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D 1.3

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Project Abstract

Biodiversity protection and restoration are critical for maintaining ecological balance and ensuring the planet's sustainability. In the absence of sustainable management and protection of natural resources, the negative impacts of climate change and other environmental issues will only increase.

Private investment can be a critical tool with the potential to play a transformative role in financing conservation and restoration efforts, as public financing alone may be insufficient to address the scale of these challenges.

By activating innovative sustainable finance solutions and incorporating technological advances within the field of geospatial analytics, private investment can be leveraged in a way that benefits the environment and secures investors' confidence.

BIO-CAPITAL is going to implement an interdisciplinary research and innovation endeavour by combining actions in the three fields of (i) biodiversity protection and restoration, (ii) biodiversity-friendly financing mechanisms and (iii) advanced space technology. Implementation will involve four key steps to leverage innovation:

- BIO-CAPITAL will analyse, understand and learn from use cases.
- BIO-CAPITAL will elaborate, monitor, and demonstrate through use cases.
- BIO-CAPITAL will co-develop, implement and amplify back to the use cases.
- BIO-CAPITAL will engage stakeholders, in order to reach shared views on these three steps and how they can be effectively combined to increase financial flows for biodiversity protection, restoration and sustainability.

Foreword

The BIO-CAPITAL project represents a pioneering initiative aimed at addressing the critical global challenges of biodiversity loss and ecosystem degradation. The project seeks to create innovative financial mechanisms that can support biodiversity protection and restoration by mobilising private investments and integrating advanced technologies such as geospatial analytics. In the face of climate change and the rapid depletion of natural resources, it has become clear that traditional approaches, relying primarily on public funding are no longer sufficient to meet the scale of these environmental challenges.

BIO-CAPITAL is an interdisciplinary project that brings together experts from various fields to explore new ways to finance conservation efforts through mechanisms like Biodiversity Certificates (BC), Payments for Ecosystem Services (PES), and Nature-based Solutions (NBS). By focusing on the intersection of finance, technology, and environmental sustainability, the project aims to create a more resilient and ecologically sound future, ensuring that biodiversity-rich areas are not only protected but also sustainably managed.

The Use Cases Description deliverable plays a crucial role in the success of the BIO-CAPITAL project. It offers a detailed exploration of real-world scenarios where innovative financial mechanisms and advanced geospatial technologies are applied to support biodiversity conservation. These use cases serve as practical examples, illustrating the challenges, solutions, and outcomes associated with integrating biodiversity protection into sustainable forest management, land restoration, and conservation efforts.

The project can gain valuable insights into how different financial instruments and technological tools can be effectively utilised by analysing these use cases. The deliverable also outlines lessons learned from each use case, highlighting both the successes and challenges encountered. These findings will be instrumental in refining the project's approach and scaling up its impact, ultimately contributing to creating more robust financial frameworks for biodiversity protection.

The Use Cases Description is a key resource for policymakers, investors, and stakeholders, offering a roadmap for how financial and technological innovation can be leveraged to address the pressing issue of biodiversity loss. It emphasises the importance of collaboration across sectors and underscores private investment's role in fostering a sustainable and biodiverse future.

List of participating organisations

Participant No.	Participant Organisation Name	Country
1 (Coordinator)	CESKA ZEMEDELSKA UNIVERZITA V PRAZE	CZ
2	GEOSYS	FR
3	AGROSOLUTIONS	FR
4	PRATENSIS	SI
5	INSTITUTUL DE CERCETARE PENTRU ECONOMIA AGRICULTURII SI DEZVOLTARE RURALA BUCURESTI	RO
6	AGCURATE BV	NL
6.1	AGCURATE BILGI TEKNOLOJILERI ANONIM SIRKETI	TR
7	GND TECHNOLOGY	LT
7.1	GND ADVISORY	LT
8	ON YEDI SURDURULEBILIRLIK HIZMETLERI DANISMANLIK AS	TR
9	UNIVERSITE CATHOLIQUE DE LOUVAIN	BE
10	FORUM PER LA FINANZA SOSTENIBILE ENTE DEL TERZO SETTORE	IT
11	JSC ONE S.R.L.	IT
12	Carbone 4	FR
13	AGRI SUD OUEST INNOVATION	FR
14	AARHUS UNIVERSITET	DK
15	OIKOPLUS GMBH	AT
16	COLLABORATING CENTRE ON SUSTAINABLE CONSUMPTION AND PRODUCTION GGMBH	DE
17	WESTCOUNTRY RIVERS TRUST LBG	UK

Change Log:

Version	Date	Description
V1.0	23.08.2024	Creation of draft version
V1.0	18.09.2024	Improved version
V1.0	30.09.2024	Reviewed and finalised by all the respective Use Cases Managers
V1.0	02.10.2024	Final version
V2.0	03.08.2025	Creation of improved version
V2.0	1.10.2025	Submission for internal review
V2.0	16.12.2025	Reviewed and finalised
V3.0	30.05.2026	Updated based on external review

Table of Contents

Definitions and Abbreviations

Abbreviation	Meaning
CA	Consortium Agreement
CICES	Common International Classification of Ecosystem Services
CMS	Content Management System
CSS	Cascading Style Sheets
D.	Deliverable
DoA	Description of Action
EC	European Commission
EU	European Union
ESS	Ecosystem Services
GDPR	General Data Protection Regulation
HTML	HyperText Markup Language
IPBES	International Panel on Biodiversity and Ecosystem Services
PU	Public
SEEA	System of Environmental-Economic Accounting
SEO	Search Engine Optimization
KPI	Key Performance Indicator
WP	Work Package
UC	Use Case

1. Introduction

The Use Cases within the **BIO-CAPITAL** project serve as practical demonstrations of how innovative financial mechanisms, coupled with cutting-edge geospatial technologies, can be employed to address biodiversity protection and restoration challenges. These real-world examples are essential in testing and refining the project's approaches to creating sustainable financing models that align environmental objectives with economic viability.

Each use case explores a distinct scenario in which biodiversity-friendly financing mechanisms, such as Biodiversity Certificates (BC), Payments for Ecosystem Services (PES), and Nature-based Solutions (NBS), which are applied to tackle complex environmental issues. By examining the dynamics of these scenarios, BIO-CAPITAL aims to generate valuable insights on how private investment can be mobilised to complement public funding in efforts to conserve natural resources, restore ecosystems, and mitigate the impacts of climate change.

In addition to the financial innovations, the use cases incorporate advanced geospatial analytics and space technologies to enhance monitoring, evaluation, and decision-making processes. These technologies enable stakeholders to track biodiversity outcomes, optimise resource allocation, and assess conservation projects' ecological and financial impacts.

The Use Cases represent a holistic approach, emphasising the importance of collaboration between diverse stakeholders, including governments, private investors, conservation organisations, and local communities. Through this interdisciplinary framework, BIO-CAPITAL seeks to ensure that the financial tools designed are not only economically viable but also socially inclusive and environmentally sustainable.

The use cases provide a structured way to assess:

- Real-world challenges and opportunities in biodiversity protection.
- The effectiveness of financial and technological innovations in delivering ecological and economic outcomes.
- The scalability and replicability of these solutions across different regions and ecosystems.

By studying these use cases, the BIO-CAPITAL project will be able to validate its strategies, refine its financial models, and provide concrete recommendations for scaling up biodiversity-friendly investments worldwide.

2. Use Cases Description: 1

2.1. UC1: Alpine forests, Austria and Italy

2.1.1 Use Case Overview

UC ID and Title

UC1: Alpine Forests, Austria and Italy

Lead Organisation(s)

JSC One

Duration and Timeline (phases of implementation)

UC1 is implemented according to the BIO-CAPITAL timeline

2.1.2 Location and Ecosystem Profile

Description of UC structure

Practice oriented

Geographic Coverage

UC1 refers to Italian and Austrian Alps and combines a general Alpine Biogeographical Region (as defined by EU legislation) perspective with a local approach based on an Italian and an Austrian case study.

The Italian Case Study refers to the areas of an ancient institution whose origins date back to the Middle Ages (the Magnifica Comunità di Fiemme - MCF, founded in 1111), covering around 20,000 ha of forests and alpine pastures, across the Fiemme Valley, the Fassa Valley and South Tyrol. Within its territory there are several areas of outstanding environmental value, designated as Natura 2000 sites. MCF is an institution based on a collective governance model (e.g., Local Commons), according to which the land and natural resources do not belong to private individuals, but to MCF, representing the local community.

The Austrian Case Study refers to an area of over 1,400 ha, owned by a private company (ASfG), located in the Radlgraben, a glen framed by striking summit structures stretching from east to west in the Reißeck group, the final south-eastern massive of the Hohe Tauern, the highest mountain range in the Austrian Alps.

Agro-environmental description

The territory of the Italian Case Study is located predominantly above 1,400m asl, but is characterised by diversified geo-pedological conditions, and correspondingly by different types of forest. Still, due to the mainly continental climatic characteristics of the MCF territory, broadleaved species are relatively under-represented and the European beech occurs only in the westernmost portion of the properties.

The territory of the Austrian Case Study ranges from about 900m asl in the east to about 2,300m in the west. The productive and non-productive, mainly spruce and larch forests, grow on steep to very steep N-NE and S-SW slopes, covering 80% of the area. The Radlgraben Case Study territory contains both areas with little or no human influence and disturbances, together with areas where the impact of anthropogenic pressures, such as past mining activities and more recent productivity-driven forestry practices, can be clearly observed. In the former, old, natural species-rich, multi-level forests have been preserved. These sites serve as valuable reference sites for the observation of forest soil development and for the study of mature fungal flora and mycorrhiza.

Ecosystem Type(s):

The UC1 habitats include alpine and subalpine grasslands, peat bogs, wetlands, scree slopes, rocky habitats, riparian ecosystems and forest formations of high ecological value. In particular, extensive areas are occupied by boreo-alpine siliceous grasslands, alpine conifer forests, heathlands, and habitats associated with peatlands and high-altitude environments.

The territory of the Italian Case Study includes the following EU Habitats: 3130, 3160, 3220, 3240, 4060, 4070, 6150, 6170, 6210, 6230, 6410, 6430, 6510, 6520, 7110, 7140, 7150, 7230, 8110, 8120, 8130, 8210, 8220, 9110, 9130, 9180*, 91D0, 9410, 9420.

The territory of the Austrian Case Study includes the following EU Habitats: 3220, 3240, 4060, 4070*, 6230*, 7110*, 8110, 8220, 9180*, 91D4*, 9410, 9411, 9420, 9421.

Map and Spatial Reference

Figure 1: UC1 Alpine reference areas in Italy and Austria

Figure 2: Italian Case Study areas in Val di Fiemme (Trento) - Natura 2000 areas in red

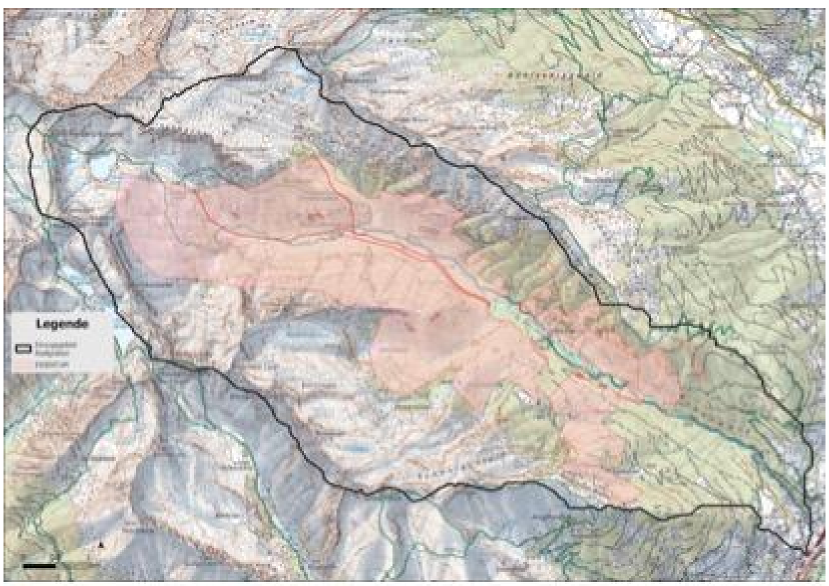


Figure 3: Austrian Case Study area within the Radlgraben watershed (Upper-Carinthia)

2.1.3 Environmental Context

Key Biodiversity Features

Alpine regional features include a relatively cold and harsh climate, high altitudes and a complex topography. These habitats host a wealth of biodiversity. Forests and semi-natural grasslands are found on the lower slopes (e.g., starting from approx. 600m asl), but, as the altitude increases and the temperature drops, trees become scarcer, giving way to alpine grasslands (e.g., at approx. 2000m asl), fells and scrub-heath communities. At their summits, amongst the rocks and snow, the vegetation is reduced to only a handful of highly adapted plants, able to tolerate extreme conditions. Alpine mountains have highly compressed life zones: habitats and species alter rapidly with altitude. The complex topography and different exposures (sheltered south-facing slopes, snow pockets, wind-blasted crags and uneven rock screes) also create a myriad of different micro-climates. All this explains why the Alpine mountains host such a rich and diverse biodiversity.

Because mountains still harbour large unfragmented areas where human disturbance is limited, they are an important retreat for many species (also large carnivores, such as wolves, bears and lynx) and birds (such as many species of raptor: eagles, falcons, vultures). The region is inhabited by true alpine specialists, including rodent species, such as the snow vole (Microtus nivalis), ungulates, such as the alpine ibex (Capra ibex), and many invertebrates, side by side with other species, well adapted to the mountain environment, including the ptarmigan (Lagopus muta). Many birds also stop over during migration. The Alpine mountains also boast a particularly large variety of insects (e.g., beetles and butterflies).

Threats and Pressures (current and historical)

Apart from climate change, which presents a major threat (see below), the Alpine Mountain ranges are also facing specific threats and pressures.

Typically, these regions have been poorly populated, due to their harsh climate, difficult access and short-growing seasons, which preserved the natural environment from anthropisation. For centuries, traditional human activities such as pastoral farming and manual wood-extraction practices, also supported natural habitats, significantly contributing to the Alpine biogeographical region’s rich biodiversity. In many Alpine areas, these traditional practices are now disappearing rapidly, negatively impacting the environment and, specifically, biodiversity.

In the past decades, other factors have heavily impacted this particularly fragile environment, e.g., the damming and channelling of alpine rivers, the construction of roads, mass tourism and the mechanisation of forestry.

But, as in the past, also, currently, the main threats and pressures are represented by wind-and snow- throws, which are also increasing vulnerability to pest outbreaks.

Climate Change Vulnerabilities

Climate change is a particular threat in high-altitude regions. Because of narrow ecological and climatic bands in the mountains, a small change has disproportionate effects. Their limited ability to absorb and retain water as well as the fast shrinking of glaciers pose an existential threat to many species, typical of those ecosystems.

Biodiversity in these areas is therefore particularly vulnerable to: rising temperatures, altered snow regimes, drought stress, increased storm intensity, pest and pathogen expansion, and possible future shifts in species composition.

In both Case Study areas, the 2018 Storm Vaia was a major disturbance event, causing unprecedented windthrow damage and leading to subsequent severe and enduring bark-beetle outbreaks.

Baseline Biodiversity Status

The baseline biodiversity status of the Case Study Areas within UC1 is characterised by a favourable conservation status, considering the continued presence of habitats and species of high conservation value, despite the rising threats and pressures from anthropisation and climate change.

The territories of both the Italian and the Austrian Case Study host key ecosystems such as forests, wetlands, high altitude ecosystems and fresh water. These ecosystems harbour a rich biodiversity and protected species.

Sustainable practices have been traditionally at the core of the forest management approach, with constant dedication to habitat restoration after natural disturbances, improving habitat suitability for ground-nesting bird species and contributing to ecosystem resilience. Generally, there is a strong commitment to balancing biodiversity conservation, sustainable resource use and long-term ecological resilience, although the contemporary mechanisation of forestry techniques has been posing critical challenges.

The Italian Case Study territory includes numerous protected areas belonging to the Natura 2000 Network, highlighting its high ecological and biodiversity value. The conservation objectives of these protected areas clearly focus on both maintaining the favourable conservation status of habitats and species and restoring the sites, following disruptive natural disturbances, in order to maintain the provision of ecosystem services (including carbon sequestration, soil protection, water regulation and landscape connectivity). Emphasis is also placed on safeguarding open high-altitude alpine habitats and landscapes, shaped by historical silvo-pastoral practice but now threatened by natural reforestation and shrub encroachment.

2.1.4 Use Case Objectives

Overview of Objectives

The objective of UC1 is to identify innovative solutions for unlocking financial flows to support sustainable Alpine-forest management practices that preserve and restore biodiversity, according to the EU Biodiversity Strategy for 2030, to the New EU Forest Strategy for 2030 and to the Regulation on Nature Restoration.

UC1 builds on two representative Case Studies for the Alpine region, impacted by the climate and environmental crises, which pose unprecedented challenges to forest managers for protecting and restoring biodiversity. These Case Studies, while fully addressing these EU policies, also encounter challenges in their practical implementation due to geophysical barriers, which limit the accessibility of sites. These barriers result in economic constraints, which depend, above all, on the fact that “Forests have a comparatively long-time delay between a management intervention and the response to that intervention. This makes it indispensable to adopt a forward-looking framework with a long-term vision” (Guidelines on Closer-to-Nature Forest Management, 2023, p. 40).

Tasks and Implementation Approach

The UC1 implementation approach is based on the continuous involvement in the research work of the key stakeholders of both the Italian and Austrian Case Studies. These aim to explore and develop new business and financial models, capable of integrating biodiversity conservation, climate adaptation and sustainable forest management to generate long-term economic value, reduce climate-related financial risks and support the diversification of forest-based revenues.

Key tasks concern the assessment of the economic and financial implications associated with:

- forest restoration through species diversification and mixed native stands;
- enhancement of ecosystem resilience to climate-related disturbances;
- biodiversity conservation and habitat management actions;
- protection and restoration of habitats;
- maintenance of ecosystem services;
- development of nature-based economic opportunities.

Within this framework, conservation measures are, at the same time, strategic investments, aimed at preserving the long-term productivity of forest ecosystems and, finally, at increasing the natural capital and economic value of the territory under management.

Environmental Goals

The objective of UC1 is to identify innovative, financially sustainable pathways to preserve and restore biodiversity according to the EU Biodiversity Strategy for 2030, to the New EU Forest Strategy for 2030 and to the Regulation on Nature Restoration. Specific goals, common to both Case Studies in Italy and Austria, are to:

- enhance forest biodiversity and habitat quality;
- increase climate resilience of Alpine forests;
- promote natural regeneration and mixed species stands;
- protect soil stability and watershed functions;
- improve ecological connectivity and long-term ecosystem integrity;
- support carbon sequestration.

