LIFE Project Number

LIFE19 GIE/IT/000311

Final Report

Covering the project activities from 01/10/2020 to 31/05/2025

(abbreviated version)

Reporting Date

31/07/2025

LIFE PROJECT Acronym

FOLIAGE

Data Project

Project location:	Italy, Lazio and Umbria regions
Project start date:	01/10/2020
Project end date:	07/05/2024 Extension date: 31/05/2025
Total budget:	€ 1,246,805 (total eligible costs: € 1,224,205)
EU contribution:	€ 659,271
(%) of eligible costs:	53.85% (52.88% of total budget)

Data Beneficiary

Name Beneficiary:	Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria (CREA)
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1. Table of Contents

Index of Tables

Index of Figures

2. List of key-words and abbreviations

AB:	Associated Beneficiary
CB:	Coordinating Beneficiary (CREA)
CREA-PB:	Consiglio per la Ricerca in Agricoltura e l'analisi dell'economia agraria – Centro di Ricerca Politica e Bioeconomia
CREA-RaF:	Consiglio per la Ricerca in Agricoltura e l'analisi dell'economia agraria - Rapporto sullo stato delle foreste e del settore forestale in Italia
ISPRA:	Istituto Superiore per la Protezione e la Ricerca Ambientale
ISTAT:	Istituto Nazionale di Statistica
Masaf:	Ministero dell'agricoltura, della sovranità alimentare e delle foreste
MATTM:	Ministero dell'Ambiente e della Tutela del Territorio e del Mare
Mipaaf:	Ministero per le politiche agricole e forestali
PM:	Project manager
SC:	Steering Committee
SIB:	Stakeholder Involvement Board
SINFor:	National Forest Information System, developed by MASAF and CREA-PB
SISEF:	Società Italiana di Selvicoltura ed Ecologia Forestale

3. Executive Summary

The LIFE FOLIAGE project (LIFE19 GIE/IT/000311) addressed a critical structural gap in the governance and monitoring of forest ecosystems in Italy, with a focus on Natura 2000 sites in the regions of Umbria and Lazio. At the start of the project, the vast majority of Italian Public Administrations lacked digital systems to track forest operations, monitor environmental conditions, or produce structured data for national and EU-level reporting. This severely limited Italy's compliance with the Birds and Habitats Directives, the EU Forest Strategy, and other environmental regulations.

LIFE FOLIAGE developed and implemented an integrated **forest-environmental governance system**, composed of four interoperable digital modules:

- **FMP/PAF** – Forest Management Platform (authorisations, declarations, and forest data);
- **EOP/PMF** – Environmental Operations Platform (monitoring of biodiversity and impacts);
- **PSG** – Governance Support Platform (reporting to national and EU stakeholders);
- **IEP/PRIF** – Public Information Interface (information and outreach).

In cooperation with national institutions (MASAF, CREA-PB, ISPRA, ISTAT) and enforcement authorities (CUFAA – Carabinieri Forestali), the project standardised forest governance indicators and linked regional data flows to the national SINFor platform. Two annual satellite-based products were developed to monitor forest cover condition and ecological anomalies within Natura 2000 areas. CUFAA now has access to a dedicated surveillance dashboard and spatial alerts for illegal logging detection.

In **Regione Umbria**, the system is fully operational and has processed over 300 authorisations within its pilot phase. Reports aligned with national formats will be delivered to SINFor and ISTAT from 2026 onward. **Regione Lazio** finalised the technical integration but will complete GDPR alignment and public rollout during the after-LIFE phase.

Despite delays due to system complexity and data protection compliance, the project achieved all core objectives. It demonstrated the feasibility and replicability of a **digital governance model** for forest and Natura 2000 site management in line with EU policy needs. The approach is open-source, modular, and transferable to other regions. A dedicated Replicability and Transferability Plan supports future uptake across Italy and other EU Member States.

LIFE FOLIAGE contributes to EU environmental policy by:

- Strengthening the **knowledge base for forest habitats** and their pressures;
- Enabling **traceable, transparent forest operations**;
- Enhancing the ability of regions and enforcement agencies to meet EU obligations;
- Supporting the **digital transition** of nature governance through harmonised, multi-level data systems.

The project sets a precedent for **integrated, multi-actor forest governance** and positions Italy to better fulfil its role within the EU Green Deal, Nature Restoration Law, and long-term biodiversity and climate targets.

4. Introduction

4.1 Environmental problem / issue addressed

The LIFE FOLIAGE project addressed a critical governance gap affecting Italy's ability to meet EU environmental reporting obligations. Despite managing vast areas of Natura 2000 forests, 17 out of 21 Italian Public Administrations (PAs) lacked digital systems to track forest authorisations, monitor environmental impacts, or generate structured data for national and EU reporting. As a result, national contributions to obligations under the Birds and Habitats Directives, the EU Forest Strategy, and the EU Timber Regulation (EUTR) were delayed or incomplete, primarily due to an acknowledged "large lack of knowledge" on forest data.

The absence of harmonised digital workflows also impaired enforcement actions against threats such as illegal logging, fires, or habitat degradation and limited transparency toward citizens and stakeholders.

Baseline situation

At project start, forest governance in the Regions of **Umbria** and **Lazio** was primarily paper-based. Permit applications, logging declarations, and management plans were processed manually, making them time-consuming, inconsistent across provinces, and inaccessible to national authorities. No real-time system existed to verify compliance with sustainable forest management principles, detect ecological disturbances, or support strategic planning in Natura 2000 sites. Monitoring activities were fragmented and infrequent, resulting in gaps in national reports and inefficient coordination between regions, enforcement bodies, and the central administration.

Project objectives

LIFE FOLIAGE aimed to establish a replicable **digital baseline for forest governance and environmental monitoring** in Italian PAs by:

- Developing a **modular, integrated information system** comprising four digital platforms:
    - Forest Management Platform (FMP/PAF)
    - Environmental Operations Platform (EOP/PMF)
    - Governance Support Platform (PSG)
    - Public Information Interface (IEP/PRIF)
- **Standardising forest governance indicators** in cooperation with national stakeholders (MASAF, ISTAT, ISPRA, CREA-PB), aligned with SINFor (National Forest Information System).
- **Improving monitoring** of Natura 2000 forest habitats through annual satellite-based indicators.
- **Facilitating enforcement** via real-time access to logging permits and anomalies for CUFAA (Carabinieri Forestali).
- **Increasing transparency** and access to environmental information by citizens and forest users.

Information and communication strategy

The project implemented a **multi-stakeholder communication strategy**, tailored to each audience:

- **Institutional stakeholders** were involved in system co-design and national workshops.
- **Law enforcement** received a dedicated dashboard and training on digital workflows.
- **Regions** were provided with annual habitat status maps and indicators to be provided to managers of natural areas.
- **General public** received communication materials (leaflets, brochures) and outreach at events.

The strategy was supported by a public website, periodic newsletters, social media dissemination, and a Layman's Report.

Stakeholders targeted

Key stakeholders included:

- Regional authorities (Regione Lombardia, Emilia Romagna, Veneto, Marche, Abruzzo, Toscana, Campania)
- National institutions (MASAF, CREA-PB, ISTAT, ISPRA)
- Natura 2000 site managers and PA administrations
- Forest professionals, owners, and planning consultants
- NGOs, technical-scientific networks (e.g. SISEF), and regional professional associations
- Citizens and forest users in project areas

A dedicated Stakeholder Involvement Board (SIB) coordinated institutional dialogue and technical alignment.

Monitoring of project impact

Project impact was measured through:

- Key performance indicators (KPIs) and usage statistics
- Monitoring of administrative activity volumes in the FMP
- Socio-economic analysis, showing time savings and reduced CO_2 emissions by transitioning to a digital-based forest system
- Validation of forest disturbance indicators with remote sensing and field data
- Surveys and feedback from stakeholders and enforcement staff

Due to implementation delays, full monitoring was completed only in Regione Umbria; Regione Lazio will report during the after-LIFE phase.

Socio-economic context

Forestry in central Italy is characterised by fragmented ownership, limited administrative capacity, and low levels of digitalisation. LIFE FOLIAGE addressed these structural constraints by introducing efficient, transparent, and data-driven processes, reducing the administrative burden on landowners and public officers, and enabling better planning and enforcement capacity.

Expected long-term impact and transferability

Effect on key stakeholders

The digital systems developed by LIFE FOLIAGE will remain operational in **Regione Umbria**, which will continue using the FMP, EOP, IEP, and PSG for managing forest practices and Natura 2000 site monitoring. CUFAA and site managers will benefit from ongoing access to remote sensing products and the surveillance dashboard. In **Regione Lazio**, deployment will continue in the after-LIFE phase upon completion of GDPR compliance.

At the national level, the indicator standardisation process led by the project has already been integrated into MASAF SINFor service (*Sistema Informativo Forestale Nazionale*), ensuring continued alignment with EU reporting needs.

Transferability and Future Use

The system architecture, indicators, and governance models are open-source and modular, making them transferable to other Italian regions and EU Member States. A Replicability and Transferability Plan includes reference to:

- Open documentation and source code;
- Technical manuals for deployment;
- Docker-based deployment packages;
- Contact points and support strategy for replication.

Regions including **Marche and Campania** have expressed interest in adoption.

Expected future impact on EU environmental policy and legislation

LIFE FOLIAGE supports:

- Improved compliance with EU environmental legislation, especially Birds and Habitats Directives and the Forest Strategy;
- Data traceability and transparency, supporting the EU Timber Regulation and future Due Diligence Regulation;
- Greater policy coherence, through alignment with national forest reporting and strategic planning instruments (e.g., SEAs, Natura 2000 management plans);
- Standardised indicators and governance models, facilitating future harmonisation of EU forest monitoring and conservation frameworks.

The project sets a foundation for the digital transition of forest governance in Europe and serves as a strategic pilot for integrating biodiversity, enforcement, and policy reporting into a single operational system.

5. Administrative part

The project is managed by CREA under action E.1, a full management plan was written and updated during project timetable. The governance management schema of the project is depicted below:

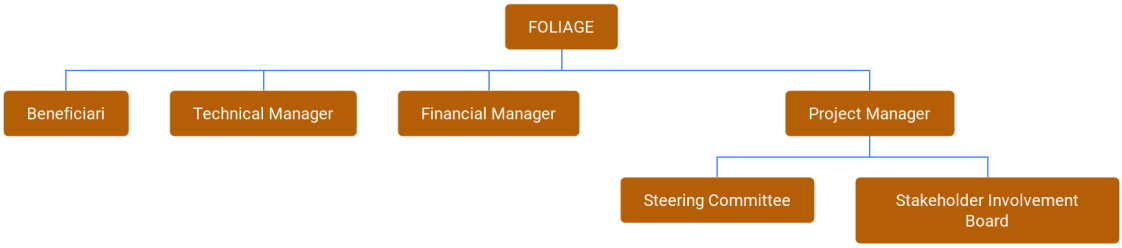


Figure 1: Management schema of the project

Eight project meetings were held, mainly via remote connection. The Steering Committee was composed of the AB managers of each beneficiary, together with the project technical manager and the project financial manager. It was led by the project manager:

Table 1: Steering Committee composition

Name	Beneficiary	Role
Marco Bascietto	CREA	Project manager
Alessandro Alivernini	CREA	Technical manager
Elena Certelli	CREA	Financial manager
Sergio Sestili	AlmavivA	AB manager
Giancarlo Papitto	CUFAA	AB manager
Fabio Genchi	RegLazio	AB manager (replaces previous AB managers)
Francesca Crea	RegUmbria	Technical manager
Francesco Carbone	UniTus	AB manager

The SC has met 12 times during the project.

The Stakeholder Involvement Board is formed by the relevant project stakeholders scouted in action A.2 and led by the project manager. It has met four times. Communication to SIB components took place according to the Stakeholder Management Plan.

Each project action features a responsible person assigned at proposal stage or assigned during a SC meeting.

Communication with CINEA Agency and the Monitoring team took place during four monitoring visits (held on 13/01/2021, 03/03/2022 + 07/03/2022, 24/11/2022, 05/09/2024) and by replying to monitoring letters by the Project Advisor.

An amendment plan requesting a 1 year-long extension to project duration was approved on 04/10/2023.

6. Technical part

6.1 Technical progress, per Action

Action A.1 Consultation with project Regional PAs

Action responsible	Start date			End date		
UniTus	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/10/2020	/	01/10/2020	30/06/2021	/	16/11/2022

Milestones, Deliverables, Indicators of Progress, Expected Results

The action was completed with the consolidation of the 3 deliverables at the Steering Committee of 2022, 16th November.

Activities undertaken and outputs achieved

Action A.1 was conducted in three main phases:

1. Administrative Harmonisation

Led by UniTus, this phase analysed and aligned forest permit procedures between Lazio and Umbria. Frequent meetings were held with regional officials, forestry agencies, professional associations, and parks. Consultations, questionnaires, and stakeholder meetings—including other regions—helped refine technical standards. The complexity of existing procedures and varied practices contributed to delays.

2. Software Requirements Definition

Based on the analysis, software specifications were developed by UniTus, RegLazio, and RegUmbria, with two major revisions. CREA led the final definition using a modular, iterative approach. Deliverable D1 was approved in November 2022 and sent to Almaviva for implementation.

3. Adoption Planning

Deliverables D2 and D3, outlining the steps for FMP adoption, were shaped by delays in national legislation (TUFF). Despite this, both Regions prepared their own plans to adapt legal and administrative frameworks for FMP implementation.

Deviations, delays and impact on other actions

Delay to achieve D1 “Requirements report for the Forest Management System”

Within Action A.1, significant delays occurred due to the complexity of transitioning forest-related applications from paper to digital format. This process required in-depth analysis and clear, comprehensive communication of requirements to the technology partner—beyond the forestry expertise provided by RegLazio, RegUmbria, and UniTus staff.

The challenges became evident upon the release of version 1 of the information system (Sub-action B.1.2, released on 31/12/2021), which, despite implementing the approved requirements, lacked essential functionalities for public use. This led to a one-year delay.

In response, the CB actively contributed to lead the drafting process of version 2 of the requirements (not initially foreseen in project proposal), ensuring a complete functional architecture aligned with regional forestry regulations, a full provision of user roles, authentication procedures and indications to fulfil the General Data Protection Regulation by Regions and CUFAA.

As version 1 of the software was incompatible with the revised requirements, a full code rewrite was necessary to achieve version 2 of the software. AlmavivA reported higher personnel costs resulting from the unforeseen need to fully rewrite the software code. During the Steering Committee meeting held on 12 February 2024, the project partners agreed to allocate a portion of their own budgets to AlmavivA in order to cover these unexpected expenses (Deviation to Almaviva budget, page 42). The delay in Action A.1 postponed the start of public use monitoring of the FMP software,

originally planned for September 2022, prompting a one-year project extension (amendment plan approved on 04/10/2023).

Delay to achieve D3 "Plan for the amendments to Lazio Region legislative and administrative regulation"

During the implementation of the action, several organisational changes affected both the RegLazio management team and the personnel assigned to the LIFE FOLIAGE project. Moreover, severe disruptions caused by malicious attacks on RegLazio's IT infrastructure led to a 15-month delay in the delivery of Deliverable D3. This delay, however, did not impact the overall timeline of other actions, as it was effectively absorbed by the broader delay in the drafting of version 2 of the system requirements.

Deviation in reaching IP3 "Provinces/municipalities/national and regional parks involved in consultations"

The draft of D1 included consultations with several non-AB Regions that provided guidance on digitisation of forest permit workflows and know-how on forest regulations in use in other Regions.

