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Authors

Pia Katila, *Natural Resources Institute Finland*

Marko Lovrić, Jeanne-Lazya Roux and Sven Wunder, *European Forest Institute*

Bart Muys, Constanza Parra, Nathalie Pipart and Eirini Skrimizea, *KU Leuven*

Bo Jellesmark Thorsen and Thomas Lundhede, *University of Copenhagen*

Mireia Pecurul and Irina Prokofieva, *Forest Sciences and Technology Centre of Catalonia*

Marc Gramberger, *Prospex Institute*

Giorgia Bottaro, *University of Padova*

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Executive summary

The main goal of SINCERE (Spurring INnovations for forest eCosystem sERvices in Europe) was to advance Innovative Mechanisms (IM), including novel policies and business models, and other mechanisms, for aligning the supply and demand of forest ecosystem services (FES). This report synthesises the main findings from SINCERE, reviewing the existing knowledge from the global research on payments for ecosystem services (PES), presenting information from the mapping and inventories of FES at European level, and especially from comparing the experiences, findings and lessons learned across twelve innovation action cases (IAs) that formed the core of SINCERE activities. Ten of the IAs were situated in Europe, namely Belgium (2), Croatia (originally 2, but one was discontinued), Denmark, Finland, Italy (2), Spain (2), and Switzerland, and two outside of Europe, one in Peru and one in Russia. The IMs developed and tested within these IAs focused on changes in the legislative framework, market-based instruments to improve provision of public goods, user-based payments for ecosystem services (ES) and securing the funding for public goods through donations.

Based on a review of the global state-of-the-art knowledge on PES, the key enabling conditions for developing PES include a strong and stable payment vehicle, which is based on sufficient voluntary willingness to pay (WTP) for ES. In Europe, the provision of ES is often predominantly seen as a public responsibility, which limits private WTP. Further, the value of payment for ES must cover the landowners' opportunity costs, i.e. the income lost by entering PES contracts. The implementing institution – in Europe, typically an intermediary, or a government agency – must be seen as legitimate, especially by ES providers. This confidence may not always pre-exist, and the process can thus entail lengthy trust-building between the parties involved. Based on the global review, the following are the key principles for PES design and implementation: 1) participation needs to be targeted to high-ES/high-threat areas, 2) mechanisms should be cost-efficient and diversify payments according to the landowner's estimated provision costs instead of fixed unit-value payments, and 3) non-compliance needs to be monitored and sanctioned.

An inventory of European cases where IMs for supporting the supply of FES have been implemented identified altogether over a hundred cases, over half of which focused exclusively on forests. A European-level survey directed to forest owners and managers looked at FES supply, demand, income from, and the

profitability and occurrence of FES-focused IMs. The upscaling of the results to European level revealed a distinction between two types of forests: one group mostly in the North-Eastern Europe (Sweden, Finland, Baltic countries, Poland, Germany, Austria and Denmark) where forest income is almost exclusively related to provisioning FES, and another group (all other countries) where forest income sources are related to all three types of FES (provisioning, regulating, cultural). In general, vast majority (80% or more) of forest income is associated with supplying provisioning FES.

The European policy framework for FES provision was analysed by (I) a bottom-up analysis of SINCERE's innovation case-study areas, (II) interviews with EU-level stakeholders and (III) focus-group discussion with participants from both local and EU-levels. The interviews showed that there is need for more transparent data on forests, better knowledge on FES and the potential of FES innovations, as well as improved coordination between the different policy actors at EU level and among the different sectoral policies affecting forests while also ensuring sufficient regional flexibility.

Recent EU forest-related policy documents and policy debates are increasingly emphasizing FES and are moving in the direction of financial incentives for the provisioning of FES. The increased focus and changing demands on FES also raise challenges, such as trade-offs amongst FES, disagreements on policy goals and which actions are needed to achieve policy coherence, and uncertainties pertaining to the existence and durability of funding. Therefore, increasing knowledge generation and communication is needed for creating a broader understanding of FES and of the potential and challenges of FES provisioning. For supporting the provision of FES and developing policies and mechanisms to this end requires cross sectoral coordination and bringing together different stakeholders at the local, national and at EU level in a manner that allows top-down approaches and policies to support and facilitate bottom-up ideas, innovations and processes.