Whereas the Italian Case Study is already substantially contributing to the EU network of protected areas with several Nature 2000 sites, the Austrian Case Study is focusing now on the identification, throughout its territory, of an OECM - Other Effective Area-based Conservation Measures (as introduced by the Convention on Biological Diversity - CBD), following the process defined by the IUCN.

Social Goals

Social goals are particularly relevant for the Italian case Study. MCF is dedicated to:

- strengthening community-based governance systems;
- preserving local cultural and forestry traditions;
- supporting environmental education and awareness;
- maintaining recreational and landscape values for residents and visitors.

Economic Goals

The overall economic goal of UC1 is to make economically/financially viable the implementation of the above-mentioned environmental and social goals.

For the Italian Case Study, the key challenge is to design and validate an innovative business model, supported by a solid financial mechanism for transitioning away from predominantly timber-based revenues. In fact, before the 2018 Storm Vaia, the MCF business model was based on a long-established and relatively stable sustainable timber production. Timber production represented a key source of revenue and supported a broad value chain connected to forest management, timber processing, local employment and ecosystem stewardship. Moreover, revenues generated from timber sales historically contributed not only to forest management activities, but also to the social and economic development of the local territory, such as the construction of the Fiemme Valley hospital. The extreme windthrow event caused by Storm Vaia, combined with subsequent bark beetle outbreaks and increasing climate-related vulnerabilities, severely disrupted this well-established business model. Timber production progressively declined from approximately 50,000 cm before Vaia to around 10,000 cm after the disturbance event and the related pest dynamics. These extreme natural disturbances (Storm Vaia and pest outbreaks) are causing a deep economic disruption, which includes the:

- significant reduction in revenues from timber sales;
- increased forest management and restoration costs;
- reduced economic predictability and long-term planning capacity;
- increased exposure to climate-related financial risks;
- deterioration of forest asset value in damaged areas.

The current situation is therefore not only an environmental challenge, but also a structural economic transition for MCF, requiring the development of an innovative business model supported by a solid financial mechanism enabling ecological restoration and long-term economic sustainability, based on both the economic valorisation of ecosystem services, apart from timber production, and on biodiversity conservation.

In a similar way, the Austrian Case Study is seeking to design and validate an innovative business model, supported by a solid financial mechanism, aiming to transition away from predominantly timber-based revenues, and to the identification of an OECM for the protection of its territory.

Policy Alignment

UC1 is intrinsically aligned to the EU Green Deal policy and specifically with the:

- EU Biodiversity Strategy for 2023;
- EU Forest Strategy for 2030 and the Guidelines on Closer-to-Nature Forest Management;
- EU Strategy on Adaptation to Climate Change;
- Regulation on Nature Restoration.

Expected Outcomes

UC1 is expected to strengthen the integration of ecological and economic decision-making processes by demonstrating how investments in biodiversity conservation and ecosystem restoration can generate long-term environmental and socio-economic value.

The UC is expected to financially support actions that strengthen the multifunctional role of forests. To this end, UC1 aims to identify coherent financial pathways to support the transition to business models less dependent on timber extraction and based on other revenue streams, consistent with the environmental goals of long-term resilience, sustainability and protection of alpine forest and high-altitude ecosystems. Expected outcomes include:

- increased recognition of natural capital and ecosystem services as key economic and financial factors, driving management and investment strategies;
- identification and assessment of innovative financial mechanisms linked biodiversity conservation and ecosystem restoration;
- reduction of long-term economic risks associated with climate change, pest outbreaks and extreme weather events.

More broadly, UC1 is expected to be a proof-of-concept and showcase its replicability to Alpine territories facing similar climate-related and economic challenges, demonstrating the economic and financial viability of business models addressing biodiversity conservation and long-term territorial resilience through closer-to-nature forest management.

2.1.5 Beneficiaries

Primary Beneficiaries

Primary beneficiaries are land owners as well as those managers responsible for the conservation of habitats and the protection of species.

Secondary Beneficiaries

Secondary beneficiaries include:

- actors along the forestry value chain;
- impact investors;
- local communities (e.g., recreation and water supply).

2.1.6 Methodology

Overview of Research & Stakeholder Engagement

Research activities are initially based on comprehensive overviews (mappings) of the existing policy framework as well as of different financial instruments / approaches. These research activities are initially carried out within WP2 for both the existing EU policy and legal framework, related to biodiversity protection, and those financial instruments/approaches potentially relevant for UC1.

Initially, these research activities are carried out through a desk research review of the scientific and grey literature, concerning: a) the policy and financial framework for biodiversity protection investments; and b) the enablers/barriers to their market adoption and the uptake of relevant financial instruments/approaches.

Based on the key findings and insights from the desk research review, WP2 identifies innovative and/or improved financial instruments/approaches, potentially relevant for enhancing biodiversity. Each financial instrument/approach is then evaluated to determine its potential effectiveness within UCs (UC1). The evaluation of their effectiveness (e.g., suitability/feasibility/scalability) would then inform the Italian and Austrian Case Study activities, carried out together with stakeholders and the WP4 and WP5 teams, for developing innovative and scalable financial instruments/approaches..

Stakeholder engagement in the two Case Studies is carried out, based on the results of the above-described research activity, to build economically and financially viable business models, which address their environmental and social goals and are coherent with the expected outcomes. Key stakeholders (e.g., land owners/managers, forest and nature conservation authorities, research institutions, NGOs and forest sector and industry operators) will be engaged within frequent working sessions (one-to-one meetings and workshops), in order to drive uptake, discuss opportunities and address economic/financial barriers and policy shortcomings (such as market failures concerning externalities not reflected in prices).

2.1.7 Innovative Financial Mechanisms

Enabling Financial Conditions and Barriers

A structured Natural Capital Accounting system is the key enabling financial condition for the transition from predominantly timber-based revenues to innovative business models, supported by robust financial mechanisms, based on the value of biodiversity and the sustainable provision of ecosystem services.

This also requires the setup of a credible MRV system, clearly defined biodiversity indicators and a strong governance system, which together form the necessary methodological and legal framework for unlocking financial flows, based on strong stakeholder engagement.

Typology of Instruments

UC1 will examine the potential adoption of the most appropriate innovative financial tools for addressing the economic issues and constraints of the two Case Studies. These will be selected from the tools identified within WP 2, 4 and 5, based on suitability, feasibility and scalability criteria.

Those financial instruments/approaches of most relevance for designing the financial mechanisms supporting the Italian and Austrian Case Studies and, more generally, for financing biodiversity projects in the Alpine mountains, include the following:

- Payments for Ecosystem Services (PES);
- Blended Finance Schemes;
- Biodiversity Certificates / Nature Credits;
- Impact Equity Funds;
- Insurance Schemes.

2.1.8 Risk Management Strategies

The transition from a) business models predominantly based on timber revenues, to b) innovative business models based on the value of biodiversity and the sustainable provision of ecosystem services, faces important challenges and consequently numerous execution risks. The challenges and risks are first of an exogenous nature, depending on climatic developments and on disruptive climatic and/or biological disturbances. Second, challenges and risks are related to the complexity of radically changing business models, which concern legal-institutional risks, and dependency on the pro-active involvement of impact investors and different key stakeholders (such as public authorities and international bodies). Third, challenges are related to operational risks concerning the difficult setting up of innovative methodologies and systems (such as Natural Capital Accounting and MRV). Finally, issues related to social acceptance can limit or delay implementation.

These risks need to be managed throughout the design and implementation process of each Case Study, based on consistent planning, close collaboration with WPs and frequent dialogue with stakeholders.

2.1.9 Implementation Roadmap

Phase / Milestone	Description	Related WP(s)	Due date	Notes
Phase 1 Setting up UC1				
	UC1 description	WP1	M3 M16	D1.3 D1.3 – Revised
Phase 2 Mapping policy/legal framework and financial mechanisms for biodiversity uplift				
UC1-M1	Integration of key findings on biodiversity financing mechanisms	WP2 WP4 WP5	M24	D2.1, D2.2, D2.4
Phase 3 Developing financial solutions for protecting and restoring biodiversity				
UC-M2	Co-design of financial solutions (incl. Biodiversity certificates and credits)	WP4 WP5	M42	D4.2, D4.3, D5.3, D5.4

3. Use Cases Description: 2

3.1. UC2: Agricultural land (arable crops, pastures and vineyards), France

3.1.1 Use Case Overview

UC ID and Title

UC2: Regenerative agriculture in France

Lead Organisation(s)

Agri Sud-Ouest Innovation (ASOI)

Supporting partners

Landowners, AgroSolutions (AS)

3.1.2 Location and Ecosystem Profile

Description of UC structure (e.g. Practice or Parcel oriented)

Practice oriented

Geographic Coverage (country, region, locality)

UC2 is located in the Aube department, in the Grand Est region of northeastern France (Figure 1), benefits from a temperate climate with continental influences, which creates favorable conditions for a wide range of agricultural activities. The region experiences cold winters and warm, often dry summers, with annual rainfall ranging between 650 and 800 mm, distributed relatively evenly throughout the year. These climatic conditions support the cultivation of key crops such as wheat, barley, rapeseed, and sugar beet, which are central to the local economy. However, agriculture in Aube also faces challenges linked to climatic variability, including late spring frosts, summer droughts, and occasional hailstorms that can affect crop yields. To adapt, many farmers are turning to sustainable practices such as conservation agriculture, which helps improve soil health, increase resilience to climate extremes, and reduce environmental impact. The plots under study in Bio-Capital (Figure 2) are not located in a Natura 2000 area (Figure 3).

Figure 1: localization of the department of Aube department in France.

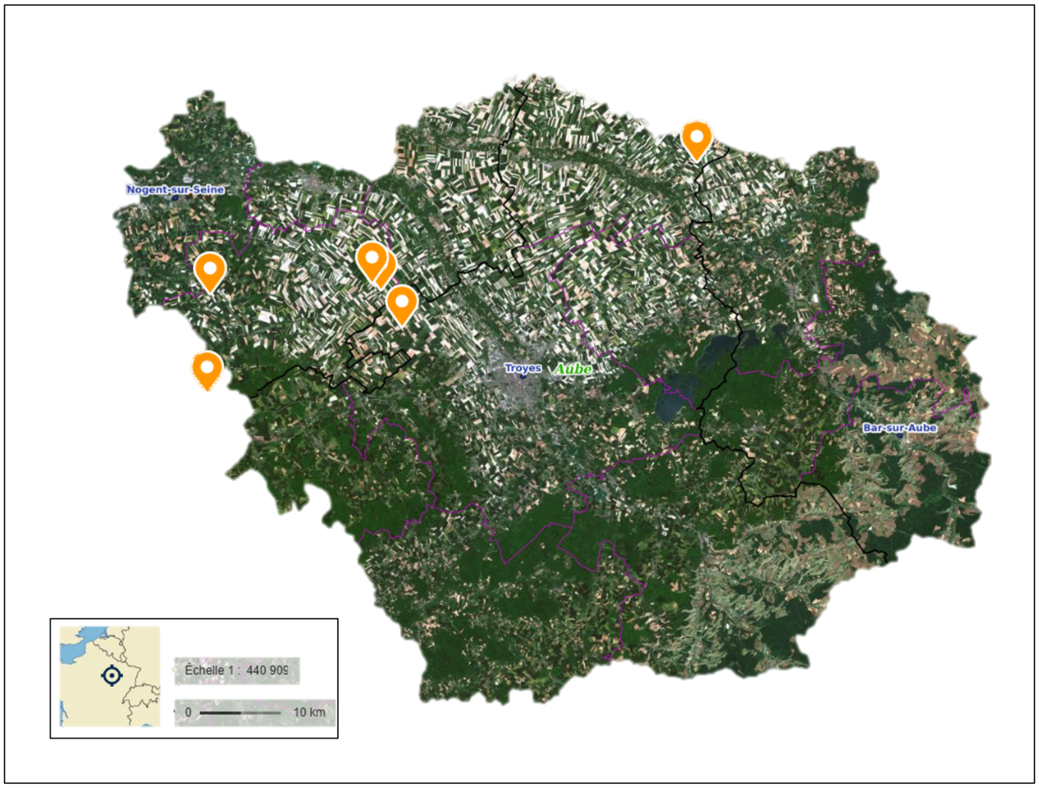


Figure 2: Location of the plots studied in UC2 in the Aube department.

Governance context

In UC2, end-users are farmers. They work with different farmers organisations: APAD and la SCARA. APAD is the Association for the Promotion of Sustainable Agriculture. It's a French NGO that works to promote sustainable and regenerative agricultural practices—especially conservation agriculture—among farmers, policymakers, and the broader public. Farmers who are members of APAD have volunteered to take part in the Bio-Capital project and make a plot or patch of land available for the study. These farmers have been specialists in regeneration agriculture for several years. La SCARA, which stands for Société Coopérative Agricole de la Région d'Arcis, is a farmers' cooperative also in the Grand Est region of northeastern France. Some SCARA farmers have also expressed a desire to take part in the project and make a plot of land available for the Bio-Capital study.

In addition, although the demonstration plots are located in the Aube department (Grand Est region), the French Use Case also seeks to engage with institutional actors beyond this territory. In particular, Agri Sud-Ouest Innovation, as a key partner based in southwestern France, is fostering collaborations with regional stakeholders in Occitanie. This broader engagement aims to facilitate knowledge transfer, compare policy frameworks, and explore the scalability of regenerative agriculture practices across different regional contexts. By connecting actors from both Grand Est and Occitanie, the Use Case contributes to a more integrated and cross-regional approach to the promotion of biodiversity-friendly farming systems.

Agro-environmental description

The Aube department, located in the Grand Est region of northeastern France, benefits from a temperate climate with continental influences, which creates favorable conditions for a wide range of agricultural activities. The region experiences cold winters and warm, often dry summers, with annual rainfall ranging between 650 and 800 mm, distributed relatively evenly throughout the year. These climatic conditions support the cultivation of key crops such as wheat, barley, rapeseed, and sugar beet, which are central to the local economy. However, agriculture in Aube also faces challenges linked to climatic variability, including late spring frosts, summer droughts, and occasional hailstorms that can affect crop yields. To adapt, many farmers are turning to sustainable practices such as conservation agriculture, which helps improve soil health, increase resilience to climate extremes, and reduce environmental impact. The plots under study in Bio-Capital are not located in a Natura 2000 area. Beyond the characterization of the regional context, the French Use Case focuses specifically on biodiversity dynamics at the field and farm scales. This is why individual plots are selected as study units within the Bio-Capital project, allowing for detailed monitoring of biodiversity under regenerative agricultural practices. However, these plots are not considered in isolation. They are embedded within broader farming systems and landscapes, and are influenced by regional policies, cooperative dynamics, and agri-environmental programs. Therefore, the Use Case adopts a multi-scale perspective, linking field-level observations with territorial frameworks in order to better understand how regenerative practices interact with regional governance and contribute to biodiversity and ecosystem services at larger scales.

The farmers involved in the Bio-Capital project have voluntarily committed to the study and are already actively implementing regenerative agriculture practices on their farms. These practices include, among others :

- reduced or no tillage,
- the permanent cover of soils using cover crops,
- diversified crop rotations (often including legumes),
- and the reduction of synthetic inputs such as pesticides and mineral fertilizers.

Some farmers also integrate practices such as the use of organic amendments, agroforestry elements, or precision agriculture tools to optimize input use. These systems aim to enhance soil biological activity, improve soil structure, increase carbon sequestration, and ultimately support higher levels of functional biodiversity within agricultural landscapes.

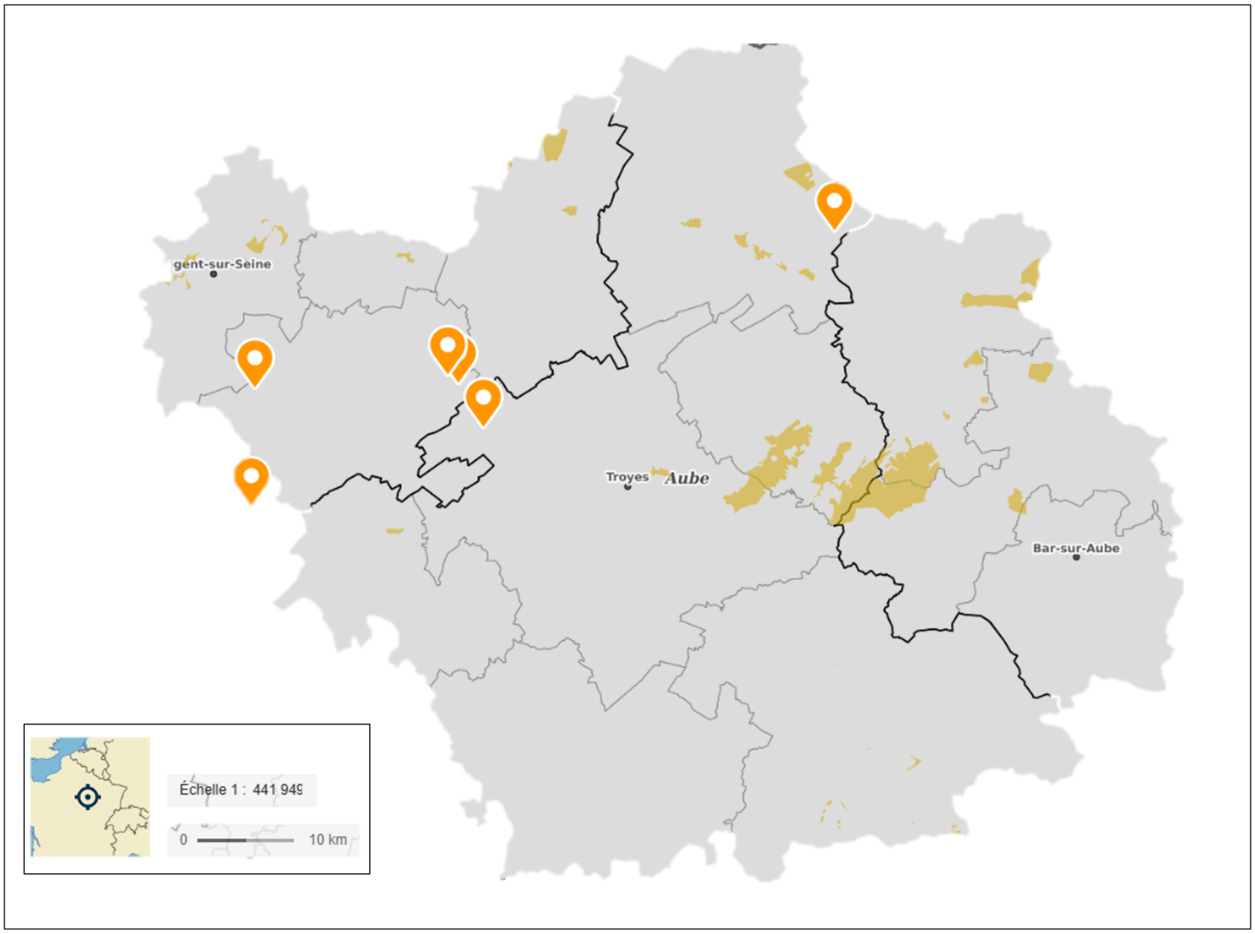


Figure 3: Location of Natura 2000 areas (in yellow) in Aube department.