Not all RegLazio provinces (3 involved out of 5 in the Region, although 2 were foreseen in the proposal), nor a significant number of municipalities (1 involved out of 4 foreseen) or regional parks (1 involved out of 2 foreseen) were included in the consultations. This was not done due to the organisational changes described above that prevented the Region to properly involve those local public bodies. A potential for lack of involvement during the adoption phase of the FMP can be foreseen by local public bodies by RegLazio.

RegUmbria, due to the centralisation of forest and environmental subjects and bodies, has the competencies and authority to adopt FMP as the regional digitisation system for forest instances, and was not affected by this deviation.

Action A.2 – Stakeholder consultation and scouting

Action responsible	Start date			End date		
CREA	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/10/2020	/	01/10/2020	30/06/2021	/	30/06/2021

Milestones, Deliverables, Indicators of Progress, Expected Results

The action was completed on schedule.

Action activities were concentrated on networking events aiming at sharing knowledge of project objectives among potential stakeholders. Two main events were held (recordings were uploaded to website):

- Project presentation (16/03/2021) "*Presentazione del FOLIAGE: informatizzazione dei processi amministrativi e del monitoraggio forestale da remoto*" chaired the PM. The meeting, shaped as a participatory event, was held on-line due to pandemic restrictions and was organised in a plenary session and 3 parallel sessions: i. Public Administrations, ii. Forest Governance, and iii. Forest Planning. 200+ people participated in the event, 24 questions (liked 68 times) were asked and answered during the final feedback session.
- Coordination meeting with stakeholder involvement board (13/04/2021): "*Introduzione del progetto LIFE e delle sue finalità*", participated by 5 national stakeholders: SISEF, MIPAAF, ISTAT, ISPRA, CREA-RaF. The meeting set out the main expectations from each of the stakeholders from the project.

As a result of a survey performed during 16/03/2021 event it was clear that participants needs were in line with project objectives:

Choice	Votes	%
Reduce time to prepare instances	30	31
Reduce administrative burden	22	23
Optimise local and regional forest planning	19	20
Give usefulness to data handled by public administrations	12	12
Monitor forest health status	10	10
Incentivise forest sector economy	4	4
Pinpoint economic incentives in the forest sector	0	0

The first Stakeholder Involvement Board meeting was held in the Project Presentation meeting, during the parallel session "Forest Governance", chaired by MB, and was participated by the national stakeholders (MIPAAF, ISPRA, ISTAT).

More than 15 one-to-one meetings with regional PAs, local PAs, private companies, and natural parks were held. The following stakeholders were scouted:

Stakeholder	FMP	EOP	IEP
Agenzia Forestale (AFOR Umbria)	x	x	x
Consiglio dell'ordine nazionale dei dottori agronomi e forestali (CONAF)	x	x	x
DREAM Italia Società cooperativa	x	x	x
Federazione dei dottori agronomi e forestali del Lazio (FODAF Lazio)	x	x	x
Federazione dei dottori agronomi e forestali dell'Umbria (FODAF Umbria)	x	x	x
Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA)	x	x	
Ministero delle politiche agricole alimentari e forestali (MIPAAF)	x	x	
Istituto Nazionale di Statistica (ISTAT)	x		
Regione Abruzzo	x	x	
Regione Campania	x	x	
Regione Lombardia	x		
Regione Marche	x	x	
Regione Piemonte	x		
Riserva Naturale Regionale Selva del Lamone	x	x	

The “Stakeholder Management Plan” deliverable was completed by CREA. It includes an analysis of the interests and roles of each stakeholder in the project—ranging from end users, knowledge providers, and dissemination supporters, to those interested in governance outcomes or the replication of software platforms. The plan also outlines a timeline for identifying and engaging additional stakeholders.

Based on a Mendelow matrix assessing stakeholders’ influence and interest, a tailored communication schedule was developed. A designated project representative was assigned to manage engagement with each stakeholder, with defined frequency (e.g., weekly, monthly) and communication channels (e.g., newsletter, email, direct contact).

Deviations, delays and impact on other actions

Deviation in reaching -ER3 “MATTM will support FOLIAGE in developing the procedures to conservation monitoring of Natura 2000 sites”

The project beneficiaries were unable to involve any contact person from MATTM. Such involvement was considered essential for drafting the requirements related to the reporting of forest practices and conservation monitoring in Natura 2000 areas.

As a contingency plan, during the early months of 2023, these requirements were gathered from the Regional Park of Selva del Lamone (Lazio), involved in the project as a stakeholder, and from the beneficiary RegUmbria, which centralises all environmental matters within the operational office participating in the project.

The outputs (i.e., reports) generated by the information system developed under Action B.4 will be made available to the Regional beneficiaries, who will be responsible for communicating them directly to MATTM through official channels.

Action B.1 – Development of the information system

Action responsible	Start date			End date		
AlmavivA	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/01/2021	/	01/01/2021	31/03/2024	31/03/2025	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

The action was completed on two months longer than scheduled by the amendment plan.

The main objective of Action B.1 is the development, deployment, and maintenance of the Digital Forest System (SDF / FEF) and all its components for the Umbria and Lazio Regions, ensuring their availability online and operational status until the end of the project.

Status of development, online deployment, and operational readiness of the SDF / FEF software modules:

Module / Platform	Region Umbria		Region Lazio	
	Deployed & online	Go-live	Deployed & online	Go-live
FMP / PAF	✅	✅	✅	❌
EOP / PMF	✅	✅	✅	✅
IEP / PRIF	✅	✅	✅	❌
PSG	✅	✅	✅	✅

B.1.1 Development of the Data Management Plan

Activities under this sub-action were successfully completed.

B.1.2 Digitalization of Forest Management Practices and Planning (FMP)

This sub-action has successfully implemented and deployed online the administrative modules planned for the Digital Forest System (PAF/FMP and PSG). As such, activities are currently aligned with the expected results defined for the sub-action.

In accordance with the action timeline:

- Release 2 of the PAF/FMP module, which manages administrative applications for forest operations, was delivered on 30 September 2023.
- Release 3 (final) of the PAF/FMP and PSG modules, including full technical documentation, was delivered on 9 May 2025.

The SDF/FEF instance for the Umbria Region, including all four modules (PAF, FMP, PRIF, PSG), is fully operational and has been accepting forest applications from private forest owners and consultants since September 2024:

https://portal.lifefoliage.eu/foliage/umbria/login

The SDF/FEF instance for the Lazio Region is online but not yet operational, pending completion of the formal GDPR compliance process required to activate access for end users:

https://portal.lifefoliage.eu/foliage/lazio/login

Both instances can also be accessed through LIFE FOLIAGE web site **https://www.lifefoliage.eu/paf/**.

B.1.3 Monitoring of Forest Anomalies (EOP)

This sub-action implemented and deployed the satellite monitoring modules planned for the Digital Forest System (PMF/EOP). Activities are currently aligned with the expected outcomes of the sub-action.

- The final release (Release 3) of the PMF/EOP module, including technical documentation, was delivered on 9 May 2025.
- The cartographic products for forest disturbance monitoring (fires, logging, etc.) are produced annually for both project regions.
- The integration between administrative data on authorised logging and disturbance alerts (via PMF/EOP) to generate alerts for potentially unauthorised (illegal) logging was tested in the Umbrian municipalities of Sant'Anatolia di Narco, and Scheggia e Pascelupo, resulting in 86 alerts over 27 hectares.

B.1.4 Facilitating Information Exchange (IEP)

This sub-action implemented and deployed the PRIF/IEP mobile app for in-forest surveys and communication with the PAF/FMP module, as part of the Digital Forest System. Activities are aligned with the expected results of the sub-action.

- The final version (Release 2) of the PRIF mobile app was delivered on 31 January 2024, in line with the action timeline.
- The app has been operational in synchrony with the PAF/FMP module since 9 May 2025, and is available for download directly from within the PAF/FMP module.

Deviations, delays and impact on other action

Delay to the go-live phase of the FMP

The operational and monitoring period for the PAF/FMP version 2, scheduled to start after the delivery of D6, in October 2023, and intended to include public access and feedback collection, experienced delays due to organisational and technical reasons. The main reasons for the postponement include:

- The need to implement additional functionalities not included in version 2 requirements but considered strategic by the regional partners at the end of the testing phase (Action B.1 meeting held on 21/03/2024 and subsequent email communications);
- The high number of use cases and the complexity of the application submission process, which required an extensive testing effort incompatible with the internal organisation of the RegLazio and RegUmbria;
- The absence of a privacy policy for end users;
- The lack of activation of SPID-based login functionality (Public Digital Identity System).

Further needs were identified during the Steering Committee meeting held on 18/06/2024, notably:

- The need to integrate the system with the "Guidelines for Secure Software Development" and the "Guidelines on Accessibility of Digital Tools" issued by AGID (Agency for Digital Italy), as requested in the above-mentioned meeting;
- The need to ensure compliance with EU Regulation 2016/679 (GDPR) by the data controllers (Region Lazio provinces and municipalities, Region Umbria, and CUFAA), specifically to uphold the principle of data minimisation (data must be adequate, relevant, and limited to what is necessary in relation to the purposes for which they are processed).

For the sake of comprehension of terms and definitions according to GDPR the two roles concerning personal data are shown in Table 1:

Table 2: Roles foreseen in the General Data Protection Regulation

Role	Determines *why* & *how* data is processed?	Acts on instructions?	Primary accountability for GDPR?
Data Controller	✅ Yes	❌ No	✅ Yes
Data Processor	❌ No (follows controller)	✅ Yes	✅ (only to the extent of processor role)

The formal compliance agreements were signed by Regione Umbria and AlmavivA; all necessary software adjustments and additional functionalities were implemented by AlmavivA and completed in August 2024 for Regione Umbria (10 months delay). The information system was made available to the public by Regione Umbria starting on 1 September 2024. The corresponding 12-month operational and monitoring period will extend beyond the project's official end, in accordance with Actions 1 and 2 of the After-Life Plan (Deliverable of Action E.3).

The information system was not made available to the public by Regione Lazio since no formal agreement in compliance to GDPR was issued by the Region to be signed by the relevant parties (provinces as "data controllers" and AlmavivA as "data processor") by the end of the project. This problem was addressed several times in project meetings and a number of solutions were proposed by the CB to the Region to involve all 5 provinces of Lazio also in compliance with suggestion by CINEA including:

1. Amend the forest regional regulation to let the Region be "data co-controller" together with its own provinces and municipalities thereby avoiding any modifications to be implemented to the software. This option was excluded by the Region due to the inability to amend the current Regional Forest Regulation within the project timeline.
2. Installation of the system on the Region I.T. infrastructure, with the Region designated as "data processor" of the data owned by provinces and municipalities (i.e. ruling out Almaviva). This option was discarded by the Region).

Regione Lazio has therefore committed to facilitating the signing of GDPR agreements between each Province and Almaviva (as discussed during project meetings in November 2024), where it will be recognised as data co-controllers together with its provinces. The regional platform will be adapted following the completion of these agreements, using Regional additional economic resources outside the project scope, still to be quantified.

Delays in the operational activation of the information system had a direct impact on the execution and results of the governance-related actions (B.3 “Improving forest governance at regional level” and B.4 “Bridging regional forest governance to national one”), due to a shorter than foreseen operational and monitoring period.

Minor deviations

The deadlines for D8, “Release 3 (final) of FMP and EOP, provision of FAQ and technical documentation”, and D9, “Report on FMP/EOP/IEP usage by front-users and back-users”, were postponed by the Coordinating Beneficiary due to delays in the process of signing the agreement to comply with General Data Protection Regulation (GDPR) by Regione Lazio. D8 and D9 were delayed as much as possible to enable any potential software modifications, including the removal of any access roles granted to Regione Lazio, that would have resulted directly from the content of the agreement. D8 was achieved anyway, taking into account usage feedbacks, tests, and requests by Regione Umbria; D9 was achieved based on the statistics gathered during the monitoring period of FMP of Regione Umbria.

The expected results of this action have been achieved, with the exception of those dependent on the continuous use of the information system during the one-year monitoring period. Specifically:

- ER1 “Forest owners and forest professionals use FMP to submit forest management applications in Lazio and Umbria Regions” was achieved on 1 September 2024 for Regione Umbria, and is expected to be achieved by Regione Lazio during the after-life phase.
- ER3 “Data on illegal logging is passed on to forest patrolling bodies (CUFAA)” was demonstrated in the Umbrian municipalities of Sant’Anatolia di Narco, Scheggia, and Pascelupo, and will become fully operational in the after-life phase. For further details, refer to the technical description of Action B.2 and its deliverable “Report on validation of vegetation anomalies and on potential illegal logging cases”.

ER4 “EU, national and regional legislation and activities in the field of forestry, biodiversity, and environment are communicated to citizens” was achieved through the project website, instead of using the PRIF/IEP mobile app, as agreed during the proposal revision phase.

Action B.2 – Validation of vegetation anomalies detected by the information system

Action responsible	Start date			End date		
CUFAA	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/01/2021	/	01/01/2021	31/03/2024	31/12/2024	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

The action was completed on 5 months longer than scheduled by the amendment.

The objective of Action B.2 was to validate the accuracy of forest disturbance alerts generated by the PMF/EOP module, and to provide an initial quantification of illegal logging by cross-referencing these alerts with administrative data from the PAF/FMP module.

All field surveys and photo-interpretation activities aimed at validating the forest disturbance detection model were completed, both during the first and second project years, including the additional year granted through the approved amendment plan.

The monitoring activities aimed to evaluate the consistency between authorised forest management practices and actual interventions, as well as to detect potentially illegal forest cuts. The activities were carried out by Carabinieri Forestali, supported by the FOLIAGE digital tools (FMP, IEP, and PMF alerts).

The report D2 “Report on first year validation by field surveys” was revised and updated on 25/09/2024 to incorporate the comments made in CINEA letter. The new revision includes quantitative results on field surveys and the analysis of the geometric accuracy affecting the results of the satellite and field surveys.

Deviations, delays and impact on other action

Delay due to an unforeseen equipment failure

The action experienced delays due to the failure of a hardware component (hard disk) that stored all drone flight data used for mapping sites flagged by the PMF/EOP module. The component was found to be irreparably damaged. As a contingency, all surveys were repeated by CUFAA personnel, without additional costs beyond the originally planned

staff resources. This deviation caused an approximate 3-month delay in making data available for Action B.1, which was absorbed by sub-action B.1.3 without impacting the overall project timeline.

Delay in PAF/FMP usage

CUFAA is currently evaluating compliance with data protection regulations in order to access the PAF/PMF module and ensure appropriate legal references are provided to access the system. The data sharing agreement with Regione Umbria has not yet been finalised, partly due to delays in the system's operational activation. Within the project framework, this delay was mitigated through a contingency plan approved during the Steering Committee of 18/06/2024, under which alert-based monitoring activities for potentially illegal logging were conducted in the two experimental areas, as previously described. As part of the after-life plan (Action 8), CUFAA will formalise the necessary agreements to enable full access to the information system to its employees.

Action B.3 – Improving forest governance at regional level

Action responsible	Start date			End date		
RegUmbria	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/04/2021	/	01/04/2021	31/03/2024	31/03/2025	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

The action was completed on two months longer than scheduled by the amendment.

Action B.3 included activities aimed at integrating the FOLIAGE information system into the forest governance frameworks of the Umbria and Lazio Regions, with the goal of improving the availability of quantitative data to support decision-making processes in the forestry sector.

B.3.1 Enforce the digitization of forest management with legislative and administrative amendments

Each Region developed a plan for administrative and legislative integration, included in the deliverables of Action A.1: "Plan for the amendments to Lazio/Umbria Region legislative and administrative regulations."