The upscaling potential of the IMs developed and tested in SINCERE was analysed and discussed along four different lines. 1) National geographical upscaling: Several of the IAs are of limited scale and local testbeds but may be upscaled to a larger geographical scale within the same country. 2) Upscaling to other schemes or effort types: The IM may have a generic feature that can be adapted to e.g. other regulatory schemes targeting the same ecosystem service through other types of efforts. 3) Upscaling in scope: The specific IM design may be suitable for upscaling to other ecosystem services. 4) Upscaling to other countries: Some of the IMs have a generic nature allowing this, whereas others are strongly depending on e.g. the distribution of exclusion rights. Analysis of the commonalities across the cases emphasizes the crucial importance of the distribution of rights for what market-based instruments may be successfully developed and implemented for enhancing the provision of FES. It also highlighted the market-based IMs for cost effective coordination of efforts across forest owners in providing biodiversity and habitat protection. For these public goods, but notably also some climate mitigation benefits, the infeasibility of exclusion and the non-subtractability effectively hamper the development of effective and transparent market-based instruments that can raise the necessary funding for enhanced provision. This is an area in need of further research.

The assessment of the environmental, social, economic and institutional sustainability of the tested IMs' (Sustainability Self-Assessment) was based on a self-assessment by the IA practice partners with support from the research partners. Most of the IMs addressed all the four dimensions of sustainability and reported to have reached a generally positive overall sustainability. Most of the IAs reported economic and/or managerial aspects as the weakest aspects in sustainability, referring to issues such as increase in transaction costs, coordination, preparation, marketing, and lack of mid- to long-term financial security. The strongest aspects across IAs were more diverse, referring mainly to the IMs' ecological sustainability, but also to participation and awareness, but less to economic sustainability. All IAs had defined future actions to address sustainability shortcomings.

In the design, implementation, and evaluation of the different IMs SINCERE employed a multi-actor engagement approach that was based on different tailor-made participatory processes conducted at different stages of the project and involving different groups of stakeholders at different levels. Evidence from the SINCERE regional multi-actor processes demonstrate that stakeholders consider such participatory processes very beneficial for the development of customized local solutions to handle FES provision. The creation of participatory bottom-up processes at regional level allows to explicitly explore the underlying factors for FES prioritization and to promote learning about FES demand-driven partnerships between forest owners and managers, business, society, policymakers and scientists.

To put forward a Europe-wide incentive system for FES it's paramount to create a common understanding at all levels and across all stakeholders of the complexity of forest ecosystems and how different forest management regimes can affect the future of our forests by delivering different outcomes. This requires skilful facilitation of engagement processes, familiarity with and commitment to participatory methods, as well as flexibility and adaptability in the face of change and challenges.

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1 Introduction

Pia Katila

1.1 Introduction to SINCERE

With the global societal challenges we currently face, like climate change, biodiversity loss and the Covid 19-pandemic, the role of forest ecosystem services (FES) and ensuring their continuous provision is increasingly recognized and valued. At the same time growing populations, economic growth and urbanization increase the demand of different FES. Furthermore, the transitions towards a bioeconomy and replacing fossil-fuel based with bio-based resources creates new and increasing demands for forests.

Forests provide multiple ecosystem services that are crucial for human well-being, including carbon sequestration and storage, regulation of water flows, erosion control, storm protection, water purification, provision of wood and non-wood forest products, as well as providing an environment for recreation and spiritual and cultural values. Biological diversity is a critical foundation for the continued supply of ecosystem services, and it can also directly influence the availability of different services, such as the presence of viable populations of edible and medicinal plants and pollinating insects (Harrison et al. 2014). While forests can provide multiple ES simultaneously, there are as well crucial trade-offs, such as among carbon sequestration, recreation or biodiversity and biomass production.

