
7.4	Annex IV Habitats Directive species	<i>Nyctalus noctula</i> /Mammals	100	150	150	150	ha
7.5.1	<i>Oxalis pes-caprae</i>		2	1	1	0	population/ Ha

Code	I level description	II level description	Base value	Estimated final value	Measured final value	Estimated value in 5 years	unit
7.5.1	Oxalis pes-caprae		3	2	2	1	individuals / m2

Coming to socio-economic effects and related KPIs, one of the more relevant domain for LIFE GREENCHANGE deals with farmers' attitudes. KPIs show a strengthening of the commitment towards organic practices and agro-environmental interventions, particularly relating to farmers already sensitive to the environmental challenges, who are ready to strengthen their engagement in land stewardship practices, even if this still remains a minority trend compared to whole farming sector in the Agro Pontino. The structure of the new CAP and the new RDP, combined with the pandemic and post-pandemic crisis, as well as the ongoing war between Ukraine and Russia with the consequent impacts on the agricultural and agri-food system, have slowed down the tendency towards the spread of greening from which the LIFE GREENCHANGE project got underway. Training, exchange and dissemination activities show a growing interest in these topics. At the same time, the activities of the information desk aimed at farmers reveal a growing willingness, especially from young farmers and women farmers, to switch to organic and conservative practices. Interest in forms of conservative agriculture is also growing to counteract the increasing problems that are occurring in recent years due to climate change.

The analysis of the complementary indicators, populated through questionnaires administered to farmers, must adequately take into account the expansion of the sample between 2021 and 2023, going from 5 companies engaged in the Greenchange demonstration actions in 2021 to 15 in 2023, including part of those who have in the meantime benefited from the exchange, training and orientation activities offered by the project. Even considering these variations in the sample, there is an interesting variation both in the areas subjected to crop rotation and non-productivity, as well as in the companies committed to expanding towards multifunctionality, both oriented towards agritourism and the transformation of products.

Given this context, the KPI indicators indicate a growing interest among farmers in organic farming practices with low environmental impact. The number of farms who accessed to the project information desk increased from 35 to 55 in two years. At the same time, the increasing involvement of farmers and students in the training activities sets the space for opening a transformative phase which will hopefully have its effects on the conversion to organic and on the ability to intercept financing for measures connecting rural development, conversion of rural practices and strengthening of ecosystem services and ecological networks in the coming years.

Exchange and dissemination activities were also central to the LIFE GREENCHANGE project and aimed to impact. Following in-depth research into projects that delved into complementary aspects of land stewardship linked to the protection of water, soil and biodiversity as a priority), several opportunities for relationships were created at a national and international level. In particular, the networking activity concerned the organization of tables and webinars, which involved the following projects, actors and networks: LIFE Perdix, Life Eremita, Life Terracescape, Life Agriculture, Life Orchids, Life Bee Adapt, Life Olivares vivos, Life Agriculture, Ncp LIFE point, ENI CBC MED NAWAMED, Landcare Europe, Xarxa Central Emilia, ANBI Lazio and ANBI Nazionale, Tuscany Coast Reclamation Consortium, Iridra srl, Crea RRN, Maes, Tuscan-Emilian Apennines National Park, Medsea Foundation, Alta Murgia

National Park, Art-Er Emilia Romagna, National Rural Network, CINEA EU, ANGA, ETIFOR, the University of Camerino, Cariplo Foundation, the University of Molise. Among these, 5 in-depth exchanges were conducted with the LIFE projects Perdix, Eremita, Terracescape, Agriculture, Orchids. The professional training activities involved a growing number of students from agricultural institutes and farmers. As anticipated in the previous sections, the interest shown by current and future farmers in the project themes and the need to promote sustainable agricultural practices is one of the factors with the greatest impact which it is hoped will lead to a partial change in the attitude of Pontine farmers, typically oriented towards forms of intensive agriculture with high use of resources, as well as accompanying Maltese farmers in their commitment to maintaining and protecting Gozo's agricultural and naturalistic heritage. From this point of view, the commitment made by the Ministry for Gozo, MIEMA, and the Gozitan local authorities to continue training activities for farmers aimed at making the most of the possibilities offered by the new rural development program will be central. In relation to the replicability of the interventions, as part of the LIFE BEEadapt project, green infrastructure interventions are being modulated based on the LIFE GREENCHANGE approach. In particular, 60 hectares of new green infrastructure are planned between Agro Pontino, the Tuscan-Emilian Apennines Park, the protected areas of RomaNatura and the Torricchio Reserve. In the same areas, by the end of the project the signing of a further 37 custody agreements are expected, which are added to the 5 that will be signed in the Agro Pontino by the end of 2023. In the Agro Pontino, some Municipalities are creating new green infrastructure interventions that derive from the governance activity resulting from Rewetland, existing river contracts and Greenchange, taking up the design approach formulated in the latter. Starting from the results and experience of Greenchange, some partners have provided consultancy to some Municipalities of the Metropolitan City of Rome Capital to plan, design and implement some green infrastructure interventions. Further and detailed information can be found both in the D2 final monitoring report (n. 49) and in the D2 KPI final report (n.51).

8 Estimation of person-days used per action

The table below illustrates the person-days spent per each action of the project since its inception.

Concerning the Preparatory actions (group A), the amount of the person-days spent is around 15% of the budgeted person days, almost perfectly in line with the budgeted person-days.

The activities of the group C – Concrete Conservation actions – resulted in an expenditure in terms of man-days equal to around 2.290 person-days (28,1% of the total estimated person days spent) with a small increase respect to what planned in the proposal budget.

The group E which includes all the activities of communication and dissemination exploited the 19,7 % of the budgeted person-days.

Relevant was the share of the person-days spent for the management activities equal to 27,5% of the total budgeted amount but quite in line with the forecasts.

Action type	Budgeted person-days	% Person-days spent	Estimated of person-days spent	Estimated % of person-days spent
Action A: Preparatory actions	1.028	14,3	1.226,87	15,0
Action C – Concrete conservation actions	2.220	30,8	2.290,74	28,1
Action D: Monitoring and impact assessment	788	10,9	792,05	9,7
Action E: Communication and Dissemination of results	1.293	17,9	1.605,08	19,7
Action F: Project management (and progress)	1.875	26	2.247,43	27,5
TOTAL	7.204	100	8.162,15	100