- Regione Umbria implemented the necessary amendments to its regional legislation to enable optional adoption of the FOLIAGE system and to simplify the procedures for evaluating authorisation requests.
- Regione Lazio has not yet enacted the necessary amendments to its forest regulation to allow for the adoption of the FOLIAGE information system and to support the simplification of administrative procedures. These legislative actions have been deferred to the after-life period, under Action 3: "Provision of the FEF / SDF to the five provinces of Lazio and its adoption as an alternative to paper-based procedures (Objective G1)."

B.3.2 Tailor FEF information access to territory managers and politics for territorial planning and economic programming

Activities under this sub-action were carried out as scheduled. Data requirements for supporting regional and national forest governance were collected during project events such as:

- "Participatory event to gather requirements from policy-makers" (14 January 2022)
- "Forest statistical data toward a unified national standard; contributions to regional and national forest governance" (within Action B.4, held on 18 June 2021)

These meetings involved 204 participants, representing MASAF, ISPRA, ISTAT, ForMipaaf (now SINFor), and freelance professionals.

The analysis of identified needs revealed key gaps in Italy's existing forest data, including:

- Absence of detailed data on timber harvested, both for energy and industrial purposes
- Inaccurate or unreliable estimates, especially for small-scale logging activities, which are often only communicated through informal channels by non-expert individuals
- The administrative platform is highly useful, but difficult to standardise across all Italian regions
- The need for the platform to support administrative simplification through integrated cadastral layers, protected area restrictions, etc.

Following a prioritisation process, the identified needs were integrated into the functional requirements of the PAF/FMP and PSG modules in Action A.1 and B.4.

All reporting systems are online; those related to Regione Lazio will become operational during the after-life phase. All action reporting deliverables have been completed. The reporting was based on data collected during the actual monitoring period of all software modules by Regione Umbria (as per following table), and on the PMF/EOP and PSG modules for Regione Lazio (i.e. excluding the administrative modules FMP and PRIF).

Forest management permits passed buy the FMP in Regione Umbria in the period September – December 2024:

Type of Request	Forest Management and Treatment Type	No. of Requests	No. of Management Units	Units with Surface Data	Units with Volume Data	Total area (ha)	Total timber volume (m^3)
Above-threshold request	Coppice: Thinning and clearing	1	1	1	1	0.14	5
Above-threshold request	Coppice: Clear-cut with retention of seed trees (standard, intensive, compound)	3	3	3	3	40.39	3231.2
Below-threshold request	Coppice: Clear-cut with retention of seed trees (standard, intensive, compound)	1	0	0	0	2.00	150
Below-threshold request	Coppice: Simple clear-cut (without retention of seed trees)	2	0	0	0	28.40	2414

Deviations, delays and impact on other action

Delay to the go-live phase of the FMP

Due to the non-operational status of the FMP/PAF system in Regione Lazio (as described in Action B.1) and the absence of amendments to forest regulation, the Region has postponed to the after-life period (Actions 1, 3, 4, 5, 6, and 7) the demonstration of how the system will support improved forest governance at both regional and local authority levels.

Regione Umbria will have access to the first automated reports generated by the PSG module at the end of 2025, after the first full year of system use. The delay has impacted the Regions' ability to develop new territorial plans or update existing ones with accurate and timely knowledge of ongoing logging activities in their territory, particularly in terms of location, surface area, and extracted biomass—within the timeframe of the project.

Mitigation Measures

A project meeting was held on 14/11/2024 to achieve a solution with Regione Lazio committing to facilitate the signing of GDPR agreements between each province and Almaviva by the end of 2024 to let them adopt the software by the end of the project. The CB informed the Technical Monitor about this final solution on 25/11/2024. Unfortunately RegLazio did not adhere to this timetable.

The Regions did not adopt specific mitigation measures because regional forest plans are typically reviewed on a five-year cycle and the first planning window had closed before the FOLIAGE platform became available. The next opportunity to use FOLIAGE data will occur in the after-life phase, when one full year of data collection—covering all types of logging applications—will be available for both Regione Umbria and Regione Lazio.

Minor deviations

IP4 ("Monthly increase of digitized forest management instances handled by FEF") was not achieved at the target rate of 10% monthly growth. This was due to the limited duration of the monitoring period for the FMP module in Regione Umbria, as well as the fact that the number of monthly applications is highly influenced by seasonal variations, closely linked to the official opening and closing dates of the forestry season (November–March) and hardly subject to increase month-to-month. This indicator will be re-evaluated during the after-life phase.

ER1 ("50% decrease in administrative time […]"): In Regione Umbria, the preliminary assessment, indicating an estimated 30% reduction in data entry time. A more detailed evaluation of processing times is deferred to the after-life phase (Actions 1 and 2). Regione Lazio is currently unable to quantify this result.

ER8 ("Report on forest management practices and mapping in 2023 […]"): the report was updated to 2024 due to the one-year extension granted through the amendment plan. The result was achieved for Regione Umbria only, as Regione Lazio is currently unable to report any impacts on its own governance or that of its local authorities due to the non-operational status of the FOLIAGE system in that Region.

Action B.4 – Bridging regional forest governance to national one

Action responsible	Start date			End date		
CREA	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/01/2022	/	18/06/2021	31/03/2024	31/03/2025	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

The action was completed on two months longer than scheduled by the amendment.

B.4.1 – Bridging Public Administrations and the National Level [CREA]

CREA developed the "PSG Requirements" (Annex T_01), separating reporting functions from FMP/EOP into a standalone module. FOLIAGE contributed to standardising forest indicators in collaboration with the SINFor project (MASAF-funded), replacing prior regional reports for the national "State of Forests" (RaF). Two key indicators—authorized logging permits and activity declarations—were included in the final PSG product set. The initial nine outputs were consolidated into four simplified reporting products, shared during a MASAF event (April 2025). Umbria will submit its first full report in 2026; Lazio in 2027.

B.4.2 – Bridging Public Administrations and the General Public [RegUmbria, RegLazio]

Public-facing information on sustainable forestry and Natura 2000 was collected and distributed through printed materials and the project website, not via the mobile app, per revised target audience defined in the Mid-Term Report.

B.4.3 – Bridging Public Administrations and Enforcement Bodies [CUFAA]

CUFAA officers received direct, role-based access to the FOLIAGE system, enabling them to consult permits, extract data, and verify in the field using the PRIF app. A new tool (PMF 2) identifies potential illegal logging by comparing satellite anomalies with approved logging data. A training session for 15 officers was held on 9 May 2025, with operational manuals provided.

B.4.4 – Improving Monitoring in Natura2000 Habitats [CREA]

Two PSG products (Nat1 and Nat2) support Natura 2000 habitat monitoring using satellite data: vegetation anomalies and forest conservation status. Indicators include forest cover, disturbance levels, and spectral diversity (Rao's Q), Figure 2 and 3. These are annually updated and shared with protected area managers and the Ministry of the Environment.

Figure 2: Percentage of forest cover affected by ecological disturbances in year 2023

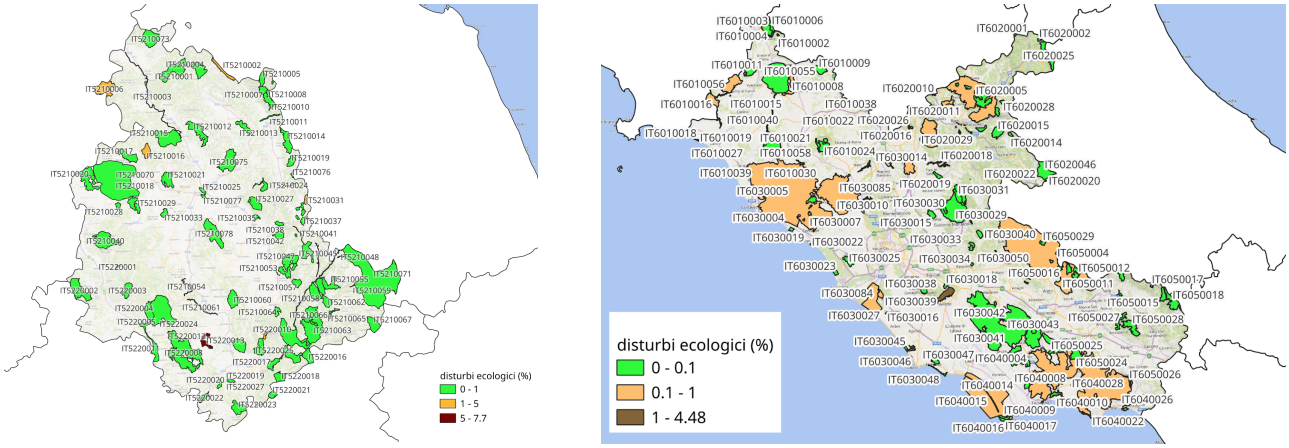
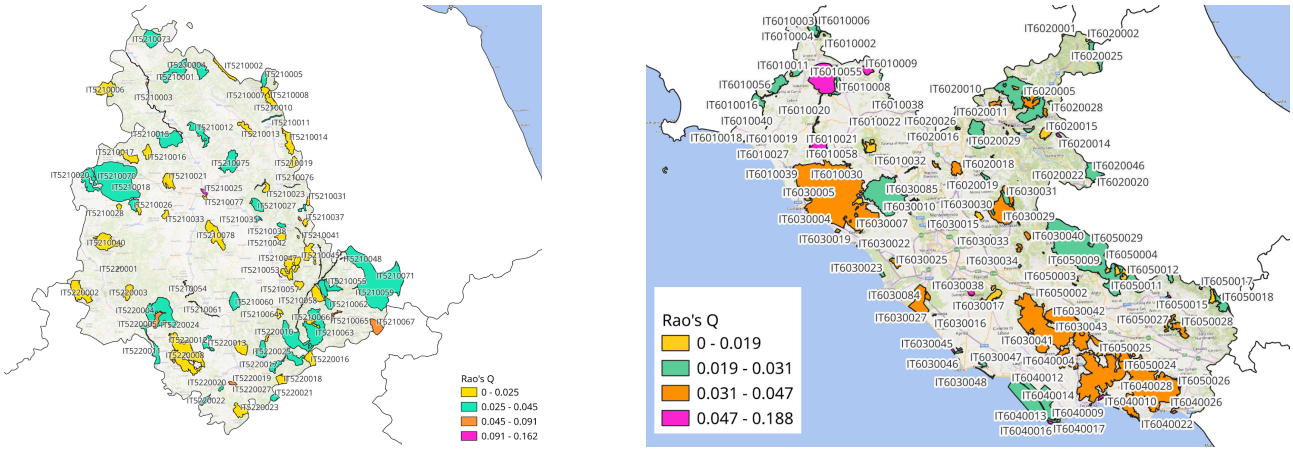


Figure 3: Mean Rao's Q index of spectral diversity (Q values are proportional to forest diversity)



Deviations, delays and impact on other action

Delay to the go-live phase of the FMP

The delay in the public go-live of the PAF/FMP module, accumulated under Action B.1, has resulted in a postponement in the delivery of automated PSG reporting products to SINFor, MASE, ISTAT, and MASAF. These final products will be delivered at the end of the one-year monitoring period (by the end of 2025 for Regione Umbria) and after the closure of the silvicultural season (November 2026 – March 2027) for Regione Lazio, as outlined in the after-life plan.

Mitigation measures

Regione Umbria will continue to rely on the traditional data provision workflow based on estimates, until the automated PSG reports will be available for the full 2025 year.

Regione Lazio has not defined a mitigation plan for the provision of data to national institutions; as a result, data delivery will not be completed.

Both Regions have access to the cartographic products on the conservation status of Natura2000 areas, as detailed in the "Mitigation" section of Action B.3.

Other deviations

D2 ("Report on Project Contribution to the National Forest Sector") was based on data collected from the usage of the informative system, during the actual monitoring period (6 months instead of 1 year).

D3 ("Report on Illegal Logging Monitoring and Administrative Monitoring") was based on illegal logging data collected by CUFAA in the experimental areas of two municipalities in Regione Umbria, as per the contingency plan agreed on during the Steering Committee held on 18/06/2024.

Action B.5 – Planning replicability and transferability

Action responsible	Start date			End date		
CREA	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/06/2022	01/01/2024	01/01/2024	31/12/2022	30/06/2024	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

Action B.5 produced the Replicability and Transferability Plan, the sole activity and deliverable of this action. The plan was first issued on 14 June 2024 and updated on 7 May 2025 to incorporate the comments made in issued by CINEA. The updated version includes four new sections 1. Replicability Strategy, 2. Communication Actions for Replication, 3. Contact and Support, 4. Ongoing Interregional Collaboration.

The plan outlines tools, strategies, and stakeholder engagements that support the replication and transfer of the Forest Environment Framework (FEF / SDF) developed by LIFE FOLIAGE. These include:

- A modular, open-source software suite for forest management, monitoring, enforcement, and governance reporting.

- Technical documentation, installation guides, and Docker containers to support independent deployment.
- Tailored design specifications (PAF and PSG modules) adaptable to regional forest legislation.
- Training materials, including manuals, videos, and live sessions, available to public administrations and professionals.
- Predefined report formats aligned with national needs (e.g., SINFor indicators for MASAF, Eurostat reporting via ISTAT, Natura2000 monitoring for MASE).
- Dedicated support services including a helpdesk and contact point (staff@lifefoliage.eu).
- Interregional meetings and workshops aimed at initiating replication (e.g., events in Umbria and planned in Lazio).

Action C.1 – Monitoring project performance indicators

Action responsible	Start date			End date		
CREA	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/01/2021	/	01/01/2021	07/05/2024	31/05/2025	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

Action activities have focused on raising the awareness of associated beneficiaries on the importance of meeting project key performance indicators and action expected results and agreeing on the appropriate ways of measuring them during the course of the project. The SWOT analysis highlighted the strong technical foundation and adaptability of the LIFE FOLIAGE system, positioning it as a valuable tool for digital forest governance. While the platform offers high replicability and aligns with key EU environmental policies, its full potential was limited by regulatory fragmentation and delays in operational rollout—particularly in Regione Lazio. Long-term impact will depend on securing institutional commitment, harmonising national standards, and ensuring sustainable technical maintenance. Full description of accomplishment of KPIs is given in section 7.

Action C.2 – Monitoring socio-economic impacts

Action responsible	Start date			End date		
UniTus (Steering Committee of 19/01/2021)	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/01/2021	/	01/01/2021	07/05/2024	31/05/2025	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

The final deliverable of Action C2 assesses the socio-economic and environmental impacts of the project's digital tools, focusing on Umbria and Lazio. Key Findings:

- Environmental Impact: In Umbria, digitalisation cut CO_2 emissions per procedure from 75.07 kg to 38.14 kg, saving approx. 5.5 tons CO_2/year (based on 150 procedures).
- Socio-Economic Gains: Digitalisation was linked to a +20% increase in value added per forest worker, +150% in registered forestry enterprises, and +120% in active forest management plans.
- Regional Gaps: Northern regions were more advanced in digital forest management, while the South showed delays. National coordination is needed to address training, resistance, and infrastructure issues.
- Human Capital: The project enabled 3.59 FTEs in IT, remote sensing, and governance, and strengthened stakeholder engagement and capacity.
- Challenges & Recommendations: Key obstacles included staff resistance, limited rural connectivity, and lack of structured training. Continued efforts should focus on national coordination, infrastructure investment, and long-term capacity building.

Action D.1 – Information for the general public and stakeholders

Action responsible	Start date			End date		
CREA	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/10/2020	/	01/10/2020	07/05/2024	31/05/2025	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

The action was completed as foreseen.