A large part of the European forests providing FES to answer to the increasing demands is privately owned, especially in western and northern Europe (Forest Europe 2020), and a large share of the private forest holdings are 10 ha or smaller. Currently forest owners are usually compensated only for the provision of those FES for which markets exist such as wood and for some non-wood forest products, while there are few incentives for securing or increasing the provision of other FES leading to an increasing gap between the broader societal demands for FES and motivations and possibilities of forest owners and managers to provide FES to meet it. For motivating forest owners and managers to provide those services that do not have direct market values new ways to value these services and create incentives for their provision are needed.

The importance of forest for biodiversity, climate change mitigation and for providing a multitude of other ES is clearly recognized in the recent EU environmental and economic strategies, the European Green Deal (2019), Biodiversity Strategy (2020), and the Forest Strategy (2021). Yet, given the diverging and evolving societal demands, increasing, and balancing the provision of multiple FES is a key challenge for forest policy and management in the European Union (EU) and its member states. Both the Biodiversity Strategy and the new Forest Strategy foresee the development of payment schemes to forest owners and managers for providing ecosystems services.

The main goal of SINCERE (Spurring INnovations for forest eCosystem sERvices in Europe) was to address this situation and advance Innovative Mechanisms (IM), including novel policies and business models, and other mechanisms, for aligning the supply and demand of FES. The IMs should further be situated in a coordinated supportive policy framework, which would support the development of a European-wide incentive system for FES.

The IMs were developed, tested and evaluated within the innovation action cases (IAs) across and beyond Europe. Ten (originally eleven, but one of the two IMs tested in Croatia was discontinued) IAs were located in different regions in Europe, one in Peru and one in Russia. The IAs are further described in Chapter 4. The design, implementation, and evaluation of IAs was done jointly by the practice partners and researchers, through co-design and co-generation of knowledge, which facilitated bringing together different types of knowledge and experiences. The multi-actor co-design process brought together different stakeholder

groups from local to national and European level. National and European stakeholders were involved in the assessment and development of the European forest-policy framework. The most intensive interaction took place within the local stakeholders with direct interest in the specific IA cases and who participated in the co-design, co-implementation and co-evaluation processes. An international Learning Architecture facilitated continuous collaborative learning from and across the IAs.

The innovations developed and tested in SINCERE varied in terms of FES targeted, actors involved, and the specific incentive mechanism tested, but together aimed to explore new means to enhance forest ecosystem services in ways that benefit forest owners and serve broad societal needs. This report synthesises the main findings from SINCERE, comparing the experiences, findings and lessons learned across IA cases and situating them into the global context and state of the art scientific and practical knowledge. The report builds on the SINCERE Deliverables, as well as the Internal Synthesis Workshop (June 2021) that focused on the key lessons from the implementation of the different IMs, and the International Conference (September 2021) that brought together research and practice partners, and policy and decision makers to discuss the conceptual and research-based foundations for creating innovative mechanisms for FES provision, FES supply and demand in Europe and beyond, the practical lessons learned from designing and implementing IMs for enhancing FES provision, further developing and upscaling these mechanisms and related business models and policy issues.

This synthesis report concentrates on presenting the main findings from SINCERE in a succinct form. More information on the data used, research and analysis methods, etc. can be found in the detailed project Deliverables referred to in the text. They are available at the SINCERE [www page https://sincereforests.eu/project-deliverables/](https://sincereforests.eu/project-deliverables/). The key concepts used in this report are defined in Box 1.

BOX 1: Key concepts

Ecosystem services (ES): include provisioning services, such as timber, non-wood forest products and water; regulating services such as climate and water regulation; cultural services such as recreation, aesthetics and cultural heritage; as well as supporting services such as nutrient cycling, soil formation (Millennium Ecosystem Assessment 2005).

