



**Sustainable Multifunctional Management by Small Forest Owners  
in Support of Bioeconomy, Biodiversity, and Climate**

**Grant Number: 101135517**

# **Deliverable D3.1**

**Recommendation of relevant PES schemes**



# Document Control & History

## Document Control

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## Abbreviations

<b>BES</b>	Biodiversity and ecosystem services
<b>CRCF</b>	Carbon removals and carbon farming
<b>D</b>	Deliverable
<b>DEC</b>	Dissemination, Exploitation, and Communication
<b>EC</b>	European Commission
<b>ES</b>	Ecosystem services
<b>EU</b>	European Union
<b>GA</b>	Grant Agreement
<b>LL</b>	Living Labs
<b>MRV</b>	Monitoring, reporting and verification
<b>NIPF</b>	Non-industrial private forest
<b>PES</b>	Payment for Ecosystem Services
<b>SFO</b>	Small forest owner
<b>S4G</b>	Small4Good
<b>WP</b>	Work Package

# Executive Summary

## Abstract

This report presents recommendations for designing payment for ecosystem services (PES) schemes that are effective and attractive for small forest owners (SFOs). Empirical evidence shows that complex contracts, high monitoring costs and misalignment with forest owners' time preferences limit participation. We therefore argue for action-based PES as the default approach, rewarding clearly defined forest management actions rather than measured ecological outcomes, with limited outcome-based bonuses only where verification is simple and low-cost. Collective participation through intermediaries, such as forest owner organisations, is identified as crucial for reducing transaction and monitoring costs and enabling the inclusion of small forest parcels. Monitoring, reporting and verification systems should be simplified and, where sufficient, built on existing data sources, remote sensing and conservative proxies. Contract designs should be flexible and modular, offering short to medium commitments, renewal options and partial upfront payments to align with forest owners' decision horizons. Bundling multiple ecosystem services within single PES schemes can improve cost-effectiveness and legitimacy. Finally, stable income streams and alignment with emerging EU policy frameworks are essential to ensure long-term participation and scalability.

## Background

The Small4Good project aims to help small forest owners implement multifunctional management and business models supported by digital and AI driven solutions. The project promotes biodiversity and carbon farming through business models, including payment for ecosystem services schemes (PES), engaging these smallholders in active forest management. The discussions of PES in the forest sector in Europe have rarely focused on the small forest owners (SFOs), their particular motivations and challenges, and how PES schemes can be designed so that they can utilise such schemes.

## Objective and links within the Small4Good project

To contribute to achieving the overall project objective, this report aims to provide recommendations of relevant payment for ecosystem service (PES) schemes, that are particularly suitable for small forest owners (SFOs) in a European context, based on the current state of knowledge.

The report is primarily based on Tasks 3.1 and 3.2 of work package 3, and links with and extends the work carried out in WP2. WP3 aims to identify business models tailored to the needs of SFOs to support multifunctional management in line with the EU Forest Strategy. It additionally draws on preliminary results from Tasks 3.3 and 3.4, especially results on existing experiences of SFOs with PES in the living lab (LL) countries and expectations towards PES

expressed by SFOs during the first round of workshops and explorative interviews. Results feed into further work in WP3 (on business models), WP4 (operational aspects of multifunctionality) and WP5 (digital tools).

### **Recommendation of relevant payment for ecosystem service schemes**

The recommendations propose designing PES schemes for SFOs that are simple, predictable, and low-cost to administer, while remaining credible and scalable. A central principle is to prioritise action-based PES—paying forest owners for clearly defined management actions rather than measured ecological outcomes—since this aligns better with owner preferences, improves transparency, and significantly reduces monitoring, reporting and verification (MRV) costs. Where feasible, limited outcome-based bonuses may complement action-based payments using low-cost, verifiable proxies.

To further reduce transaction costs, collective participation through intermediaries, such as forest owner organisations, should be the core delivery mechanism. Aggregation enables economies of scale in contracting and MRV, standardisation of activities and contracts, and easier inclusion of small parcels over time. MRV systems should be simplified and built on existing data and planning tools, relying on sampling, modelling, remote sensing and conservative default values rather than costly plot-level field verification. Outcome-based payments will likely require stricter MRV procedures.

Contracts should be flexible and modular, reflecting SFOs' time preferences and regional differences in how forest management temporality is understood. Short to medium commitments with renewal options, partial upfront payments, and clearly defined exit conditions can increase participation without undermining long-term objectives. PES schemes should also aim to bundle multiple ecosystem services—such as carbon, biodiversity and water—rather than focusing on single services, improving cost-effectiveness, reflecting real management decisions, avoiding that services crowd out others, and enhancing perceived fairness and legitimacy.

Finally, the recommendations stress the importance of stable and predictable income streams, ideally combining public baseline payments with private or market-based top-ups, and reinvesting part of revenues into forest management support. PES schemes should be policy-aligned and future-proofed, ensuring compatibility with emerging EU carbon farming and nature credit frameworks, harmonising rules across regions, and offering simplified pathways for small and collective projects to sustain long-term participation and trust.

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# 1. Introduction

## About the Small4Good project

The Small4Good project aims to help small forest owners implement multifunctional management and business models supported by digital and AI driven solutions. The project promotes biodiversity and carbon farming through payment for ecosystem services schemes, engaging these smallholders in active forest management. Small4Good’s approach involves understanding the motivations of small forest owners and developing business and management models through a multi-actor living lab approach across Europe, promoting rapid prototyping and implementing realistic, locally adapted pathways towards multifunctionality.

## Objectives of the deliverable

To contribute to achieving this overall project objective, this report aims to provide recommendations of relevant payment for ecosystem service (PES) schemes, that are particularly suitable for small forest owners (SFOs) in a European context, based on the current state of knowledge. “Small” is not concretely defined in the project, except that such owners are typically “non-industrial” with forest holding(s) of relatively limited size. The perception of size may vary between countries (Häublein et al., 2025).

In doing so, this report first conducts a synthesis of relevant PES schemes in Europe, including those that target the specific stakeholder groups identified in the project. These include, in addition, to the SFOs themselves, and subgroups of these with different motivations, forest owner associations, government actors and private sector actors. The report then goes on to assess key elements of these PES schemes and draws out general recommendations.

## Links with other work packages and tasks

This report is primarily based on Tasks 3.1<sup>1</sup> and 3.2<sup>2</sup> of work package 3, and links with and extends the work carried out in WP2 (especially Task 2.2<sup>3</sup>, but also the survey carried out under Task 2.3<sup>4</sup>). WP3 aims to identify individual and collective business models tailored to the needs of small-scale forest properties owned by traditional and non-traditional forest owners to support multifunctional management in line with the EU Forest Strategy. The departure point for the business models are the motivations and barriers for multifunctional management as

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<sup>1</sup> Task 3.1: Design of carbon farming and biodiversity schemes

<sup>2</sup> Task 3.2: Review and design of MRV systems for carbon and biodiversity for small-forest owners

<sup>3</sup> Task 2.2: Identify key properties for acceptance and take-up of PES and carbon farming schemes

<sup>4</sup> Task 2.3: Quantitative Survey and Analysis

identified in the interviews and surveys of forest owners in WP2 (D2.1)<sup>5</sup>. The links between work packages and deliverables are depicted in Figure 1.

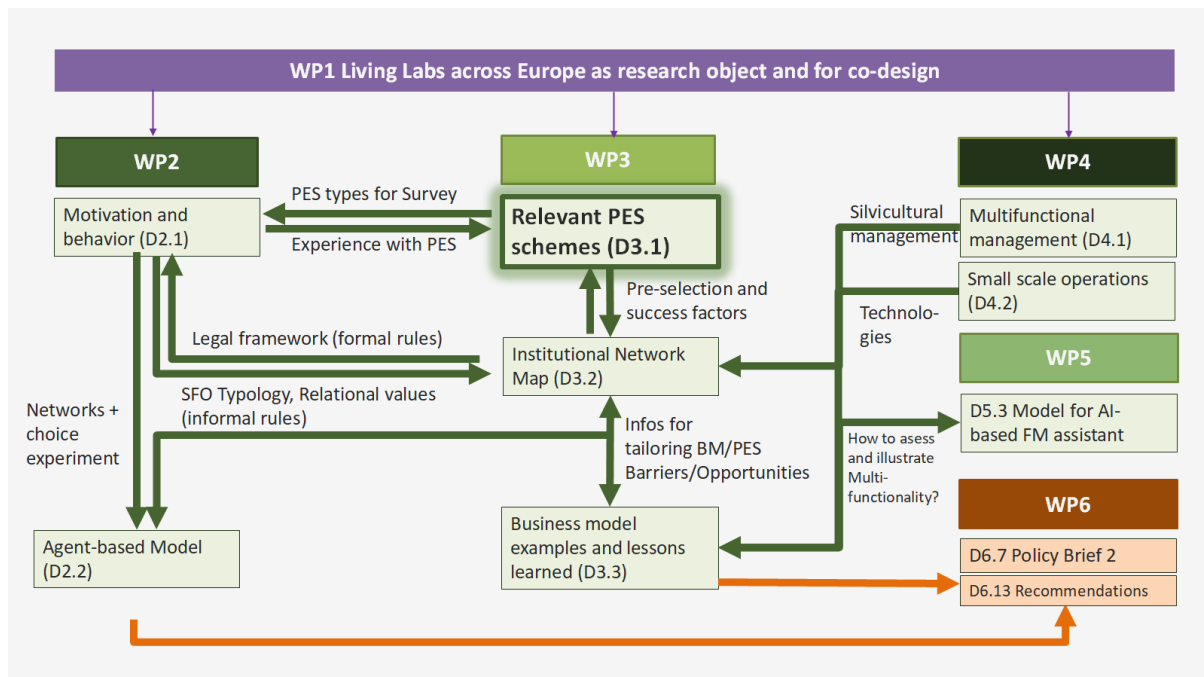


Figure 1: Illustration of links between WPs and Deliverables (selection) of the Small4Good Project. Arrows show direct links of information flows and data exchange.

The guiding principle for the extended and new business models, explored further in Tasks 3.3<sup>6</sup> and 3.4<sup>7</sup>, will be that the owners should maintain or improve the financial return from their property while still providing products for a forest-based bioeconomy and contribute towards improved carbon storage and biodiversity protection. In the business model development, financial return can be enabled by PES schemes, especially for carbon and biodiversity.

This report additionally draws on preliminary results from Tasks 3.3 and 3.4. Specifically, preliminary results on existing experiences of SFO with PES in the living lab (LL) countries and expectations towards PES expressed by SFO during the first round of business model workshops and explorative interviews are incorporated here. PES recommendations are therefore preliminary in the sense that business-models are still being co-created in the project in collaboration with the forest owners in the LLs of the project and also need to draw from and contribute to advancements in other work packages that are still ongoing. For example, various multifunctional forest management options and indicators to measure resulting changes

<sup>5</sup> Deliverable D2.1 Motivations and Barriers of Small Forest Owners for Multifunctional Management

<sup>6</sup> Task 3.3: Actor and business model analysis

<sup>7</sup> Task 3.4: Collaborative business model development



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in biodiversity and ecosystem services (BES) (key to any PES schemes) are explored in WP4. Further, in WP5, digital tools are developed that aim to support and engage small-forest owners in multifunctional management. Such tools may help, for example, in measuring changes in BES indicators. In the recommendations based on this analysis we therefore focus on some general principles and issues that are important to consider when designing PES schemes, rather than at this stage prescribing detailed “recipes” for the case countries with their specific contexts. These general rules will inform the further collaborative business model development in Tasks 3.4, building on the deeper institutional analyses in Task 3.3. At the end of the project, outputs from this report and remaining project work will enter into the deliverables D6.7 (Policy brief 2) and D6.13 (Policy recommendations).

### **Structure of the report**

The report is structured as follows: Chapter 2 briefly explains the basic concepts of PES for those who are unfamiliar with such schemes and describes the methods used in our review and analysis of such schemes in Europe.

Chapter 3 goes through results from (1) a systematic review and meta-regression analysis of such schemes in Europe based on published studies, (2) describes and discusses a catalogue of identified PES schemes in operation by SFO (organisations), focusing on the case countries in the project, (3) presents a brief review of MRV systems in PES and (4) Presents results from selected questions on forest owner attitudes towards PES, from the survey conducted in the case countries in WP2.