Main dissemination events held

2021 and 2022

1. On 16 March 2021 CREA and all beneficiaries held a public outreach event to introduce LIFE FOLIAGE to the Public Authorities, potential stakeholders, and forest professionals: "*Presentazione del progetto LIFE FOLIAGE ai portatori di interesse*". The event held 3 parallel forums titled "*Forum degli enti amministrativi*", "*Forum della governance forestale e della statistica*", "*Forum della pianificazione forestale*". Overall 213 people joined the event.
2. In October 2021 **networking online meetings** were held with LIFE project GOPROFOR to discuss future cooperation and experience exchange.
3. In January 2022 **networking online meetings** were held with LIFE integrated project Imagine Umbria (Ms Livia Bellisari) to exchange experience on Natura2000 management in the Umbria Region.
4. **CREA** participated in the **Info Day LIFE 2021 – 2027** on 18/10/2021 organised online by Regione Umbria, and by Scuola Umbra di Amministrazione Pubblica. The PM presented the governance objectives of the project. About 230 people joined the event. Link to event.
5. **CREA** and all beneficiaries held a dissemination event on line on 14 January 2022 titled "Aspettative e utilità dall'introduzione del sistema digitale forestale" in collaboration with MASAF. Recipients were forest professionals (170 people joined).
6. **CREA** and **UniTus** participated in the 13th congress of the Italian silvicultural and forest ecology society **(SISEF)**: "Alberi-Foreste-Biodiversità dal New Green Deal alla Farm to Fork Strategy" from 30/05/2022 to 02/06/2022. with two posters and an oral presentation about FOLIAGE: Link to event.
7. **CREA** organised a dissemination meeting with Local Health Authority on 17/06/2022 in CREA premises: "*IL TELERILEVAMENTO: l'osservazione del mondo dallo spazio*". 20 people joined the event.
8. **UniTus** participated in the 11th Conference of the Italian Association of Agricultural and Applied Economics **(AIEAA)** 16 and 17/06/2022 University of Tuscia in Viterbo with a poster: Barbarese et al. title: "Digitalization of Italy forest system". Link to event.
9. **UniTus** participated in the 53rd **Congress of Agronomy Economics society** 29 and 30/09/2022 in Palermo with a poster: Barbarese et al. title: "The digitization of the forestry system to support governance".
10. A **LIFEis30** event was held on **15/10/2022** in Rocca di Papa (Lazio Region), represented by Mrs Annamaria Fondi and Francesco De Santis, with the collaboration of **PEFC** (Programme for the Endorsement of Forest

Figure 4: Group photograph of the LIFEis30 event held in Rocca di Papa on 15 November 2022

Certification). **CREA**, **UniTus**, and **RegLazio** have walked the 150 participants into chestnut forests and disseminated project aims, information on forest management sustainability and Italian and EU forest strategies. About 30 pen drives, 150 leaflets, and 30 water bottles were given out to participants. Link to event.

11. **CREA** participated in the **Maker Faire 2022** (7–9 October 2022) with a dedicated LIFE FOLIAGE project booth titled *"The Life Foliage Project for Improving Forest Governance"*. Estimated audience: 150 people.
12. **CREA** organised a **photo contest** titled *"Foliage in a Click – Snapshots in the Forest"*. A jury composed of photographer Elio Vergati, set designer Francesco Bronzi, and social media freestyle champion Antonio Colella selected the winning photo among submissions from 11 participants. Link to contest results.
13. **UniTUS** hosted the conference *"The TUFF, the National Forest Strategy, and Opportunities for Institutions and the Territory"* on **14/12/2022**. Link to event. Estimated audience: 100 people. CREA and UniTUS contributed with two presentations.

2023

14. **CUFAA** organised the **Kick-Off Meeting** for the project *"Smart Forest Urban Monitoring" (SUFM)* on **26 January 2023**, with a presentation by **CREA** (MB) on LIFE FOLIAGE activities. Estimated audience: 30 people
15. **CREA** and **Regione Umbria** participated in the **AgriUmbria – National Agriculture, Livestock and Food Exhibition** on **1 April 2023**, presenting *"The LIFE Foliage Project for Improving Forest Governance"* (by CS and LO). Estimated audience: 30 people
16. **CUFAA** and **CREA** organised a **public outreach event** titled *"Simulation of forest surveys conducted by Carabinieri environmental monitoring teams using drones"* on 30 May 2023 at Altipiani di Arcinazzo (FR), with participation from all project partners. Estimated audience: 50 people. Distributed materials: all remaining branded water bottles, ~20 USB drives, ~50 leaflets, ~15 t-shirts.
17. **Regione Umbria** organised a **photo contest** promoted by the Managing Authority of the Complementary Rural Development Program for Umbria, titled *"Angolo di Campo – Another Way to Tell the Story of Italian Agriculture"*. FG and FCr awarded the best photo in the "Forest" category. Estimated audience: 112 people
18. **UniTus** took part in the **European Researchers' Night** on **29 September 2023** at its Viterbo campus with a talk titled *"The Digitalization of the Forest System in LIFE FOLIAGE as a Tool Against Climate Change"*. Estimated audience: 30 people
19. **CREA** participated in the **European Researchers' Night** on **29 September 2023** at **CNR Montelibretti (RM)** with a LIFE FOLIAGE booth and the educational game *"Landscape Hunt"*. Materials distributed: all remaining mugs with FOLIAGE logo, ~50 leaflets, ~50 pencils and sticky notes, ~10 t-shirts. Estimated audience: 300 people
20. **CREA** and **Almaviva** participated in **Maker Faire 2023** (7–9 October 2023) with a LIFE FOLIAGE booth and a *"Landscape Hunt"* game station, which recorded 139 rounds played. Estimated audience over 3 days: 500 people Materials distributed: ~150 pencils and sticky notes, ~20 mugs, ~100 leaflets. An interview to project coordinator, MB, was aired on EQUtv. Link to video.

2024

21. **CREA** participated in a **technical-scientific dissemination event** as part of a **FILAS course** (an agency of Regione Lazio supporting entrepreneurship), with a presentation on the LIFE FOLIAGE project focusing on remote sensing and a general overview of Italian forest resources (06/05/2024). Estimated audience: 30 people

22. **UniTus** organised the first **Mobile Dissemination Event** titled *"Discovering the Foliage and Nature of Monte Torre Maggiore"* on **27 October 2024**. The event included a scientific and recreational trekking activity in the Monte Torre Maggiore protected area, a **Natura2000 Site** (SIC IT5220013). The trail served to explain **sustainable forest management**, **silviculture within Natura2000 areas**, the concept of foliage, and the LIFE FOLIAGE project. Audience: 21 people. Link to event.

Figure 5: Group photograph from the event held in Torre Maggiore on 27 October 2024

23. **CREA** participated in the 14th Congress of the Italian Society of Silviculture and Forest Ecology **(SISEF)** titled *"Forests for the Future"*, held from 9–12 September 2024, presenting:
    - Mastrogregori E, Bertin S, Oreti L, Palma A, Taglienti A, Tiberini A, Bascietto M Detection of an alien pest species in an urban forest using PRISMA satellite: a case study. Abstract link
    - Oreti, L., Crecco, L., Ferrara, C., Bajocco, S., & Bascietto, M. (2024). *Leveraging forest permits databases to remote sensing for timely forest harvest monitoring.* Abstract link
24. **CREA** contributed to **ForestSAT 2024**, held from **9 September 2024** in **Rotorua, New Zealand**, with the presentation Oreti, L., Crecco, L., Mastrogregori, E., Palma, A., & Bascietto, M. (2024). *Clear-cut mapping using Sentinel-2 and PRISMA hyperspectral imagery.* ForestSAT site Presentation link
25. **CREA** participated in its **Research Open Day** on **28 November 2024** at the Monterotondo (RM) headquarters, an event open to high school students from the provinces of Rome and Viterbo. Estimated audience: 50 people

2025

26. **UniTus** organised the second **Mobile Dissemination Event** at the **Parco dei Castelli Romani** on **11 April 2025**, attended by students from the Forest Sciences degree program. Participants: 30 people
27. **CREA** participated in the **EGU General Assembly** from **27 April to 2 May 2025** in Vienna, Austria, with the presentation: Bajocco, S., Ferrara, C., Crecco, L., Bregaglio, S., & Bascietto, M. (2025). *Late frosts weaken spring leaf onset carryover effect on autumn senescence.* DOI link Presentation PDF
28. **CREA** organised the **final project conference** on **16 May 2025** titled *"Innovation in Forest Governance. Communication among Citizens, Professionals, and Public Authorities: The Digital Transition in the Forestry Sector"*, held at CREA headquarters in Rome (Via della Navicella). **Participants:** 94 people, including ~44% professionals and ~25% regional stakeholders and public authorities interested in replication. **Materials distributed to in-person attendees:** FOLIAGE-branded folders with notepad, pen, leaflet, t-shirts, and Layman's Report.
28. **UniTus** and **CUFAA** held the third **Mobile Dissemination Event** on **21 May 2025** in a forest property located in the municipality of Velletri, within the Parco dei Castelli Romani, where they demonstrated the use of drones to map logging areas for the LIFE FOLIAGE project. Participants: 12 people

Other Dissemination Tools

- **Four editions of the LIFE FOLIAGE Magazine** were published and distributed via email to recipients subscribed to the project newsletter:

#	Date	Recipients	Link
1	April 2021	164	Newsletter #1

2	May 2023	218	Newsletter #2
3	November 2024	243	Newsletter #3
4	April 2025	244	Newsletter #4

- The project website **lifefoliage.eu** was visited by approximately **42,500 unique users**, generating around **113,400 page views**. It was updated several times during project course and to incorporate the Layman's report, Replicability, and After-life deliverables as well as details on all scientific papers and participation to congresses.
- Articles on general and domain-specific media outlets:
  - **CREA** published a post on the web site of the Società Italiana di Selvicoltura ed Ecologia Forestale on **21 March 2021** titled "*Semplificare, monitorare, comunicare: gli elementi chiave per migliorare la governance forestale?*". Link to post
  - **RegUmbria** published an article about the project efforts published in the journal "Sherwood – Foreste ed Alberi Oggi" (number 255, **November – December 2021**) titled "*Telerilevamento e analisi delle utilizzazioni forestali in Umbria*". This media outlet is available upon subscription, the total monthly subscriber base (revealed by the editor, Compagnia delle Foreste) is ~2,100 people. Link to table of contents.
  - A whole-page article titled "Foliage: l'incanto delle FOLIAGE che cambiano colore" was published in the **newspaper Il Tempo** on 1**6/11/2022**, reaching an estimated audience of approximately 7,000 people.
  - **CREA** published a post on the web site of the Società Italiana di Selvicoltura ed Ecologia Forestale on 14 May 2025 titled "Innovazione nella governance forestale – Congresso Finale del progetto LIFE FOLIAGE – Roma, 16 Maggio 2025". Link to post.
- A **promotional video** about the PAF was produced and shown during dissemination events: Watch the video
- The estimated increase in awareness of the role of forest management (ER 1) was assessed through questionnaires administered at the beginning and end of two events (events no. 16 and 22). The questionnaire was answered by 45 participants. 3 people out of 4 changed their mind after participating in the event. The questionnaire included 4 questions ("What is the forest area in Italy?"; "Is cutting down a forest always wrong?"; "Where does Italy's energy-use wood come from?"; "Why is sustainable forest management important?").

Deviations, delays and impact on other action

There are no delays to report. However, a few dissemination events were not carried out. More details were presented on section "Deviation to outreach events", on page 26. A portion of the allocated budget under the "Travel" and "Other costs" categories—initially planned for events that were later cancelled—was reallocated to AlmavivA to cover unforeseen personnel expenses related to the development of the information system, as detailed in Action A.1 (page 9) and the section "Deviation to Almaviva budget" (page 42).

Action D.2 – Technical dissemination

Action responsible	Start date			End date		
CREA	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/01/2022	/	01/03/2021	31/03/2024	31/05/2025	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

Action activities focused on informational events aimed at introducing the objectives and implementation of the FOLIAGE web and mobile services to end users. Several informative workshops were conducted to present the goals and implementation concepts of the FOLIAGE services, thereby preparing users for the adoption of the upcoming software. These events, not listed here, also proved valuable for gathering user requirements to support the software development process.

Reached milestones and indicator of progress include:

1. **Regione Umbria** held the **M3** event on 30 May 2025, presenting LIFE FOLIAGE technologies for potential replication in other Regions. Discussions focused on aligning forest legislation and workflows to identify

necessary software adaptations. Attendees included 2 officials from other public administrations, 1 professional, and 7 officials from bodies connected to Regione Umbria.

2. Under **M4**, the **Regions** organised two accredited technical dissemination events for forestry professionals and landowners—held on 12/02/2025 in Perugia and 04/04/2025 in Rome. The sessions focused on the forest administrative platform, illustrating both the submission and evaluation of logging authorisation requests and the roles of applicants, professionals, and competent authorities. A total of 19 professionals attended in Umbria and 40 in Lazio
3. **CREA** organised the **M5** event held on 14 April 2025 at the Ministry of Agriculture, Food Sovereignty and Forests (MASAF, formerly MIPAAF), to present the technological features of the four LIFE Foliage platforms and their replicability. Key topics included: automated statistics on forest authorisations, integrated monitoring of logging using administrative data and satellite imagery, support tools for CUFAA field operations, implementation progress in Lazio and Umbria, and opportunities for forest digitalisation across Italy. Participants included the Director of the DIFOR II Office, a ministry official, a ministerial consultant, and an ISTAT researcher, with competency in forest statistics.
4. **CUFAA** and **CREA** prepared the "Manuals and handouts for internal dissemination of CUFAA" (**M7**). The use of CUFAA's operational tools was presented during a dedicated technical dissemination event held on 09/05/2025 (Action B.4.3, page 17).
5. Scientific papers published (**IP4**): **CREA** and **UniTus** published three scientific contributions as part of the project effort. Papers under review are not included here.
    1. Barbarese, F., Oreti, L., Bascietto, M., Alivernini, A., Romano, R., Andreopoulou, Z. S., & Carbone, F. (2024). *The Impact of Digitalization on the Italian Forestry Sector: An Analysis Based on Socio-Economic Indicators*. Forests, 15(12), 2077. https://doi.org/10.3390/f15122077.
    2. Barbarese, F., Andreopoulou, Z. S., Mattioli, W., Oreti, L., & Carbone, F. (2024). *Combatting Climate Change within the EU Green Deal in Contemporary Forestry Administrative Systems: A Case Study of the Umbria Region*. Forests, 15(5), 745. https://doi.org/10.3390/f15050745.
    3. Barbarese, F., Alivernini, A., Bascietto, M., Oreti, L., & Carbone, F. (2022). *The Digitalization Framework of the National Forest System at 2020*. Environmental Sciences Proceedings, 22, 8. https://doi.org/10.3390/IECF2022-13111.

Deviations, delays and impact on other action

Some technical events were not held and, consequently, a few indicator of progress on the number of people reached were not met impacting on a lower than foreseen initial number of professionals starting to use the software tools.

M2 – One-day meeting in Rome, introducing Foliage technologies [...]

The event was not held is due to the lack of experience gained from using the forest administrative platform, which is not yet operational for **Regione Lazio**. However, the Region has already committed to organising the event in the project's after-life, once the platform is in use by the competent authorities (e.g., Provinces). As an added value to the project results, this event will serve to present the adaptations made to ensure the platform complies with GDPR agreements signed by data controllers (e.g., Provinces and Municipalities) and the data processor (Almaviva). Regione Lazio considers this theme potentially relevant for other Regions that have also designated Provinces and Municipalities as competent authorities.

M4 – One-day meetings (x7) with forest professionals and forest owners […]

Following a Steering Committee decision on 01/04/2025, **Regione Lazio** and **Regione Umbri**a opted to hold one technical dissemination event each, instead of the initially planned five and two, respectively. The decision reflected the availability constraints of forestry professionals—due to overlapping Rural Development Programme deadlines—and the benefits of delivering training in a single hybrid session. The **UniTus** supported this approach after consultation with professional bodies. Additionally, part of the project's "Travel" budget savings was reallocated to Almaviva to offset increased personnel costs for the development of the information system (Budget shift described in Deviations from foreseen expenditure, page 42).