3.1.3 Environmental Context

Agricultural biodiversity refers to a wide range of elements like crop diversity, livestock diversity, soil biodiversity, pollinators, natural pests, etc. The ones we are interested in in Bio-Capital are the ones which are measurable by geodata

- diversity of crops and livestock breeds thanks to the technical itineraries of farms and plots
- semi-natural elements like hedgerows, flower strips, and wetlands which increase habitat complexity and support wildlife. Diverse farming landscapes also enhance ecosystem services such as water regulation and carbon storage.

Agriculture has faced numerous historical and current threats to biodiversity. Historically, the shift toward monocultures and intensive farming reduced crop and livestock diversity. Widespread pesticide and fertilizer use degraded soil health and harmed non-target species like pollinators. Land-use change, including deforestation and wetland drainage, destroyed natural habitats. Today, climate change adds pressure, altering growing conditions and stressing ecosystems. Water overuse for irrigation affects aquatic biodiversity. The loss of hedgerows and field margins reduces habitats for beneficial insects and birds. Invasive species introduced through global trade can outcompete native ones. Overgrazing by livestock depletes vegetation and soil life. Urban expansion continues to fragment farmland. Together, these factors reduce ecosystem services and resilience in agriculture.

Climate change vulnerabilities

Climate change poses several vulnerabilities to biodiversity in agriculture, affecting both ecosystems and food production. Key impacts include:

- Shifts in species distribution: many plants, pollinators, and pests are moving to new areas, disrupting ecological balances. Rising temperatures and habitat loss reduce populations of bees, butterflies, and other vital pollinators.
- Soil degradation: increased droughts, floods, and heatwaves reduce soil biodiversity and fertility.
- Water stress: scarcity of water affects both crop health and aquatic biodiversity in agricultural landscapes.

Baseline biodiversity status

The baseline biodiversity status before interventions refers to the initial condition of ecosystems and species diversity in an agricultural area before any restoration or conservation actions are taken. It serves as a reference point to measure progress and the effectiveness of future interventions.

In agriculture, this baseline typically includes:

- Species richness and abundance: in the case of Bio-Capital, this kind of data can be expressed by the technical itinerary of the plot (i.e. associated crops, cover crops, …). Existing pressures such as pesticide use, monocultures, erosion, and pollution could also be indicated.
- Habitat quality and landscape diversity: presence or absence of natural features like hedgerows, flower strips, wetlands, or wooded patches, which can be easily measured by geodata.
- Soil biodiversity: microbial activity, earthworm populations, and overall soil health indicators. These indicators would be difficult to measure in the case of Bio-Capital project.

The indicators to measure these parameters are being developed in WP3.

Alignment of current agricultural policies in France with regenerative practices

France has progressively aligned its agricultural policies with regenerative agriculture principles, particularly through the promotion of agroecology and sustainable farming practices. Since the early 2000s, the country has recognized agroecology as a key component of its agricultural strategy, emphasizing the integration of ecological principles into farming systems. This approach was institutionalized with the 2014 Law for the Future of Agriculture, Food, and Forestry, which aimed to promote agroecological practices by supporting economic and environmental interest groups and incorporating agroecology into agricultural education.

The Economic and Environmental Interest Groups (GIEE) are a central pillar of France's agroecological policy and are closely aligned with the principles of regenerative agriculture. Created under this same law, these collectives bring together farmers and other stakeholders around projects aimed at simultaneously improving the economic, environmental, and social performance of farms. They promote technical, organizational, and social innovation through collaborative and place-based approaches.

The CAP encourages the establishment and maintenance of agro-ecological infrastructure (AEI) on farms (hedges, fallow land, permanent grassland, ponds, ditches, isolated trees, etc.). To be eligible for the CAP, a farm must have at least 4% of its Utilised Agricultural Area (UAA) in agro-ecological infrastructure.

The CAP also favours farms with the Organic Farming or High Environmental Value labels.

France has been a frontrunner in promoting agroecology, which shares many principles with regenerative agriculture, such as minimizing chemical inputs, enhancing biodiversity, promoting crop rotations, and increasing soil organic matter. The Loi d'Avenir pour l'Agriculture (2014) formally introduced agroecology as a national objective, encouraging farmers to shift toward more sustainable practices. Under the CAP, France implements eco-schemes (éco-régimes) that provide financial incentives to farmers adopting practices like cover cropping, extensive pasture-based systems, and hedgerow maintenance, all of which align with regenerative principles.

Deliverable D2.1 covers all French policies related to agriculture in general, and specifically the laws and programs related to regenerative agriculture.

2.1.4 Use Case Objectives

Environmental goals

Restoring biodiversity in agriculture is vital for creating sustainable farming systems that support ecosystems and improve resilience. It enhances essential services like pollination, soil fertility, and natural pest control, reducing the need for harmful chemicals. Diverse agricultural landscapes also improve water regulation and soil health, helping to sequester carbon and mitigate climate change. Biodiversity fosters genetic diversity in crops and livestock, ensuring greater resilience to pests, diseases, and extreme weather events. By incorporating practices like agroforestry and crop rotation, biodiversity restoration helps create more resilient, environmentally friendly agricultural systems that support both nature and food security.

Regenerative agriculture

Regenerative agriculture is a holistic approach to farming that focuses on restoring and enhancing the health of ecosystems, particularly soil, biodiversity, and water cycles, while maintaining or even increasing agricultural productivity. Core practices include cover cropping to prevent erosion and build soil organic matter, crop rotation and diversification to break pest cycles and enrich biodiversity, and minimal or no tillage to preserve soil structure and microbial life. The application of compost and organic amendments boosts soil fertility and carbon content, while agroforestry and the integration of perennial species foster more complex and resilient ecosystems. Holistic grazing systems mimic natural patterns to regenerate pastures, and efforts like wetland restoration or the planting of hedgerows create habitats for pollinators and wildlife. Reducing synthetic inputs and promoting natural pest control further supports ecological balance. These practices are intrinsically linked to biodiversity, as they increase species richness both above and below ground, improve habitat connectivity, and create more stable and resilient agricultural landscapes. In essence, regenerative agriculture not only sustains but actively enhances biodiversity, making it a powerful tool for ecological restoration and climate resilience in farming systems.

Adoption barriers

Despite their well-documented benefits, the adoption of regenerative agriculture practices still faces several barriers.

- economic risk associated with the transition phase, during which farmers may experience temporary yield variability or increased management complexity. These practices often require specific knowledge and technical skills, making access to advisory services, peer networks, and training essential.
- the lack of dedicated and stable financial incentives limits wider adoption, as ecosystem services such as biodiversity enhancement are not yet consistently valued by markets or public policies.
- structural factors, such as existing equipment, labor organization, and contractual obligations within supply chains, can also slow down changes in farming systems.

Social and economic goals

The social and economic goals of biodiversity restoration focus on improving community well-being and ensuring sustainable livelihoods. By restoring ecosystems, biodiversity can support local economies through enhanced agricultural productivity, ecotourism, and sustainable resource management. Healthier ecosystems improve food security, offering a stable supply of diverse crops and resources. Furthermore, biodiversity restoration can reduce long-term costs by mitigating the impacts of climate change and environmental degradation, ensuring economic stability for future generations. This approach promotes social equity by supporting marginalized communities in achieving sustainable development.

Policy Alignment

Biodiversity restoration in agriculture aligns with several key policies and frameworks designed to promote environmental sustainability and agricultural resilience. These include:

1. EU Biodiversity Strategy for 2030: This strategy aims to protect and restore biodiversity across Europe. It emphasizes the restoration of ecosystems, promoting nature-based solutions in agriculture, and enhancing biodiversity through the establishment of protected areas and ecological corridors.
2. European Green Deal: Aiming for a climate-neutral Europe by 2050, the Green Deal supports biodiversity restoration by promoting sustainable agriculture, reducing pollution, and encouraging practices that restore ecosystems, such as agroecology and agroforestry.
3. Common Agricultural Policy (CAP): The CAP includes measures to promote environmental sustainability in agriculture, such as green direct payments, eco-schemes, and agro-environmental measures, which incentivize biodiversity-friendly practices and help restore habitats and ecosystems in agricultural landscapes.
4. Water Framework Directive (WFD): This EU directive focuses on the protection and improvement of water quality. Biodiversity restoration in agriculture supports the WFD by reducing water pollution from agricultural runoff, improving water retention, and maintaining healthy wetlands and riparian zones.
5. Farm to Fork Strategy: Part of the European Green Deal, this strategy emphasizes sustainable food systems. It promotes biodiversity restoration in agriculture by encouraging sustainable farming practices, reducing pesticide use, and supporting organic farming, all of which enhance biodiversity.
6. UN Sustainable Development Goals (SDGs): Biodiversity restoration in agriculture aligns with SDG 15 (Life on Land) and SDG 2 (Zero Hunger), fostering sustainable land management, food security, and conservation of biodiversity.

Uniqueness of French Use-Case

The French Use Case (UC2) is distinguished by its focus on already mature regenerative agricultural systems, implemented by farmers who have several years of experience with practices such as conservation tillage, permanent soil cover, and diversified rotations. Unlike UC3 in Romania, which explores the transition towards agroecological practices in contexts still facing strong structural constraints (e.g. high climate vulnerability, lower adoption levels, and the need to demonstrate feasibility), UC2 builds on existing, well-established practices and farmer networks (APAD, SCARA). This allows for a more advanced analysis of biodiversity outcomes and the operationalisation of financial mechanisms such as biodiversity certificates, PES, and parametric insurance. In addition, UC2 adopts a multi-scale and cross-regional approach, linking plot-level biodiversity monitoring with regional policy frameworks and stakeholder engagement beyond the immediate study area, whereas UC3 is more focused on site-specific demonstrations and replication potential within similar agroecosystems. As such, UC2 is particularly positioned as a pilot for scaling up and standardising biodiversity-based financial instruments in high-performance regenerative systems, complementing UC3's role in exploring adoption pathways in more transitional contexts.

3.1.5 Beneficiaries

Primary beneficiaries

In the French UC, primary beneficiaries of financial mechanisms for biodiversity restoration would be landowners and farmers. They would benefit from financial support to implement biodiversity-friendly practices, such as habitat restoration, sustainable land management, using remote sensing data to optimize land use and minimize environmental impact.

Secondary beneficiaries

- **Investors**: Private investors are secondary beneficiaries as they can achieve financial returns through sustainable projects that enhance biodiversity and ecosystem services, such as carbon credits, biodiversity credits, and other market-based mechanisms.
- **Public Institutions and Governments**: Local and national governments would benefit from the improved ecosystem services resulting from biodiversity restoration, such as enhanced flood control, water quality, and climate change mitigation. They may also see improved alignment with environmental regulations and international biodiversity commitments.
- **Consumers**: In the long run, consumers may benefit indirectly from the positive environmental outcomes of biodiversity restoration, such as better food security, healthier ecosystems, and reduced environmental risks.
- **NGOs and Environmental Advocacy Groups**: These groups benefit by gaining funding and data (e.g., from remote sensing technologies) to monitor and advocate for biodiversity conservation, habitat protection, and ecosystem restoration efforts.
- **Supply Chain Stakeholders**: Companies involved in agriculture, forestry, and natural resource management may benefit through increased access to sustainably sourced products, potentially leading to better market positioning and enhanced corporate social responsibility (CSR) profiles.

3.1.6 Methodology

The methodology linked to this Use Case will focus on the monitoring of various agroecological practices across farms (WP3). The implementation of practices promoting biodiversity is quite variable among the pool of farms. Our methodology includes:

- Engaging farmer groups to adopt agroecological infrastructure and transition agriculture. Agroecological infrastructures that farmers can adopt include hedgerows and buffer strips for habitat and erosion control, agroforestry, and crop diversification to enhance biodiversity and soil health, and cover crops to improve fertility and prevent erosion. Ponds, wetlands, and wildlife corridors support wildlife, while integrated pest management reduces chemical pesticide use.

- Experimenting with biodiversity-enhancing practices such as crop diversification, hedgerows, and no-till farming. These practices help maintain ecosystems' balance, improve resilience to climate change, and support essential ecosystem services such as pollination, pest control, and soil fertility.
- Evaluating the relevance of various financial mechanisms to support farmers during their transition phase. Different financial mechanisms will be assessed. The most appropriate mechanisms for UC2 are PES, parametric insurances, biodiversity certificates and green loans. The evaluation will focus on the deployment potential of each mechanism regarding:
    - Evaluation and monitoring mechanisms thanks to review of landowners
    - Organisation between stakeholders: contractualisation, governance, certification and audit processes.
    - Match between the cost of implementing the practices and the funder's willingness to pay.
    - Replicability (different agricultural and local contexts, larger areas)

Monitoring and evaluation rely on both ground-level data and geospatial technologies, while socio-economic and ecological impacts are tracked to ensure long-term sustainability.

3.1.7 Innovative Financial Mechanisms

In a research project aiming to mobilize private investments for the restoration of biodiversity in agriculture through teledetection, several financial instruments are studied (WP2) and some are most appropriate.

Biodiversity certificates can serve as tradable units that represent measurable ecological gains, which can be verified and monitored using remote sensing technologies. These instruments offer a way to channel private funding into agricultural practices that restore habitats or improve ecosystem functions, such as agroforestry, hedgerow planting, or regenerative farming.

Payments for Ecosystem Services (PES) also represent a highly appropriate instrument. They offer a relatively straightforward framework to compensate farmers for maintaining or enhancing ecosystem services such as soil fertility, water regulation, and habitat provision. In the French context, PES schemes could build on existing agri-environmental measures while integrating more precise and scalable monitoring through remote sensing technologies.

Parametric insurance schemes constitute an innovative and complementary approach. By linking payouts to predefined environmental indicators (e.g. vegetation indices, soil cover levels, or climatic thresholds), these instruments can help reduce farmers' financial risks associated with the transition to regenerative agriculture. This is particularly relevant in regions such as Aube, where climatic variability (e.g. droughts or extreme weather events) can affect the performance of agricultural systems. Teledetection enables the objective and rapid verification of triggering events, making such schemes more feasible.

Green loans, especially when designed as sustainability-linked financial products, can further support the transition. These loans can offer preferential conditions (e.g. lower interest rates) to farmers who adopt or maintain regenerative practices and achieve measurable environmental outcomes. Their relevance depends on the extent to which the associated requirements remain compatible with farm management constraints and provide tangible economic benefits to farmers. In this respect, linking loan conditions to indicators monitored through remote sensing could increase their attractiveness and credibility.

The enabling financial conditions for these instruments include the availability of reliable and standardized metrics for measuring biodiversity gains, which is where remote sensing offers strong potential. Clear regulatory frameworks, such as biodiversity offset policies or green finance taxonomies, are also critical to build investor confidence. The presence of demand from corporate actors seeking to meet environmental, social, and governance (ESG) commitments, or to offset biodiversity impacts, supports the development of such instruments. However, there are also significant barriers. One of the main challenges is the complexity of valuing biodiversity, which is multi-dimensional and context-specific. The lack of mature markets for biodiversity credits and the absence of widely accepted methodologies for biodiversity accounting can hinder investor interest. Additionally, in some cases, teledetection may not capture all relevant ecological changes, particularly for species-specific or micro-habitat data, limiting its applicability as a sole verification tool.

3.1.8 Risk Management Strategies

The transition towards regenerative agriculture and the implementation of biodiversity-based financial mechanisms involve several types of risks in the French Use Case. These risks are agronomic, climatic, economic, and methodological, and require a combination of complementary strategies.

At the farm level, a key risk is the agronomic uncertainty linked to the adoption of regenerative practices. Practices such as reduced tillage, cover cropping, and crop diversification generate long-term benefits but may lead to short-term variability in yields. To mitigate this, farmers rely on diversified rotations, technical support from cooperatives such as SCARA, and peer-to-peer knowledge exchange within networks like APAD.

Climatic risks are also significant in the Aube region, with droughts, late frosts, and extreme weather events affecting crop performance. Regenerative practices themselves contribute to risk reduction by improving soil structure and water retention. In addition, parametric insurance schemes, based on indicators derived from teledetection, can provide rapid compensation in the event of adverse climatic conditions.

From an economic perspective, farmers face income uncertainty, as biodiversity benefits are not yet fully valued by the market. The development of Payments for Ecosystem Services (PES), biodiversity certificates, and green loans helps reduce this risk by creating additional and more stable revenue streams linked to environmental performance.

Another important challenge is the measurement and verification of biodiversity outcomes. Teledetection offers strong potential for large-scale monitoring but does not capture all ecological dimensions. To address this, the French UC tries to combine remote sensing data with in situ observations, increasing the robustness and credibility of the monitoring system.

Finally, regulatory uncertainty remains a potential risk, as frameworks for biodiversity finance and ESG investments are still evolving. Engagement with stakeholders and public authorities, both in Grand Est and Occitanie, helps anticipate these changes and align the Use Case with emerging policies.

3.1.9 Implementation Roadmap

The implementation of the French Use Case is structured around several key phases aligned with the different Work Packages (WPs) of the Bio-Capital project.

Within WP2 (Financial Instruments), the activities focus on understanding the policy and regulatory context and its implications for the Use Case (T2.1), as well as engaging with stakeholders through working groups, interviews, and surveys to gather feedback on future biodiversity-related financial mechanisms (T2.2). In addition, the French UC contributes to the evaluation of the relevance and effectiveness of proposed financing mechanisms in its specific context (T2.4).

In WP3 (Biodiversity baselines and metrics), the first step consists in defining the pilot sites and producing a detailed description of the Use Case area (T3.1). This is followed by field visits and workshops to validate geospatial data through ground-truthing and ensure the robustness of biodiversity indicators (T3.2).