Based mainly on Chapter 3, Chapter 4 draws lessons and recommendations for PES schemes suitable for small forest owners and clarifies links to remaining, downstream work in the project.



## 2. Concepts and methods

### 2.1 Payment for ecosystem services explained

#### Defining PES

Payment for ecosystem services (PES) is typically defined by five criteria (Wunder, 2005:3) : “(1) a voluntary transaction where (2) a well-defined service (or a land-use likely to secure that service) (3) is being ‘bought’ by a (minimum one) ES buyer (4) from a (minimum one) ES provider (5) if and only if the ES provider secures ES provision (conditionality).” In essence, PES is thus defined as an integration of a user fee with a targeted, conditional subsidy (Wunder, 2015).

The aim of the payments is to incentivize the provision of common goods and ecosystem services that otherwise would not be produced in the sufficient amount or quality, and hence, it is a mechanism to “internalise” the social values of these services and make participation economically more attractive (Engel et al., 2015).

The payment made to the provider is either for specific actions conducted or results achieved where a trajectory for relevant indicators *with* actions is compared to a baseline situation where the landowner continues *without* actions, i.e. “business as usual”. A key distinction is commonly made between input-based (or action-based) PES that pay for actions (e.g., longer rotations, retaining deadwood, designating habitat trees,), while results-based (or outcome-based) PES pay for verified environmental improvements (e.g., increase in biodiversity or carbon sequestration).

Results-based schemes are often preferred theoretically for efficiency reasons but action-based schemes are more common due to easier monitoring and lower uncertainty, though hybrid models are also emerging. Some recent evidence from Finland and Denmark suggests that results-based schemes may require higher payments compared to action-based schemes (Süring and Lundhede, 2025).

Figure 1 makes a simple illustration of a forest carbon PES schemes for three types of baselines, where the development of the carbon stock is constant without further action (panel A), deteriorating (panel B) or increasing (panel B).

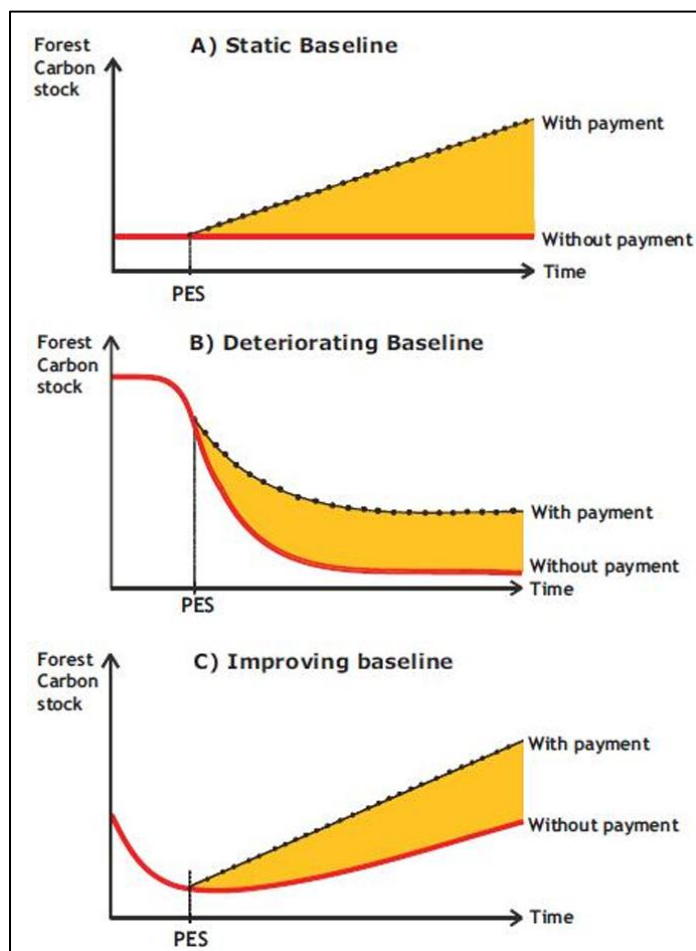


Figure 2. PES scheme illustration. Three different baseline scenarios. The red line visualizes how ES provision develops through time in the absence of PES payments. The yellow part of the graph depicts the effect of the PES payments on ES provision. Source: Wunder (2005).

An effective PES scheme requires that payments cause a positive change in the relevant good or service compared to the baseline, i.e. ensures so-called *additionality*. To verify additionality, a reliable monitoring, reporting and verification (MRV) system is required (Chapter 3.3). Other important elements of PES schemes include ensuring permanence and avoiding leakage. Permanence means that management interventions paid for by beneficiaries should not be readily reversible, thus providing continued service provision. Avoiding leakage means that PES schemes should be set up to secure that an increase in the flow of an ecosystem service in one location does not lead to the loss or degradation of ecosystem services elsewhere.

### PES in the context of Small4Good

In the context of Small4Good, we focus on SFOs as service providers, who take over a social-environmental stewardship role by managing the forest in a way that supplies goods and services both to themselves (such as cultural, provisioning, and relational values) and to beneficiaries outside their forest boundaries (particularly regulating, cultural, and habitat

services) (Wunder 2015). The benefits created for private and public beneficiaries can generate financial income streams for SFOs.

The demand side of ecosystem services may comprise individual or collective users who become buyers of these services, including private users such as companies, through market-financed PES, clubs (user associations), or governments via publicly funded PES schemes<sup>8</sup>. The demand may come from private or public obligations to e.g. protect biodiversity, beyond current requirements from certification or regulations on the forest owners.

The connection between providers and users is often facilitated through intermediaries. This is especially relevant for SFOs who may lack the financial and human resources to negotiate necessary agreements, contracts and MRV. Wunder et al. (2015) also highlight that collective organisation on both sides—the providers and the users—can limit the degree of voluntariness for individual participants. This can apply, for example, to taxpayers in government-funded PES or to forest owner associations of SFOs that provide and market specific services through agreements at a higher organisational and collective level, which, in some cases, may result in limited impact for individual members.

Similarly, biodiversity credits and offsetting have recently gained increasing attention, as evidenced by the EU Nature Credits Roadmap<sup>9</sup>. A biodiversity credit measures a unit of positive biodiversity outcome that is additional to what would otherwise occur, and can be traded (Wauchope et al., 2024; Wunder et al., 2025). To date, the majority of voluntary agreements aimed at enhancing biodiversity do not market biodiversity gains; rather, they compensate for biodiversity loss elsewhere. Therefore, no credits are traded; instead, biodiversity loss in one location is offset by the same amount of biodiversity gain in another location. These credit systems are mostly regulated by national or state authorities (as shown in the examples in Chapter 3). Such regulations aim to prevent net biodiversity loss at the state or national level (Koh et al., 2019) by focusing on offsetting impacts at or near the site of impact. More recently, biodiversity credits that are independent of direct compensatory mechanisms offsetting local biodiversity losses are gaining attention. Wunder et al. (2025) refer to these as “non-compensatory biodiversity credits”, which are increasingly demanded, particularly within the context of Corporate Social Responsibility (CSR) reporting by private companies. From here onwards, we refer to PES as voluntary contracts, including both the enhancement of ecosystem services (such as carbon sequestration) and biodiversity.

### **PES as innovation**

Such voluntary agreements have the potential to enhance forest multifunctionality while maintaining or increasing financial income streams for forest owners and managers. PES may

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<sup>8</sup> We use a wide definition of PES here considering both private and public funders. Sometimes interpretation of PES is limited to private markets and payments (firms or individuals) (e.g. Vatn et al., 2011).

<sup>9</sup> [https://ec.europa.eu/commission/presscorner/detail/nl/ip\\_25\\_1679](https://ec.europa.eu/commission/presscorner/detail/nl/ip_25_1679)

thus be regarded as an innovation (Báliková et al., 2024). Maier et al. (2021) differentiate between innovations in the forest sector, referring to forest product innovations, service innovations, organisational/network innovations, and payment schemes. Weiss et al. (2021) state that in forestry, innovation research has primarily focused on process innovation rather than on product innovation. Fragmented property rights and small forest holdings, with owners who do not have a primary economic interest, as is often the case for SFOs (see D2.1 in Häublein et al. 2025), are considered to have a weak innovation orientation, while larger forest holdings are similarly innovative compared to other sectors (Weiss et al., 2021). However, the demand for ecosystem services creates new business opportunities for SFOs via PES. These opportunities link business innovation to social innovation, benefiting society at large, and to transformative innovation needed to achieve sustainability. This requires rethinking business models as a whole, in which innovation creates business opportunities.

### **PES as part of a business model**

A business model is a conceptual tool that describes the principles by which an organisation creates, delivers, and captures value, and expresses a company’s fundamental business logic for generating profitable and sustainable revenue streams (Osterwalder and Pigneur 2010). Business models are described by the value proposition of values embedded in the products offered (“the what?”), the (1) value creation and delivery of key activities, resources, channels, technology (“the how is it organised”), the (2) value capture, and (3) the costs and revenues streams, referring to how the business earns money (“how to earn money”). In the entrepreneurship literature, business model innovation is increasingly recognized as a key driver of success, profitability, and competitive advantage. It refers to re-thinking the values, the value creation and capture. PES can be considered a business model innovation, as it typically affects multiple elements of a business model. However, it is also often regarded solely as a way for improving the income stream for a value already provided, but not yet financially appreciated. Outside the forestry sector, the concept of “Sustainable Business Models” has evolved, emphasizing contributions to society and nature (Feger and Mermet 2022). This links the challenge in forestry of providing multiple ecosystem services and biodiversity to society at large with the need to remain a viable and competitive business.

### **SFO, PES and business models**

While decision-making and strategic planning of SFOs may function very differently compared to large businesses, the components of the business model apply equally to very small businesses. For example, Sustainable Business Models often rely on diversifying income streams and customer segments. Even though such innovations are more limited for SFOs, PES are one option to diversify income streams. However, they need to be well aligned to the overall value creation and capture of the entire business model, as they still require forest management activities and usually do not prohibit other income streams, as e.g. selling wood. The value proposition of the Business Model concepts links to the values forest owners see in the forest as outlined in the previous work on relations values in this project (Häublein et al., 2025).



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In this respect, the value concept presented here forms a subset of the various relations forest owners have towards their forests, as argued in D2.1 (Häublein et al., 2025, Himes and Dues, 2024). The business model can aim at increasing various different values. While the focus in this report is on material value creation (i.e. financial and ecological) it is not necessarily limited to those. Still, the focus chosen in D2.1 is thus influencing the research presented here: Taking a more comprehensive perspective and including various values beyond mere financial ones can enhance understanding and also align with the SFO’s interests, as financial aspects are not necessarily a driving force when forest stands are small.

Therefore, in this report we focus on PES schemes but assess them in terms of the suitability for SFO business models. We therefore partly also consider business models that are not directly linked to common PES schemes of carbon and biodiversity. We assess these schemes with a focus on the values forest owners pursue with their forest and forest-related activities, given its importance for further business model development. With SFOs being embedded in institutional settings (Fig. 3) and often managed via intermediaries, we give examples of how implemented PES are embedded in SFO organisations as part of their business model. The conclusions on criteria for PES schemes tailored to SFOs will directly feed into Task 3.3 and 3.4 in the on-going business model co-creation, where PES are one potential new business opportunity.

Figure 3 provides an overview of how business models, including PES schemes, are embedded within the wider context, including the widest level of structural context and discourses, intermediate level of the institutions (in a wide sense of the word) and within this the actor networks around the forest owners and their forest management activities. In order to initiate change towards multifunctionality, the business models have the role to incentivise change in current forest management – away from business as usual.