M6 – One-day workshop during a SISEF congress focused on the Foliage APIs use and IP6 – Members of scientific community participating to the SISEF workshop on Foliage APIs

The planned APIs for accessing FOLIAGE administrative data for research purposes were replaced with Open Data on the same datasets. This approach broadened access to include not only the research sector, as originally foreseen in the proposal, but also citizens and other public authorities.

Deviations and mitigation activities in the indicators of progress of the Action:

	Indicator	Expected result	Confirmed result	Deviation	Mitigation
IP1	Personnel of PAs / National and Regional parks reached in the dissemination events held in Rome and in Perugia.	60 / 6	7 / 2	Lower than foreseen number of PA personnel involved in replication activity	Replication events to be held by Regions in After-life plan (action 10)
IP2	Forest professionals / forest owners reached in the dissemination event in each Province of Lazio and Umbria	300 / 100	RegLazio: 40 RegUmbria: 19	Lower than foreseen number of professional reached due to delay in the go-live date of the software tools	Continuous training foreseen in After-life plan (actions 1 and 2)
IP3	Personnel of Mipaaf and other ministries reached in the dissemination event held in Rome	30	2	The foreseen value (30) was wrongly assessed in the proposal stage. The personnel of Mipaaf/MASAF do not bear any role in using FOLIAGE tools thus have no interest in learning its usage.	No mitigation
IP5	Manuals distributed for internal dissemination of CUFAA	200	15	The 200 foreseen copies of the manuals were not printed (Budget shift described in Table 9: Main project budget deviations [omitted], page 42)	The CUFAA manual was distributed in digital format to ensure rapid dissemination across regional operational units and allow for future updates based on ongoing field experience.
IP6	Members of scientific community participating to the SISEF workshop on Foliage APIs	40	13	The technical dissemination event foreseen was not held	The event was replaced by a specific session during the project's final event, held in hybrid format, reaching 82 participants from various stakeholder groups, including 13 researchers.

Action E.1 – Management of project by CREA

Action responsible	Start date			End date		
CREA	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/10/2020	/	01/10/2020	07/05/2024	31/05/2025	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

All action activities were carried out.

Action E.2 – Monitoring of the project progress

Action responsible	Start date			End date		
CREA	Foreseen	Amended	Actual	Foreseen	Amended	Actual
	01/10/2020	/	01/10/2020	07/05/2024	31/05/2025	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

All action activities were carried out.

Action E.3 – Planning after LIFE communication

Action responsible	Start date			End date		
CREA	Foreseen	Amended	Actual	Foreseen	Amended	Actual

	01/04/2023	01/04/2024	01/02/2025	31/12/2023	31/12/2024	31/05/2025

Milestones, Deliverables, Indicators of Progress, Expected Results

All action activities were carried out.

6.2 Main deviations, problems and corrective actions implemented

Deviations to Technical Activities

Some technical deviations occurred during the implementation of LIFE FOLIAGE, mainly related to delays in system development, GDPR compliance, regional legislative alignment, and national reporting integration. These deviations led to rescheduling and a reduced operational testing period but did not compromise the project's main outcome: the release of the forest digital platforms.

1. Delay in system requirements definition (Action A.1)

A delay of about one year affected the delivery of the Forest Management Platform (FMP) requirements due to the complexity of digitising heterogeneous regional procedures. Multiple revisions and extensive consultations were required. The first software release (end of 2021) was considered inadequate, leading to a full redesign and code rewrite, with a new release in 2023. This impacted the overall development timeline and resulted in a one-year project extension (approved in 2023).

2. GDPR compliance and accessibility delays (Action B.1)

Public deployment of the FMP was delayed by GDPR compliance requirements, AgID accessibility and cybersecurity standards, and the lack of formal GDPR agreements in Regione Lazio. As a result, the system went live in Umbria about 10 months later than planned, while Lazio postponed public deployment to the after-LIFE phase.

3. GDPR data controller issue in Regione Lazio

Regione Lazio unexpectedly declared it could not act as GDPR data controller and failed to formalise agreements with its provinces. Despite mitigation proposals, no solution was adopted, preventing the official launch of the FMP in Lazio within the project duration.

4. Reduced operational monitoring period

Due to deployment delays, full 12-month monitoring was completed only in Umbria. In Lazio, monitoring was deferred to the after-LIFE phase. Some reports were produced using partial data, while Natura 2000 remote sensing monitoring was unaffected.

5. Increased workload and non-eligible effort

Technical deviations increased the workload of partners, especially CREA and AlmavivA. This was addressed through budget reallocation from other actions and additional internal effort not charged to the project, including amendments to partnership agreements.

Deviation to outreach events

Action	Event	Foreseen in proposal	Achieved
Dissemination events			
D.1	Mobile dissemination events (x4) hosted by stakeholder NGOs are completed	Yes	✓ (3 out of 4)
D.1	LIFEis30 event (15 October 2022, in Rocca di Papa)	No	✓
D.1	Public outreach event (30 May 2023, at Altipiani di Arcinazzo)	No	✓
Participation to national congress			
D.1	Dedicated event at SISEF conference	Yes	✓ (moved to final project congress)
Technical dissemination events			
D.2	One-day meeting in Rome, introducing Foliage technologies to Regions, other PAs, National and Regional Parks	Yes	x

D.2	One-day meeting in Perugia, introducing Foliage technologies to Regions, other PAs, National and Regional Parks	Yes	✓
D.2	One-day meetings (x7) with forest professionals and forest owners, in each Province of Lazio and Umbria are completed	Yes	Partly (Lazio: 1 meeting Umbria: 1 meeting)
D.2	One-day meeting in Rome, introducing Foliage technologies to Mipaaf	Yes	✓
Workshops			
D.2	One-day workshop during a SISEF congress focused on the Foliage APIs use	Yes	✓ (during final congress)
B.4	Workshop of CUFAA to spread FEF usage among law enforcement	Yes	✓
Other outreach events			
D.1	Participation at DGA event	Yes	x
E.1	Participation at LIFE KOM in Bruxelles	Yes	x

Summary of deviations related to events held

- **Mobile App Dissemination Events**: only **3 out of 4** scheduled mobile app dissemination events were carried out.

  This deviation was mitigated by the organisation of an unforeseen public outreach event, which included a **live demonstration of drone-based surveillance** conducted by CUFAA in Altipiani di Arcinazzo. This mitigation measure is detailed on **page 21.**

- **Technical Dissemination Events**: only **3 out of 10** planned technical dissemination events were implemented.

  This deviation is addressed under "*M4 – One-day meetings (x7) with forest professionals and forest owners [...]"* on **page 24**.

  As a result, the total number of forest professionals reached was **59**, significantly below the 400-person target established in the **Action D.2 Indicator of Progress** (see page 25, "*IP2"*). This underperformance is primarily attributable to the delayed go-live phase of the software. This unspent budget from RegLazio, RegUmbria, UniTus beneficiaries was transferred to Almaviva to compensate the increased workload that exceeded the initially allocated budget for personnel under Action B.1 (section "Deviations from foreseen expenditure", page 42).

  Regione Lazio and **Regione Umbria** have committed to addressing this gap by involving additional professionals through technical training activities foreseen under **Action 1 of the After-Life Plan**, with no additional budget required.

- **Participation in a National Congress**: the planned participation in 1 national congress did not take place.

  The cancellation was due to insufficient data availability from the software—expected for demonstration—resulting from its delayed go-live. As a mitigation measure, dedicated sessions were organised during the **Final Project Congress** held in **May 2025**, Two dedicated sessions during the final project conference (16 May 2025) were held:

  - a session on Open Data made available through FOLIAGE informative system titled "LIFE FOLIAGE e gli open-data per la comunità scientifica ed il pubblico", hosting two contributions: 1. Gli open data: da innovazione ad opportunità per aumentate la conoscenza (D. De Nart, CREA), and 2. Gli open data in LIFE FOLIAGE (A. Alivernini, CREA);
  - a session on the project's contribution to regional forest policy and national programming, with participation from project partners and national stakeholders: 1. LIFE FOLIAGE e SINFOR: due elementi di uno stesso puzzle (R. Romano, CREA-SINFor); 2. Dati per la programmazione forestale regionale e le aree protette (F. Grohmann, Regione Umbria); 3. La Piattaforma di Supporto alla Governance di FOLIAGE (M. Bascietto, CREA); 4. Dati per le "Forestry Statistics and Account" (G. Seri, ISTAT); 5. Conclusioni e domande (R. Romano)

  The unspent budget ("Sponsorization of SISEF congress with dedicated session" in "Other costs" category) from the CB was transferred to Almaviva to compensate the increased workload under Action B.1.

  It is important to note that the scientific and academic community was nonetheless widely engaged throughout the project, with a total of **392 individuals from academia** reached through:

  - initial participatory events (Action A.2, page 10),
  - the "Participatory event to gather requirements from policy-makers" (Action B.3.2, page 15),

- knowledge sharing sessions on forestry governance at both regional and national levels (Action B.4.1, page 17), and
- the Final Project Congress (Action D.1, page 22).

- **Participation at international DGA and KOM events**: the joint LIFE KOM in Bruxelles was not carried out due to COVID pandemic restrictions. The "Dissemination meeting at Directorate-General for Agriculture" event was not carried out due to the delays that affected actions B1 and B3, B4 leading to the inability to complete the monitoring period and the lack of 1 year worth of data that was to be presented at DGA. Dissemination of the system's replicability to other Member States will be carried out through international conferences, where the results of FOLIAGE remote sensing methodologies and data on forest logging permits recorded by the FMP will be featured. This unspent budget ("Travel" category) from the CB was transferred to Almaviva to compensate the increased workload under Action B.1 (section "Comments on financial deviations", page 42).

6.3 Evaluation of Project Implementation

Methodology applied: project implementation was monitored in Action E.2 using standard monitoring tools such as action dashboards and effort spreadsheets and activities such as periodic one-to-one meetings between CB and each AB to discuss action progress and technical and financial issues. Project objectives, indicators, deliverables and progress indicators were clearly assigned to specific responsible ABs. This approach proved to be fairly successful in early spotting difficulties experienced by ABs and the potential issues affecting linked activities by other involved ABs. Project wide issues were escalated to the project steering committee by the PM to take project-level decisions. The PM² project management methodology, developed and endorsed by the European Commission, was used as management methodology.

Results achieved: the following tables compare quantitative and qualitative activities with the objectives and expected results in the proposal at Action level.

	Foreseen in the revised proposal	Achieved	Evaluation
A.1	Objectives: 1. shape the concept of the Forest Management Platform (FMP) 2. map the regulations and all other forms of administrative and legislation forms Expected results: Complete understanding of the requirements of the regional forest sector to develop the software platforms	The objectives and results were all achieved.	Action deliverables were met with significant delay (1.5 year) due to a number of reasons including: • several organisation rearrangement of RegLazio functional offices, role of personnel and specific staff assigned to FOLIAGE, starting January 2021 all through September 2022, also hindering the hiring of the external assistance • hacker attack of RegLazio IT infrastructure • COVID pandemic situation in 2021 prevented face-2-face meetings early during action course The delay of Action activities has strongly affected Action B.1 software development and, consequently, regional and national governance actions (B.3, and B.4), and technical dissemination activities foreseen in Action D.2.
A.2	Objectives: To scout and consult other stakeholders interested in project results and products. Expected results: Involve national and regional stakeholders interested in FMP (5), EOP (5) and IEP (2)	The objectives were achieved.	All action deliverable and expected results have been met in time.
B.1	Objectives: Develop an informative system that will be the main hub for forest management data and forest plans, at the level of the regional and local public administrations. Expected results: IT support for improving forest governance at regional and national level	All forest governance IT support platform (FMP/EOP/IEP) were developed and are online for RegUmbria and RegLazio beneficiaries	A delay of 10 months in action activities was caused by several amendments that were made to the requirements drafted by Action A.1 by the regions and by a lack of incorporating GDPR regulations into a previous version of the software developed. The software platforms are now online and aligned to amended regional requirements

			and EU regulation.
B. 2	Objectives: Validate the accuracy of the vegetation alerts detected by the Earth Observation Platform. Expected results: Provide support for field control of illegal logging	Year 1 and 2 of field validation were carried out. Illegal logging cases and vegetation alerts were assessed on experimental areas	All activities were carried out and results achieved on time.
B. 3	Objectives: 1. Enforce the digitisation of forest management with legislative and administrative amendments 2. Tailor FEF information access to territory managers and politics for territorial planning and economic programming Expected results: Simplification of administrative burden for forest owners and PA. Provision of real-time data and reports of forest logging activities to the PA	All objectives and results were achieved for Regione Umbria. Despite being online for Regione Lazio the software cannot be used by its provinces/townships due to missing agreements between the Region and the provinces/townships at the end of the project.	All action activities foreseen in the have been carried out. The provision of real-time data and reports is granted to all PA users of the software. The monitoring of the usage of the software platforms (1 year long) has started in September 2024 (RegUmbria). Agreements between authorities in RegLazio are under way and expected to take place by the end of 2025.
B. 4	Objectives: Improve national knowledge of forest harvest dynamics in Lazio and Umbria regions Expected results: 1. Provide forest harvest indicators to national reporting stakeholders. 2. Increase public awareness about sustainable management. 3. Provide real-time data about forest harvests to patrolling bodies. 4. Improve monitoring of Natura 2000 areas.	Forest governance reports aggregating forest permits and ecosystem condition maps of Natura2000 areas were implemented following local, regional and national stakeholder guidance and can flow to them without any further aggregation performed by humans.	All action activities foreseen in the have been carried out. The delay of Action B.1 has affected by 1 year the timing of the flow of the first yearly reports to stakeholders (expected by the end of 2025).
B. 5	Objectives: Plan the transfer of technical knowledge, results obtained in the project Expected results: Deliver the project replicability and transferability plan	The “Replicability and Transferability Plan (RTP)“ deliverable was achieved.	The deliverable was amended following external monitor recommendations.
C. 1	Objectives: Measure the concrete impacts of the project Expected results: Public tenders follow GPP criteria	Expected results have been achieved	All project beneficiaries were aware of Key Project Indicators and all project actions expected results have been assigned to unique ABs. Monitoring of progress is performed through IT tools and one-to-one meetings among CB and each AB.
C. 2	Objectives: Measure the impact of the project on society, environment, and economy Expected results: Quantitative and qualitative improvement of forest digitisation in Lazio and Umbria Regions.	Expected results have been achieved. Quantitative questionnaires to project stakeholder have been handed out and their results elaborated to estimate the project baseline and the impact of the digitisation on the forest sector in the PA	All activities were carried out. Quantitative figures were estimated to assess the impact of digitisation. A number of scientific papers were published documenting the results.
D. 1	Objectives: 1. increase the capacity building of public managers and civil servants 2. improve citizen awareness in the subject of sustainable forest management and biodiversity conservation 3. disseminate project results to other PAs and Member States Expected results: Website, printed dissemination material, layman’s report, dissemination meetings, presentation in national and international conferences	Most of the expected results the in reporting period have been achieved.	All foreseen audiences were achieved and the number of people reached in dissemination events and through the Web far outreached what was foreseen. A major dissemination event was not carried out concerning the “Dissemination meeting at Directorate-General for Agriculture”. This was due to the delays that affected actions B1 and B3, B4 leading to the inability to complete the monitoring period and the lack of 1 year worth of data that was to be presented at DGA. Dissemination of the system’s replicability to other Member States will be carried out through international conferences, where the results of FOLIAGE remote sensing methodologies and data on forest logging permits recorded by the FMP will be featured
D. 2	Objectives: Deliver the know-how of Foliage technologies to Regions, Provinces, Municipalities, forest	Technical disseminations events were organised in hybrid format (in presence	The number of events was lower than foreseen due to the delays that affected action B1.

	professionals, Forest owners, National and Regional Parks, Ministries, the scientific community Expected results: Forest owners, professionals and PA have knowledge to use FOLIAGE software	and online) that included all audiences that will be using the software platforms.	
E. 1	Objectives: manage technical, scientific and financial issues of FOLIAGE to meet LIFE requirements Expected results: No expected results	No expected results	All action activities are on track.
E. 2	Objectives: measure the effectiveness of the project actions as compared to the baseline, objectives and expected results Expected results: No expected results	No expected results	All action activities are on track.
E. 3	Objectives: Plan the communication after end of project Expected results: Deliver the After-life plan	The "After-LIFE Plan" deliverables was met.	The plan for the after-life is a comprehensive documents detailing all activities and beneficiary responsible to carry out the monitoring period initially foreseen in action B1, the agreements between authorities in Region Lazio, and all replications activities

Visible project results

The most visible project results are the software platforms (FMP/EOP) developed. They are all online and used by the public and the PAs of Regione Umbria to collect forest authorisation permits and to monitor forest harvests and conservation status through remote sensing:

- **https://portal.lifefoliage.eu/foliage/umbria/login**
- **https://portal.lifefoliage.eu/foliage/lazio/login**

The IEP app is available for download upon authentication to the FOLIAGE platforms, and the data collected within its usage in forest integrated within the workflow of FMP.