WP4 (Developing innovative financial solutions) plays a central role in structuring the Use Case. Activities include identifying dependencies on ecosystem services and assessing environmental, social, and economic impacts (T4.1). The French UC also contributes to the development of PES indicators (T4.2), biodiversity accounting frameworks (T4.3), and the co-design of insurance products adapted to agricultural systems (T4.4).

In WP5 (Co-building biodiversity certificates), the Use Case supports the development and implementation of certification schemes. This includes providing data and feedback (T5.1), contributing to the implementation of biodiversity certificates (T5.3), and participating in methodological developments related to their issuance (T5.4).

Finally, WP6 (Stakeholder engagement and communication) ensures the involvement of local actors through the organization of field visits and stakeholder workshops (T6.2), which are essential for co-design, validation, and dissemination of project outcomes.

4. Use Cases Description: 3

4.1.UC3: Agricultural land, Romania, agroecological practises

4.1.1 Use Case Overview

UC ID and Title

(UC3) Agroecological practices

Lead Organisation(s)

Institute of Agriculture Economy and Rural Development from Bucharest (ICEADR)

Duration and Timeline (phases of implementation)

4.1.2 Location and Ecosystem Profile

Description of UC structure

Practice oriented, based on two complementary agricultural interventions:

- Certified organic farming
- Arable crops with forest belts around the plots

Geographic Coverage

Romania, South Muntenia Region, Bucu-Ialomita: forest belts farm: The farm is located in an intensively cultivated agricultural plain area, specific to South Muntenia region, where the land is dominated by arable crops such as wheat, corn and sunflower. In such a landscape exposed to wind erosion, drought and habitat uniformity, the introduction of forest curtains transforms the farm into an example of efficient green infrastructure essential for agricultural resilience. Located a few hundred meters from a forest and in the vicinity of a lake that functions as a wetland, the farm benefits from a valuable natural context, which the forest curtains amplify by creating local ecological corridors. The planted trees and shrubs provide microhabitats for birds, beneficial insects and micromammals, reduce wind speed and contribute to soil protection and moisture maintenance. Thus, the farm becomes a model of integrating natural elements into plain agriculture, contributing both to long-term productivity and to the conservation of biodiversity in an otherwise intensely exploited area.

Romania, South Muntenia Region, Valcele-Calarasi: certified organic farm

In an agricultural landscape dominated by traditional and intensive farms, the organic farm in Vâlcele functions as a true oasis of biodiversity and regenerative agricultural practices. Here, land management is based on principles that put nature at the center of production: vegetation cover, diversity strips, complex rotations, and the elimination of synthetic chemical inputs. These practices allow the restoration of soil biodiversity, the attraction of pollinators and beneficial insects, and the stabilization of the agricultural ecosystem in an area affected by severe drought. Despite the fact that the nearest forest is several kilometers away, the farm itself creates a core of biodiversity and functions as a strategic point of ecological connectivity in an otherwise simplified landscape.

Agro-environmental description

Ialomița – Bucu:

- Fertile chernozems and alluvial soils, but sensitive to wind erosion and pedological drought
- Low precipitation, continental climate with drought episodes
- Dominated by arable crops (wheat, corn, sunflower)

Călărași – Vâlcele:

- Cambic chernozem, fertile soils but affected by severe pedological drought
- Strong continental climate
- High potential for regenerative-ecological practices (mulching, plant cover, various rotations)

Ecosystem Type(s):

Ialomița – Bucu: Ecological corridor landscape.

Călărași – Vâlcele: Agroecological biodiversity hotspot

Map and Spatial Reference

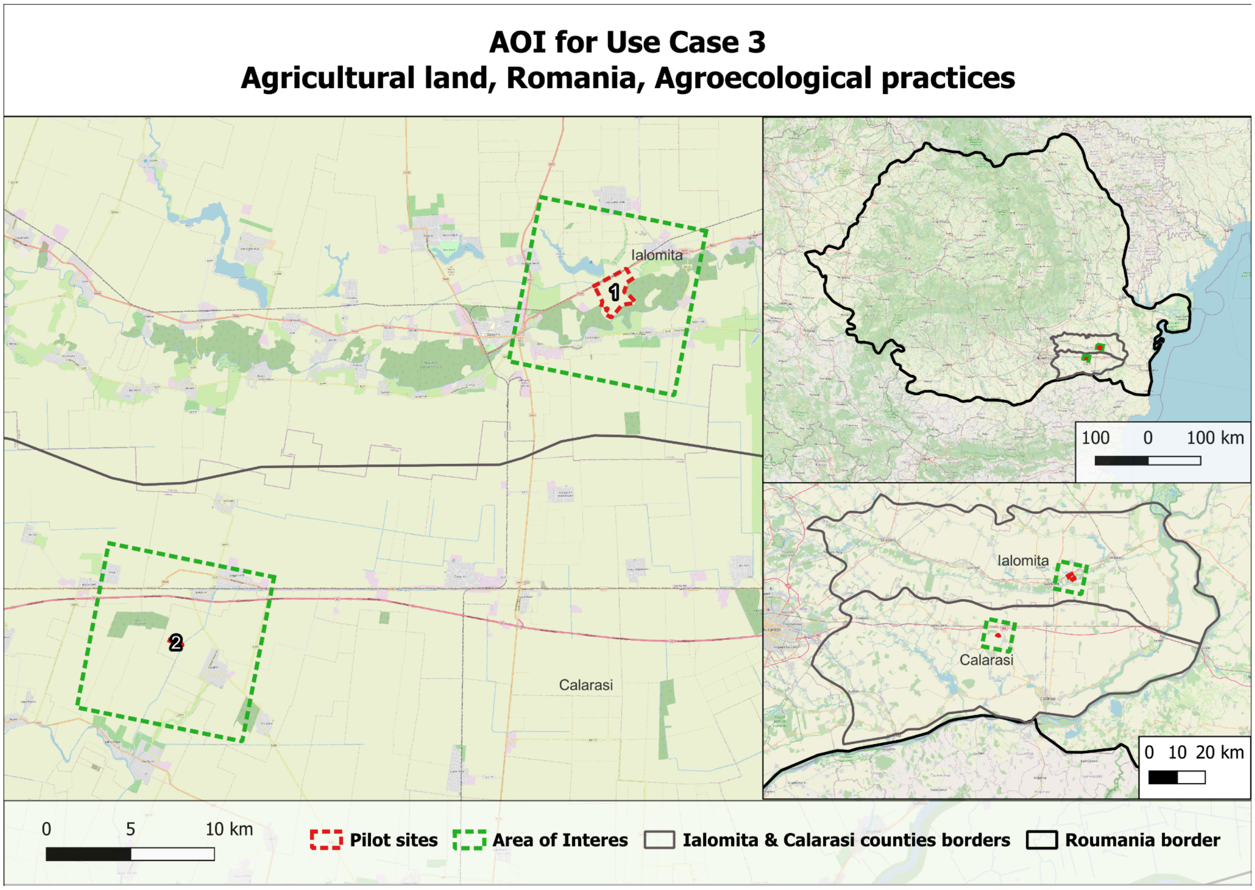


Figure 1. Map and spatial reference for UC3 study area

4.1.3 Environmental Context

Key Biodiversity Features

Ialomița – Bucu: Ecological corridor landscape;

Forest curtains introduced into the intensive agricultural landscape generate a complex agroecological structure, which supports valuable biodiversity. Vegetated edges and planted shrubs attract numerous pollinating insects, essential for the health of the agricultural ecosystem. Trees and shrubs provide support for insectivorous birds, such as starlings or sparrows, which contribute to the natural control of pests. In the transition areas between crops and shade curtains, a diverse spontaneous vegetation develops, which increases the resilience of the agroecosystem. Small mammals, such as hedgehogs, rabbits or useful rodents, which help to aerate the soil and maintain the ecological balance, also find shelter here. Overall, these elements transform the farm into a vital habitat and a biodiversity corridor in an area otherwise dominated by conventional agriculture.

Călărași – Vâlcele: Agroecological biodiversity hotspot

The organic farm in Vâlcele represents a valuable agroecological nucleus in an intensified agricultural landscape, where soil biodiversity is particularly high, due to the presence of earthworms, microorganisms and mycorrhizal fungi. The practices applied favor the emergence of beneficial insects, such as ladybugs, hoverflies and parasitoid wasps, along with numerous spontaneous plant species that contribute to the resilience of the ecosystem. Permanent plant cover, diversified rotations and buffer zones with flowering vegetation create ideal conditions for the restoration of pollinators and for the formation of microhabitats that support small fauna, such as insectivorous birds or hedgehogs. The lack of chemical inputs allows for the gradual improvement of soil structure and increased water infiltration, making the farm more drought-resistant

Threats and Pressures (current and historical)

- Intensive agriculture in surrounding areas leads to ecological isolation
- Pesticides used in neighboring farms can induce risk of drift and insect reduction
- Increased wind erosion in the Ialomița plain together with extreme drought for both areas
- Mortality of forest canopy seedlings
- Competition for land: perception that canopy “takes away from arable land”
- Weeds/pests in the absence of herbicides for the organic farm

Climate Change Vulnerabilities

The UC areas of Romania (Ialomița, Călărași) are among the most vulnerable to climate change:

- severe water deficit
- summers with +40°C
- strong wind phenomena
- torrential rains that lead to crusting and erosion
- exposed soils and rapid water loss

In this context, forest curtains are an excellent adaptation solution because they reduce wind speed, increase soil moisture, protect crops and can generate habitat for biodiversity. At the same time, ecological practices are complementary because they increase organic matter, water infiltration and soil resilience.

Baseline Biodiversity Status

Before the implementation of the interventions, the arable was characterized by a completely exposed arable land, with low biodiversity and no functional habitats for birds or pollinators, in the absence of any green infrastructure. The area was strongly affected by drought and water stress, conditions that reduced soil vitality and increased crop vulnerability

The organic farm in Vâlcele presented a moderate level of biodiversity, but on an upward trend due to the conversion to agroecological practices. Before the transition, the soil had low biological activity and production depended on external chemical inputs, which limited the development of natural processes of restoration of the agricultural ecosystem.

4.1.4 Use Case Objectives

Overview of Objectives

The objective of this Use Case is to identify and design innovative financial mechanisms that can support the uptake and scaling of agroecological practices and green infrastructure (such as forest belts) in lowland agricultural landscapes in Romania.

The Use Case focuses on demonstrating how financial instruments can incentivise farmers to adopt biodiversity-enhancing practices. The two pilot farms in Ialomița and Călărași will serve as representative case studies for assessing the ecological benefits and financial feasibility of agroecological approaches within intensively cultivated lowland agroecosystems. Insights from this analysis will be used to propose scalable financial solutions that can be replicated across similar farms in the region.

Tasks and Implementation Approach

The implementation of this Use Case is structured around a set of analytical, technical and stakeholder-driven tasks designed to identify financial mechanisms that can effectively support agroecological practices and green infrastructure in lowland agricultural systems. Building on the two pilot farms in South-Muntenia (Vâlcele – Călărași and Bucu – Ialomița), the Use Case will examine how biodiversity-enhancing measures such as agroecological field management and the establishment of shelterbelts can generate measurable ecological outcomes that are suitable for financial valuation.

A core component of the approach is exploring the feasibility of a biodiversity-linked financial instrument, such as a biodiversity-linked bond or performance-based payment scheme. These instruments would tie financial returns to the achievement of specific ecological targets — including improved soil health, enhanced pollinator activity, increased habitat connectivity, and strengthened climate resilience. By doing so, they create a direct and transparent link between financial performance and biodiversity outcomes. Use Case will map existing financial initiatives available in Romania, including CAP ecoschemes, compensatory payments for organic farming, agri-environment-climate measures, and emerging private-sector mechanisms. Stakeholders (farmers, authorities, investors, NGOs and financial institutions) will be engaged to identify practical barriers and opportunities for scaling up financial instruments that reward biodiversity benefits. Insights from the two farms will inform the design of financial mechanisms that can be replicated across other commercial farms in the region, ensuring both ecological relevance and financial viability

Environmental Goals

• Increase soil and pollinator biodiversity.

• Reduce soil erosion and increase water retention.

• Increase drought resilience through agroecological practices and green infrastructure elements

Social Goals

• Improving farmers' perception of agroecological practices and the role of forest curtains.

• Strengthening the sharing of good practices at the local level.

• Creating replicable models for other farms in South-East Romania.

Economic Goals

• Demonstrate the economic feasibility of agroecology and forest curtains by developing financial instruments that cover implementation costs.

• Increase the long-term stability of agricultural production.

• Identify new financial flows (biodiversity credits, habitat payments, insurance, etc.).

Policy Alignment:

• EU Biodiversity Strategy 2030

• Green Deal

• New Common Agricultural Policy (CAP) — eco-schemes, environmental and climate measures

• National Strategy for Sustainable Development of Romania

• Natura 2000 Directives (where applicable)

Expected Outcomes

The Use Case aims to identify financial instruments adapted to the specificities of lowland agroecosystems, so that farmers can easily adopt agroecological practices and green infrastructure. Based on the two pilot farms, a replicable framework for small and medium-sized farms will be created, which can be expanded at regional level. Through dedicated evaluations, the project will estimate quantifiable benefits on biodiversity, from soil improvement to increased habitats for pollinators and birds. All conclusions and proposals will directly integrate feedback from farmers and relevant authorities, thus ensuring the feasibility and acceptance of solutions at a practical level.

4.1.5 Beneficiaries

Primary Beneficiaries:

Farmers

Secondary Beneficiaries:

- ✔ Local communities (microclimatic benefits, dust reduction, soil stabilization).

- ✔ Investors in green projects.
- ✔ Local and county administrations.
- ✔ Agri-food sector (more stable production over time).

4.1.6 Methodology

Overview of Research & Stakeholder Engagement

For this UC, activities will include bibliographic analysis on agroecology, CAP eco-schemes and the role of forest belts in agro-ecosystems, followed by discussions to the two pilot farms to understand the local context and practical implementation conditions. The process will be supported by iterative consultations with other farmers, to collect relevant information, as well as by constant dialogue with project partners, who will contribute with technical expertise in defining and testing the proposals.

4.1.7 Innovative Financial Mechanisms

Enabling Financial Conditions and Barriers

In Romania, the implementation of financial instruments to support agroecological practices and green infrastructure is supported by the existence of eco-schemes under the CAP and the growing interest in nature-based solutions, as well as the considerable potential of lowland agricultural landscapes to integrate elements of high ecological value. However, these opportunities are accompanied by important structural barriers, such as the lack of incentivised funds for the maintenance of green infrastructure elements in the early years, the perception of farmers that agroecological practices may reduce the overall production and the absence of functional markets for biodiversity credits at national level. In this context, for this UC it was proposed to analyse how these constraints can be overcome through appropriate financial instruments and through continuous dialogue with farmers and institutional actors.

4.1.8 Risk Management Strategies

The implementation of financial instruments dedicated to agroecology in lowland agroecosystems in Romania faces a number of structural risks and challenges. First, there are operational risks related to high climate variability, especially severe drought, which can affect both farmers' motivation to adopt new practices and their efficiency in the first years. There are also institutional risks, generated by the complexity of administrative procedures and the limited level of integration of innovative financial instruments into existing agricultural policies.

At a social and economic level, some agroecological practices are perceived as potentially risky or costly, especially in commercial farms oriented towards maximum productivity. The lack of mature markets for biodiversity credits or other mechanisms for financial valorisation of ecosystem services represents an additional challenge, which may limit the interest of private investors. At the same time, the existence of limited administrative capacity at local and regional level may make it difficult to adopt and monitor the proposed financial instruments.

To overcome these challenges, the Use Case will focus on continuous dialogue with farmers, authorities and institutional partners, as well as on realistic assessment of the financial feasibility of the analysed mechanisms. In addition, close collaboration with experts and project partners will allow for gradual testing of the proposed solutions and their adjustment before potential larger-scale implementations.

4.1.9 Implementation Roadmap

Expected Replicability Potential

The Use Case has a high replicability potential across lowland agricultural regions in Romania, particularly in areas dominated by conventional arable farming where agroecological practices and green infrastructure remain limited. The financial mechanisms explored—such as payments for ecosystem services, blended finance solutions or performance-based instruments—are designed to be adaptable to a wide range of farm sizes and operational contexts. Since the two pilot farms reflect common challenges in Romanian agriculture, including exposure to drought, limited habitat diversity and economic constraints related to the adoption of nature-based practices, the lessons learned can be easily transferred to other farms within the South-Muntenia region and beyond. Through clear guidance, practical insights from farmer consultations, and scalable financial structures, the Use Case is expected to provide a replicable framework that can support broader uptake of agroecological approaches in similar agricultural landscapes.

5. Use Cases Description: 4

5.1. UC4: Species-rich grasslands, Slovenia

5.1.1 Use Case Overview

UC ID and Title

UC4: Species-rich grasslands, Slovenia, Nature-based solutions for pollinators

Lead Organisation(s)

Pratensis

Duration and Timeline (phases of implementation)

UC4 is implemented within the BIO-CAPITAL project timeline and contributes to the progressive development of biodiversity baselines, financing mechanisms, stakeholder engagement, and replicability analysis for species-rich grassland conservation and restoration in Slovenia

5.1.2 Location and Ecosystem Profile

Description of UC structure (e.g. Practice or Parcel oriented)

Practice oriented

Geographic Coverage (country, region, locality)

UC4 is located in Slovenia and focuses on species-rich semi-natural grasslands within nine Natura 2000 sites. The use case combines a national-level policy and financing perspective with site-level implementation and analysis in selected grassland landscapes. Its main focal areas are Goričko and Osrednje Slovenske gorice, which are particularly relevant for biodiversity conservation, pollinator-supporting landscapes, and the testing of financing mechanisms in relation to Natura 2000 and CAP implementation. Slovenia provides a particularly informative context because it combines high biodiversity value, extensive Natura 2000 coverage, strong dependence of grassland biodiversity on continued management, and a financing context still largely dominated by public support. Slovenia is particularly relevant as a grassland case because it lies at the junction of several biogeographical influences and combines high habitat diversity with very extensive Natura 2000 coverage.

The use case covers the following Natura 2000 sites:

- SI3000302 Osrednje Slovenske gorice
- SI3000221 Goričko
- SI3000117 Haloze – vinorodne and SI3000118 Boč - Haloze - Donačka gora
- SI3000311 Vitanje – Oplotnica
- SI3000224 Huda luknja
- SI3000313 Vzhodni Kozjak and SI3000337 Zahodni Kozjak
- SI3000335 Polhograjsko hribovje

Together, these sites provide a useful range of grassland contexts, from more structured and better-known conservation landscapes to more overlooked and under-supported Natura 2000 areas, allowing UC4 to capture variation in ecological condition, governance setting and financing needs.