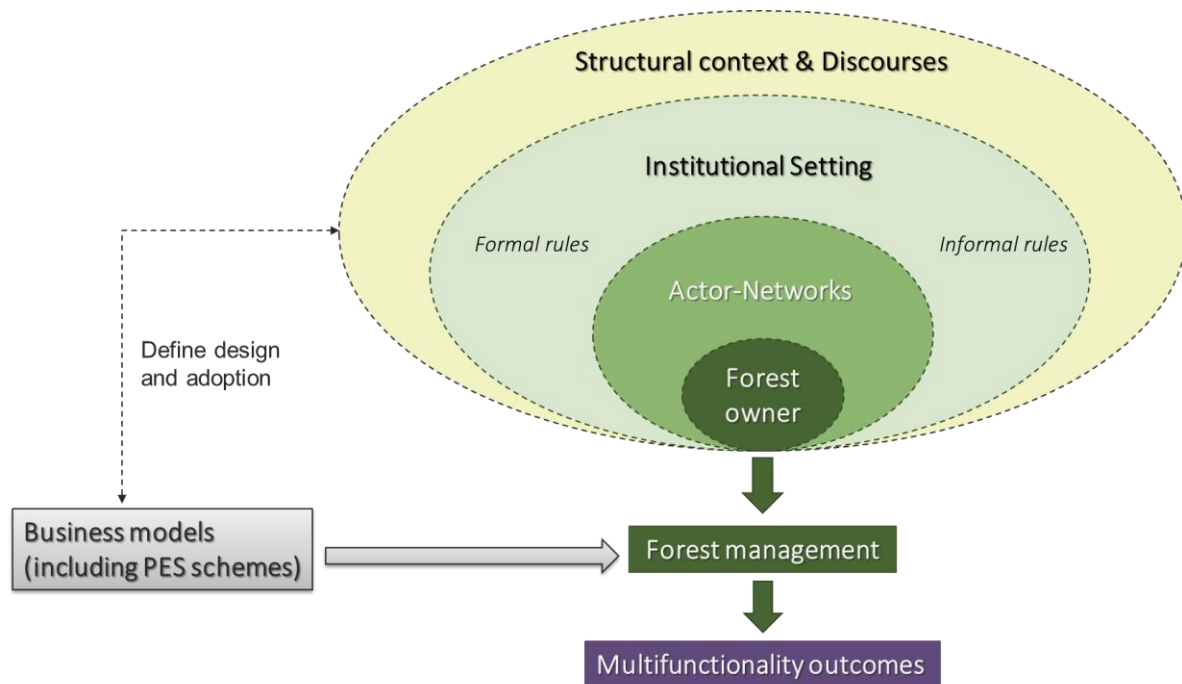


Figure 3: Conceptual approach used across WP2 and 3 which shows the micro, macro and discourse level in which decisions of forest management are embedded and how they are affected by current and potential new business models, including PES as one component.

### EU policy background on carbon farming and PES schemes

PES in European forests are not governed by a single dedicated EU regulation but instead emerge from a combination of strategies, guidance documents and sectoral policy frameworks. The principal policy anchor is the EU Forest Strategy for 2030, which explicitly promotes the development of public and private payment schemes to reward forest owners for ecosystem services such as carbon sequestration, biodiversity conservation, water regulation and climate resilience (European Commission, 2021).

This strategic orientation is operationalised through the Commission’s guidance on the development of public and private payment schemes for forest ecosystem services, published in 2023, which provides voluntary design principles rather than binding rules (European Commission, 2023a). Further policy momentum is generated indirectly through the Nature Restoration Regulation, the emerging EU carbon farming and carbon removals certification framework, and the EU nature credits roadmap, all of which increase demand for incentives that can remunerate forest ecosystem service provision (European Commission, 2024a; European Commission, 2025).

Other relevant documents in this context include the commission’s work on certification for carbon removals and carbon farming (CRCF) (European Commission, 2024b), the report on scoping of the CRCF registry and minimum requirements for certification scheme registries (European Commission, 2025b), verification rules under the CRFC regulation (European



### Small4Good D3.1 –Recommendation of relevant PES schemes

Commission, 2025c), and the technical guidance handbook on result-based carbon farming mechanisms (COWI et al., 2021). The CRCF is now in force, creating the first EU-wide voluntary framework for certifying carbon removals, carbon farming and carbon storage in products, across Europe. However, approval of first methodologies is expected by early 2026<sup>10</sup>. The CRCF introduces a voluntary but harmonized EU quality standard, built on four pillars: quantification, additionality, long-term storage, and sustainability. The framework covers permanent removals (several centuries), carbon farming (>5 years permanence), and product-based storage (>35 years permanence). The CRCF Certificate of Compliance set a standard to enable the deployment of carbon removal and carbon farming activities across the EU to help achieve the EU's nationally determined contribution. The further development and operationalisation of the CRCF will be ongoing in parallel with the Small4Good project. In later deliverables in the project, the more specific implications of this regulation will be considered for business model development in general, including PES schemes.

Despite this enabling policy environment, forest-related PES in Europe remains fragmented, small-scale and largely experimental, with implementation delegated to Member States, regions and local actors (Forest Europe, 2018; JRC, 2017). Ongoing debates focus on unresolved design questions. A central issue concerns the trade-off between action-based payments, which reward prescribed forest management practices, and results-based payments, which remunerate measured outcomes such as biodiversity indicators or carbon stocks. While results-based approaches are often considered more environmentally effective, they typically involve higher monitoring costs and greater risk for landowners (JRC, 2016; Matzdorf et al., 2019, Wunder et al., 2025). A second debate concerns whether PES schemes should target single ecosystem services, notably carbon, or bundles of services, reflecting the multifunctional character of European forests and avoiding unintended trade-offs (Forest Europe, 2018).

Small owners face high transaction costs, limited administrative and technical capacity, fragmented landholdings and difficulties in complying with complex monitoring and reporting requirements (JRC, 2016, Bösch et al., 2018, Wunder et al., 2025). Small owners often lack capacity to navigate PES schemes, especially complex result-based or market-linked ones. Thus, PES schemes tailored to SFOs need to be accessible, administratively feasible and attractive in terms of payment levels and contract conditions (European Commission, 2023).

While data bases on successful PES examples exist<sup>11</sup>, few have focussed on SFOs. Previous evidence has shown the importance of collective participation through intermediaries through forest owner organisations (European Commission, 2023, Forest Europe, 2018). This could help reduce the burdens related to administration and transaction costs.

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<sup>10</sup> <https://resources.goodcarbon.earth/blog/crcf-europes-rules-of-play-for-carbon-removal-and-carbon-farming>

<sup>11</sup> see e.g.

<https://airtable.com/appXHR0Nau8HqfPa8/shrt5JZqmLMrQgdF/tblTM31mqfzbGGBtR/viwLkSPMhe3K76baF> or <https://foresteurope.org/ecosystem-services/payments/forest-ecosystem-services/> for examples.

This report, therefore, explicitly focuses on relevant PES schemes for SFOs and experiences from implementation from the perspective of SFO organisations.

## 2.2 Methods

In this report we have used a mixed-method approach. First, we have conducted a systematic literature review of papers and studies from Europe on PES, compiled a meta-dataset and conducted statistical meta-regression analysis (Chapter 3.1).

Second, we have supplemented this review with searching, compiling and categorising PES schemes that are in operation in Europe by SFO (organisations) (Chapter 3.2). This search was based on (1) explorative interviews with key informants (carried out in WP2, see D2.1, Table 1), and participating forest owners and forest owner associations in the LLs, and (2) based on synergistic on-going work of the of the European Landowners' Organisation (ELO) in the INTERCEDE project<sup>12</sup>. This work involved document (e.g. policy documents and systematic web search) and literature review and interviews with selected informants from organisations implementing PES, to learn more about individual schemes. Informal workshops within the LLs (as part of WP1) with forest owners have also been an informative source about selected forest owner opinions about multifunctionality and PES. Organisations for small forest owners (particularly where the size of ownership is very small as in Germany and Spain have been useful in identifying and providing information about existing PES initiatives.

Finally, we include the results of selected questions about PES from the SFO survey carried out as part of WP2

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<sup>12</sup>“Incentivising future forest ecosystem services and incomes in Europe” <https://intercede-project.eu/> funded by the European Commission



## **3. Synthesis of European payment for ecosystem service schemes**

### **3.1 Systematic review and meta-analysis of PES schemes**

#### **Systematic literature review and meta-regression on biodiversity and ecosystem service (BES) provision preferences**

We conducted a stocktake of factors shaping acceptance and uptake of voluntary PES and carbon-farming schemes among European non-industrial private forest (NIPF) owners, combining a systematic literature review with meta-regression (Ringier et al., 2025)<sup>13</sup>. This analysis is the main component of Task 3.1, the review and evaluation of existing and proposed PES schemes. The review includes studies of PES schemes that are mostly published in the academic literature and does therefore not cover ongoing or proposed schemes that have not yet been studied academically (see Chapter 3.2). These studies either investigate real PES schemes or proposed/hypothetical schemes that could be realistic to implement and for which forest owner preferences are relevant to investigate.

#### **Literature Review**

The review (closed July 2024) drew on common literature databases such as Scopus, EconLit, and Web of Science and was pre-registered on the open science platform OSF<sup>14</sup>. The search focused on the participation preferences of NIPF owners<sup>15</sup> in voluntary forest management programmes. Hence, we did not include larger, industrial owners. The work built on and extended the data collection and analysis conducted by Mitani and Lindhjem (2022). Descriptive review results appear in Deliverable 2.1, while the full methodological descriptions and results can be found in the full paper.

#### **Meta-Analysis**

Following the data collection, the literature was synthesised using a meta-regression approach (Harrer et al., 2021), with participation rate in voluntary forest management agreements as dependent variable (“effect size”). The participation rates, sourced from academic publications, originated from stated preference dichotomous choice surveys, choice experiments, census data, and other methodologies. Where participation rates were not directly stated, they were estimated either as the proportion of respondents intending to enrol or via a binary logit model

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<sup>13</sup> The full review, including methodological and technical details are published in the journal *Ecosystem Services*.

<sup>14</sup> <https://osf.io/5hku4/>

<sup>15</sup> Most of these are SFOs with relatively small forests.

(Mitani and Lindhjem, 2022). The use of standard errors allowed for weighting each survey's impact in the regression, ultimately revealing preferences and patterns in voluntary management program participation. Various explanatory variables were coded in a meta-dataset in order to explain factors that are important for forest owners' participation in different types of PES schemes.

Two meta-regression specifications were estimated: Model 1 (571 observations; 28 datasets) and Model 2 (adds monetary moderators and a payment-schedule dummy; 561 observations; 22 datasets).

## Findings

The findings were split into two sections. Firstly, explicit contract variables and secondly the contract aims and external influences, which were used to approach the NIPF owners' motivations towards a certain PES agreement. Results are summarised below and shown in Figure 3.1

### Contract design

Four contract design variables were evaluated: (i) contract duration, (ii) withdrawal rights, (iii) management requirements and (iv) monetary compensation level.

Contract duration: Participation was highest for shorter contracts, particularly those lasting 1–10 years. Preferences were non-linear: the shift from 1–10 to 11–20 years was less attractive than the shift to 21–30 years. The model further indicates that perpetual contracts may appeal more to owners than fixed terms exceeding 31 years. This result may be considered counterintuitive, but it is similar to what Mitani and Lindhjem (2022) find.

Withdrawal rights: The baseline was explicit no-withdrawal, i.e. that it was not possible to pull out of the scheme. Contracts offering conditional or full withdrawal rights were associated with higher participation. This is logical. Forest owners value flexibility. When withdrawal rights were unspecified, participation did not differ significantly from the no-withdrawal baseline.

Management requirements: The reference category was silvicultural requirements. Contracts without specified requirements were associated with higher participation than those with silvicultural requirements. The models further indicate that mandatory conservation measures were the least preferred among the requirement types examined.

Compensation: In the second model which included compensation terms, participation rose with higher payments, as expected. A €1,000 increase in annual compensation was associated with a 34% increase in participation, while the same €1,000 as a lump-sum increased participation by 9%. This indicates that even if NIPF forest owners have multiple objectives and motivations as shown in (Häublein et al., 2025), the monetary element is still very important for many forest owners. Independent of amount, a payment-schedule dummy indicated a preference for lump-sum payments over annual payments. This may have to do

with pure time preference (an amount today is worth more than the same amount in 5 years) or perhaps uncertainty related to future payments.

As can be seen from the figure, variables which bars do not have confidence intervals overlapping zero significantly affect participation rates (positively or negatively).