Results of replication efforts

The replication efforts follow what has been foreseen under Action B5 and E3. Replication actions are integrated into the after-life plan, particularly under Actions 10, 11, 13, 14, and 15, which focus on dissemination, technical assistance, stakeholder networking, and reuse of the system by other public authorities.

During the project, LIFE FOLIAGE engaged with several Italian regions interested in system replication, including:

- **Abruzzo** and **Marche**: definition of functional and administrative requirements for adapting the Forest Monitoring Platform (FMP) to non-partner regional frameworks.
- **Toscana** and **Piemonte**: exchange of technical expertise on satellite-based forest monitoring.
- **Lombardia** and **Toscana**: exchange of experience on regional administrative systems.
- All Italian regions and autonomous provinces were reached through communications sent to the Permanent Table on the Forest Sector, involving **117 public officials** in collaboration with MASAF.

On 30 May 2025, Regione Umbria organised the event "*One-day meeting in Perugia, introducing FOLIAGE technologies to Regions, other PAs, National and Regional Parks*", to present the project's digital platforms and technologies.

Participants included municipalities with forested land, agrarian communities, AFOR (regional forest agency), and Managers of parks and protected areas. Around 10 participants attended, and the agenda covered:

- Overview of current regulations and internal procedures for forest intervention authorisations in Umbria
- Digitalisation approaches introduced by LIFE FOLIAGE
- Demonstration of the PAF platform and its integration with AFOR procedures
- Pre-evaluation processes for interventions in protected areas and Natura2000 sites, and their integration into digital workflows and management plans
- Open discussion and participant feedback.

Effectiveness of the dissemination activities

The dissemination activities have so far reached almost 53,496 people from the general public including people directly reached at dissemination events and those that connected with the project through its social media, website and newsletters. 283 forest professionals participated in FOLIAGE online events and in technical trainings.

A total of **53,496 people** were reached through various dissemination events under **Action D.1**, broken down as follows:

Table 3: Audience of the dissemination events organised by the project

Type of Event	Outside Project Area	Within Project Area	Total
Press articles	7,26	–	7,26
Conferences	219	230	449
General dissemination	350	793	1,143
Scientific dissemination	–	392	392
Governance	–	14	14
Landscape Hunt game	190	10	200
LIFE FOLIAGE Magazine	823	42	865
LIFEIs30	–	150	150
Mobile dissemination	–	76	76
Social media	40,800	2,147	42,947
Total	**49,652**	**3,854**	**53,496**

This table provides an overview of the categories of individuals and institutions involved in the LIFE FOLIAGE project, as well as the project's technical dissemination activities under **Action D.2**.

Table 4: Audience of the dissemination events organised by the Action D.2

Audience or Category	Number
Professionals	283
NGO Staff	3
Parks Personnel	8
Ministry Staff	12
Public Administration Staff	129
Researchers	96
CUFAA Personnel (Army Forestry Corps)	22
Total audience reached	**553**
Scientific Articles	3
Oral Presentations at Scientific Conferences	4
Posters Presented at Scientific Conferences	4

During dissemination events we handed out 90 FOLIAGE branded water bottles and 95 branded usb sticks as gadgets and 500 brochures. Two roll-ups were printed and displayed on all dissemination events of action D.2. The after life plan, replication plan, and layman's reports are available on the project web site. Printed copies of the layman report were disseminated during project final congress (15 May 2025) along with project brochures and leaflets. The layman reports were distributed among project beneficiaries for further dissemination.

The project **web site** received 42,500 unique users, generating around 113,400 page views. Most visited pages were the Home page (~36,000 views), the Contact page (~14,500 views), the News on Maker Faire 2022 (~13,000 views), and the Page describing the Forest Administrative Platform (~5,000 views). A **promotional video** about the PAF was produced and shown during dissemination events: Watch the video

In addition to communication tools, the effectiveness of the dissemination activities was also boosted by the participation of FOLIAGE CB in a number of events held by the "Permanent Conference for relations between the State, the Regions and the Autonomous Provinces of Trento and Bolzano". The conference pursues the objective of achieving loyal cooperation between central and regional administrations on all aspects of Community policy which are also of regional and provincial interest.

The project has been widely disseminated among forest services of all Italian Regions and autonomous provinces. Many of them have been recruited as stakeholders either to collaborate on drafting the requirements for the FMP (such as Piemonte, Lombardia and Toscana) or to have a chance to evaluate the FMP on the project cloud infrastructure (such as Campania, Abruzzo and Marche).

Policy impact

Support to legislation

LIFE FOLIAGE made a significant contribution to improving the governance of forest ecosystems in Italy by equipping regional Public Administrations—specifically **Regione Umbria** and **Regione Lazio**—with tools and methods that align with EU environmental legislation. The project addressed a critical national gap: the inability of most Italian Protected Areas (PAs) to manage or monitor their forest resources effectively, and consequently, their limited capacity to contribute to national and EU environmental reporting.

Through the co-development of the **FOLIAGE information system**, including the **Forest Management Platform (FMP)**, the **Environmental Operations Platform (EOP)**, and the **Governance Support Platform (PSG)**, the project created a baseline for standardised, scalable, and transparent forest monitoring. These tools support Italy's obligations under:

- The **Birds and Habitats Directives**, by enabling monitoring of forest habitats and conservation status within Natura 2000 sites;
- The **EU Forest Strategy**, by enabling tracking of forest interventions against sustainable forest management (SFM) criteria;
- The **Environmental Information Directive**, through open access to administrative and ecological forest data;
- The **Due Diligence Regulation and EU Timber Regulation**, by facilitating traceability and control of timber sourcing through digitalised logging authorisation workflows.

Main barriers and actions taken

The project encountered several barriers, which were addressed through coordinated technical and governance strategies:

- **Fragmented data standards and absence of harmonised indicators** made it difficult to align regional forest information with national and EU-level reporting.

  Response: The project contributed to the **SINFor project** (coordinated by MASAF) to co-define standard forest indicators at national scale. FOLIAGE supported the development of indicators such as "*Authorized logging permits issued"* and "*Notices of logging activities"*, which are now integrated into the PSG and formatted to meet SINFor, ISTAT, and ISPRA requirements.

- **Lack of integration between local, national, and EU governance levels**.

  Response: LIFE FOLIAGE acted as a bridge between regional PAs and national authorities (e.g., MASAF, CREA, ISPRA), co-developing four consolidated PSG products for streamlined governance reporting. These were presented publicly at the MASAF event on 15 April 2025 and will begin contributing to national reports starting from 2026 (Umbria) and 2027 (Lazio).

- **Inadequate access to reliable forest data by enforcement bodies.**

  Response: The system was extended to **CUFAA** (Carabinieri Forestali), enabling secure access to application data, documentation, and spatial verification tools. A dedicated cartographic product (*PMF 2*) alerts authorities to potential illegal logging by intersecting satellite-detected anomalies with authorised permits.

- **Low capacity for monitoring forest conservation status in Natura 2000 areas.**

  Response: The project implemented two annual satellite-based products—*Nat1 (vegetation anomalies)* and *Nat2 (forest conservation status)*—providing Natura 2000 site managers and the Ministry of the Environment with key indicators such as cover extent, disturbance percentage, and Rao's Q diversity index.

- **Need for improved public awareness**, especially regarding Natura 2000 objectives and sustainable forestry.

Response: Although general public use of the IEP/PRIF mobile app was excluded during project negotiation, outreach materials were produced, disseminated via brochures and events, and partially published on the project website.

Policy Developments Resulting from the Project

LIFE FOLIAGE contributed to several tangible developments in forest policy and governance:

- **Institutionalisation of forest indicators**, via the SINFor project, allowing the replacement of ad hoc regional contributions to national forest reports with structured, platform-generated data.
- **Formal collaboration between Regions and national institutions** (CREA, MASAF, ISPRA, ISTAT) on forestry reporting and data sharing.
- **Introduction of operational dashboards and annual products** that can inform Natura 2000 site conservation plans and strategic environmental assessments (SEAs).
- **Digitalisation of control mechanisms**, enhancing efficiency and transparency in enforcement actions by CUFAA and regional agencies.

These developments are a direct response to national shortcomings identified by the EU in terms of insufficient knowledge on forest habitat status, and represent steps toward more coherent, measurable, and enforceable environmental governance in Italy.

Delivery of EU added value

LIFE FOLIAGE fully delivered on the EU added value foreseen in the Grant Agreement Form B3:

- It established a **robust digital infrastructure** for forest monitoring that can readily be replicated across all Italian Regions, enabling PAs to produce verifiable, standardised data to support EU reporting obligations (Figure 6).

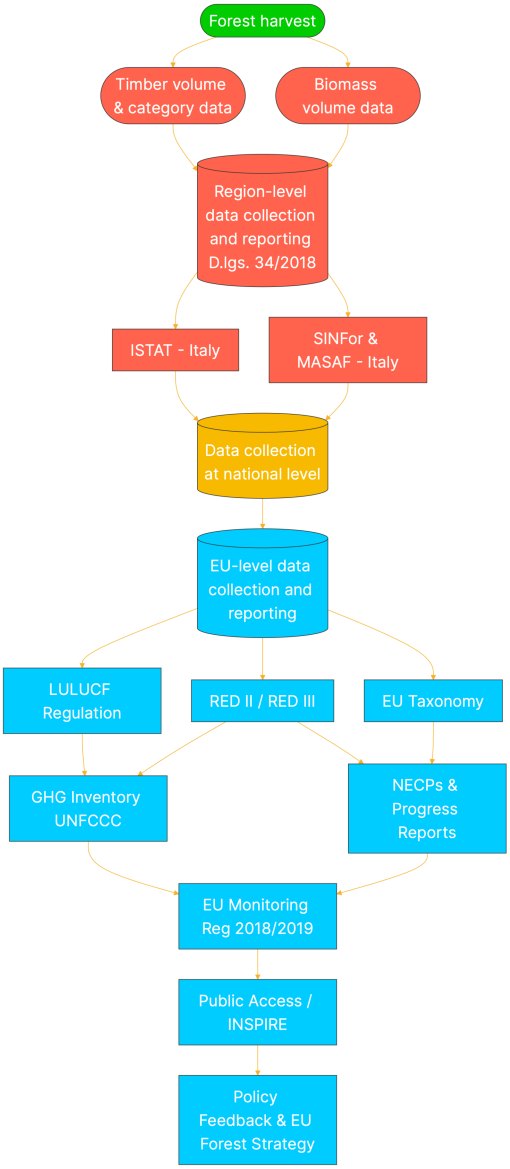


Figure 6: Flow of forest harvest data from Regional to National and EU levels. FOLIAGE software level is shown red colour.

- It **aligned regional systems with EU policies**, creating an interoperable governance framework that facilitates reporting under the Birds and Habitats Directives, EU Forest Strategy, and EUTR.
- It fostered **inter-administrative dialogue**, enhancing coordination between regional authorities, environmental ministries (MASAF), and enforcement bodies (CUFAA).
- It supported **institutional capacity building**, including technical training for PA staff and CUFAA officers, and the design of customised interfaces for different user profiles.
- It laid the groundwork for **scaling up** the model to other Italian regions and potentially to other EU Member States facing similar challenges in forest governance and Natura 2000 management.

6.4 Analysis of benefits

The project has delivered substantial benefits in line with the LIFE Environmental Governance and Information objectives:

- **Institutional Benefits:** The creation of a unified digital forest governance framework has significantly improved the capacity of Regione Umbria to process forest-related authorisations and to monitor forest management practices. The FMP system allows for the standardisation of workflows, increases transparency, and supports regulatory compliance. Although not fully deployed in Lazio, the system is technically ready and can be activated upon completion of administrative prerequisites.
- **Environmental Benefits:** The Earth Observation Platform (EOP) enabled near-real-time detection of forest disturbances, supporting early identification of illegal logging and natural damage events. Alerts were tested successfully in pilot areas, showcasing the potential to strengthen enforcement and conservation monitoring in line with the EU Biodiversity and Habitat Directives.
- **Societal Benefits:** Through the Information Exchange Platform (IEP), the public gained access to georeferenced information on forest activities, contributing to enhanced transparency and awareness. Engagement with citizens and forest stakeholders improved the social acceptability of forest governance measures.
- **Policy and Replicability:** The project has laid the foundation for broader replication in other Italian regions. Its compliance with INSPIRE and open-source principles, coupled with extensive documentation and stakeholder involvement, ensures high transferability potential. The inclusion of structured after-LIFE commitments further supports sustainability and long-term impact.

Overall, LIFE FOLIAGE represents a relevant, effective, and sustainable intervention for improving forest governance in line with EU environmental policy frameworks.

Governance Benefits

The LIFE FOLIAGE project has significantly improved forest governance at both regional and national levels by digitalising key administrative procedures, enhancing institutional transparency, and enabling structured data flows for policy reporting. The governance benefits can be summarised as follows:

Multilevel Legal and Policy Alignment

LIFE FOLIAGE has made a substantial contribution to strengthening forest governance in Italy and aligning regional practices with both national and European regulatory frameworks. In particular:

- The system developed under the project enables the structured transmission of forest data from Regions to MASAF and ISTAT, as required by Article 7 of Legislative Decree 34/2018, through integration with national forest information systems (SiTeR and SiNFor).
- The platform generates data that directly support the National Forestry Plan (PFN), contributing to the monitoring of silvicultural activities, managed forest areas, approved forest management plans, and available biomass resources.
- Project outputs comply with the INSPIRE Directive (2007/2/EC), ensuring interoperability and public access to environmental data across the EU.

In addition, FOLIAGE directly supports Italy's compliance with a number of key European regulations:

Table 5: Key European regulations supported by the project governance reporting

EU Regulation / Directive	FOLIAGE Contribution
Regulation (EU) 2018/1999 – Governance of the Energy Union	Provides data for Integrated National Energy and Climate Plans (NECP)
Regulation (EU) 2018/841 – LULUCF	Tracks forest removals and supports accounting of emissions and removals
Decision No. 529/2013/EU	Supports data collection on deforestation, afforestation, and forest management
Directives RED II & RED III	Ensures traceability of forest biomass and compliance with sustainability criteria (Art. 29)
EU Forest Strategy for 2030	Promotes harmonised monitoring of forest conditions and wood extraction
Regulation (EU) 2023/1115	Supports traceability of products linked to deforestation
Regulation (EU) 2020/852 – EU Taxonomy	Provides data for environmental classification of forest-related activities

Thanks to these contributions, the FOLIAGE platform serves as a national digital reference model for forest monitoring, governance, and data reporting, with direct impacts on the implementation of the European Green Deal, the EU Forest Strategy, and broader environmental and climate reporting obligations.