Spatial scale

UC4 operates across multiple spatial scales. At the national scale, it addresses Slovenia's legal, policy and financing framework for species-rich grasslands. At the multi-site scale, it covers nine Natura 2000 sites with different ecological and governance characteristics. At the focal landscape scale, the use case concentrates on Goričko and Osrednje Slovenske gorice. At the parcel and habitat-patch scale, it addresses management, monitoring and restoration opportunities relevant for biodiversity indicators and financial mechanisms.

The **Goričko Nature Park** is one of the two main focal areas of UC4. It was formally declared on 9 October 2003 by the Republic of Slovenia and covers approximately 46,200 ha (462 km²) of low hills in northeastern Slovenia, at the transition between the Alps and the Pannonian Basin. The park lies in the border region with Austria and Hungary and forms part of the trilateral Three Countries Park (Goričko–Raab–Őrség), which adds a cross-border ecological dimension to the use case. The landscape is a mosaic of meadows, arable fields, traditional high-trunk orchards, hedgerows, woody patches, forests and streams. It is recognised for its biodiversity and cultural-landscape value and includes several habitat types and species protected under the Natura 2000 framework, including grassland habitat types 6210, 6410, and 6510. According to project and monitoring material, habitat quality in parts of the site has declined due to intensification, abandonment and fragmentation, which makes Goričko a particularly relevant focal landscape for restoration and biodiversity finance. It is therefore particularly useful as a site where conservation planning, restoration practice, monitoring and potential financing mechanisms can be considered together.

Osrednje Slovenske gorice is the second main focal area of UC4. It is located in the Slovenske gorice region in northeastern Slovenia and represents a hilly agricultural landscape characterised by vineyards, orchards, semi-natural grasslands, hedgerows and small woodland patches. The site belongs to Slovenia's Natura 2000 network and is particularly relevant for grassland habitats and butterfly conservation. It covers approximately 2,076 ha and is especially important for meadows and butterflies. Relevant grassland habitat types include 6210, 6410, 6510 and 6520. The site is associated with high butterfly diversity and is important for indicator species such as *Phengaris teleius, Phengaris nausithous*, and *Lycaena dispar*. At the same time, it faces biodiversity decline linked to intensification, abandonment, woody encroachment, fragmentation and the loss of traditional management. In this sense, it provides an important contrast to Goričko by representing a less visible but highly relevant Natura 2000 grassland landscape where restoration and financing needs are also significant.

Governance context

Governance in UC4 is multi-level and combines Natura 2000 planning, protected area management where relevant, CAP implementation, national and local public authorities, farmers and landowners, advisory services, and conservation institutions. Key actors include the ministries responsible for CAP, Cohesion and LIFE-related funding, the paying agency, the Institute for Nature Conservation, protected area management in Goričko, municipalities, and other local stakeholders. This governance setting is important because biodiversity outcomes in species-rich grasslands depend not only on ecological conditions, but also on coordination between conservation planning, agricultural support, local delivery and future biodiversity-finance design.

Agro-environmental description

UC4 focuses on species-rich semi-natural grasslands in Slovenia, particularly those embedded in mosaic agricultural landscapes with high biodiversity value. These grasslands are among the most species-rich agricultural ecosystems in Europe and provide a wide range of ecosystem services, including pollination, climate regulation, soil fertility, water regulation, erosion control, ecological connectivity, and cultural landscape value. They are also strongly management-dependent: their biodiversity depends on continued low-intensity mowing, grazing and associated traditional practices. Semi-natural grasslands are therefore both ecological assets and expressions of long-term cultural landscape management.

Ecosystem Type(s)

Semi-natural grasslands, management-dependent meadows and pastures, and mosaic farmland landscapes with associated landscape features such as hedgerows, orchards, woody patches and field margins.

The land-management context is characterised by small and heterogeneous farm structures, fragmented ownership, and a mix of owner-managed and leased land, which is important for the design of management measures and future biodiversity-finance mechanisms. In the selected UC sites, average farm sizes are generally below the national average, and land managers often operate under complex ownership and tenancy arrangements.

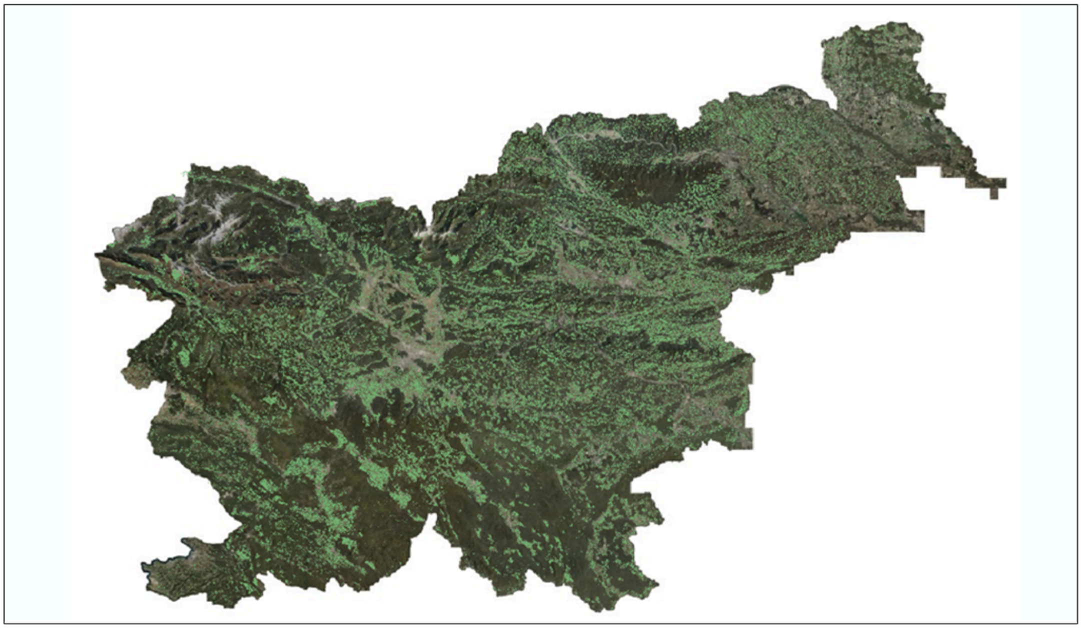


Figure 2: Spatial distribution of grasslands in Slovenia (https://rkg.gov.si/vstop/)

Protected Areas/Natura 2000 status

UC4 is strongly anchored in Slovenia's Natura 2000 network. Slovenia has one of the highest shares of Natura 2000 area in the EU, and the use case focuses on sites where biodiversity-rich grasslands are protected under the Birds and Habitats Directives. In addition, one of the two main focal areas, Goričko, is also a protected area (Nature Park) with its own management structure, which makes UC4 particularly relevant for analysing how Natura 2000 planning, protected area management and agricultural support interact in practice.

Map and Spatial Reference

The spatial distribution of the selected Natura 2000 sites and the two main focal landscapes is illustrated in the figures below, which provide the main cartographic reference for UC4.

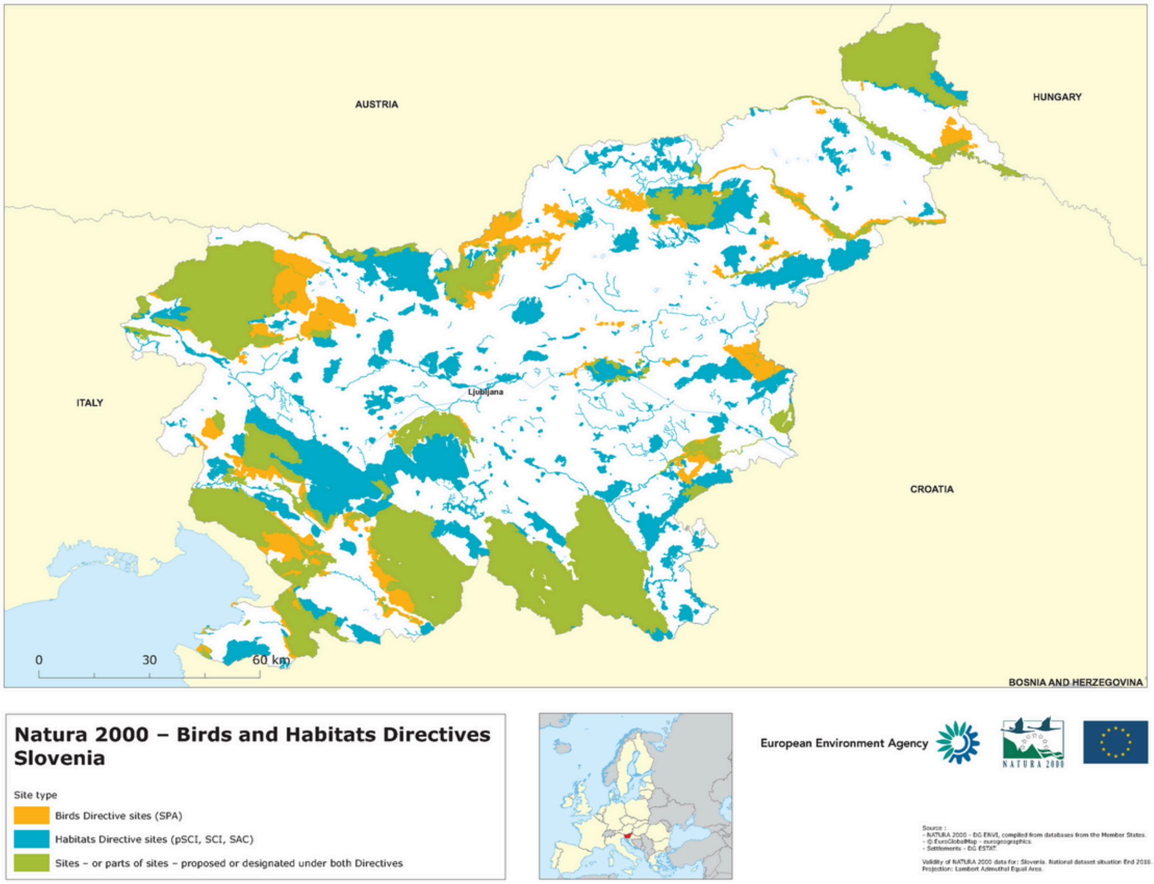


Figure 3: Natura 2000 - Birds and Habitats Directives in Slovenia (https://www.eea.europa.eu/data-and-maps/figures/natura-2000-birds-and-habitat-directives-10/slovenia)

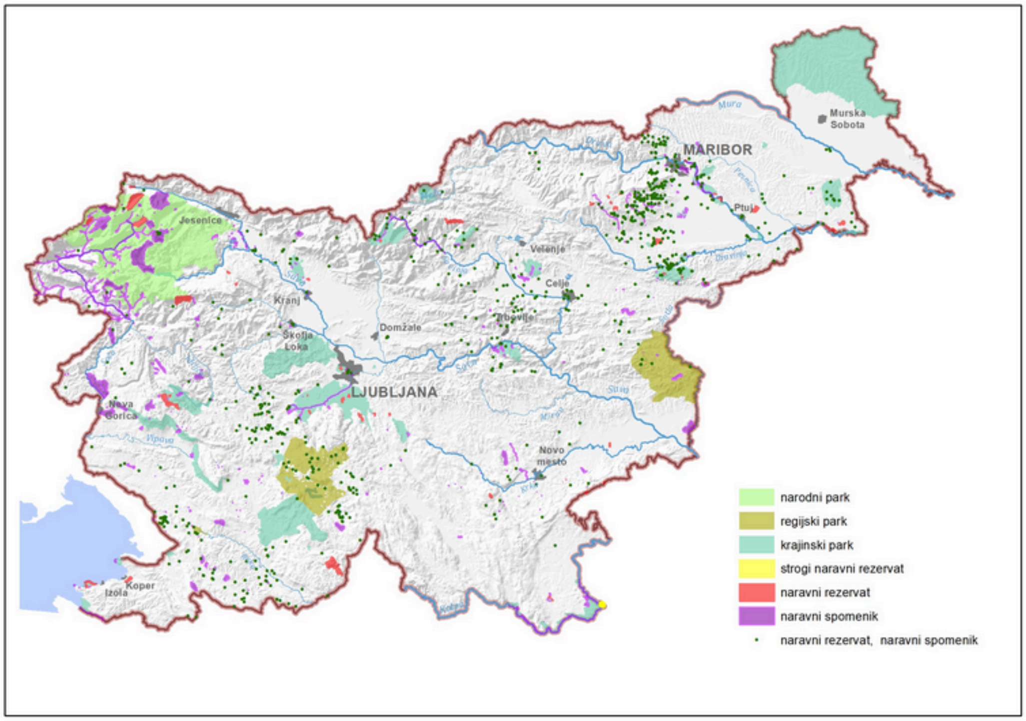


Figure 4: map of all the protected areas in Slovenia (https://kazalci.arso.gov.si/sl/content/zavarovana-obmocja-5)

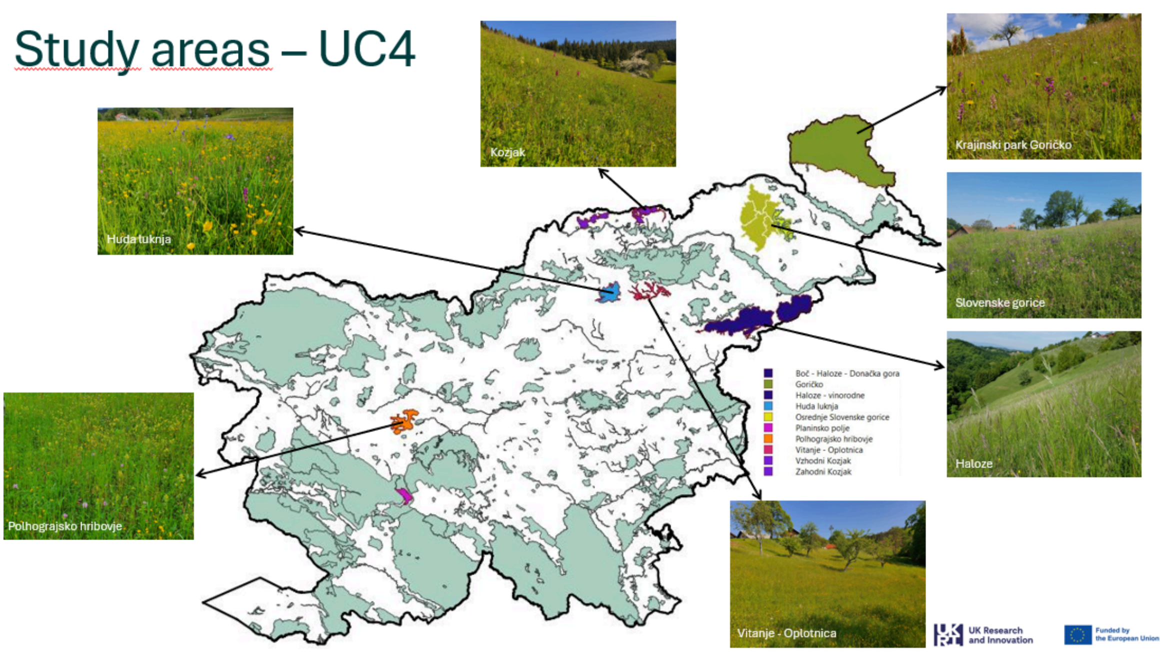


Figure 5: map of the UC4 study areas

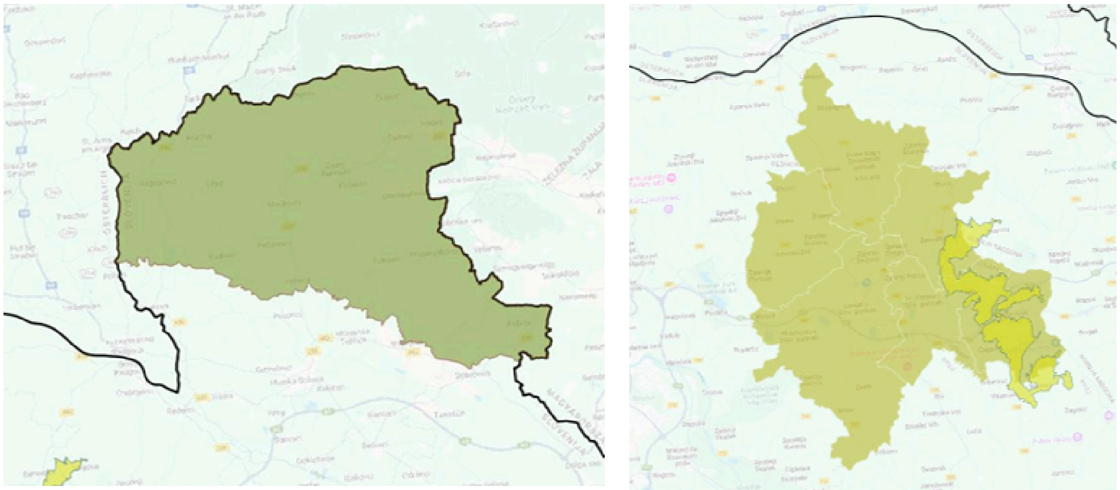


Figure 6: map of the 2 most important UC4 study areas – Nature park/N2000 site Goričko (on the left) and N2000 site Osrednje Slovenske gorice (on the right)

5.1.3 Environmental Context

Key Biodiversity Features

UC4 focuses on species-rich semi-natural grasslands that support high levels of plant, pollinator and butterfly diversity within mosaic agricultural landscapes. The main habitat types relevant to the use case are 6210, 6410, 6510 and, in some sites, 6520, all of which depend on continued extensive management and are vulnerable to intensification, abandonment and fragmentation. The biodiversity logic of UC4 is closely linked to grassland-dependent pollinators and butterflies, but also to broader habitat, landscape and ecosystem-service functions. This also means that the ecological value of the system is inseparable from continued management, making UC4 especially relevant for analysing biodiversity outcomes in management-dependent habitats. In this context, indicator species such as *Phengaris teleius, Phengaris nausithous*, and *Lycaena dispar* are particularly relevant because they make the condition of species-rich grassland systems visible in ecological and monitoring terms.

Threats and Pressures (current and historical)

The main pressures affecting UC4 sites are agricultural intensification, abandonment or under-management of grasslands, woody encroachment, habitat fragmentation, loss of traditional management practices, and climate-related stress. In some areas, invasive alien species and hydrological change also contribute to habitat degradation. These pressures are reinforced by socio-economic factors such as ageing farmers, depopulation, low profitability of small-scale extensive farming, and weak continuity of management knowledge and practice.