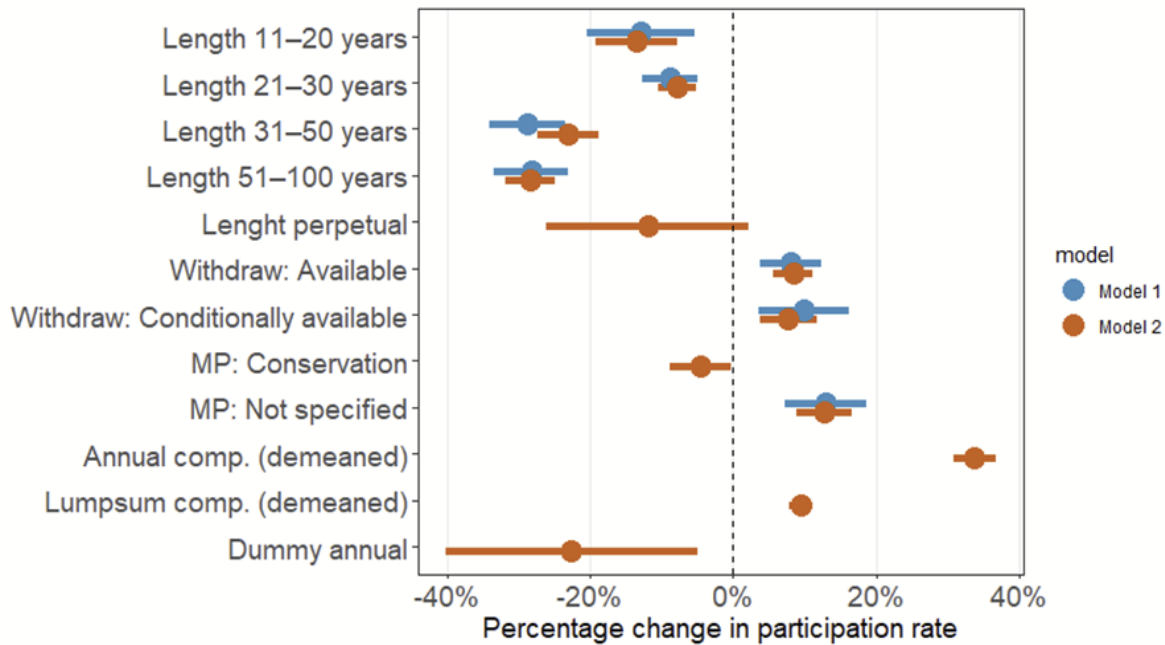


Figure 4: Effects of contract design variables ( $p < 0.1$ ) in the two meta-regression models. Circles represent the model coefficients corresponding to the contract design variables, and whiskers indicate the 95% confidence intervals. MP: Management practice. **Reference levels:** Length; 1-10 year contracts, Withdraw; no contract withdrawal possible, Management practice (MP): Silvicultural management requirements.

### Motivations and external influences

**Program aims:** The reference category was timber production. Participation was higher for programs targeting biodiversity, carbon sequestration, and recreation, and lower for water protection than for timber. In line with the aims of the Small4Good project, BES programs, focusing on multifunctional forest BES provisions increased participation, all else equal. In other words, such programs appear attractive for forest owners regardless of other factors including monetary compensation levels. Results are shown in figure 5 below.

**Interaction effects with compensation varied:** annual payments interacted positively with recreation, but negatively with biodiversity and multifunctional BES (annual compensation increases were less effective than for timber). For lump-sum payments, recreation, water, and multifunctional BES showed stronger positive interactions than timber, while biodiversity and carbon did not differ significantly from timber.

**Temporal effects:** Our exploratory analysis suggests a growing preference over time for programs delivering BES beyond timber, with heightened interest in biodiversity and carbon, especially for multifunctional programs that expand multiple BES simultaneously.

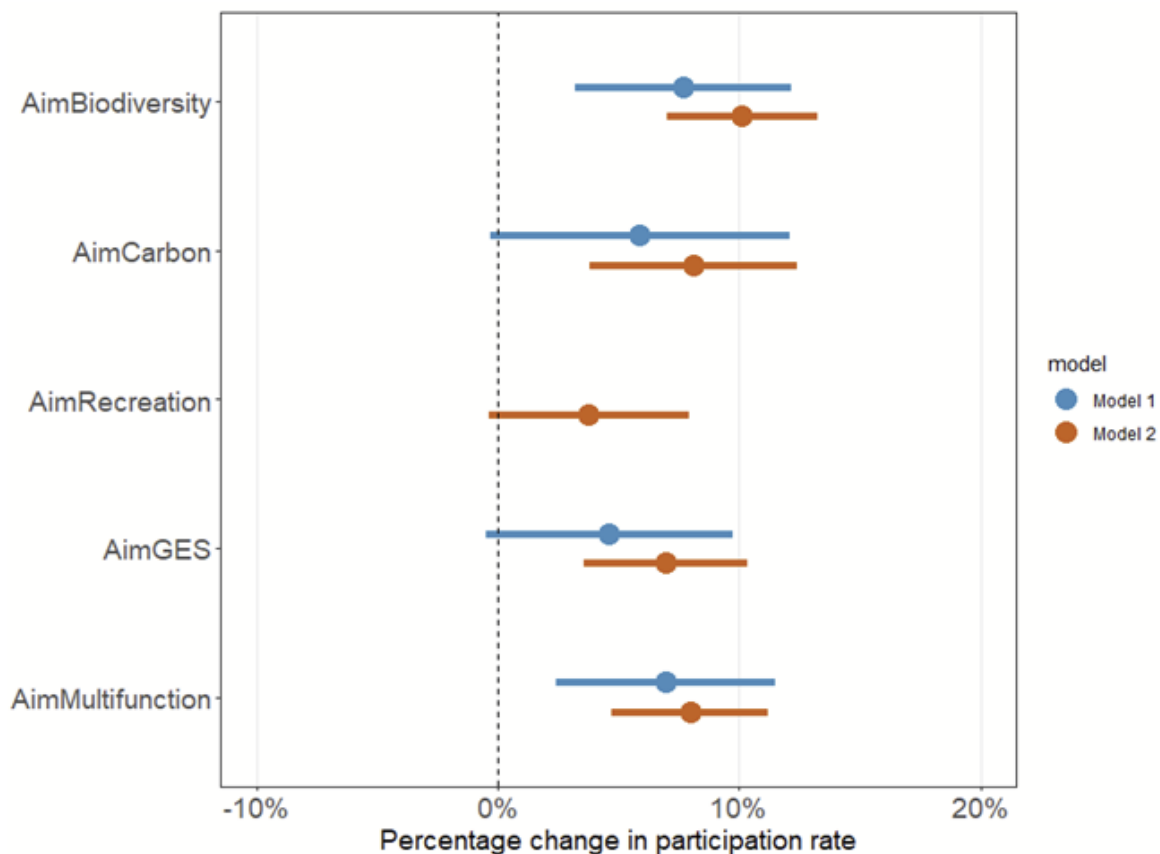


Figure 5: Effects of agreement aim variables ( $p < 0.1$ ) in two meta-regression models. Circles represent the model coefficients corresponding to the contract design variables, and whiskers indicate the 95% confidence intervals. **Reference levels:** Timber production agreements. GES: general ecosystem services; Multifunction: contracts combining two or more biodiversity or ecosystem services.

### Conclusions:

NIPF owners seek to reduce uncertainty and constraints in forest management agreements. This is reflected in their preferences for shorter contracts, lump-sum payments over annual payments, available withdrawal options, and lower or no management requirements. While these features may not naturally support long-horizon, prescriptive programs that offer policymakers planning stability, they identify levers to increase participation.

Beyond economic returns and timber production, forest owners show a range of participation interest in programs targeting biodiversity, carbon sequestration as well as supporting the provision of multifunctional BES.

Building on these levers, programs can harness path dependence in management behaviour (Calle, 2020; Lutter et al., 2019): because owners tend to repeat past practices, attractive short-term contracts can deliberately interrupt existing routines and seed new management

approaches among NIPF owners. Once adopted, management practices are more likely to persist.

**Text box 1: METSO (Finland): Flexible contracts to promote biodiversity protection**

Operational since 2002, METSO engages forest owners through flexible, voluntary agreements ranging from 10-year terms to long-term and permanent contracts. The program reportedly met its target of conserving 96,000 ha ahead of schedule (Kangas and Ollikainen, 2025; Batpurev et al., 2025). METSO’s combination of contract flexibility and the inclusion of relatively short temporary agreements likely supported rapid early participation and impact. METSO does not set a minimum property size requirement in the general programme description: the eligibility is not based on owning a large forest area. Rather, forest owners can participate regardless of the overall size of their forest property. Many forest owners have entered into METSO environmental aid agreements for fairly small sites — for instance, average sizes of just over ~3 hectares for 10-year agreements have been reported, showing participation by owners of modest parcels. What primarily matters is that the portion of forest offered has ecological value under the programme’s criteria and is approved by authorities.

Limitations:

It is important to note that the results of the study are correlational and possibly influenced by heterogeneous aim labelling, unobserved country/ecological context, method and sampling differences, and English-only peer-reviewed coverage. Hence, with examples of sparse evidence for some aims/regions (e.g., water protection; Southern/South-Eastern Europe), and strong local differences, generalization should be done with caution and strengthened by new behaviour-based studies.

While national preferences for forest provisions vary across Europe, the findings from this study suggest that forest owners share a disposition to participate in voluntary BES agreements and support multifunctional forests. Forest owners’ growing and diverse interests, beyond timber production, present an opportunity to better tailor agreements and incentives, thereby reaching a wider range of forest owners interested in providing a multifunctional landscape of BES, including the smaller forest owners that are the target of the Small4Good project.

### 3.2 Example PES schemes in operation by SFOs

While the previous section focused on the identification of general patterns of PES schemes, this section outlines the results of an in-depth analysis of case studies of PES schemes already in operation (and not necessarily covered in the review in the previous chapter). We focus on



## Small4Good D3.1 –Recommendation of relevant PES schemes

those schemes already implemented by SFO organisations or those available to SFOs<sup>16</sup>. The latter refers to schemes that meet at least one of the following criteria: (1) they do not impose a minimum land-area requirement; (2) there is evidence of participation by small forest owners or associations representing smallholders; or (3) they can, in principle, be implemented without intermediaries. The PES schemes were distinguished between action-based and outcome-based schemes. Action-based schemes compensate owners for carrying out specified practices or activities that are assumed to generate ecosystem services, whereas outcome-based schemes provide payments only when ecosystem service outcomes are actually delivered and verified. Our review focused on the beneficiaries, land management measures, institutional set-up, intermediaries, actors involved, payments design, (other) design features, links to policy support and targeted ecosystem services.

A summary table of the main characteristics of the operational PES schemes found across the LL countries is shown in the Appendix. The table reveals that across the countries, the analysis shows clear thematic differentiation:

- Carbon-oriented PES (Norway, Germany, Switzerland, Spain) is typically voluntary and market-driven.
- Biodiversity and water-focused PES (Switzerland, Germany, Spain) relies more on public or mixed funding, where voluntariness is restricted
- Fire prevention and recreation services (Spain) are contracted locally through municipalities or utilities.

Despite these contextual differences, one pattern is constant: Most cases relied on intermediary organizations (cooperatives, associations, or cantonal agencies) for implementation, who help aggregate plots, manage verification, and negotiate with buyers. This collaborative model can reduce transaction costs and may transform PES into a realistic business opportunity for fragmented forest holdings. Below, we describe some selected operational business cases in more detail, supported by in-depth interviews with SFO organisations conducted in collaboration with Task 3.3. These interviews examined perceived challenges and barriers to PES schemes within the SFO's business model and assessed their organisational feasibility. After a brief overview of each scheme, the focus shifts to the barriers and opportunities of PES as perceived by SFO organisations that have implemented these schemes. The cases are currently restricted to LL Central as interviews with organisations in other countries, as well as translation and analyses was still ongoing at the time of this deliverable.

The schemes mainly incorporate two groups of PES: Those targeting at increasing biodiversity and carbon, respectively. We also include the example of marketing recreation and other cultural services through cemetery forests. While the latter is not a PES scheme in the strict sense, we include it here as an extended ecosystem services-based business model given its potential relevance to SFO in LL Central, as indicated by interviews with local key informants.

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<sup>16</sup> Based on synergistic work by the project INTERCEDE in the selection of PES schemes.