Regional Digitalisation of Forest Procedures

- **Regione Umbria** has fully digitised all experimental applications through PAF. It introduced new legal provisions (RR 4/2023, Art. 111bis) mandating digital-only workflows for forest procedures. Results include a **30% reduction in submission time** and streamlined administrative reviews.
- **Regione Lazio** is finalising its regulatory adoption (via Regional Government Resolution), with GDPR-compliant data access for municipalities and supervisory bodies. Technical modules (PAF, PSG) are ready and scheduled for public release in the After-LIFE phase.

Both regions are integrating PMF and PSG products into their public geoportals and regional forest plans.

Improved Planning and Control

Thanks to digitalisation:

- Monthly and annual reports on forestry operations are generated automatically at regional level;
- Mapping of digital forest applications (18+ cases within months in Umbria) supports strategic forest planning;
- Digital pre-assessment of environmental compatibility accelerates authorisation;
- Cross-validation with CUFAA field alerts (PMF) enhances enforcement.

These outputs also support **adaptive governance** for Natura 2000 sites and protected areas.

Support to National Governance and EU Reporting

The project supports:

- Generation of data for **ISTAT forestry indicators**;
- Structured flows to MASAF for national reporting obligations;
- Data contributions to EU monitoring frameworks (LULUCF, Forest Strategy, NECP);
- Compatibility with ongoing digital transformation under the **Italian 2022–2040 National Forest Strategy** the.

Replicable and Interoperable Framework

FOLIAGE is fully replicable:

- The software is based on open standards and modular architecture;
- Demonstrations were delivered to stakeholder regions (**Abruzzo, Marche, Emilia-Romagna, Tuscany, Campania**);
- The project was presented at the **State–Regions Technical Working Group on Forestry Digitalisation**, receiving strong institutional interest;
- Beneficiary regions **committed to active dissemination** in the After-LIFE Plan, including training, documentation sharing, and technical onboarding.

FOLIAGE stands as a **national digital reference model** for forest governance, supporting harmonisation, accountability, and efficient data management across Italy and potentially other EU Member States.

Environmental monitoring benefits

Through the Earth Observation Platform (EOP), the project enables **near-real-time detection of forest disturbances**, such as fires, illegal logging, and defoliation. In pilot areas, the system generated **86 validated alerts** across **27 hectares**, which were investigated by CUFAA. The integrated monitoring function supports **carbon sink accounting** and biodiversity protection under EU climate and forest policies.

Impact on Natura 2000 Forest Areas

FOLIAGE enables effective environmental monitoring of forest habitats within the Natura 2000 network through two key geospatial products:

- **PMF 1**: mapping of authorised forest interventions intersecting Natura 2000 sites;
- **PMF 2**: satellite-based detection of ecological disturbances (e.g. defoliation, fire).

These products:

- Provide **quantitative biodiversity metrics** using indices such as Rao's Q (spectral heterogeneity);
- Allow **early identification** of anthropogenic or natural disturbances;
- **Support site managers** in planning adaptive conservation strategies;
- Reduce costs and increase coverage compared to field inspections;
- Enable compliance with **EU Birds and Habitats Directives** and national biodiversity monitoring targets.

The Region of Umbria has already integrated the system into its Natura 2000 site governance processes, and is using PMF outputs to adjust conservation priorities and validate forest intervention plans. Lazio is adopting a similar model for protected area management through its regional parks system (e.g. Monti Simbruini).

Economic benefits

The FOLIAGE project demonstrated a measurable economic impact through the digitalisation of forest administrative processes and enhanced forest management efficiency. In the Umbria Region, a Life Cycle Assessment (LCA) applied to administrative procedures showed a reduction of CO_2 emissions from 75.07 kg to 38.14 kg per procedure, equivalent to ~5.5 tCO_2 avoided per year across 150 procedures.

At the systemic level, statistical analysis (Action C2) revealed that increased digitalisation correlates strongly with:

- A **20% increase** in value-added per worker in the wood industry;
- A **150% increase** in the number of registered forest enterprises;
- A **120%+ growth** in approved forest management plans.

These results support the conclusion that digital tools (PAF, PRIF, PMF, PSG) improve not only process efficiency but also support **economic development** in rural areas and expand the bio-economy around non-timber forest products and services. The platforms further enable cost reductions via process dematerialisation, reduced processing times, and greater transparency in licensing and planning.

Societal and Capacity Benefits

Over **11,426 individuals** were reached during dissemination activities (ie excluding social media users), with usage projected to exceed **12,000**. Capacity building was achieved through stakeholder training, benefitting at least **104 public officials and forestry professionals**, with **28 users** demonstrating behavioural change. This user base represents approximately 25% of professionals active in forestry management operations in the Umbria Region.

FOLIAGE's digitalisation strategy has produced tangible **social impacts**, particularly in skills development, professional engagement, and public sector performance. The project:

- Enabled the recruitment of 3.59 additional **FTEs**, including young researchers, digital technicians, and communication staff, many of whom transitioned to temporary or stable positions (e.g. job contracts at Regione Umbria).
- Strengthened the role of **professional foresters** through training, participatory testing, and active involvement in platform design.
- Promoted inclusivity and simplification for forest owners, especially smallholders, by reducing the complexity of application procedures and offering mobile-based support tools (PAF + PRIF).
- Created interfaces usable by **non-forest stakeholders**, such as protected area managers and Natura 2000 site administrators, enhancing participatory governance.

Social dialogue forums, technical focus groups, and stakeholder events reached over **130 individuals** from national, regional, and local institutions, promoting shared ownership and readiness to replicate the solution. The project also supported **institutional innovation** by aligning with the national SINFor platform and contributing to EU-mandated statistical flows.

Support to National and EU Reporting Frameworks

The system is **INSPIRE-compliant** and interoperable with existing national infrastructures. It supports Italy's commitments under several policies:

Table 6: Contribution of the software platforms to comply to national or EU policy

Policy / Instrument	FOLIAGE Contribution	Implemented By
Legislative Decree 34/2018 (Italy)	Generates and aggregates forest data (FMP) for MASAF and ISTAT as required by Art. 7	FMP (Umbria, Lazio)
National Forestry Plan (PFN)	Supports PFN indicators through harmonised digital reporting from regional systems	FMP + Reporting Dashboard
INSPIRE Directive (2007/2/EC)	Provides spatial datasets via INSPIRE-compliant architecture	All platforms (FMP, EOP, IEP)
Regulation (EU) 2018/1999	Enables monitoring/reporting of carbon sinks via alerts and forest usage data	EOP + Monitoring Reports
Regulation (EU) 2018/841 (LULUCF)	Tracks removals/emissions using EOP; supports national LULUCF accounting	EOP + FMP Integration
RED II & RED III (2018/2001 & 2023/2413)	Provides traceability of harvested biomass, supporting RED criteria compliance	FMP + Traceability Metadata
EU Forest Strategy for 2030	Enables multi-region coordination and reporting in line with EU Forest objectives	After-LIFE regional dissemination

Replicability and Uptake

The replicability of the LIFE FOLIAGE platform is structurally embedded in the project design:

- The entire software framework (FMP, EOP, IEP) is developed using **open-source components** and released under **free open licences**, ensuring that **all Italian Regions and EU Member States** can adopt and adapt it without licensing constraints.
- The project beneficiaries participated in multiple sessions of the **technical working group of the State–Regions Conference**, where the platform was officially presented. Its potential for national adoption was positively acknowledged.
- The platform was demonstrated directly to stakeholder regions including **Marche, Abruzzo, Toscana, Emilia-Romagna**, and **Campania**, which expressed concrete interest in adopting the system.
- Both beneficiary regions (**Umbria** and **Lazio**) have **formally committed**, through the After-LIFE Plan, to promoting the adoption of the FOLIAGE system among other regional administrations by:
    - Sharing documentation and use cases;
    - Supporting training and onboarding sessions;
    - Hosting technical demonstrations and knowledge-sharing events.

This active approach positions LIFE FOLIAGE as a **model of national coordination and EU-aligned digital transformation** in forest governance, with the potential to become a **standard reference framework for Italian forestry management** and a replicable solution in other Member States.

7. Key Project-level Indicators

The final actual values of the KPIs for LIFE FOLIAGE project were inserted in the online KPI database.

Four KPIs could not be reached, due to the delay in the online operational status of the software platforms specifically for Region Lazio.

Table 7: Unmet Key Project Indicators

KPI	Descriptor	Goal value	Reached value
1.6 Humans (to be) influenced by the project	Other persons influenced	1,200	405
1.6 Humans (to be) influenced by the project	Persons who changed their behaviour or practices due to the project actions	40	28
10.1.2 Supervisory/enforcement bodies involved	Local authorities	7	2
12.2 Professional training or education	Professionals – experts in the field	125	104

When Region Lazio will have completed its GDPR agreement to let its provinces use the software platforms, specifically tailored by Almaviva, the reached values are set to increase, as planned in the After-LIFE Plan (Action 3 "*Fornitura del FEF / SDF alle cinque province della Regione Lazio e sua adozione come modalità alternativa al cartaceo*", Action 4 "*Monitoraggio del sistema di flusso dei dati aggregati dei tagli boschivi autorizzati dalle Province alla Regione Lazio*"), and in sections "Deviations, delays and impact on other action" of Action B.1, page 13, "Summary of deviations related to events held", page 27, "Replicability and Uptake", page 37.

KPI 1.5

KPI 1.5 "Project area/length" reports on the total forested area for Umbria and Lazio regions (4,166 km^2 the former, 6,677 km^2 the latter) according to the most recent national forest inventory (year 2015). This indicator is in-line to what estimated at project beginning.

KPI 1.6

KPI 1.6 "Humans (to be) influenced by the project" includes 4 descriptors:

- Compared to Mid-Term Report a new descriptor has been added to account for "**Persons with improved capacity or knowledge due to project actions**" (first level descriptor) *i.e.* forest professionals that undergone technical training or joined the project technical dissemination events (104 people)
- The value for descriptor "**Persons who may have been influenced via dissemination or awareness raising project-actions (reaching)**" was increased to account the number of people directly influenced by the project dissemination events (11,426 people); at the beginning of the project the estimation it was valued at 1,200 people
- The value for descriptor "**Other persons influenced**" was pinpointed by reporting the potential total number of forest professionals in the Umbria and Lazio associations of foresters and agronomists that will change their behaviour when pursuing for an authorisation for a forest operation such as logging (405 people); at the beginning of the project we estimated to reach 1,200 people. This value was not reached due to the delay in the online operational status of the software platforms. Beneficiary regions committed to active dissemination in the After-LIFE Plan, including training, documentation sharing, and technical onboarding.
- The value for the descriptor "**Persons who changed their behaviour or practices due to the project actions**" included the number of P.A. employees (RegUmbria, RegLazio, and CUFAA) that worked in the project or that actively use the informative system developed by the project (28 people); at the beginning of the project we estimated to reach 40 people. This unachieved KPI is accounted for by the delay in the involving process of local authorities carried out by Region Lazio in the usage of the software platforms.

KPI 7.1: Ecosystem assessment

This indicator applies to two protected areas that joined the project as stakeholders. They are the "Parco dei Castelli Romani" (province of Rome) and "Selva del Lamone" (province of Viterbo). The "Ecosystem Assessment" descriptor

given is the compound area of the 2 areas. No new areas were established and no enlargements were done during the project as they are not among project objectives and results.

KPI 10.1.1: Duty holders covered

The duty holders that took part in the project are 2 regions (Lazio and Umbria, beneficiaries), a national ministry (for forest and agriculture, MASAF, stakeholder) and the national statistical body (ISTAT, stakeholder), as foreseen at the beginning of the project.

KPI 10.1.2: Supervisory/enforcement bodies involved

This KPI includes two descriptors:

- "**Local authorities**". The value of 7 local authorities foreseen at the beginning of the project was not reached due to the delay of Regione Lazio in activating its 5 provinces (Viterbo, Rieti, Roma, Latina, Frosinone) into adopting the FOLIAGE software. The final value reached was 2 (Perugia, Terni)
- "**National authorities**". The value of 2 national authorities involved foreseen was reached (MASAF and CUFAA).

KPI 10.1.3: Risk-based compliance/enforcement system put in place/completed

This KPI value, 3, was reached. Three systems were developed: i. administrative controls on field; ii. illegal loggings; iii. forest anomalies (fires, frosts, …).

KPI 10.2: Involvement of non-governmental organisations (NGOs) and other stakeholders in project activities

This KPI value, 2, was reached by involving Esplora Tuscia Aps-Ets based in Nepi (VT), and Inter_Valli Aps ASD, based in Ferentillo (TR) into dissemination events.

KPI 11.1: Website (mandatory)

This KPI value was increased to final value 42,500 (was estimated as 2,000 at the beginning of the project).

KPI 11.2: Other tools for reaching/raising awareness of the general public

This KPI includes 6 descriptors. Three descriptos were updated since project beginning:

- "**Other distinct media products created (e.g. different videos/broadcast/leaflets)**". This value was increased from 4 to 5 from beginning of the project, to account for the development of a web game not initially foreseen
- "**Number of different publications made (Journal/conference)**". This value was increased from 2 outcomes to 8 outcomes to account for the contributions to conferences actually carried out during the project
- "**Number of events/exhibitions organised**". This value was increased from 2 events to 5 events to account for the dissemination events at exhibitions organised by the projects (i.e. two Maker Faire and three Researches Night or open days)

Three more descriptors were added at the end of the project:

- "**Number of different displayed information created (posters, information boards)**". The project created two roll-up to be displayed during dissemination events. The value reached is 1.
- "**Number of articles in print media (e.g. newspaper and magazine articles)**". This descriptor accounts for the general public articles published during the project, not foreseen at the beginning. Its values is 4.
- "**Number of Hotline/information centers created**". This descriptor, not initially foreseen, accounts for the creation of a help line available for forest professionals and PAs interested in replicating the software. Its values is 1.

KPI 12.1 Networking (mandatory)

This KPI value was increased to final value 215 (was estimated as 82 at the beginning of the project to account for closed consultations with stakeholders) to additionally account for the people who participated in the open participatory events to gather requirements from stakeholder and forestry professional groups.

KPI 12.2 Professional training or education

This KPI includes two descriptors:

- "**Professionals – experts in the field**": forest professionals that undergone technical training or joined the project technical dissemination events (104 people). The target value (125 people) was not reached due to the delay in the online operational status of the software platforms in Region Lazio.
- "**Laymen**": this descriptor include the number of layman people involved in the 10 general dissemination field trips organised during the project (1,143 people). This descriptor includes very successful events carried out such as the **LIFEis30** (15/10/2022, 150 people), the "Simulation of forest surveys conducted by Carabinieri environmental monitoring teams using drones" event (30/05/2023) and the Maker Faire events. This descriptor replaces the "Other" descriptor added at the beginning of the project, with value 240.