Forest ecosystem services (FES): the ES obtained from forest ecosystems.

Innovative mechanisms (IM): novel policies, business models and other mechanisms, including payments for environmental services, to support the provision of forest ecosystem services (Bottaro et al. 2018).

Innovation action (IA): activities conducted in the regional cases directly aimed at co-designing, co-testing, co-implementing and co-evaluating innovative mechanisms that support the provision of forest ecosystem services.

Innovation action cases (IA cases): the regional cases where innovation actions were developed and tested.

Payments for Ecosystem/Environmental Services (PES): voluntary transactions between service users and service providers that are conditional on agreed rules of natural resource management for generating offsite services (Wunder 2015).

Stakeholders: all types of active groups with an interest in IM and forest governance, ranging from public officials and administrations to private-sector interest groups. SINCERE distinguishes three types of stakeholders: (i) national and international (European) stakeholders, (ii) (mostly local) stakeholders linked to the IA cases; and (iii) (mostly local) stakeholders outside the IA cases with an interest in IA.

1.2 Theory of change framework

A Theory of Change framework (Figure 1.1) was used to structure the assessment of and discussion on the upscaling potential of the IMs developed and tested in the different IAs. It draws on the PES-related Theory of Change presented by Wunder et al. (2020, 2021) and Börner et al. (2020) and allows for a well-structured description of the IMs tested in SINCERE facilitating structured thinking about the linkages between the elements of a causal chain from inputs and treatments to outputs, outcomes, and impacts, as well as the challenges that upscaling of the IMs will face along this chain. It is used to describe the importance of the contextual conditions (the inputs) where the IMs are situated, the thinking and ambition of the IMs (treatments) aimed at enhancing FES provision, related outputs such as e.g. forest conservation contracts, that lead to changes in forest management and related livelihood effects (outcomes), further leading to enhanced provision of FES and related welfare benefits (impacts) – that is the chain from treatment to impact. Reflecting this causal chain, the Theory of Change frameworks are often presented as linear chains. However, in the context of the analyses presented in this report, the Theory of Change framework is understood and presented as a circle. This is to highlight the crucial relationship between the availability of financial resources (input), i.e. funding, for the payments to be made and the actual value creation resulting from the changes in the management targeted. The value to society of the enhanced ES is the welfare economic argument for why financing for their provision should be in place to begin with (Lundhede et al. 2022).