## **Biodiversity Improvement**

### Ökokonto (Germany)

The Ökokonto (eco-account) is a policy instrument under the German Federal Nature Conservation Act (BNatSchG, §15–16) that allows landowners or other actors to carry out compensatory or replacement measures for environmental impacts in advance of future development projects. These measures, once approved by the responsible nature conservation authority, are recorded as eco-points (Ökopunkte) that can later be used to offset ecological damage caused by construction or other interventions. The system thereby monetizes ecological value: each measure's contribution to restoring or enhancing biodiversity, soil, and landscape quality is assessed through formal evaluation methods such as the Biotope Value Method. The Biotope Value Model (*Biotopwertverfahren*) is the core quantitative assessment method used in almost all German federal states to determine how many Ökopunkte a conservation or restoration measure generates. In simple terms, it translates ecological quality changes into standardised numerical values, which then become tradable compensation units within the *Eingriffsregelung* (impact-mitigation regulation). According to the thesis, all states except Brandenburg use this model (with variations), making it the common technical backbone of the Ökokonto system

The Ökokonto provides an incentive-based mechanism to link economic activities and ecological restoration, allowing compensation to occur flexibly in time and space while fostering a market for ecosystem improvements.

According to the comparative desk analysis of the formal Ökokonto regulations across each federal state in Germany, there is substantial heterogeneity among federal states. While all states refer to Section 16 of the German Federal Nature Conservation Act (§16 BNatSchG), many interpret or extend its requirements differently. The majority rely on the Biotope Value Method for valuation, yet the procedural depth and administrative layers vary widely. For example, some states require certification or long-term land registration, while others allow simplified approvals. Brandenburg is unique in using a verbal-argumentative evaluation system rather than a numerical one. The ecological impacts and compensation measures are assessed qualitatively through expert judgement and written justification, without assigning standardized numerical biotope value. Such institutional variety demonstrates that eco-account governance in Germany is decentralised and shaped by differing environmental priorities and administrative capacities (Liebeheim, 2025).

### Relevance to SFOs

For SFOs, the Ökokonto concept offers an opportunity to integrate forest conservation into economic activity. Since many small forest properties face limited profitability and fragmented management, the possibility to register and trade eco-points creates new income sources from ecological restoration and sustainable forest management. While legal and academic sources do not report monetary values for Ökopunkte, practitioner interviews reveal substantial regional price variation, ranging from approximately €0.50 per point in northern Bavaria to



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€2.50–€5.00 per point in the Munich metropolitan area. Measures such as converting conifer stands to mixed forests, increasing deadwood, or restoring water regimes can qualify for eco-points if they go beyond legal obligations.

### Case Study: Forest Owners Association in Bavaria

One interviewee representing a forest owners' association in Bavaria described the active implementation of the Ökokonto system to enable members, including small-scale forest owners, to benefit financially from ecological restoration and forest conversion measures.. The association acted as an intermediary, pooling small forest areas to create larger, ecologically meaningful compensation projects. These included reforestation with native species, deadwood retention, and habitat connectivity improvements. The eco-points generated from these measures were then sold to local developers who needed to compensate for construction-related ecological impacts. Transactions remained regional, as the association emphasised that buyers and compensators operated within the same natural region.

The main challenges revolved around bureaucratic hurdles and communication barriers with the local nature conservation authorities (*untere Naturschutzbehörden*). Participants described significant delays—sometimes waiting several months for responses or approvals—and inconsistent attitudes among officials, ranging from cooperative to obstructive. These obstacles increased administrative burdens, discouraged participation, and created frustration among forest owners. A cultural barrier was also noted: some authority staff perceived private eco-account activities with scepticism, seeing them as profit-driven rather than conservation-oriented. Another challenge concerned the limited duration of recognition for private eco-accounts, typically 25 years, which participants criticised as too short to ensure ecological permanence or economic stability. Forest owners feared future policy shifts could invalidate their efforts, given the rapid pace of changing environmental regulations.

Despite these difficulties, the association considered every implemented Ökokonto a success—both ecologically and economically. The association emphasised positive outcomes for forest health, biodiversity, and owners' income, as well as the local construction sector's ability to meet compensation obligations through reliable, high-quality projects. The model demonstrated that even small forest owners could engage effectively in ecosystem service markets when organised collectively.

### Compensation and offsetting measures - *Ausgleichs- und Ersatzmaßnahmen* (Lower Saxony, Germany)

The measures involve payments from actors who must compensate for environmental impacts—typically construction or infrastructure developers—to landowners who provide ecosystem restoration or enhancement. Although it is conceptually similar to Ökokonto or carbon credit systems, it functions outside a formal credit market: compensation is priced **per square metre / per hectare**, not per point. Authorities define how many hectares must be compensated (based on forest loss or ecological impact). The price per m<sup>2</sup> is then negotiated between the compensation provider and the party obliged to compensate (developer / project

proponent). The authority approves the measure, but does not see or regulate the price. Therefore, pricing is quasi-market based, but still embedded in administrative approval. Interview evidence from a forest owners' association indicates that compensation land is marketed at approximately €8–9 per m<sup>2</sup>, corresponding to roughly €80,000–90,000 per hectare.

### Relevance to SFOs

Similar to the case of Ökokonto, the scheme is relevant to SFOs, particularly to integrate forest conservation into economic activity. Through PES-style compensation, these owners receive financial incentives to convert farmland to forest or improve forest quality (e.g., transforming monocultures into mixed stands). It allows them to generate income from land that might otherwise be economically unviable, while retaining ownership and a role in forest management.

### Case Study: Forest Owners Association in Lower Saxony

Within this PES scheme, an intermediary forest owners' organisation identifies suitable land, frequently involving the conversion of agricultural land to forest, oversees reforestation or ecological enhancement measures, and formalises long-term stewardship arrangements. Implementation is usually initiated by landowners offering underutilised agricultural parcels.

The association finances reforestation, secures permits, coordinates planting with foresters from the Landwirtschaftskammer Lower Saxony, and later sells the “compensatory value” of these areas to developers obliged to offset environmental impacts. Contracts typically last indefinitely, since reforested areas become legally classified as forest under the Waldgesetz. Buyers include both private individuals (e.g. homeowners) and large companies (automotive, utilities) expanding infrastructure. Payments are direct, and once fulfilled, buyers are released from further obligations.

Challenges perceived by the intermediary include legal complexity and inconsistent implementation among local authorities. Regulations differ by county (Landkreis), and interpretations of legal regulations such as the Naturschutzgesetz and Waldgesetz vary. Some offices require notarized registry entries for compensation areas, others do not. Bureaucratic fragmentation causes delays and uncertainty. Moreover, while authorities issue numerous offsetting obligations, they seldom monitor long-term ecological outcomes, citing staff shortages. The association thus bears practical responsibility for ensuring that reforestation and maintenance persist.

## **Carbon Sequestration**

### Wald-Klimaschutz Schweiz (Switzerland)

Wald-Klimaschutz Schweiz is a voluntary, market-based carbon scheme. The mechanism enables forest owners or associations to generate and sell CO<sub>2</sub> certificates by maintaining or increasing forest carbon stocks through extended rotation, reduced harvesting, or forest

reserves. Each certificate corresponds to one ton of CO<sub>2</sub>-equivalent stored or not emitted as a result of changed management practices. Certification follows ISO standards<sup>17</sup> and is verified by TÜV Nord, ensuring credibility and transparency for buyers. The scheme operates in the voluntary carbon market, independent of the Swiss federal emission trading system, and thus enables local communities, companies, or individuals to purchase verified forest-based climate offsets<sup>18</sup>.

### Relevance to SFOs

Although the framework includes both public and private forests, its core relevance lies in enabling collective participation of SFOs through existing regional or cooperative structures. In the Waldklimaschutz Luzern project, for example, around 75% of the area belongs to small private owners who participate via forest owner organisations and cooperatives (*Genossenschaften*). These organisations manage administrative and technical aspects on behalf of members, significantly reducing transaction costs.

### Case Studies

#### Forest Owners Association in Lucerne

The project involves multiple regional forest organisations managing a large, contiguous forest area. Participating organisations commit to maintaining a minimum standing volume over a long-term period, thereby generating verifiable carbon storage. Implementation was facilitated by pre-existing cooperative structures and the availability of detailed forest inventory data. Revenues from certificate sales are reinvested in forest conversion towards climate-tolerant species and young stand management. Key challenges include limited initial market demand and sustaining participant motivation over extended contract durations.

#### Community Forest in St. Gallen

This smaller forest carbon project covers approximately 22.5 hectares and was initiated by a local collective forest owner primarily for financial reasons. Declining revenues from timber sales motivated the local authority to explore carbon certification through a voluntary market mechanism. Project development involved collaboration with an external forestry engineering consultant and an independent third-party verifier. Carbon certificates are marketed online at an indicative price of around CHF 80 per tonne. Reported challenges include high upfront investment costs, administrative complexity, and reputational uncertainty linked to

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<sup>17</sup> ISO 14064-2 (greenhouse gas projects) with independent third-party verification by TÜV.

<sup>18</sup> Across the Swiss forest carbon cases, price information is largely absent due to limited market activity. However, one case reports an indicative reference price of approximately CHF 80 per tCO<sub>2</sub>, which interviewees emphasise is negotiable and has so far resulted in only limited sales.

controversies surrounding international carbon offset markets. Despite these constraints, the project benefited from support through cantonal biodiversity programmes and has served as a reference case for similar initiatives in other municipalities.

*Community Forest in St. Gallen* In a remote mountainous community, carbon certificates were generated by designating a large forest area as long-term natural and special forest reserves.. The area is publicly owned, steep, and only accessible by boat or foot, making timber use economically unviable. While commercial harvesting was already highly unlikely in the baseline due to physical and economic constraints, certification introduced additionality through formal reserve designation, long-term contractual commitments, and verifiable carbon accounting. Implementation required 50-year contracts and detailed growth modeling by forestry engineers. Key challenges included ensuring accurate carbon accounting and balancing reserve establishment with ongoing protection functions (e.g., avalanche and rockfall control).

#### MoorFutures (Germany)

MoorFutures is a carbon-based PES program established by several German federal states (initially Mecklenburg-Vorpommern, Schleswig-Holstein, and Brandenburg). The scheme generates and sells CO<sub>2</sub> certificates based on the emission reductions achieved through peatland rewetting (Wiedervernässung). Each certificate represents one ton of CO<sub>2</sub>-equivalent emissions avoided. The emission calculations are based on standardised, scientifically validated models (the “Gas Emission Standardtypen”), and projects are certified and cross-validated by independent institutions (e.g., University of Kiel, Greifswald Moor Centrum). Revenue from certificate sales finances project planning, rewetting, and long-term maintenance over a 50-year period, making MoorFutures a voluntary, market-based climate mitigation instrument. Interview evidence refers instead to payments made to landowners, which are negotiated individually and typically amount to approximately 30–50% of local land reference values, depending on site productivity and location.

#### Relevance to SFOs

Currently, MoorFutures operates primarily on open land (*Offenland*)—former agricultural grasslands or degraded peatlands—because emission factors and hydrological data for forested peatlands remain insufficient. However, the organisation is developing methodologies to include wooded peatlands (*bewaldete Moore*) in future project phases, recognizing their significant carbon storage potential.

For SFOs, the relevance lies in potential inclusion and land-use diversification. While the current participants are mainly large private, church, or municipal landowners, smallholders can become involved when part of larger, contiguous project areas (e.g., 200 ha projects involving 70 owners). The model demonstrates how fragmented ownership structures—typical for small forest owners—can still contribute if coordinated through collective agreements or

facilitation by local associations or nature parks. Landowners receive compensation (typically 30–50% of the land’s assessed value) for granting long-term use rights via *Gestattungsverträge* (easement contracts), while retaining ownership and sometimes partial land use (e.g., mowing edges or harvesting wetland crops such as *Rohrgranzgras*).

*Findings from Interview with MoorFutures (no case study in forest yet)*

While MoorFutures currently focuses on agricultural and open peatland restoration, the organisation has explored the feasibility of including forested peatlands. The main obstacle is scientific uncertainty: there are not yet standardised emission factors or hydrological models for calculating CO<sub>2</sub> reductions from forested peat soils. This lack of reliable data prevents certification and trading of carbon credits from forested areas.

In practice, the program collaborates with landowners, municipalities, and local environmental agencies to identify suitable project sites. Once an area is approved, a *Gestattungsvertrag* (easement contract) is established for at least 50 years, ensuring legal permanence of the restoration. MoorFutures manages the technical planning, financing, and monitoring of rewetting measures, while landowners receive compensation but retain ownership.