KPI 13: Jobs

Table 8: Full time Equivalents (FTEs) provided during project and during after-life

Category / role in the project	Beneficiary	At the beginning	At the end	Beyond 3 years	Remarks
Research scientist / Remote sensing engineer	CREA	0	0.926	0.667	Extension of employment through an additional contract beyond the proposal's scheduled end date supported by CREA funding. Later employed on a **temporary contract** by the Umbria Region
Research scientist jr / Governance reports and GIS specialist	CREA	0	0.556		
Programming specialist	CREA	0	0.133		Collaboration supported solely through CREA funding, **no EC contribution sought**
Information Technology engineer	CREA	0	0.222	0.200	Collaboration supported solely through CREA funding, **no EC contribution sought**
News professional / Project communication consultant	CREA	0	0.222	0.010	
Communication agency	CREA	0	0.222	0.010	
Research fellow / expert in territorial management	UniTus	0	0.800	0.333	Later employed on a **temporary contract** by the Umbria Region
Regional communication and laws specialist consultant	RegUmbria	0	0.511	1.00	Later employed under a **permanent contract** by the Umbria Region
Regional communication and laws specialist consultant	RegLazio	0	0.00	0.00	
Total FTE		**0**	**3.59**	**2.22**	

KPI 14.1: Running cost/operating costs during the project and expected in case of continuation/replication/transfer after the project period

This descriptor has reached its foreseen value.

KPI 14.3: Future funding

This descriptor value (44.200 €) was estimated for the after-life period according to the effort foreseen in the after-life plan.

8. Comments on the financial report

8.1 Deviations from foreseen expenditure

Major financial deviations are detailed in the following table. Rows in red colour mark unforeseen expenses, rows in black colour mark savings partially or completely transferred between beneficiaries or between categories, rows in blue colour mark savings, rows in green colour mark variations at equal cost.

Table 9: Main project budget deviations [omitted]

8.2 Comments on financial deviations

Deviation to Almaviva budget

Almaviva incurred higher-than-anticipated personnel costs under Action B.1 due to a combination of factors that significantly increased the required effort. Personnel costs were calculated based on actual daily hours worked, including hours exceeding the standard working schedule, resulting in a higher number of billable hours per month. Furthermore, the activity was carried out by highly qualified staff with elevated hourly rates.

A full redesign, redevelopment, and retesting of the functionalities implemented in PAF v.1 was necessary, as the updated system requirements (v.2), delivered under Action A.1, introduced substantial changes to previously developed components. Additional work was also needed to develop and test PAF v.2, including multiple collaborative iterations with project partners to refine and finalise the new specifications.

The consortium's joint testing campaign prior to the public release of PAF v.2 required intensive coordination and technical support from Almaviva. Moreover, new features requested by regional partners for the public release, which were not part of the official version 2 requirements, required further development. Additional significant effort was also needed to ensure full GDPR compliance of both the PAF and PRIF systems, necessitating architectural and data processing adaptations.

To address the increased workload, Almaviva reallocated its internal resources and exceeded its initially allocated personnel budget for Action B.1. CREA, UniTus, and RegUmbria agreed to transfer unspent funds to Almaviva, as detailed Table 10.

Table 10: Budget shifts to Almaviva from project beneficiaries

	From Beneficiary	To Beneficiary	Amount	Reference	Annex
1	CREA	Almaviva	€ 17,928.58	Amendment to partnership agreement CREA-Almaviva (June 2024)	F_18
2	CREA	Almaviva	€ 6,000.00	Amendment to partnership agreement CREA-Almaviva (December 2024)	F_19
3	RegUmbria	Almaviva	€ 8,654.80	Amendment to partnership agreement CREA-Almaviva (May 2025) Amendment to partnership agreement CREA-RegUmbria (May 2025)	F_20 F_21
4	RegUmbria	Almaviva	€ 5,553.73	Direct bank transfer	
5	UniTus	Almaviva	€ 3,470.00	Direct bank transfer	
	Total		**€ 36,053.38**		

The budget transfer to Almaviva was approved during the Steering Committee meeting held on 12 February 2024, formally communicated to the Project Authority on 05 June 2024 (Annex F_22), and received preliminary acceptance on 24 June 2024 (Annex F_23).

Deviation to RegLazio budget

A budget transfer from RegLazio to CREA was implemented to compensate for the additional efforts undertaken by CREA in response to activities not carried out by RegLazio (row 13 of Table 9). The reallocation covered: (1) Personnel costs under Actions A.1, A.2, and B.3 (€9,938.00); (2) Travel and subsistence costs for participation in congresses and communication events under Action D.1 (€2,400.00); (3) External assistance costs under Action B.3 (€16,000.00); and (4) Other costs, such as congress fees (€2,600.00). Supporting documentation is provided in Annex T_02.

Following the project's conclusion, RegLazio informed the Coordinating Beneficiary that the individual recruited for the external assistance role "Regional Communication and Laws Specialist Consultant" formally declined the assignment and did not assume the position (row 14 of Table 9). The consultant was expected to carry out technical communication activities aimed at forestry professionals; however, due to delays in platform deployment by RegLazio, no such activities were implemented.

8.3 Summary of Costs Incurred

Table 11 provides a detailed overview of the costs incurred by the project across all budget categories compared to the original allocations defined in the Grant Agreement. As shown, the total expenditure during the reporting period amounts to €1,252,418.41, representing 100% of the total project budget (€1,246,805.00). This near-complete utilisation of the available budget reflects an efficient use of resources across most categories, although with some significant deviations that were previously discussed in this report.

Table 11: Project costs incurred

	Cost category	Budget according to the grant agreement in €*	Costs incurred within the reporting period in €	%**
1	Personnel	853,879.00	969,497.15	114%
2	Travel and subsistence	45,540.00	11,893.28	26%
3	External assistance	174,000.00	127,917.42	74%
4	Durables goods: total non-depreciated cost	45,200.00	37,774.50	84%
	- Infrastructure sub-tot.			
	- Equipment sub-tot.			
	- Prototype sub-tot.			
5	Consumables	6,600.00	3,769.04	57%
6	Other costs	41,500.00	21,794.76	53%
7	Overheads	80,086.00	78,450.26	98%
	TOTAL	**1,246,805.00**	**1,252.418.51**	**100%**

The most notable deviation occurred in the **Personnel** category, where actual costs reached €969,497.15, representing 114% of the originally allocated amount. This overrun, as explained in detail in the section regarding budget deviations for Almaviva (see section "Deviation to Almaviva budget" on page 42), was primarily due to the need for extended working hours, the involvement of highly qualified staff with higher hourly rates, and additional development work required by substantial changes to system requirements (e.g., the redesign and implementation of PAF v.2). Similar increases were also observed in CREA personnel contributions, especially under Actions A.1 and B.1.

To compensate for this overrun, resources were partially reallocated from categories where significant savings were achieved. In particular, the **Travel and subsistence** category was substantially underutilised, with only €11,893.28 spent out of a €45,540.00 budget (26%). This reduction was primarily due to the project's adoption of remote collaboration tools, and the shift of foreseen events as specific sessions of the final project congress, as described in row 21 of Table 9, and in the section "Deviation to outreach events" on page 28, which limited the number of in-person meetings and reduced travel-related expenses.

Similarly, the **External Assistance** category recorded a lower-than-expected expenditure (€127,917.42 or 74% of the budgeted €174,000.00). This is largely explained by the RegLazio deviation described earlier, where the planned engagement of an external consultant was cancelled due to delays and the formal withdrawal of the selected candidate, and to savings on the recruitment contracts, awarded to the lowest bid tender.

Expenditure in **Equipment** (€37,774.50, or 84% of budget) and **Consumables** (€3,769.04, or 57% of budget) remained within expected ranges, aligned with the project's cautious procurement strategy and GPP (Green Public Procurement) criteria.

The **Other costs** category also remained moderate, with €21,794.76 spent (53%), with savings thanks to the usage of external fundings for costs of participation at congresses, for printing of training materials by beneficiaries, and to the shift of foreseen sponsorisation of events as pointed out in the Travel and subsistence paragraph.

Finally, **Overheads** reached €78,450.26, which closely aligns with the maximum allowable ceiling (7% of direct costs), and was calculated based on actual eligible costs incurred.

In conclusion, the financial performance of the project shows a strategic reallocation of resources to address unplanned needs, particularly in personnel, while maintaining overall budget discipline. These reallocations were justified, documented (see Annexes F_18 to F_23 and T_02), and agreed upon by the consortium during formal coordination meetings.

8.4 Accounting system

All FOLIAGE project beneficiaries implemented structured and transparent accounting systems to ensure correct cost registration, allocation, and traceability, in line with LIFE Programme requirements, as reported in the Mid-term Report.

CREA used the *TeamGov* platform, assigning a unique project code (Ob. Fu. 1.08.09.61.00) and CUP code C72I20000110002 to identify all financial documents. Costs are approved following internal procedures requiring authorization from the project coordinator and the head of the research centre. Time is recorded electronically via the *Juppiter* system, with badge stamping and validation workflows.

Almaviva employed a dedicated SAP-based accounting and project tracking system, assigning the WBS code *22W-E13600.0001* to FOLIAGE. All costs are recorded via SAP and validated through a structured approval chain. Time registration is electronic, both in-office (badge) and remote (Web Stamp system via intranet), and project references are included on all supplier invoices, including AWS.

Regione Umbria used the SAP platform, assigning project-related codes (e.g., 00781-E) for income and expenses. Costs are validated through executive acts. Time tracking was managed first via Iriswin and later through the *Hepresenze* system, combining badge stamping and digital validation. Invoices include the project CUP code I69E20000410008 for traceability.

CUFAA managed FOLIAGE funds through the *SAP-IGRUE* platform of the Italian Ministry of Economy, using dedicated project and account codes (e.g., LIFE19 GIE/IT/000311 and CUP D85J20000080007). Time recording was manual, based on daily signed sheets and monthly data consolidation in the "Memoriale" system. All invoices had to explicitly include the project and CUP codes.

Regione Lazio used the *SICER* system, with FOLIAGE costs identified under code U0000A33276. Cost approvals were signed by the competent regional director. Time recording was electronic (badge + NOIPA platform), and references to the project were ensured through the CUP code F89B22000310006, mentioned in all relevant documentation.

UNITUS adopted the *EASYWEB* system with a unique budget code (DIBAF.LIFE.FOLIAGE.FCARBONE) and CUP J83C20002040002 to trace all transactions. The cost approval process involved both the scientific director and department administrators. Time tracking was electronic (START WEB) for technical staff and manual for researchers, with signed monthly timesheets for each. All invoices and payments explicitly referenced the project code and CUP.

8.5 Partnership arrangements

Partner agreements have been signed between CB and each AB.

Amendments to partnership agreements were agreed to certify budget transfers between ABs:

- 2 amendments to the partnership agreement between CB and Almaviva were agreed to account for the "Budget transfer between beneficiaries (to Almaviva)", row 7 of Table 9. The amendments were signed by the legal representatives of CREA and Almaviva on June 2024, and December 2024.
- 1 amendments to the partnership agreement between CB and RegUmbria was agreed to account for the transfer of budget from RegUmbria to CB. The amendment was signed by the legal representatives of CREA and RegUmbria on May 2025.
- 1 final amendment between CB and Almaviva was agreed to transfer RegUmbria budget to Almaviva. The amendment was signed by the legal representatives of CREA and Almaviva on May 2025.

The financial transactions between the CB and the ABs took place through bank transfers, as per the following table:

Table 12: Payments made to Associated Beneficiaries

AB	Amount	Payment date	Bank account
AlmavivA	€ 61,224.80 € 61,224.80	20/11/2020 10/05/2023	BANCO POP SOCIETA' COOP IT38 A050 3401 6890 0000 0004 913
CUFAA	€ 25,492.00 € 25,492.00	20/11/2020 12/05/2023	Conto di Tesoreria provinciale dello Stato IT07E0100003245350200023211
RegLazio	€ 16,909.60	20/11/2020	UNICREDIT BANCA ROMA 151 – REGIONE LAZIO 2 IT03 M020 0805 2550 0040 0000 292
RegUmbria	€ 17,309.60 € 17,309.60	20/11/2020 10/05/2023	Conto di Tesoreria provinciale dello Stato 0031068
UniTus	€ 25,541.60 € 25,541.60	20/11/2020 12/05/2023	CASSA RISPARMIO VITERBO AGENZIA DI CITTA' N. 3 IT10 N060 6514 5081 0000 0300 003

The consolidated cost statement has been prepared by the CB incorporating the information that has been entered by the ABs in the Financial Reporting.

8.6 Certificate on the financial statement

Not relevant.

8.7 Estimation of person-days used per action

Table 13 provides an overview of the actual person-day effort invested across the main groups of project actions, compared to the initially budgeted values. The total estimated effort amounts to 105% of the originally planned 3,825 person-days, highlighting a general overcommitment of resources, particularly in **Preparatory** and **Core actions**.

Table 13: Person-days involved in group of actions of the project

Action type	Budgeted person-days	Estimated % of person-days spent
Action A: Preparatory actions	156	136%
Action B: Core actions	2,260	112%
Action C: Monitoring of the impact of the project action	263	92%
Action D: Public awareness/Communication and dissemination of results	321	95%
Action E: Project management	825	86%
Total	**3,825**	**105%**

The significant overrun in **Preparatory actions (Actions A: 136%)** is mainly attributable to delays in "Action A.1 Consultation with project Regional PAs", as detailed in the technical sections of the report (pages 9 and Errore: sorgente del riferimento non trovata). This action, originally planned to last 9 months, was extended to 21 months due to the need for extensive coordination with regional stakeholders and the redefinition of software requirements. The increased effort ultimately led to the formal request and approval of a one-year project extension (Amendment approved on 04/10/2023, `Ref. Ares(2023)6737762`).

The **Core actions (Actions B)**, which represent the operational backbone of the project, also showed a notable overrun (112%). This was driven primarily by extended development and validation phases for the PAF and PRIF platforms, as described in the section on "Deviation to Almaviva budget" (page 42). The need to redesign functionalities following changes in system requirements (from PAF v.1 to v.2), the coordination of multi-stakeholder testing, and additional requests for new features by regional partners, significantly increased workload. This is also reflected in Table 11, where personnel costs exceeded the budget by 14% (€973,986.54 spent vs. €853,879.00 budgeted), confirming that much of the over-expenditure is linked to these core technical activities.

Monitoring actions (Actions C) and **Communication actions (Actions D)** remained within acceptable margins (92% and 95% respectively), suggesting a good alignment between planned and actual execution. Slight under-runs may be due to the reallocation of personnel resources to the more demanding preparatory and development phases, or to

increased reliance on internal capacity rather than external contractors—consistent with the underuse of the *External Assistance* budget seen in Table 11 (62% execution).

Management actions (Actions E) show the lowest utilisation rate (86%), which is coherent with the increased focus on technical delivery in Action B and A, particularly during critical phases such as software deployment and user training. Despite this slight underutilisation, administrative and coordination tasks were effectively managed, as confirmed by the project's overall execution rate (98% of total budget spent per Table 11) and the compliance with reporting and governance structures.

In conclusion, the data in Table 13, when viewed in conjunction with the financial figures in Table 11, provides a consistent picture of the project's dynamics: resource reallocations were required to address unexpected delays and technical complexities, particularly in Actions A and B, while other areas maintained operational efficiency without major deviations. The flexibility and responsiveness of the consortium ensured the achievement of the majority of objectives within the available budgetary framework.

9. List of annexes

Annexes are included in folders according to their nature:

- Project deliverables in folder “D_Technical_report/”
- Financial report and other administrative documents in folder “F_Financial_report/”
- Other technical and dissemination documents in folder “T_Technical_docs/”.

9.1 Technical report (D)

Project deliverables were delivered through the online Butler system and are not attached to this report.

9.2 Financial report (F)

Individual Financial Report (signed version and spreadsheet version) for each beneficiary, Consolidated Financial Report (signed version and spreadsheet version)m and other administrative documents are included in the folder “F_Financial_report/”.

References in the report and file names start with the letter “F”.

Table 14: List of financial annexes to the final report [omitted]

9.3 Other technical documents (T)

References in the report and file names start with the letter “T”.

Table 15: List of technical annexes to the final report [omitted]