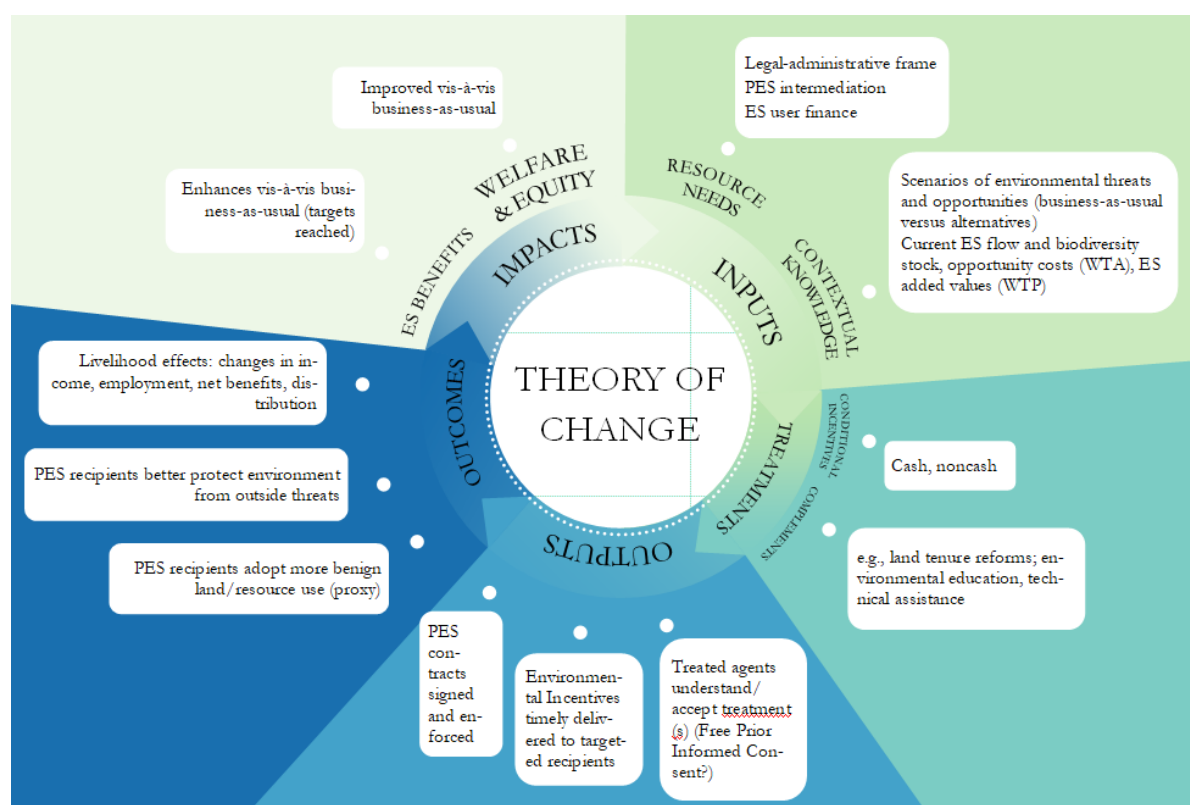


Figure 1.1 Theory of change framework (revised from Wunder et al. 2020).

2 Payments for environmental services: global state of the art

Sven Wunder

2.1 Introduction to PES

Payments for environmental services (PES) are a specific contractual tool to incentivize forest owners' adequate provision of environmental services (ES). Preferably they are defined as voluntary transactions between service users and service providers that are conditional on agreed rules of natural resource management for generating offsite services. PES have become increasingly popular globally, but the majority of these experiences has been outside of Europe.

The PES model is not equally apt for every type of ES. Scrutinizing the classical ES categories from the Millennium Ecosystem Assessment, PES are in fact never used for incentivizing so-called 'provisioning ES' (forest products), they are seldom for 'supporting ES' (e.g. soil formation), sometimes for 'cultural ES' (e.g. recreation), and very often for 'regulating ES' (e.g. watershed protection). This is because PES are a tool for addressing spatial externalities, where users different from forest owners proper stand to benefit the most but cannot be charged directly by forest owners in common marketplace transactions. In most cases, PES are stated as customized, land-use focused contracts, rather than constituting proper 'markets' for ES.

Various PES-like initiatives exist also in Europe, fulfilling some but not all PES criteria. While most PES globally are forest-focussed, in Europe and other industrialised regions agri-environmental schemes dominate. Why have PES emerged more in some regions (the Americas, Australia) than in others (Europe, Africa)? What can Europe learn from more advanced regions? Are there key contextual differences in PES preconditions? And how can policymakers better adapt to these? To answer these questions, we draw in this section on state-of-the-art knowledge about global PES experiences to explore the preconditions, design and implementation, and contextual factors of PES. We provide an accessible overview of best practices in PES, and their known environmental impacts. From that basis, we also tentatively examine under what circumstances PES could be implemented more successfully in Europe. This chapter is based on the SINCERE Deliverable 1.4 (Wunder et al. 2019).