## Recreation and Cultural Services

*Cemetery Forest (Case: Ruhewald Bildtann, Germany)*

The Ruhewald Bildtann represents an ecosystem service–based business model that monetises non-material forest services, particularly cultural ecosystem services associated with burial, recreation, and nature experience. The forest area—owned by the municipality of Gengenbach and leased by the Waldservice Ortenau (WSO) for 99 years—serves as a forest cemetery (*Bestattungswald*). Instead of extracting timber, the forest provides an amenity and emotional service to visitors through natural burial sites. Each burial tree (*Bestattungsbaum*) is assigned multiple grave plots, sold under 20-, 40-, or 60-year contracts. The revenues from these contracts finance forest maintenance, infrastructure (paths, benches, and safety), and ecological care, ensuring the forest’s long-term conservation. In essence, the scheme operates as a market-based PES mechanism for cultural and spiritual ecosystem services — translating ecological stewardship and landscape beauty into income.

The Ruhewald Bildtann covers 14 hectares (7 ha active) and functions under a long-term lease (*Pachtvertrag*) with the city. The WSO is responsible for all maintenance—tree safety, pruning, infrastructure, path care, and ceremonial sites. A small dedicated team (about one full-time equivalent) manages daily operations, marketing, and customer relations. The project emerged from a municipal initiative about 20 years ago, developed collaboratively by local politicians and foresters, and was met with broad community support.

Challenges include increasing bureaucratic regulation (EU and national forestry/environmental directives), changing permit requirements, and the administrative burden of maintaining a cemetery in a forest setting. The team emphasized about how “overregulation” limiting managerial flexibility and rising compliance costs. Another difficulty lies in balancing

ecological objectives with public safety: deadwood and natural structures must often be removed to ensure visitor safety, creating trade-offs between ecological integrity and liability.

Despite these issues, the Ruhewald concept has proven economically and socially successful, inspiring two more planned sites in the region. The operators attribute this success to regional embeddedness, modest marketing, and trust-based governance with the local community.

### Relevance to SFOs

While the Ruhewald model is currently applied in municipal forests, it offers important insights for SFOs exploring diversified, non-timber income sources. The model shows that forest-based PES systems can be designed around non-material ecosystem services (such as recreation, spirituality, and biodiversity conservation), not just carbon or biodiversity credits. However, interviewees emphasised that such an initiative requires long-term legal and institutional stability — something smallholders typically lack. Because the forest is used for burial and public access, a secure ownership structure and liability framework are essential. The WSO experts noted that small private forests would face difficulties implementing such projects due to:

- fragmentation of ownership and liability issues,
- limited financial capacity to ensure safety and infrastructure, and
- lack of continuity guarantees if ownership changes.

Thus, while smallholders can benefit from similar ecosystem-service concepts (e.g., recreation partnerships or memorial forests), Ruhewald-type projects are better suited for collective or municipal management.

## 3.3 Monitoring, Reporting and Verification

When considering small forest owners, the main relevant activities (Table A, Appendix) is a wide variety of Improved Forest Management (IFM) activities. A Monitoring, Reporting, and Verification (MRV) system is a structured framework used at the project level to measure, document, and independently verify the impacts of IFM activities on forest carbon stocks, biodiversity or another ecosystem service. In IFM projects, MRV systems are essential for demonstrating that changes in forest management practices lead to measurable and credible climate and ecological benefits compared to a defined baseline scenario (cf. Figure 2 in Chapter 2.1), while remaining consistent with sustainable forest management principles widely applied across Europe.

IFM projects in Europe commonly focus on changes such as extended rotation lengths, reduced harvesting intensity, retention of habitat trees and deadwood, continuous-cover forestry, protection of high conservation value areas, and improved spatial planning of harvesting operations (Appendix). If the IFM project includes results-based payments, MRV systems must

be capable of detecting incremental changes in forest structure, biomass accumulation, and ecological conditions resulting from these management adjustments, rather than large-scale land-use change.

Monitoring these slow and incremental changes is very challenging and requires substantial technical capacity and are time demanding and costly. In some cases, and for some carbon pools (e.g. soil carbon) results-based monitoring may simply not be feasible given the enormous investment in monitoring that would be required to reliably observe changes and is one of the reasons that many existing carbon-focused schemes do not include the soil carbon pool (confer schemes in Appendix). If the PES scheme is action-based, the MRV process becomes much more manageable, as the monitoring is focused on the changed action (e.g. no-harvest compared to harvest or continuous cover forestry versus clearcutting) rather than on the incremental changes in the forest structure.

An MRV system consists of three core components—monitoring, reporting, and verification—supported by robust methodologies, data management systems, and clear institutional arrangements.

**Monitoring** involves the systematic collection of data to track changes in forest condition, carbon stocks, and biodiversity over time, typically over many years. Carbon monitoring typically builds on existing forest management plans, national or regional forest inventory data, and project-specific field measurements, complemented by remote sensing data such as satellite imagery or airborne laser scanning. Biodiversity monitoring often combines field-based habitat assessments with targeted species surveys, focusing on indicators that reflect forest structure.

**Reporting** refers to the transparent documentation of monitoring results, methodologies, and assumptions. Project-level reports describe implemented IFM practices, the project boundary, baseline (what would have happened without the scheme) and management scenarios, monitoring methods, uncertainties, and observed outcomes. Carbon reporting follows approved project-level accounting methodologies, while biodiversity reporting documents trends in selected indicators in relation to clearly defined conservation objectives (Hunault-Fontbonne and Eyvindson, 2023; COWI et al., 2021). Clear and consistent reporting enables stakeholders, including investors and regulators, to assess the credibility of the project’s claimed carbon and biodiversity benefits.

**Verification** is the independent review of reported information by qualified third-party auditors or experts. Verification confirms that IFM practices have been implemented as described and that monitoring and reporting comply with approved methodologies and quality requirements.

There are a wide variety of different methodological approaches for MRV that have been reviewed in recent extensive reviews (e.g. Leoni et al. 2025) However, it should be remembered that all the existing operating PES schemes (Appendix) come with some custom-made solution to MRV so the individual SFO does not have to design their own MRV system or even necessarily understand how it works. However, MRV costs may heavily impact the monetary

returns that can be expected from a PES scheme and then in return impact the willingness to join PES schemes. As mentioned before, transaction costs are a major challenge for PES implementation for small forest owners and as such the complexity and costs of MRV should be a major point for evaluation of PES schemes relevant for small forest owners.

As noted in previous chapters, a central issue for PES concerns the trade-off between action-based payments, which reward prescribed forest management practices, and results-based payments, which remunerate measured outcomes such as biodiversity indicators or carbon stocks. While results-based approaches are often considered more environmentally effective, they typically involve higher monitoring costs and greater risk for landowners (JRC, 2016; Matzdorf et al., 2019, Wunder et al. 2025). Further, it can be argued that activity-based systems are more transparent as there is a more direct link between the payment and the changed behavior. While in results-based payments the link can be much less obvious as the complexity of the MRV system and issues such as natural disturbance and climate change can bring the actual results in jeopardy and necessitate complex mechanisms ensuring permanence as well as avoiding leakage effects.

In summary, given that transactional costs are one of the main barriers for PES implementation for small forest owners, it can be argued that activity-based schemes with lower MRV costs could be most attractive for small forest owners. If results-based schemes are used, they need to be implemented in a collaborative framework (e.g. several SFOs go together) to keep MRV costs acceptable, but this comes with a challenge of transparency and directly links between actions by the individual owner and the payments.

### 3.4 Forest owner attitudes towards participation in PES

The previous sections have described dimensions of PES that seem to be important for participation in the literature (section 3.1), analysed some practical schemes in operation and derived some lessons from these (section 3.2) and summarised design elements of MRV systems, an integral part of effective PES schemes (section 3.2). But what do the forest owners in our LL countries think about PES schemes and their potential participation in these?

D2.1 found three clusters of SFOs based on the online survey of private forest owners across Europe (Häublein et al. 2025). The typology uses the relations of SFOs to their forest and distinguishes between conflicted, enthusiastic and flexible relations (Häublein et al. 2025). Targeting multifunctional forests, this work suggests that financial policy instruments could enhance effectiveness and acceptance when being aligned with these relational values.

For example, for SFOs in the conflicted cluster, who are characterised by high economic and ecological attachment with the forest serving also as financial resource – express support for and/or subsidy payments related to the current business model and the focus on wood provision may be essential. SFOs within this cluster have a more diverse stream of income sources, compared to the other two clusters (cf. Figure 5 in Häublein et al. 2025). Beyond selling wood,

which is by far the most important source of income, they also to some extent make use of e.g. non-wood forest products and agroforestry, carbon credits and biodiversity offsetting schemes. Forest owners of this cluster are thus not only dependent on PES schemes but also most likely to participate in them.

The enthusiastic cluster, in contrast, is less dependent on additional payment schemes but exhibits a stronger ecological connection. Accordingly, new business models and income streams, including especially voluntary agreements (e.g. PES), eco-tourism or educational business models may be highly attractive to this actor group. As reliance on additional income has not been reported for this cluster so far, the possibility to create awareness for further management and funding options is especially fruitful.

We included a question in the survey about the SFOs’ willingness to adapt management practices in exchange for support/compensation<sup>19</sup>. The overall results are given in Figure 6 below:

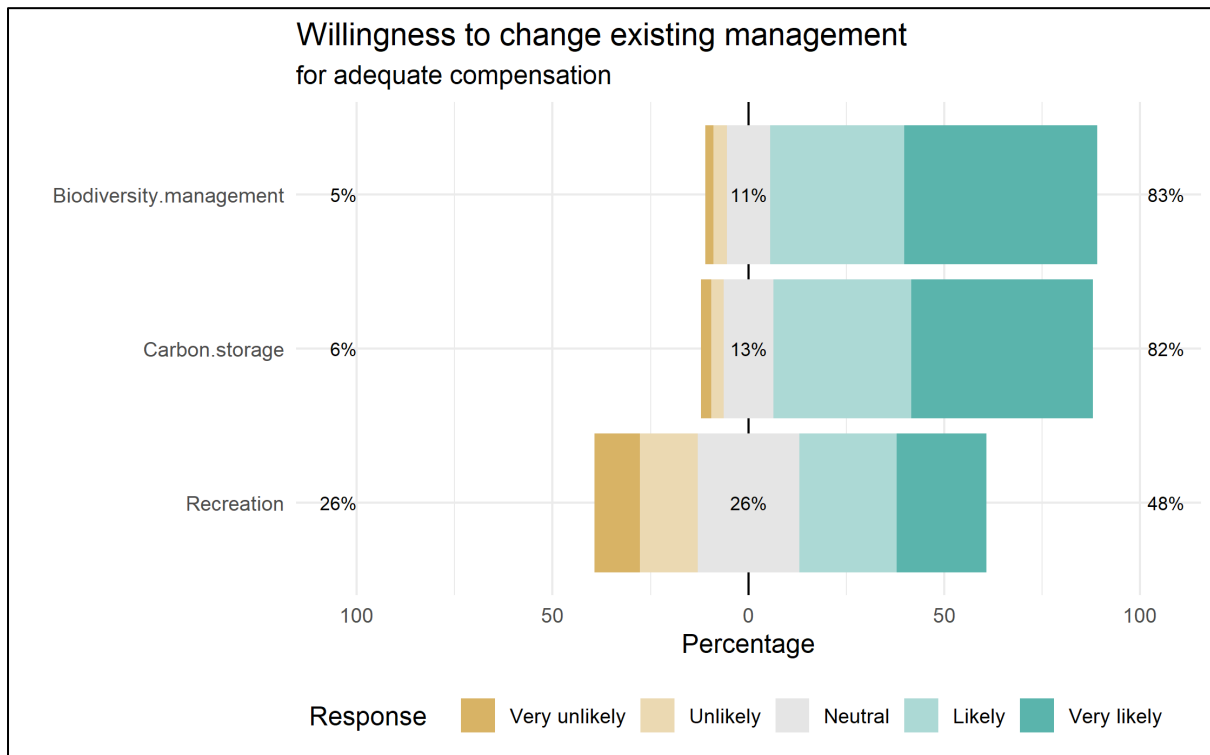


Figure 6: To which extent SFOs are willing to adapt management practices if receiving adequate financial support or compensation. Based on survey data from Häublein et al. (20259 (D2.1))

<sup>19</sup> “Would you be willing to adapt your management practices, if you received adequate financial support or compensation for:” Categories were “biodiversity conservation, increased carbon storage, more suitable for recreation and tourism and other, please specify”. For each option a Likert scale of very likely, likely, neutral, unlikely and very unlikely” was used.