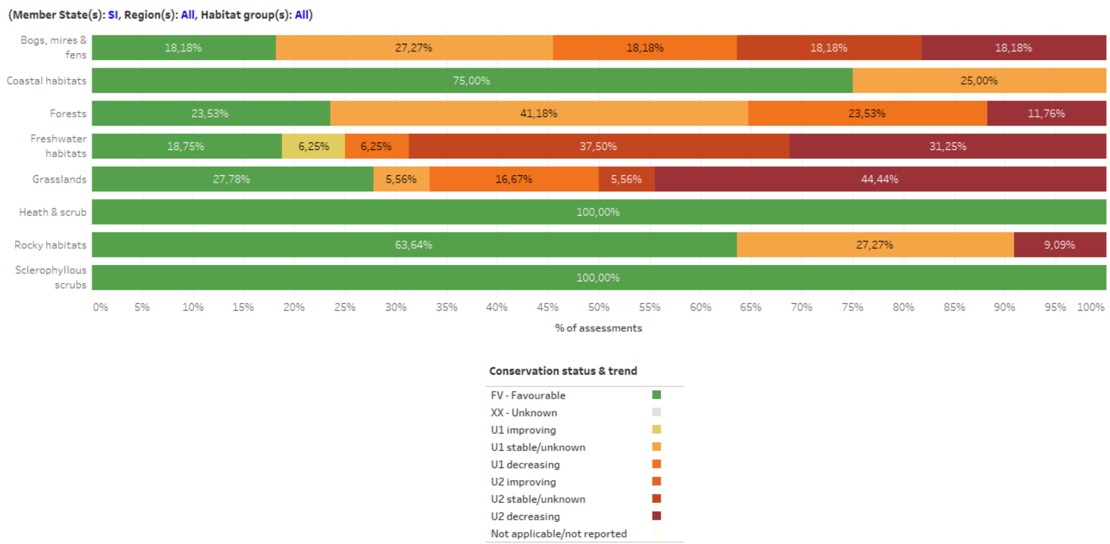


Figure 7: Conservation status and trends of habitats in Slovenia (https://www.eea.europa.eu/en/analysis/maps-and-charts/conservation-status-and-trends-article-17-national-summary-dashboards-archived)

Climate Change Vulnerabilities

Species-rich grasslands in Slovenia are increasingly vulnerable to hotter and drier summers, more frequent drought, frost, storms, hail and extreme rainfall events. These pressures can alter mowing and grazing windows, reduce habitat quality, affect flowering dynamics and weaken the ecological conditions required by pollinators, butterflies and other grassland-dependent species. More generally, climate hazards increase the instability of agricultural production and reduce the resilience of already fragile grassland systems.

Baseline Biodiversity Status

The baseline biodiversity status of UC4 is characterised by the continued presence of habitats and species of high conservation value, but also by significant degradation and uneven management quality across sites. Many target grassland habitats remain in unfavourable conservation status, and key butterfly indicators such as Phengaris teleius, Phengaris nausithous, and Lycaena dispar show declining trends. UC4 therefore starts from a situation where biodiversity assets are important but fragile, and where management and restoration needs are already well documented. In practical terms, the baseline is characterised by a mixture of still valuable grassland patches and sites where management decline, abandonment or intensification have already reduced habitat quality. Relevant ecological indicators include habitat extent and condition, plant species richness, colourfulness of grasslands, abundance of indicator species, and the share of agricultural land with high-diversity landscape features.

Alignment with current ecological monitoring and data development

The environmental context of UC4 is also relevant for the development of biodiversity indicators and MRV-compatible approaches within BIO-CAPITAL, because the grassland system combines high ecological value with relatively clear management dependencies and measurable habitat- and species-related signals. This makes UC4 particularly suitable for linking ecological baselines, management intensity, landscape structure and biodiversity outcomes.

5.1.4 Use Case Objectives

Overview of Objectives

The objective of UC4 is to identify and support financing approaches that can contribute to the conservation and restoration of species-rich semi-natural grasslands in Slovenia, with a particular focus on biodiversity outcomes, pollinator-supporting landscapes, and management-dependent habitats. The use case seeks to understand how biodiversity-positive grassland management and restoration can be linked to measurable indicators, stakeholder-supported governance arrangements, and financing mechanisms that complement existing public support.

Tasks and Implementation Approach

The implementation of UC4 combines policy and financing analysis, ecological and geospatial assessment, stakeholder engagement, and case-based testing of financing approaches for biodiversity. Building on the selected Natura 2000 sites, and especially on Goričko and Osrednje Slovenske gorice, the use case examines how management practices, ecological conditions, monitoring opportunities, and funding mechanisms interact. A key part of the approach is to assess how biodiversity-related indicators can support the design of financing mechanisms such as biodiversity certificates, PES-type arrangements and other complementary instruments, while ensuring coherence with existing CAP and conservation support.

Environmental Goals

The environmental goals of UC4 are to maintain and restore species-rich semi-natural grasslands, improve habitat quality for pollinators and other grassland-dependent species, support the ecological functionality of mosaic agricultural landscapes, and reduce pressures that lead to degradation, fragmentation and biodiversity decline. The use case also aims to contribute to better integration of biodiversity conservation, restoration and ecological monitoring.

Social Goals

UC4 also addresses the social dimension of biodiversity conservation by supporting the viability of traditional land management, maintaining management knowledge in rural areas, and strengthening the connection between local communities, cultural landscapes and biodiversity outcomes. This is particularly important in landscapes affected by depopulation, ageing farmers and reduced continuity of low-intensity grassland management. The use case therefore recognises local communities, land managers and place-based stewardship as central to long-term biodiversity outcomes, not merely as secondary beneficiaries.

Economic Goals (including Investment Requirements and Financial Scope)

Economically, UC4 explores how biodiversity-positive grassland management and restoration can be supported through a mix of public and innovative finance. Existing support comes primarily from the CAP and other public sources, while BIO-CAPITAL examines how biodiversity certificates, PES-type approaches and other complementary mechanisms could help remunerate biodiversity outcomes, restoration efforts, long-term stewardship and transaction costs not fully covered by current schemes. This is particularly important in a context where biodiversity-rich grassland management remains economically fragile and where existing support is still insufficient to create stable, long-term biodiversity-investment conditions. The use case is therefore not aimed at replacing public support, but at improving the conditions under which biodiversity-related outcomes can become more measurable, financeable and potentially investable.

Policy Alignment

UC4 is aligned with the EU Biodiversity Strategy for 2030, the European Green Deal, the Birds and Habitats Directives, the Natura 2000 framework, the Common Agricultural Policy (CAP), and the Nature Restoration Regulation (NRR). It is also relevant to the EU Pollinators Initiative and to broader policy efforts aimed at restoring ecosystems, improving biodiversity monitoring, and linking ecological outcomes to implementation and financing frameworks.

Expected Outcomes

UC4 is expected to deliver a clearer understanding of how species-rich grassland conservation and restoration can be linked to measurable biodiversity indicators, governance arrangements, and financing mechanisms in a real-world Slovenian context. It should also contribute to the identification of feasible financial pathways for supporting biodiversity outcomes in management-dependent habitats and to the development of a transferable model for similar grassland landscapes in Europe. In addition, UC4 is expected to clarify how ecological indicators, governance arrangements and financing design can be better aligned in practice in a Natura 2000 grassland context.

KPIs

Key indicators and KPIs for UC4 include grassland habitat extent and condition, area of extensively managed grasslands, area under agri-environment commitments, abundance of indicator species, farmland bird and butterfly trends, plant species richness and colourfulness, and the share of agricultural land with diverse landscape features. Relevant social and economic indicators include the number of active farms, average farmer age, participation in agri-environment schemes, and the share of farm income linked to public support.

Comparative positioning of UC4

Compared with UC1, which focuses on forest ecosystems and closer-to-nature forest management, UC4 addresses semi-natural agricultural landscapes where biodiversity depends on continued low-intensity management. Compared with UC2 and UC3, which focus on broader agricultural production systems and agroecological transitions, UC4 is centred more specifically on Natura 2000 species-rich grasslands, management-dependent habitats, and biodiversity-oriented restoration and financing needs. This makes UC4 particularly relevant for understanding how biodiversity protection, restoration, management continuity and finance interact in high-conservation-value agricultural landscapes.

5.1.5 Beneficiaries

Primary Beneficiaries

Primary beneficiaries are farmers, tenants and land managers responsible for grassland management, as well as the species-rich grassland habitats and associated species that depend on appropriate mowing, grazing and restoration measures.

Secondary Beneficiaries

Secondary beneficiaries include local communities, municipalities, protected area managers, Natura 2000 and conservation institutions, public authorities, advisory bodies, NGOs, processors and tourism actors, and potential future private buyers or funders of biodiversity outcomes. These actors benefit through improved ecosystem services, stronger landscape resilience, better alignment between conservation and rural development objectives, and greater long-term viability of biodiversity-positive land management. In the Slovenian context, this also includes the preservation of cultural landscapes and local identity linked to low-intensity farming systems and species-rich grasslands.

Stakeholder Roles and Engagement Strategy

Stakeholder engagement is essential because the use case depends on aligning the interests of landowners, tenants, farmers, public authorities, advisory services and conservation actors in a context of fragmented ownership, mixed farm structures and uneven institutional capacity. UC4 therefore requires a participatory and multi-actor approach in which ecological priorities, management realities and financing opportunities are discussed together. Stakeholder engagement also plays a key role in improving trust, feasibility and social acceptance of future biodiversity-finance mechanisms.

5.1.6 Methodology

Overview of Research & Stakeholder Engagement

The methodology combines policy and financing analysis, ecological and geospatial assessment, stakeholder engagement, and case-based testing of financial mechanisms. It includes review of regulatory and financial frameworks (WP2), biodiversity baselines and indicators (WP3), development of financial solutions such as PES and biodiversity certificates (WP4 and WP5), and engagement with land managers, public authorities and other stakeholders (WP6). Site-based analysis is complemented by field visits, expert input and geospatial monitoring in order to connect ecological conditions with governance and financing opportunities. The methodological approach is therefore designed not only to describe the use case, but to support the practical development of financing concepts that are ecologically credible, socially feasible and institutionally compatible with the Slovenian grassland context.

Technical Tools

Technical tools include remote sensing and GIS for land cover and habitat analysis, field-based ecological observations, and monitoring indicators covering ecological, social and financial dimensions. These tools are intended to support future MRV-compatible biodiversity financing approaches and to improve the consistency between ecological monitoring, management evidence and financing design.

Remote Sensing / GIS

Remote sensing and GIS are used to support land cover analysis, grassland and landscape-feature mapping, monitoring of management-relevant changes, and the development of biodiversity-related indicators that can later contribute to MRV systems.

Field Data Collection

Field visits, expert knowledge and ecological observations are used to support site-level understanding, validate spatial information and help relate biodiversity patterns to management conditions and restoration needs.

Monitoring Indicators (Ecological, Financial, Social)

UC4 combines ecological, financial and social indicators. Ecological indicators relate to grassland habitat condition, indicator species and landscape structure. Social indicators relate to farming continuity, participation in schemes, and management capacity. Financial indicators relate to public-support dependence, funding structure and future biodiversity-finance feasibility.

5.1.7 Innovative Financial Mechanisms

Financial mechanism and stakeholder involvement

The financial architecture of UC4 is based on a mixed model in which public funding remains the baseline, while BIO-CAPITAL explores how innovative biodiversity-finance mechanisms could complement this baseline. Key financial stakeholders include the ministries responsible for CAP, Cohesion and LIFE-related funding, the paying agency, conservation institutions, municipalities, advisory bodies, farmers, tenants, landowners, banks and other potential future funders of biodiversity outcomes. In the Slovenian context, biodiversity preservation and restoration are currently financed mainly through CAP-related support and other public programmes, while private biodiversity finance remains very limited. At present, no dedicated private funding stream plays a significant role in the concrete UC sites, which reinforces the importance of understanding how future biodiversity-finance mechanisms could be built on top of an existing public-support baseline.

Financial Instrument Development Process

The financial instrument development process in UC4 follows a stepwise logic: identifying targeted ecosystem services and biodiversity outcomes, mapping providers and potential buyers/funders, analysing complementarity with existing public support, selecting indicators and MRV needs, and assessing which mechanism design — including biodiversity certificates, PES-type arrangements or blended approaches — is most feasible for the Slovenian grassland context. This process is intended to ensure that financing options are grounded in ecological reality, governance feasibility and the constraints of existing policy frameworks.

Typology of Instruments:

Biodiversity Certificates (BC)

Biodiversity certificates are considered a potentially relevant instrument for UC4 because they could help channel additional funding toward biodiversity-positive grassland management and restoration. Their relevance depends on the existence of robust indicators, a credible MRV framework, clear additionality rules, and governance structures able to support issuance, verification and communication of biodiversity outcomes.

Payments for Ecosystem Services (PES)

In Slovenia, no schemes are currently implemented under the explicit label of PES. Existing CAP agri-environment support follows only part of the PES logic and remains mainly action-based, with only a very limited result-based element. In practice, current support in the focal UC areas remains predominantly action-based, while the existing result-based element in Slovenia is recent and small in scale. This means that UC4 is not building on an already mature PES market, but on a public-support baseline that could inform future PES-type or blended biodiversity-finance mechanisms. Any PES-related development in UC4 would need to be designed carefully to avoid overlap with existing CAP support and to ensure clear additionality.

Blended Finance / Green Bonds / Insurance Schemes

Blended finance approaches may be relevant in the Slovenian grassland context because they can help combine public baseline support with complementary funding for restoration, stewardship, monitoring and transaction costs. In parallel, biodiversity-related insurance thinking is relevant in a context where natural hazards such as drought, hail, storms, frost and flooding increasingly affect agricultural systems and biodiversity assets. However, these approaches remain at an exploratory stage and depend on stronger market maturity, clearer risk assessment and more investable biodiversity-performance frameworks.

Result-based Payments

A limited result-based element exists in Slovenia, but it remains small in scale and recent in implementation. This shows that movement toward more outcome-oriented support is possible, but it is not yet sufficient to constitute a mature biodiversity-finance model for UC4.

Alignment with Triple Capital Accounting (Natural, human/social, financial capital)

UC4 is particularly relevant for a Triple Capital Accounting perspective because biodiversity-rich grasslands depend simultaneously on natural capital, human/social capital, and financial capital. Natural capital includes the grasslands, pollinators, soils, water-regulation functions and landscape heterogeneity that underpin ecosystem services. Human/social capital includes family farms, local knowledge, advisory systems, local identity and community stewardship. Financial capital includes CAP support, public conservation funding, and the possible future development of biodiversity-related financial instruments. Degradation in one of these capitals can undermine the others, for example when depopulation leads to abandonment, or when biodiversity decline reduces ecosystem services and farm viability.

Enabling Financial Conditions and Barriers

Key enabling conditions include clearly defined biodiversity indicators, credible monitoring and MRV systems, legal and methodological clarity on additionality, strong stakeholder engagement, and governance arrangements able to connect biodiversity outcomes with financing flows. Existing public funding sources include CAP payments and agri-environment-climate support, Natura 2000-related support, and project-based public funding such as LIFE, Cohesion and Interreg where relevant. These sources are essential but remain largely public, fragmented, and focused on management compensation rather than investment-oriented biodiversity finance. As a result, they are more effective at maintaining supported management than at creating robust financial conditions for larger-scale restoration, long-term stewardship or outcome-based biodiversity financing. The main barriers are fragmented land ownership, short and informal leases, low trust and engagement from farmers, limited advisory support, the absence of mature biodiversity-finance markets, transaction costs, and the need to avoid overlaps or double funding with CAP and other public support.

5.1.8 Risk Management Strategies

At present, ecosystem service delivery is not monitored through a dedicated outcome-based MRV system; controls are focused mainly on compliance with management requirements. This limits the ability to link payments directly to verified biodiversity outcomes and illustrates one of the central implementation challenges for future biodiversity-finance mechanisms in Slovenia. Strengthening outcome-based monitoring and verification will therefore be essential if UC4 is to support more mature PES-type, certificate-based or other biodiversity-finance approaches in the future.

Environmental Risks

Environmental risks include drought, heatwaves, frost, storms, hail, flooding, and the continued deterioration of grassland habitats under intensification, abandonment or woody encroachment. Climate-related stress can reduce habitat quality, weaken ecological resilience and affect both agricultural viability and biodiversity outcomes.

Operational Risks

Operational risks include fragmented ownership, short-term and informal leases, stakeholder resistance, low trust, limited advisory support and administrative complexity. These conditions make it more difficult to implement coherent management and restoration measures across landscapes and reduce the feasibility of more advanced biodiversity-finance models. They are also closely linked to a broader stewardship risk, namely the gradual loss of local management capacity and continuity in landscapes where biodiversity depends on active low-intensity use.

Financial Risks

Financial risks include low profitability of extensive grassland management, insufficient compensation, absence of mature biodiversity-finance markets, weak private demand, and uncertainty of long-term funding. The dependence on public support remains high, while private funding streams for biodiversity are still largely absent in the UC area.

Mitigation Measures

Mitigation measures include continued public support through CAP and other programmes, farmer advisory and engagement, pilot testing of new financing approaches, use of insurance and risk-mitigation tools where available, and development of clearer indicators and MRV systems for future biodiversity-finance mechanisms. Strengthening coordination among institutions and improving stakeholder trust are also important for reducing implementation risk.

5.1.9 Implementation Roadmap

Phases and Milestones

UC4 is implemented progressively through the BIO-CAPITAL work plan, starting from use-case description and ecological/policy framing, followed by biodiversity baseline development, stakeholder engagement, assessment of financing mechanisms, and the design and testing of candidate financial solutions. The implementation logic is iterative and depends on interaction between ecological evidence, stakeholder input and financing design.

Integration with Other WPs

UC4 is implemented through interaction across work packages: WP2 provides the policy and financial framework analysis; WP3 develops biodiversity baselines and metrics; WP4 and WP5 support the design and testing of financial solutions such as PES and biodiversity certificates; and WP6 supports stakeholder engagement and communication. This integration is important because UC4 aims to connect ecological conditions, management realities and financing opportunities rather than treating them separately.