2.2 Preconditions for PES

A few key PES enabling conditions stand out from our research:

i) Strong and stable ES payment vehicle needed

PES financing is by definition based on voluntary willingness to pay (WTP). Obviously, WTP is likely to be higher when the quality and scarcity of the ES in question is elevated. Overall, sufficient WTP by environmental service (ES) users and a pre-identified stable payment vehicle – who will make continuous contract payments? – seem also to be the main obstacles. In European societies, safeguarding the provision of ES is often predominantly seen as a public responsibility, which thus limits private WTP.

ii) Opportunity costs reasonably low

How much to pay is the other side of the economic equation. The value of payment for ES must cover the landowners' opportunity costs, i.e. how much potential income is lost by entering PES contracts and foregoing lucrative, but environmentally degrading land uses. Notably, at the agriculture-forest frontier of many developing countries, some high-value commodities (e.g. oil palm, soybeans, perennials) may yield such large per-hectare returns that PES cannot match them. In Europe, this balance is situation-specific, but where rural land abandonment and forest regrowth abounds, the opportunity costs on marginal lands are typically low.

iii) Implementing agency must be legitimate

First, ES users have to be able to get their act together to engage in user-financed PES – or their public-sector representatives must take initiative for a government-financed PES programme. The implementing institution – in Europe, typically an intermediary, or a government agency – must be seen as legitimate, especially by ES providers. This confidence may not always pre-exist, and the process can thus entail lengthy trust-building between the parties involved.

iv) Clear property rights to land must exist

ES providers must have at least the right to exclude outsiders from entering or acting on their forestland in ways that might endanger ES delivery. This is a killer assumption for PES in many settings with poorly developed institutions, such as in tropical forest frontiers. In Europe, with more consolidated land tenure systems, this factor plays less of a role – except perhaps for those cases with public landownership, where PES hence usually are not the preferred solution.

The basic economics of PES (i and ii) thus seems to constitute a hierarchically dominant precondition. While the PES principle may appear simple, PES are institutionally demanding tools, vis-à-vis (iii) and (iv). This implies that, although there may be a clear economic argument for PES, in some scenarios of institutional backwardness or collective action problems, PES will not emerge. Yet, when the institutional preconditions (land tenure and ES user/ intermediary institutions) are not met, PES implementation might still be enabled by supplementary actions, such as land tenure reform, contract negotiation, or institutional capacity building. In turn, when willingness to pay for and to accept PES do not match, PES will simply not emerge.

2.3 PES design and implementation

In general, three lessons to implementers stand out from our global literature review:

i) Participation needs to be targeted to high-ES/ high-threat areas

ES distribute unequally in space, and so do the threats against them. Adverse selection biases abound at various levels. Implementers often go first for the low-hanging fruits of low-threat areas when starting PES programmes. The first landowners to apply for PES are typically those who would environmentally comply even without PES. Low additionality, i.e. low incremental impacts from PES, thus constitutes the largest challenge worldwide for PES programmes today. Spatial targeting is the single-most important PES design remedy against such an ‘adverse selection bias’. Europe’s performance here is probably about average: some targeting to areas with high-density ES and/or to areas that face salient threats is clearly occurring, but there is still much room for improvement in *a priori* differentiating where PES likely will make a difference.

ii) Make payments cost-efficient

Costs of ES provision often vary much across landowners, but in ways that are not fully known by environmental agencies or ES buyers. Mechanisms and proxies used to diversify payments so they better align with the distribution of costs can result in massive efficiency gains. In Europe, as in other high-income regions, more payment diversification exists than in the Global South. Again, much more can still be done to increase cost efficiency. Recent experiences with inversed procurement auctions where landowners compete for offering ES provision at a lower cost through bidding have also been tested in the SINCERE project; they constitute one such mechanism of cost efficiency that can potentially lower the environmental principal’s (e.g. public agencies’) budgetary burden.

iii) Non-compliance needs to be monitored and sanctioned

PES implementers around the world often shy away from sanctioning contractual non-compliance, even when detected through monitoring. They probably often do so out of fears to lose long-established social capital with rural communities, or to lose votes when government-financed PES are concerned. Conditionality – the defining *quid pro quo* feature of PES – is thus, de facto, often not seriously enforced. It should not be a surprise then that PES do not always work optimally. In Europe, very little is known about the degree of non-compliance and moral hazard in PES and PES-like schemes. The matter deserves increased attention.