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The figure shows that the willingness to participate in a scheme that involves adapting management practices towards more carbon storage or biodiversity management is very high. The willingness is relatively lower for recreation, but there is still a much higher share in favour of this than against. Results broken down by country (not depicted here) shows that the support is generally high across all countries, with Spain and Romania as the two countries with the highest support (94 and 86 per cent for biodiversity and 92 and 86 per cent for carbon sequestration for Spain and Romania, respectively). For the other countries, SFOs in Switzerland have the lowest willingness, especially for carbon sequestration (64 per cent).

Finally, we also asked a question about “which of the forest functions you already provide with your forest, would you like to be adequately financially supported or compensated for”. Answers to this question indicated that many SFOs seem to think that they already provide biodiversity and carbon benefits that they currently are not (fully) compensated for.



## **4. Recommendations for relevant PES schemes and next steps**

### **4.1 Basis for recommendations**

Chapter 3 has provided a review and evaluation of a number of European PES schemes in operation, with a focus on the living lab countries, or as investigated in the published research literature. In addition to this, we base the recommendations in this chapter on preliminary results from interviews conducted as part of Task 3.3 (Actor and business model analysis) and Task 3.4 (Collaborative business model development). This ensures links between the tasks in WP3 and makes a preliminary “ground-proof” validation of PES schemes and business models as seen by the small forest owners in the LLs. Finally, we draw on lessons from other, recent international literature on good practice for PES in the forest sector in the western world (e.g. Börner et al, 2017; Kangas and Ollikainen, 2025; Zu Ermgassen et al., 2025; Maron et al., 2025; Miles et al., 2025; Salzman et al., 2018; Wauchope et al., 2024; Wunder et al., 2025; Yan et al., 2022).

### **4.2 Key recommendations and guidance**

Note that in WP2 we showed that forest owners all have many relations to their forests, and not simply a material/financial one (Häublein et al., 2025). SFOs have other motivations than just financial gain, which has been shown in many other studies as well (e.g. Mitani and Lindhjem, 2015). This may be an important difference between SFOs and larger, more industrialised forest owners (their behaviour may more closely reflect profit maximisation than what is observed for SFOs). In interviews and workshops across Europe in WP3, small-scale forest owners highlighted that the purpose of the forest is not only to contribute to economic gains, but also as family heritage, part of their personal identity, and foundation of life.

Hence, PES schemes may benefit from being designed according to the multifaceted values of small-scale forest owners which may include non-monetary recognition, for example, symbolic acknowledgement, in addition to monetary recognition/financial gain. Further, as the values of SFOs vary between individuals (also within the three groups identified in WP2 (Häublein et al. 2025)), PES schemes may also benefit from being designed modularly, meaning that small-scale forest owners can individualise PES schemes according to their values. There might not be a one-size-fits-all PES scheme but a need for more modularly designed schemes so as to allow more value-sensitive PES schemes.

Hence, when designing PES schemes and making recommendations these multiple motivations and objectives need to be taken into account in a sensitive and careful way, so that, for example, financial incentives do not crowd out intrinsic motivations for conservation and stewardship that forest owners may already have (Rode et al., 2015).



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Further, it is important that any actual or amended PES schemes for SFOs are credible and have high integrity, ensuring that payments are made only for actions that generate real gains in carbon sequestration, biodiversity or other ecosystem services. This is especially important in light of the recent criticism of the voluntary carbon market (Romm et al., 2025). A high-integrity scheme ensures that efforts are truly additional and thereby that the scheme is environmentally effective. Other criteria that are important to consider when designing PES schemes are economic efficiency (the most BES gain for the lowest amount of public or private funds<sup>20</sup>), sustainability (long-term persistence, environmentally and financially for SFOs), manageable institutional and practical arrangements (e.g. avoiding excessive administrative burdens and transaction costs) and scalability (potential for expansion among SFOs). Finally, on the societal level, equity and distributional issues may also be relevant to consider, e.g. if costs and benefits of the schemes fall very unequally across regions or socio-economic groups of SFOs within a country.

Below, we have structured the recommendations into seven main areas, presented and discussed one-by-one. Table 1 summarises the conclusions, the main idea and rationale/benefit for each.

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<sup>20</sup> As such funds for conservation currently are highly limited in both private and public sectors.



Table 1. Key recommendations of PES schemes of relevance for small forest owners

#	Recommendation	Core idea	Main rationale / benefit
1	Action-based PES as default	Pay for clearly defined forest management actions rather than measured outcomes	Lower administrative burden, reduced MRV costs, clearer incentives, lower risk for forest owners
2	Collective participation via intermediaries	Use forest owner organisations to aggregate parcels, contracts, MRV and payments	Economies of scale, lower transaction costs, simpler participation for SFOs
3	Simplified, standardised MRV	Build MRV on existing data, tools and proxies; verify at collective level	Costs proportionate to payments while maintaining scheme credibility
4	Flexible, modular contracts	Offer short to medium contracts with renewal options and partial upfront payments	Better alignment with SFO time preferences, higher uptake and liquidity
5	Bundled ecosystem services	Remunerate packages of services without double counting	Reflects multifunctional management, improves cost-effectiveness and legitimacy
6	Predictable income streams	Combine public baseline payments with private or market-based top-ups	Reduces income risk and supports long-term participation
7	Policy alignment and future-proofing	Align PES schemes with evolving EU carbon and nature-credit frameworks	Builds trust, reduces bureaucracy, enables future scaling

**1. Prioritise action-based PES as the default for SFOs as it is simpler**

Recommendation:

- Design PES schemes that pay for clearly defined management actions (e.g. extended rotations, deadwood retention, habitat trees, set-aside areas), not measured outcomes (e.g. change in biodiversity indicators).

- Considering using hybrid models<sup>21</sup>, where outcome-based bonuses are added, only where outcomes can be verified cheaply/reliably (e.g., remote-sensed canopy change, harvest avoidance, coarse deadwood proxies where defensible etc.)<sup>22</sup>.

Basis for recommendation and advantages:

- Aligns with forest owners' clear preferences, as demonstrated in WP2 and 3, for low administrative burden, transparency, and predictable payments.
- Will likely cut MRV costs substantially.
- Improves transparency: It is clear to the forest owner what he or she is paid for, as it is clearly defined and more easily measurable. This could also reduce risk for the forest owners.
- Potentially reduces disputes over additionality and permanence as this will be more transparently linked to actions.

**2. Make collective participation the core mechanism to reduce transaction costs**

Recommendation:

- Channel PES contracts through a suitable intermediary (such as forest owner organisations) that can assist in aggregating small parcels, negotiate contracts, manage MRV centrally and distribute payments to members of the scheme. Most schemes reviewed of relevance to SFOs are based on some form of intermediary.
- Recognise these organisations formally as eligible PES counterparties in appropriate legal frameworks on the appropriate geographical and administrative levels (e.g. national or regional schemes). This could imply keeping legal and contractual work centralised. Standardisation reduces costs and increases scalability.
- Try as much as possible to standardise contracts, activities and units and use standard participation pathways. Keep definitions simple and harmonised across regions to the extent feasible. The EU's nature-credit roadmap stresses simplicity/usability and minimising administrative burden from the outset.

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<sup>21</sup> Could e.g. include a bonus payment (result-based) in addition to an action-based payment as the basis payment. This approach matches the carbon farming handbook's focus on result-based mechanisms while allowing pragmatic MRV tiers MRV (i.e. cheap by default but rigorous where needed) (COWI et al., 2021).

<sup>22</sup> The METSO example illustrates a workable model: participation is conditional on biodiversity criteria, administered regionally, with contract types including 10/20-year agreements and permanent options (Batpurev et al. 2025).

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- In a “grouped” structure of PES allow for new parcels to be added over time without re-validating each one from scratch.
- Single SFOs entering into PES contracts should likely be action-based, making transaction and MRV costs more manageable.

Basis for recommendation and advantages:

- Economies of scale in administration and verification can save costs and administration time, especially lowering per-owner costs related to MRV and contracting.
- If the collective participation is based on an existing institutional arrangement, such as a forest owner organisation, the time and transaction costs related to cooperation would likely be lower than if individual owners try to coordinate themselves or a new intermediary institution is set up to deal specifically with PES.

**3. Use simplified, standardised MRV systems built on existing planning tools and data**

Recommendation:

- Since the MRV systems are likely the single largest cost driver in PES for SFOs, MRV arrangements should as much as possible be based on existing planning tools and data, such as existing forest management plans, national/regional forest inventory data, remote sensing and/or simple proxies (e.g. area under no-harvest, number of habitat trees etc.). The MRV system may have to be strengthened if results-based payments are used.
- Apply sampling and modelling at collective level, not plot-level verification based on potentially costly field campaigns at individual forest properties. Rely on standardised factors (e.g. emission/removal factors) and conservative default values where accuracy gains do not justify field costs (especially for biodiversity).

Basis for recommendation and advantages:

- Keeps verification costs proportionate to relatively small payments expected from SFO management.
- Maintains credibility of the scheme without excluding small properties.

**4. Design contracts to match SFOs’ time and flexibility preferences**

Recommendation:



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- Since the meta-analysis in Chapter 3.1 has shown that many forest owners are sensitive to the time schedule preferring short to medium contracts with flexibility and front-loaded payments, offer modular contracts, including:
  - short initial commitment with renewal options,
  - optional long-term tiers for willing owners.
- Based on WP3 interviews, the contract length could be designed differently across Europe so as to reflect the regional understandings of temporality. For example, Germany, Switzerland, and Norway show an “enduring temporality” allowing PES schemes to be designed more long-term. Spain shows an “iterative temporality”, meaning that temporality is based on non-wood forest product cycles and hence shorter compared to Germany, Switzerland, and Norway. PES schemes in Spain may benefit from being designed with a shorter time-horizon and in synchrony with non-wood forest product cycles. Romania shows a “constraint temporality” and designing PES schemes more short-term with options of renewal might mitigate institutional distrust of SFOs.
- Include partial upfront payments to make future benefits tangible. PES schemes may also be designed with short-term milestones so as to bridge the temporal disconnect of future and present.
- Allow exit under pre-defined conditions, including potential penalty.

### Basis for recommendation and advantages:

- Potentially increases uptake without undermining long-term behaviour change.
- Allowing for front-loading of some of the payments, future benefits are materialised more into the present and creating liquidity for SFOs. For example, upfront payments when signing a PES contract may help make long-term goals materially tangible for SFOs.
- Aligns PES temporality with SFO decision horizons. The perception of time emerged as an important topic in interviews and workshops with small-scale forest owners. Early data shows that a temporal misalignment, between PES schemes, management measures, and small-scale forest owners’ understanding of it, may hamper the adoption of PES schemes.

## **5. Bundle ecosystem services rather than single-service schemes when possible**

### Recommendation:

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- Develop PES that remunerate packages of services (e.g. carbon, biodiversity co-benefits, water services), where this is possible. Important that these services are “stackable but not double-counted”.
- Avoid narrow, single-indicator schemes unless there are very good reasons to focus on one type of BES.

Basis for recommendation and advantages:

- Would align with findings from interviews/workshops and from our review of literature that SFOs show clear preferences for multifunctionality over single ecosystem service schemes/objectives.
- Managing for more than one service would potentially improve cost-effectiveness (when compared to separate schemes) and manage (sometimes unintended) positive and negative co-benefits of single-service schemes. In other words, this would help align incentives so that biodiversity does not get “crowded out” by carbon (and vice versa).
- Bundling of services would spread fixed transaction and MRV costs across multiple services.
- Better reflects real forest management decisions.
- Increases perceived fairness and legitimacy in the broader society.

**6. Ensure predictable, stable income streams to make schemes attractive for SFOs**

Recommendation:

- As SFOs are reluctant to engage in schemes with volatile or uncertain revenues, it would be desirable to combine:
  - public baseline payments (risk-reducing). Could for example co-finance verification and setup costs.
  - private or market-based top-ups (upside potential).
- Reinvest part of PES revenue into forest management support via appropriate intermediaries (e.g. dedicated forest owner association’ funds).

Basis for recommendation and advantages:

- Case studies show success where PES revenues are regular, earmarked, and long-term.
- Combining public and private funds would enhance financial viability and reduce risk for forest owners.

- May potentially reduce dependence on timber income alone.
- Can sustain participation over time if private funding is more volatile.