Expected Replicability Potential

UC4 has good replicability potential for other European species-rich grassland landscapes where biodiversity depends on extensive management and where conservation outcomes are shaped by the interaction between Natura 2000 planning, agricultural policy, and public or mixed financing. Its approach is especially relevant in areas with semi-natural meadows and pastures, fragmented ownership, and the need to combine management support with restoration finance. Replicability is strongest where site-level ecological knowledge, advisory support, governance capacity, and measurable biodiversity indicators are available. It is particularly transferable where biodiversity outcomes depend on management continuity, where protected-area or Natura 2000 planning already exists, and where future financing instruments must complement rather than replace CAP-type support. The use case therefore provides complementary insights to other agricultural UCs by focusing specifically on management-dependent habitats of high conservation value rather than on broader production-system transitions.

6. Use Cases Description: 5

6.1. UC5: River corridors and wetlands buffers, UK

6.1.1 Use Case Overview

UC ID and Title: UC5: River corridors and wetlands in UK

Lead Organisation(s): Westcountry Rivers Trust

Supporting Partners: Engaged Landowners

6.1.2 Location and Ecosystem Profile

Description of UC structure: Practice oriented

Geographic Coverage

The southwest of England, with demonstration sites located in Devon and Cornwall. These sites represent typical lowland agricultural catchments and valley systems, where historical modification and land drainage have reduced habitat diversity and connectivity.

The sites represent typical small-scale farming landscapes, characterised by traditional hedge-bank systems and integrated water management practices. Each site exemplifies different aspects of nature-based solutions implementation, from wetland restoration to invasive species management and riparian buffer enhancement.

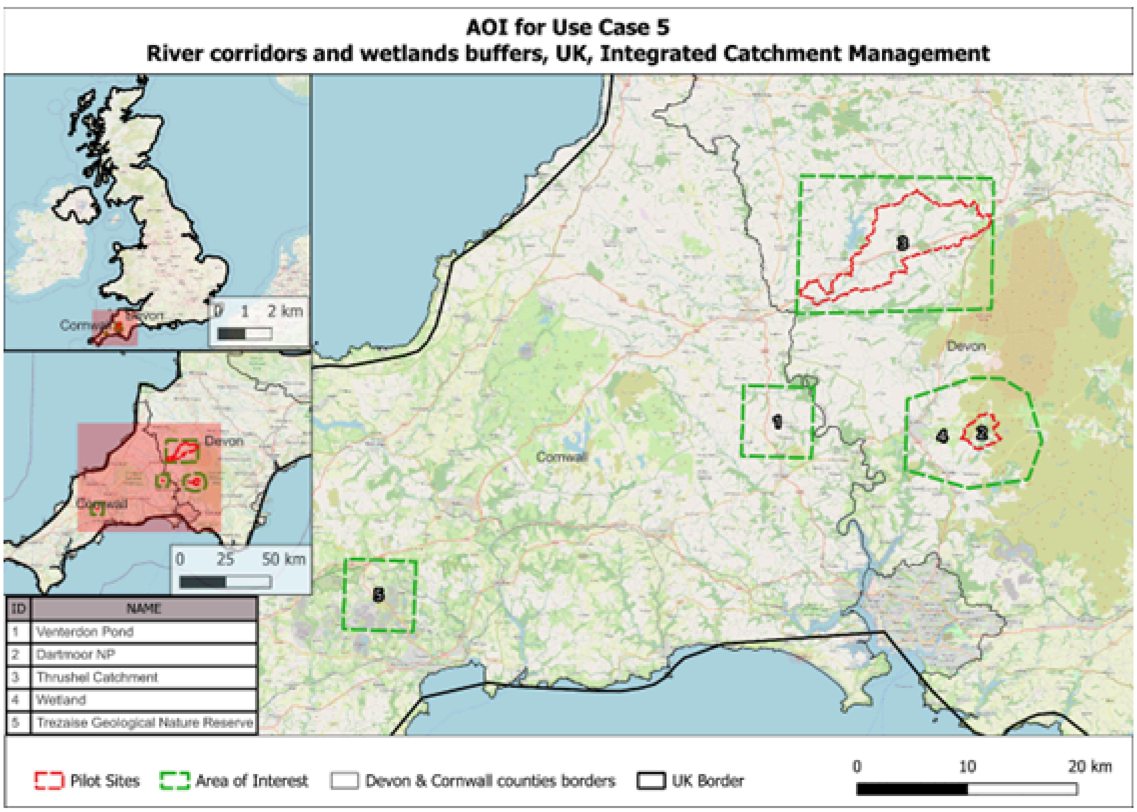
Agro-environmental description

Agricultural activity has a strong influence on the condition of river corridors and wetlands. In many areas, livestock have unrestricted access to watercourses, leading to bank erosion, poaching, and nutrient enrichment. Intensive cultivation and drainage have often extended right up to the river edge, reducing riparian vegetation, increasing sediment and nutrient runoff, and disconnecting rivers from their floodplains. The use of fertilisers and pesticides further contributes to water quality pressures, while the loss of buffer strips and wetland margins limits habitat connectivity and resilience. However, well-managed farmland can also play a positive role. Agri-environment schemes that promote buffer zones, reduced stocking densities, and the rewetting of floodplains can help restore natural processes, improve water quality, and support biodiversity within agricultural landscapes.

Ecosystem Type

The project focuses on the restoration of river corridors and associated wetland habitats to enhance biodiversity, improve water quality, and strengthen climate resilience.

Map and Spatial Reference



As part of this work, WRT are engaging with a multitude of sites and landowners to understand the nuances of different interventions, scale and scope.

6.1.3 Environmental Context

Key Biodiversity Features

Wetlands and river corridors in the UK are rich in biodiversity and form vital natural networks that span and connect habitats across the landscape. Shaped by dynamic hydrological and geomorphic processes, they exist in a state of quasi-equilibrium, constantly adjusting to changes in flow, sediment, and climate while maintaining their overall ecological balance. This dynamism creates a mosaic of habitats, including riffles, pools, backwaters, fens, reedbeds, and wet woodlands, which support species such as salmon, trout, otter, water vole, white-clawed crayfish, and kingfisher. Riparian vegetation provides shading, stabilises banks, and facilitates species movement between habitats, while floodplains, scrapes, and ponds offer key breeding and feeding areas for birds and amphibians. These systems also deliver essential ecosystem functions such as nutrient cycling, water purification, flood storage, and carbon sequestration, making them among the most valuable and ecologically active habitats in the UK.

Threats and Pressures (current and historical)

Rivers and wetlands in the UK have been heavily shaped by both past and present human activity. Historically, land drainage, channel straightening and embankment building were carried out to improve agriculture and control floods, but these actions disconnected rivers from their natural floodplains. Industrial waste and untreated sewage also left long-lasting pollution in sediments. Today, water quality remains under pressure from agricultural runoff, urban drainage and combined sewer overflows. Flow regulation, abstraction and barriers such as weirs continue to alter natural hydrology and block species movement, while development, intensive land use and invasive species contribute to further habitat loss. Hard engineering and bank erosion have reduced the ability of rivers to adjust and form diverse habitats.

Climate Change Vulnerabilities

Climate change adds to these challenges, bringing more frequent floods and droughts, warmer water temperatures and rising sea levels that threaten coastal wetlands. Together, these pressures have simplified river systems, reduced connectivity and weakened their ecological resilience.

Baseline Biodiversity Status

The baseline watercourse unit values represent the existing biodiversity value of each assessed river reach prior to any restoration. Most of the sections surveyed show low baseline values (generally below 1 unit), indicating short or degraded reaches likely in moderate to poor condition. A few higher values, such as 3.71 and around 0.9, suggest longer or better-quality sections within the surveyed area. Overall, the dataset indicates a river system with relatively low baseline ecological value, offering good potential for biodiversity enhancement and measurable uplift through habitat improvement.

6.1.4 Use Case Objectives

Overview of Objectives

Restoration and protection of riparian and wetland ecosystems through conservation covenants and nature-based solutions.

Tasks and Implementation Approach

In the context of river and wetland restoration in the UK, River Condition Assessment (RCA) and Biodiversity Net Gain (BNG) provide a structured, evidence-based framework for planning and delivering habitat improvements. RCA provides a mechanism to help identify pressures on a river system, enabling the prioritisation of actions to restore hydromorphology, connectivity, and ecological condition. The implementation of BNG ensures that these actions are linked to measurable biodiversity gains (through ‘habitat units’) and supported by financial mechanisms, making restoration economically viable for landowners and developers.

Practical interventions may include riparian planting, livestock exclusion, floodplain reconnection, barrier removal, and creation or enhancement of wetland habitats, all designed to improve habitat quality and landscape connectivity. Engaging stakeholders across the catchment is essential to align ecological objectives with financial opportunities, for example through conservation covenants, habitat banking, or environmental investment schemes.

Together, RCA and BNG provide a framework that guides evidence-based ecological restoration and secures the necessary funding plus incentives to ensure long-term implementation, maintenance, and measurable biodiversity outcomes.

Conservation Covenants through ‘Responsible Bodies’ (such as WRT) are routes to protecting conservation interventions through a legal contract formed between the landowner (the seller) and the Responsible Body, with established Habitat/Environment Banks acting as brokers with potential buyers.

Environmental Goals

To identify and implement innovative solutions for the restoration and protection of riparian and wetland ecosystems, enhancing habitat quality, connectivity, and resilience. This includes the application of conservation covenants, nature-based solutions, and Biodiversity Net Gain mechanisms to deliver measurable biodiversity improvements. To understand if BNG and Conservation Covenants as well as novel Biodiversity Certificates can be real routes to leverage finance for river restoration ambitions.

Economic Goals

To make the restoration and protection of riparian and wetland ecosystems economically and financially viable. This involves identifying and mobilising investment flows, funding mechanisms, and market-based instruments such as Biodiversity Net Gain, conservation covenants, and environmental investment schemes to support the implementation of nature-based solutions. By aligning ecological objectives with financial incentives, the approach aims to enable landowners, developers, and stakeholders to adopt restoration measures without compromising economic feasibility, while ensuring long-term maintenance and measurable biodiversity outcomes.

Policy Alignment:

By linking ecological restoration to financial incentives and investment flows, these approaches aim to make habitat enhancement economically viable, encourage stakeholder participation, and secure long-term ecological benefits. The work aligns with the EU Biodiversity Strategy for 2030/ UK Biodiversity Strategy and the 25 Year Environment Plan, which set targets for ecosystem restoration, species recovery, and the creation of nature networks. It also supports objectives under the Water Framework Directive, which remains part of UK law and promotes good ecological and chemical status in water bodies, and is reinforced through Environmental Land Management (ELM) schemes, which provide funding for biodiversity-friendly land and river management. Additionally, these interventions contribute to climate adaptation and Net Zero objectives, promoting nature-based solutions that enhance flood resilience and overall ecosystem function. BNG is now a legal route in the UK for leveraging biodiversity improvements linked to development.

Expected Outcomes

To understand if BNG and Conservation Covenants as well as novel Biodiversity Certificates can be real routes to leverage finance for river restoration ambitions.The project seeks to formalise the mechanism to deliver measurable improvements in the ecological condition of riparian, river and wetland habitats, including enhanced biodiversity, restored hydromorphology, and increased habitat connectivity via conservation covenants, Biodiversity Net Gain or other mechanisms. The project will provide financially viable pathways for landowners and stakeholders to adopt restoration measures. Overall, the approach aims to create long-term, sustainable benefits for ecosystems, people, and the wider landscape, aligning with national and EU biodiversity targets.

6.1.5 Beneficiaries

Primary Beneficiaries: Nature, landowners, farmers, and river corridor managers

The primary beneficiary of river and wetland restoration is Nature. Positive ecological outcomes, such as improved habitat quality, enhanced biodiversity, and restored hydromorphology, do not usually generate immediate financial returns for landowners or managers. They contribute to environmental conservation and protection, providing long-term benefits for society and the environment.

However, landowners, farmers, and river corridor managers are also primary beneficiaries in that they may receive financial incentives for implementing restoration measures, as well as intrinsic benefits such as enhanced landscape quality, stewardship, and long-term resilience of the land they manage.

Secondary Beneficiaries: local communities, recreational users, public institutions, and investors.

Secondary beneficiaries include landowners and stakeholders (e.g flood authorities) across the catchment, who may gain indirect benefits such as improved flood resilience, water quality, and access to natural spaces. Wider communities benefit from enhanced environmental resilience, including climate adaptation, natural flood management, and mitigation of the detrimental effects of degraded ecosystems. Investors, public bodies, and conservation organisations also benefit from measurable biodiversity gains and evidence-based monitoring. By protecting and restoring ecosystems, these interventions contribute to both planetary and human health, demonstrating that safeguarding nature ultimately supports people, society, and long-term sustainable development through ecosystem services.

6.1.6 Methodology

Remote Sensing:

- Enables scalable assessment of habitat condition, vegetation cover, and landscape changes over time.

GIS:

- Supports detailed spatial mapping of riparian zones, wetland margins, and habitat connectivity.
- Helps identify priority areas for intervention and informs the design of nature-based solutions that deliver Biodiversity Net Gain (BNG).

Indicator Development:

- Ecological and hydromorphological indicators support schemes such as Upstream Thinking.
- Aligns with the Water Framework Directive (WFD), providing a framework for monitoring, evaluation, and adaptive catchment management.

Overall Purpose:

- Facilitates evidence-based, data-driven decision-making.
- Links habitat restoration with measurable biodiversity outcomes and long-term ecosystem resilience.

Field Data Collection – MoRPh BNG RCA

River Condition Assessments (RCA):

- Conducted usingCartographer software to evaluate river habitat condition.
- Identifies ecological pressures and facilitates the prioritisation of restoration interventions.

MoRPh Framework:

- Standardised hydromorphological surveys of channel form and structure, sediment, and flow dynamics.

Biodiversity Net Gain (BNG) Frameworks:

- Quantifies baseline habitat units and proposed habitat enhancements.
- Supports development of biodiversity offset requirements and monitoring of long-term ecological gains.

Ground-level measurements:

- Soil testing, water quality analysis, and pesticide modelling.
- Provides complementary data to support evidence-based restoration planning.

eDNA Sampling:

- Collects environmental DNA from water, sediment, or soil to detect and monitor species presence, including rare or elusive aquatic organisms.
- Supports biodiversity assessments and complements traditional field surveys, providing rapid, cost-effective, and non-invasive data.

Sensor-Based Monitoring:

- Includes automated sensors for water level, flow, temperature, turbidity, and nutrient concentrations.
- Provides continuous, high-resolution data to track hydrological and water quality changes over time.

6.1.7 Risks and Challenges

Environmental Risks:

- Natural disturbances, including floods, droughts, and extreme weather events, which may affect restoration outcomes.
- Climate change impacts hydrology, water quality, and species distributions.
- Invasive species or unexpected ecological responses.

Operational Risks:

- Stakeholder resistance or uncertainty, particularly among landowners, farmers, and river corridor managers.
- Land tenure complexities or access restrictions.
- Coordination challenges across multiple sites or catchments.
- Specific BNG-related risks, including landowner uncertainty around financial returns, and fluctuating demand for off-site units.
- Responsible Body risks of long term agreements, ability to enforce breaches in covenant

Financial Risks:

- Insufficient or short-term funding to implement or maintain measures legally secure through BNG for 30 years.
- Situations where financial incentives for interventions (e.g., small weir removals) may not fully cover delivery and maintenance costs .
- Dependence on emerging BNG markets, with price and demand uncertainties.
- High upfront costs of restoration interventions without immediate financial return.
- Uncertainty around legal responsibilities surrounding conservation covenants, long-term management, and resource requirements.
- Complexity surrounding stacking of credits.

Mitigation Measures

- Transparent communication and engagement with landowners and organisations to manage expectations.
- Capacity building and guidance on legal, taxation and management obligations for conservation covenants.
- Emphasising ecological co-benefits, resilience, and long-term ecosystem gains alongside financial incentives.
- Prioritising stacked interventions to maximise both ecological and financial outcomes.
- Adaptive management informed by monitoring, eDNA, sensor data, and RCA/MoRPh surveys.
- Responsible Bodies (e.g. WRT) favour taking on low-risk proposals when agreeing responsibilities surrounding conservation covenants, with realistic and minimal management expectations.
- Diversifying funding sources, including BNG funding, environmental investment schemes, and public funding.

6.1.8 Implementation Roadmap

- **Integration with Other WPs**

WP3: Biodiversity baselines and metrics

The baseline watercourse unit values represent the existing biodiversity value of each river reach, forming the foundation for assessing Biodiversity Net Gain (BNG). Under the BNG metric, each section of watercourse is assigned a numeric value based on its length, habitat condition, and strategic significance within the wider landscape. These values together provide a quantifiable measure of the river's current ecological quality.

Most of the baseline values that have been surveyed are below one unit, suggesting that the surveyed reaches are in moderate to poor condition, with limited habitat diversity or connectivity. A few higher values, such as 3.71 and around 0.9, correspond to those already supporting better-quality habitat.

Overall, the baseline results indicate that the river reaches that have been surveyed currently provide a relatively low biodiversity value, highlighting opportunities for significant ecological uplift. Through restoration actions such as renaturalising modified banks, establishing riparian buffer zones, removing in-stream barriers, reinstating natural processes, and improving in-channel habitat, the post-intervention condition scores would increase, resulting in measurable gains in biodiversity units. These gains, when compared to the baseline, form the basis for demonstrating compliance with Biodiversity Net Gain requirements.

Preliminary Results & Insights

Early-stage findings, pilot feedback, stakeholder responses

Watercourse BNG units are currently valued between £95,000 to £205,000. There is scarce availability of these units on the market, which can be highly complex to parcel up , due to complex landownership of watercourses in the UK, and limited expertise on watercourse assessment and project design.

7. Conclusion

This deliverable presents a comprehensive overview of various use cases aimed at advancing biodiversity conservation and ecosystem management across different regions and ecosystems. Each use case highlights unique approaches and methodologies tailored to specific environmental challenges and objectives, reflecting the diversity of strategies needed to address complex ecological issues.

Overall, these use cases collectively highlight the multifaceted nature of biodiversity conservation and ecosystem management. They demonstrate the need for diverse and context-specific approaches to address environmental challenges, integrate ecosystem services, and promote sustainable practices. The experiences and findings from these use cases offer valuable insights for replicating successful strategies in other regions and for developing innovative solutions to emerging environmental issues.

As we progress, it is crucial to continue fostering collaboration among stakeholders, leveraging technological advancements, and ensuring that financial and policy frameworks support effective conservation and restoration efforts. By building on the knowledge and experiences presented in these use cases, we can advance our understanding of biodiversity dynamics, enhance ecosystem resilience, and contribute to the sustainable management of natural resources across Europe and beyond.