## **7. Increase policy alignment and future-proof PES schemes**

### Recommendation:

- Since Europe is moving towards more formalised carbon removal/carbon farming requirements and broader markets for nature credits (cf. Chapter 2.1), it is important to structure PES schemes for SFOs today so that they can map to the current and evolving regulations and be “upgradeable” into future EU nature-credit market expectations.
- Harmonise rules across regions nationally where possible to reduce bureaucratic overload.
- Where possible, introduce simplified PES tracks for small and collective projects.

### Basis for recommendations and advantages:

- Since EU regulations and implementation in this area are under development, adherence to these rules will be important to create trust in the market, especially for buyers. Carbon outcomes are currently more mature for market transactions than biodiversity/nature outcomes.
- Even with overarching EU rules emerging, there is considerable potential for harmonisation of rules within countries and regions. Such harmonisation would lower entry barriers and signal institutional trust and long-term commitment. Case studies in Chapter 3.2 (and Appendix) reveal delays, inconsistent interpretation, and bureaucratic overload as major deterrents for SFO participation.

### **Other issues that will be considered going forward:**

There are some issues that have either been noted by forest owners or pointed out in the broader literature on PES that will be considered going forward in the Small4Good project, but where clear recommendations at this stage would be somewhat premature. We mention two here:

- **Concerns about risk:** SFOs are likely not willing to join PES schemes if they fear too much risk and buyers will not enter the market for the same reasons. There are, for example, risks related to the *permanence* of any credits produced (e.g. in the case of forest fires etc). There is likely a need to find mechanisms to share liability in acceptable ways for both providers and buyers in the market. To get buyer confidence without exploding MRV costs, there may have to be conservative rules not overestimating gains. Wauchope et al. (2024), for example, underlines that both biodiversity and forest

carbon markets have faced major criticism around additionality, so risk related to this needs to be handled. There are many suggestions in the literature (for example that need to be investigated on this point<sup>23</sup>).

- **Reinvention of new structures instead of “piggybacking” on existing systems:** Many small forest owners already interact with certification bodies and group certification structures. There is a suggestion in the literature that such certification schemes could be used and refined for the purpose of PES. For example, the Forest Stewardship Council (FSC) has an Ecosystem Services Procedure and explicitly emphasizes verified impacts, and it has been evolving to be more accessible and robust; FSC also highlights group-focused clarity and revenue sharing in its revised standard. But integrating PES into existing group forest management and use one audit cycle, shared documentation, shared safeguards etc. would likely be more efficient than creating new institutional structure for PES. However, since forestry certification schemes have been controversial among the public, using and refining these, may require closer investigation of pros and cons.

## 4.3 Conclusions and next steps

The PES recommendations are preliminary in the sense that business-models are still being co-created in the project in collaboration with the forest owners in the LLs of the project and also need to draw from and contribute to advancements in other work packages that are still ongoing. For example, various multifunctional forest management options and indicators to measure resulting changes in biodiversity and ecosystem services are explored in WP4. Further, in WP5, digital tools are developed that may help support and engage small-forest owners in multifunctional management. Such tools may help, for example, in measuring changes in BES indicators compared to a baseline.

The recommendations will inform the further collaborative business model development in Task 3.4 (second round of business model workshops including these results will be carried out in 2026 and 2027), building on the deeper institutional analyses in Task 3.3. This will include existing PES business cases of SFOs and will be published with examples across all LLs, based on co-design and not limited to PES. At the end of the project, outputs from this report and remaining project work will enter into the deliverables D6.7 (Policy brief 2) and D6.13 (Policy recommendations). These policy briefs will be closely aligned with ongoing policy development in Europe, e.g. carbon removals and carbon farming, as relevant to SFOs.

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<sup>23</sup> Wauchope et al. (2024) describe how methodologies often deduct credits for leakage and use buffers (often ~20%) to address uncertainty, and also commonly require minimum project lengths (often at least 20 years) to address permanence.

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## Appendix: Overview of PES schemes in case countries

*Table A. Examples of PES Schemes currently in operation with relevance for Small-Scale Forest Owners from the LL countries of the Small4Good project*

PES Scheme	Country	(Spatial) Scope	Targeted Ecosystem Services	Buyers / Payers	Policy	Action/Outcome-based schemes	Type of Instrument	Payment method
Catalan Climatic Credit	Spain	Catalonia	Biodiversity improvement, Water quantity improvement, carbon sequestration, Fire mitigation	Businesses (outside of value-chain)	ESCAC 2021-2030	Outcome-based	Tradable Permits, Direct market, voluntary price signal	One-off
Selvans Mature Forest Conservation	Spain	Regional (Catalonia; initially Girona province)	Biodiversity improvement (protecting mature forest stands with high ecological value)	Public-Private mix: Provincial government (Girona) and NGO/Private sponsors		Action-based	Subsidy & Sponsorship	One-time subsidy per reserve covering timber stumpage value for a 25-year no-logging agreement
Bizkaia “Forests for Ecosystem Services” Subsidy	Spain	Regional (Bizkaia, Basque Country)	Landscape/Recreation value (scenic forest landscape for cultural services) and Water regulation (quality & quantity)		Basque County Forest Policy	Action-based	Policy-Backed Subsidy	Annual subsidy. Payment rates will compensate additional costs or income foregone for choosing longer rotations, native species, etc
Valencian Voluntary Carbon Market (ValVolCar)	Spain	Regional (Valencia Community)	Carbon sequestration	Companies and organisations in Valencia (voluntary carbon offset buyers)	Voluntary Carbon Market Standards	Outcome-based	Tradable permits	
MICOCYL Mushroom Permit System	Spain	Regional (Castile and León, 8 provinces)	Recreation / Cultural	General public (foragers and tourists purchase permits)	Regional regulation (decree) requiring permits	Action-based	Regulatory price signal (user fees for ecosystem access)	Sale of mushroom picking permits (various durations and types, priced ~€3 up to €300) to access forest lands for recreational/commercial foraging


**Small4Good D3.1 – Recommendation of relevant PES schemes**

Eco-account / Ökokonto	Germany	Available in all regions	Biodiversity improvement, Water quantity and quality improvement, Soil erosion reduction	Government, businesses (outside of value chain), Municipalities	German Federal Nature Conservation Act	Outcome-based	Tradable permits and direct payment	Depend on the contract
Waldaktie	Germany	Mecklenburg-Vorpommern	Recreational services, carbon sequestration	Users and Local Communities	-	Action-based	Direct Market	One-off
MoorFutures	Germany	Northern Germany	Biodiversity improvement, carbon sequestration	Business and Value Chain Actors	-	Outcome-based	Tradable permits	
Trinkwasserwald	Germany	National	Biodiversity improvement, water quality and quantity improvement			Action-based		
Compensation measure and offset	Germany	Regional (Lower Saxony)	Biodiversity improvement	Businesses (outside of value-chain)		Outcome-based	Direct payment per hectare	
Cemetery Forest	Germany, Switzerland	Various locations	Recreation and cultural services	Users and local communities		Action-based	Direct payment	One-off
EVA Wald-Klimaschutz	Germany	National	Biodiversity improvement, carbon sequestration	Businesses	Voluntary Carbon Market Standards	Outcome-based		Ex-ante and Ex-post
Wald Klimaschutz Schweiz	Switzerland	National	Carbon sequestration with co-benefits for biodiversity and sustainable forest management.	Private companies and organisations buying carbon credits or funding forest climate projects; the association itself in partnership with forest owners.	Voluntary Carbon Market Standards	Outcome-based	voluntary offset/credit mechanism	
Naturschutz im Wald (Kanton Basel-Landschaft)	Switzerland	Regional (Kanton Basel-Landschaft)	Biodiversity improvement (protection of ecologically important forest habitats, old trees, deadwood etc) primarily.	The canton (Basel-Landschaft) government, supported in part by federal funds (Switzerland) for nature-conservation measures.	Kanton law/regulation on nature and landscape protection; the program has been in place since 1998 and the canton is legally obliged to compensate landowners for conservation losses.	Action-based	Public subsidy / conservation contract / grant	One-off after forest owners manage forests in biodiversity-favourable ways.




**Small4Good D3.1 – Recommendation of relevant PES schemes**

“Waldfünfliber” Recreation Fund (Canton Solothurn)	Switzerland	Regional (Kanton Solothurn)	Recreation (forest access & upkeep)	All municipalities in canton (via mandatory levy)	Cantonal regulation (mandatory fund)	Action-based	Public transfer	Public fiscal	Continuously. Each municipality pays 5 CHF per resident annually into a fund; the fund distributes grants to forest owners for maintaining publicly accessible forests
Fribourg Recreation Subsidy (Canton Fribourg)	Switzerland	Regional (Kanton Fribourg)	Recreation	Cantonal government (public budget)	Cantonal policy (direct support program)	Action-based	Public subsidy		Direct payments to forest owners for providing recreation amenities (e.g. trails, picnic areas). The canton co-finances leisure and recreation services in forests via grants
Bern “Waldvignette”	Switzerland	Local (City of Bern & peri-urban forests owned/managed by Burgergemeinde)	Recreation	Forest visitors (voluntary “Waldvignette” donations), event organizers & commercial users (seilpark, public/commercial events) paying fees; municipality/owner tops up as needed		Action-based	Voluntary price signal		Voluntary contributions earmarked for forest upkeep; permit/usage fees charged for commercial/public events or facilities in forest
Baden “Ökosponsoring”	Switzerland	Local (City of Baden, Canton Aargau)	Biodiversity and Conservation	Local companies & individuals (corporate eco-sponsoring; private patrons adopting young-forest plots); city may co-finance		Action-based	Private sponsorship / donation		One-off
Voluntary forest conservation (Frivillig vern av skog)	Norway	National (private forests)	Biodiversity conservation (protection of habitats, old-growth forests, and rare species)	Government (Ministry of Climate and Environment (via the Environment Agency) funds payments to compensate private forest owners for forgone timber income)	Nature Diversity Act (2009)	Action-based	Subsidy / Compensation from the government		100% funding of planting costs; landowner must keep new forest (registered covenant)
Env. Forest Grants (NMSK miljøtiltak)	Norway	National	Biodiversity, recreation, landscape, heritage in managed forests			Action-based			Multi year agreements or one-off




**Small4Good D3.1 – Recommendation of relevant PES schemes**

Climate Afforestation 'Klimaskog'	Norway	National	Carbon sequestration (new forest sinks)			Action-based	100% funding of planting costs; landowner must keep new forest (registered covenant)	One-off
Forest Carbon Management (Landbruksdir.)	Norway	National (productive forests)	Carbon uptake (enhanced growth); timber productivity co-benefit			Action-based	Subsidies: e.g. 30% of extra planting costs, 40–50% of fertilization costs	One-off
Trefadder <sup>24</sup> (Voluntary carbon projects)	Norway	National	Carbon sequestration & storage; biodiversity co-benefits	Business outside value chain and value chain actors	Voluntary Carbon Market Standards	Outcome-based	Tradable permits	Contracts
Oslomarka "Closed-Logging" Pilot	Norway	Local region (Oslo Marka forests)	Recreation (scenic forests), climate adaptation, biodiversity			Action-based	Grants for using selective/partial harvest instead of clearcut	One-off

**Insights from Romania:**

We conducted an interview with our Living Lab in Romania to explore about the available PES schemes in the country that are feasible for small-scale forest owners. Despite having a handful of active forest-based PES and PES-like schemes, Romania lacks state-level public PES framework that is easily accessible to small-scale forest owners. Most conservation and climate-related forest payments are designed and funded through EU instruments (Natura 2000, EU EAFRD), often with high administrative or technical entry requirements. As a result, the practical uptake by smaller private owners remains limited.

Additionally, Romania does not yet operate a regulated carbon market. This means that forest-based carbon sequestration projects must rely on voluntary carbon markets, where transactions are more complex and less predictable. While selling carbon credits is technically possible—as shown by emerging private initiatives like Silvadór or Rotunda—the process is often out of reach for individual or small-scale forest owners. One key barrier is the lack of operational associations or cooperatives structured for joint project development. In Romania, most forestry associations are oriented toward representing member interests or lobbying, rather than pooling land, resources, or technical capacity to lower the transaction costs of participating in carbon markets. This fragmentation hinders economies of scale, verification efficiency, and ultimately access to PES revenues tied to carbon sequestration.

<sup>24</sup> There are also other private initiatives on carbon sequestration in Norway, such as the one led by the start-up Noora (<https://noora.com/>). This company has started with the relatively larger forest owners but may also include smaller owners (or cooperations between such owners) in the future.