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9. Annex

Annex 1a – Comparative table of Use-case dimensions

Comparable Dimension	Case-Specific Variation Across UCs	Comparable / Complementary	Rationale
Geographic context	UC1: Alpine forests in Austria/Italy; UC2: Aube, Grand Est, France; UC3: South Muntenia, Romania; UC4: Slovenia; UC5: Devon/Cornwall, UK	Complementary	The use cases are intentionally distributed across different socio-ecological and policy contexts to test transferability and applicability across Europe.
Spatial scale	UC1 combines Alpine territorial scales; UC2 and UC3 operate mainly at farm/plot scale; UC4 integrates national, landscape, and parcel scales; UC5 focuses on multiple sites and catchment-level landscapes	Partly comparable	All cases connect local implementation with broader policy and financing contexts, but the scale structure differs according to ecosystem type and management needs.
Ecosystem / intervention type	UC1: forest ecosystems; UC2: regenerative agriculture; UC3: agroecological transition and green infrastructure; UC4: semi-natural grasslands; UC5: river corridors and wetlands	Complementary	The diversity of ecosystems is intentional and supports testing of biodiversity finance mechanisms across different ecological contexts.
Governance structure	UC1 combines commons-based and private governance; UC2 involves farmer networks and regional actors; UC3 includes farmers, authorities, and institutional partners; UC4 relies on multi-level Natura 2000 governance; UC5 is coordinated through Westcountry Rivers Trust and landowners	Partly comparable	All use cases involve multi-actor governance arrangements, though institutional configurations vary significantly.

Indicators / monitoring	UC1 focuses on forest integrity and natural capital; UC2 on soil health, hedgerows, and biodiversity features; UC3 on crop diversity and ecological infrastructure; UC4 on detailed habitat and socio-economic indicators; UC5 on river and wetland biodiversity restoration	Partly comparable	Monitoring approaches are comparable at methodological level, while the indicators differ according to ecosystem and intervention type.
Financial mechanisms	UC1: PES, blended finance, biodiversity certificates, insurance; UC2: PES, parametric insurance, green loans; UC3: PES and performance-based instruments; UC4: biodiversity certificates and result-based payments; UC5: agri-environment support schemes	Partly comparable	Mechanism categories are comparable across UCs, but differ in maturity, implementation level, and regional context.
Implementation pathway	All use cases integrate WP2–WP5 activities through phased implementation and iterative testing	Comparable	All UCs follow the project integration logic linking policy, monitoring, certification, and finance through practical implementation.
Social framing	UC1 emphasises local forestry traditions and collective governance; UC2 focuses on farmers and cooperatives; UC3 highlights adoption barriers and local administrative capacity; UC4 addresses local communities and ageing farmers; UC5 focuses on landowner participation and ecosystem stewardship	Comparable at category level	Social framing is present across all cases, though the degree of articulation and emphasis varies.
Replicability / scalability logic	UC1 tests Alpine replication; UC2 supports scaling of biodiversity finance instruments; UC3 targets transferability across Romanian agriculture; UC4 addresses replication in European grasslands; UC5 supports transferable river-corridor restoration approaches	Complementary	Each use case contributes different lessons for replication and scalability across ecosystems and governance contexts.

Annex 1b – Synthesis table summarizing core Use-case dimensions

Case Study	Location	Spatial Scale	Key Indicators / Monitoring Focus	Financial Processes / Mechanisms	Governance Arrangements
UC1 – Alpine Forests	Austria and Italy (Alpine region)	Territorial and site scale; approximately 20,000 ha in Italy and 1,400 ha in Austria	Forest habitat integrity, biodiversity conservation status, natural capital value, climate and disturbance risk, MRV requirements	PES, blended finance, biodiversity certificates/nature credits, impact equity funds, insurance schemes	Multi-stakeholder engagement with landowners, conservation actors, and research institutions
UC2 – Regenerative Agriculture	Aube, Grand Est, France	Farm and plot scale with regional stakeholder integration	Soil biodiversity, hedgerows, flower strips, wetlands, crop and livestock diversity, geodata-linked habitat features	PES, parametric insurance, biodiversity certificates, green loans	Farmers, APAD, SCARA, landowners, regional stakeholders, and project partners
UC3 – Agroecological Transition	South Muntenia Region, Romania	Farm and regional scale	Crop diversity, forest belts, ecological corridors, soil protection, vegetation cover, biodiversity-supporting infrastructure	PES, blended finance, performance-based instruments	Farmers, local authorities, institutional partners, experts, and project stakeholders

UC4 – Species-Rich Grasslands	Slovenia (Goričko and Osrednje Slovenske gorice Natura 2000 areas)	National, landscape, and parcel scale	Grassland habitat condition, extensively managed grasslands, indicator species, farmland birds and butterflies, participation in agri-environment schemes	Biodiversity certificates, PES-type schemes, blended finance, result-based payments, CAP and Natura 2000 support instruments	Multi-level governance involving Natura 2000 institutions, ministries, municipalities, advisory services, conservation bodies, and landowners
UC5 – River Corridors and Wetlands	Devon and Cornwall, United Kingdom	Multi-site and catchment scale	River and wetland restoration, habitat connectivity, water quality, biodiversity recovery, climate resilience	Agri-environment schemes supporting buffer zones, rewetting, and sustainable land management	Westcountry Rivers Trust working with landowners and local ecosystem stakeholders

Annex 2 – UC1 Case Studies

UC1 examines a few case studies based on the list of closer-to-nature forest management interventions described in the Eu-Guidelines 2023. These case studies relevant for the implementation of the biodiversity strategy 2030 are considered independently and/or within initiatives of a broader scope (e.g., area-based conservation measures).

Case Study 1. Ensuring respectful harvest conditions - Logging techniques.

"When planning harvesting operations, it is necessary to take account of the need to preserve all the functions of the forest" (EU-Guidelines 2023, p. 22). This preservation goal in Alpine forestry is often very difficult to apply in practical operations. One key factor is the difficult accessibility of sites, which requires the use of machinery and methods with limited flexibility (such as cableways). A second key factor is wood extractions following disturbances such as wind throws and pest outbreaks: during the last decade, in many locations, these unwanted/unplanned extractions have become the rule. The combination of these two factors poses a high barrier for implementing closer-to-nature harvest conditions. Certainly, an "undue use of unsuitable machinery" and working methods also depends on the challenge of extracting wood at economically viable rates. This can often "cause negative environmental impacts such as soil compaction", whereas "Soil properties and soil ecosystem services must be protected as the very foundation of healthy and productive forests" (EU Forest Strategy).

Case Study 2 - Mixed-species forests.

"The composition of forest species and the genetic diversity of populations of a given species are largely determined by the type of forest management practiced", and as a matter of fact "for centuries, forest management was built on optimising or even maximising tree growth and yield measured by the production of wood. Formerly diverse forest landscapes were progressively replaced by less diverse plantations, with reforestation often reduced to a limited number of high-yield species harvested well before their longevity potential, leading to the simplification and homogenisation of European forests" (EU-Guidelines 2023, Part I). Management practices that support biodiversity, such as diverse forests, can help to limit the outbreak and spread of bark beetles and increase a forest's physical reliance. Successful mixed reforestation requires increasing the capacities of the whole forest reproductive-material supply-chain (seed collection, storage, transport, nurseries), which is vital for both SFM and coping with disturbances. Barriers to effectively implementing these strategies in Alpine environments include the costs of fencing off afforestation areas or the individual protection of saplings from grazing cattle, sheep and wild animals. These costs of establishing and maintaining, over the first few years, the protection of young trees can be very high, given their geophysical characteristics and, often, the limited accessibility of sites.

Case Study 3 - Deadwood management.

The long-term environmental viability of forests requires that standing and fallen dead wood should be left in quantities and distribution, necessary to safeguard biological diversity as deadwood plays an important role "by serving as a natural habitat, a nutrient pool, water storage and a precursor of soil organic matter for several thousand species" (EU-Guidelines 2023, p. 26). The optimisation of deadwood retention is also critical for the objective of "Preserving and restoring forest soils and water ecosystems", among others, because it can be an effective NbS against erosion in steep Alpine slopes. On the one hand, current forest management practices, driven by productivity and cost-reduction needs, often conflict with this evidence, especially when costly and inflexible machinery needs to be used and doesn't have viable alternatives. On the other hand, frequent large scale pest break-outs encourage practices for hygiene purposes that lead to the extraction of large quantities of wood that could have otherwise been left in the forest stands (see EU-Guidelines 2023, p. 27).

Annex 3 – EU Guidelines 2023

Guidelines on Closer-to-Nature Forest Management (27.07.2023) *https://environment.ec.europa.eu/publications/guidelines-closer-nature-forest management_en*

Annex 4 – UC5 Case Studies

Case Study: Riparian Buffer Strips – Tamar Valley

A site was forecasted with 10m riparian buffer strips, with a total of 0.67 km of watercourse to be enhanced. Baseline habitat units were 6.03, with a target of 9.75, and the project delivered 3.72 units, representing a 61.7% uplift. Based on the BNG Pricing Report (2025) value of £153,750 per unit, the projected habitat units correspond to a biodiversity value of approximately £571,950, or roughly £854 per metre of enhanced buffer. The intervention includes several cost components: the development phase for establishing Conservation Covenants is estimated at £3,000 (Finance Earth), the Habitat Management and Monitoring Plan (HMMP) development costs £10,000, and tax/broker fees are approximately 5% of the development expenditure. Delivery and maintenance costs, including planting, fencing, and habitat upkeep, are expected over the project lifetime, while monitoring costs (e.g., five-yearly RCA surveys, advice, and reporting) provide ongoing oversight of condition and BNG performance. When considered alongside these costs, the riparian buffer intervention demonstrates a strong potential return in ecological value, highlighting its effectiveness as a cost-efficient measure for generating BNG credits.

Other interesting case studies from other similar projects:

Weir Removals

Case Study: Large Weir

Our largest baseline (pre-intervention) value came from a main watercourse at 3.7 units running through a managed woodland. The forecasted intervention onsite achieved 5.94 units, delivering 3.53 BNG units. The design assumed a partial weir removal, improving the condition class from moderate to fairly good and with the site strategically located within the Local Nature Recovery Strategy (LNRS) area.

Interestingly, the forecasted partial weir removal produced the same unit uplift as a full removal, as neither scenario resulted in significant impoundment. The Biodiversity Metric Guide allows partial removal of encroachments when full removal of engineered structures (e.g. bank revetment or in-channel structures) is not feasible. In such cases, the encroachment multiplier can be reduced from major to minor within the enhancement tab. Cost estimates for the partial weir removal were £475,000 compared with £300,000 for full removal. Based on a valuation of £153,750 per BNG unit (BNG Pricing Report, 2025), the 3.53 units delivered equate to approximately £543,000 in biodiversity value. Therefore, this means the BNG units would just cover the cost of removal but not necessarily setting up a Conservation Covenant and maintenance over the 30 year agreement period.

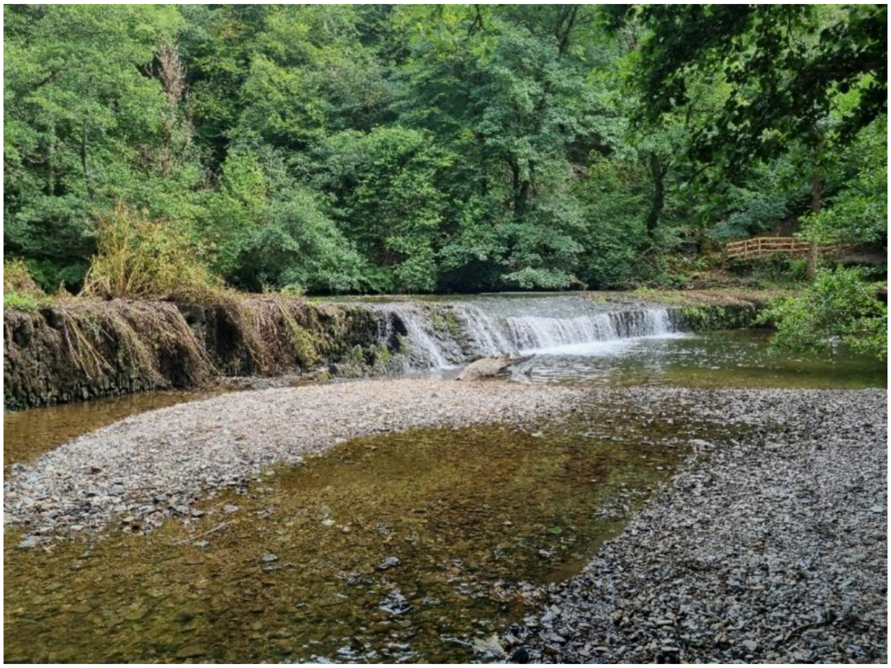

Figure 1. Photograph of weir (Case Study One).

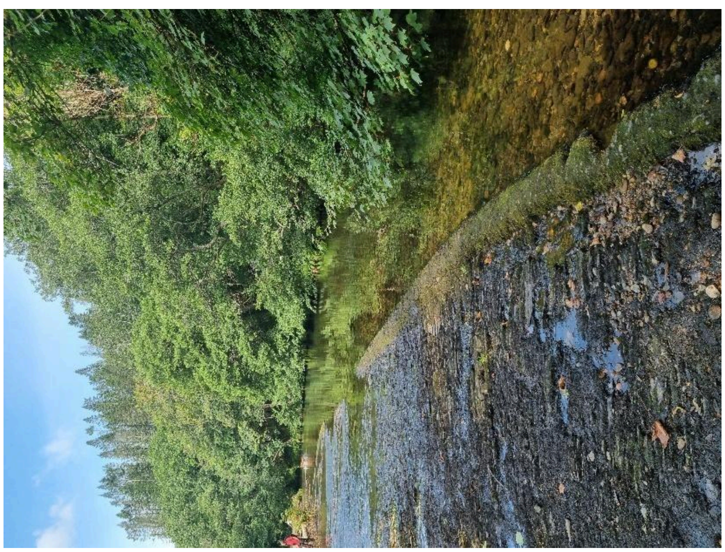

Figure 2. Photograph showing the span off weir to be removed.

Case Study: Small weir removal

Another site focused solely on a weir removal, with no stacked interventions. The RCA produced a preliminary condition score of 1.182 and a baseline biodiversity value of 0.16 units. Post-intervention modelling using the BNG Calculator and RCA Cartographer predicted an uplift to 0.29 units (a gain of 0.13 BNG units). One month after removal, monitoring recorded a post-intervention score of 1.895, corresponding to 0.24 BNG units delivered, exceeding forecasts. The modelled condition score was 1.619, showing an improvement from moderate to fairly good.

A riparian buffer strip could further enhance this site, adding an estimated 0.30 BNG units if bank-top encroachment is reduced, subject to landowner agreement, as the left bank is currently farmed to the water's edge.

Costs for the weir removal were at £36,650. Using the 2025 BNG Pricing valuation, the 0.24 units delivered equate to approximately £36,900, excluding any additional uplift from buffer creation. However, both cases have not taken into account setting up a conservation covenants agreement within this fee.

Both pilot sites demonstrate that larger weirs with extensive impoundment can deliver just enough uplift to justify removal costs, while smaller or medium-sized structures (baseline values around 0.2–0.3 units) produce lower forecasted gains of 0.1–0.3 BNG units. Based on the BNG Pricing Report, this equates to £15,000–£46,000 per site, depending on site condition and design extent. Therefore, costs would often not be covered through the BNG funding mechanism.

Figure 3 & 4. Chipley weir before removal (Case Study Two).

Figure 5. Chipley weir directly after removal.

Figure 6. Chipley weir downstream view around 1 month post removal.

Figures 7-10. Photographs showing poaching from cattle and sediment incentivising riparian

buffer strips (Case Study Three).

Insights

Early BNG metric calculations indicate that interventions such as reducing watercourse encroachment, establishing riparian buffers, and reconnecting floodplains generate the greatest predicted habitat condition uplift and biodiversity unit gains. In contrast, standalone weir removals generally produced lower BNG uplifts unless combined with complementary measures or a very long length of upstream impounded water.

Preliminary cost analyses, covering implementation, monitoring, and maintenance, suggest that stacked interventions, such as combining riparian buffer creation with targeted channel restoration, deliver stronger ecological outcomes per unit cost and significantly increase potential BNG credits. Findings also highlight that reducing encroachment is particularly valued within the BNG metric, especially where interventions enhance connectivity and restore natural channel form.

Baseline monitoring demonstrates that sites with reduced watercourse encroachment are particularly effective at generating BNG units. Large weir removals that alleviate extensive impoundment deliver substantially higher uplifts than smaller structures, as they restore longer reaches of natural flow and habitat diversity. This relationship emphasises that primarily, weirs impounding sufficient water volumes can achieve just enough habitat uplift to make removal financially viable.

Weir removals often require detailed design planning for example, determining whether to remove the full structure, the bank face only, or the entire width to estimate potential BNG units accurately. Without this information, forecasting uplift is challenging, which can increase upfront costs during feasibility stages when assessing whether the expected habitat gains justify removal, stakeholder engagement, and associated works. Moreover, maintenance of the original weir structure (if retained) imposes ongoing safety, repair, and liability costs, which can make removal more cost-effective in the long term and therefore can be seen as incentive for removal.

Stakeholder feedback reflects interest in financial incentives linked to BNG outcomes but emphasises the need for transparent communication regarding costs, maintenance responsibilities, and the long-term ecological value of restoration works.

Conservation Covenant / Costs to be Considered within Unit Price

Phase	Cost	Notes
Development phase cost: Cost of Establishing Conservation Covenant	£10,200	Estimate taken from quotes acquired by Finance Earth *
Development phase cost: Creation of HMMP and baselining activities	£3,000 (HMMP) + baselining costs £700 (WRT to estimate)	Pre-survey prep (£205), RCA surveys (£477) Data Analysis BNG Calculations, Reporting (£2,454) = £2,934 Estimate for HMMP only, taken from quotes acquired by Finance Earth *
Development phase cost: Landowner tax, legal advice and other costs	£10,000 + tax	Estimate taken from quotes acquired by Finance Earth *
Broker costs	5% (low?)	Estimate from Finance Earth*
Delivery phase cost: Capital for initial habitat works	£1,749	Structure Removal (from medium weir removal Craig)
Maintenance and management cost: Ongoing materials and maintenance costs including contingency	£10,000	Maintenance in case something blows out.
Monitoring cost: 5-yearly RCA monitoring, advice and reporting over 30-year period	£25,000 (from Craig's 30-year costing sheet)	Finance Earth est = covenant monitoring costs @ £850 p/y for 30 years, AND £2k every 5 years for 'verification' = £37.5k)
Total Cost of Project Delivery:	**£61,844** (excluding tax on legal/landowner costs)	