2.4 Contextual factors shaping impacts

Beyond design, many contextual conditions influence the environmental impacts of PES:

i) Adequate policy mix

PES are seldom the only game in town; they tend to be applied jointly with other environmental and non-environmental interventions that affect resource use. PES are thus in practice no strict alternatives to regulation ('command and control') and protected areas ('fortress conservation'); rather, incentives and disincentives, 'carrots and sticks', may in practice often work together well. In Europe, particularly the relation of environmentally focused PES to the Common Agricultural Policy remains a key policy coordination issue for PES interventions.

ii) Motivation crowding effects likely to be small

Recipients of PES will supposedly be positively motivated by the incentives they receive to carry out specific pro-environmental actions. Yet, sometimes the opposite could occur: PES might 'crowd out' pre-existing intrinsic, non-monetary motivations, i.e. provision of ES from landowners who per se 'want to do the right thing'. In most empirical settings, altruistic motivations seem to remain unchanged; true PES crowding-out is probably more exceptional.

iii) Magnet and rebound effects are small

PES interventions do affect local income generation and rural development dynamics. If they were to create large income gains among local ES providers, this might attract immigrants ('magnets'), and trigger additional resource consumption ('rebound'), both of which might cause new environmental pressures. In Europe, this has not been a key factor – probably because PES has not raised rural incomes so much for the two effects to play out solidly.

iv) Leakage effects little known, but maybe exaggerated

Tight environmental budgets and far-reaching problems may mean that not all targetable land areas can be PES enrolled. Pressures could thus partially 'leak' from enrolled to non-enrolled lands. Leakage can diminish overall environmental impacts, although for small interventions and high-value commodities, impacts can be larger. This is especially relevant for globally targeted ES, such as mitigating forest-based greenhouse gas emissions, but it is also a natural reaction of rational economic agents. For Europe, leakage issues have not yet been well-researched.

v) Solid linkage between land-use proxy and ES required

Most PES contracts are coined in terms of outcomes, i.e. land-use proxies, such as amount of forest cover – instead of proper impacts, such as carbon stocks or biodiversity levels. In the longer term, linkages between proxy and ES must be verified. Sometimes, contracts can also be linked to both proxies and ES

impacts, or directly the latter. Research on agri-environmental payments in Europe shows that more performance-based payments can increase PES impacts.

vi) Low transaction costs

PES systems may be fairly costly to establish (lengthy negotiation processes, possibly need for setting up new institutions), while being economic to operate once they are up and running. In Europe, many government-financed schemes seem not to exhibit excessive transaction costs.

vii) Permanence seldom realistic

What happens after payments end? As theory tells us, most land use and ES effects naturally dissipate when PES end, if the underlying environmental problem persists; you only get what you pay for, as long as you pay. An exception are PES designed explicitly as adoption subsidies for new technologies that, once in place, become profitable in their own right. But a continuous payment vehicle (e.g. water fees) can also allow for payments to last. Europe's agri-environmental schemes hold examples of both transitory and permanent boosts of ES provision.

2.5 PES impact evaluations

How do we know what really works? Quantitative impact evaluations, though still incipient, have been rapidly expanding globally over the last decade. Rigorous environmental impact evaluations construct business-as-usual scenarios about what would have happened without the intervention, so they can plausibly attribute impacts. Europe is markedly behind the curve in terms of making use of rigorous impact evaluations for assessing environmental interventions.

For PES, rigorous impact evaluation studies exhibit a wide variation in land-use outcomes worldwide, even when applied to different subregions for the same PES programme. This underscores the importance of local contexts for environmental results. Many PES schemes have been carried out in low-threat environments, thus harvesting low-hanging conservation fruits – but when compared to matching low-threat baseline scenarios, their attributable impact is low. Yet, for other conservation tools (e.g. protected areas, certification), similar adverse selection biases prevail. PES are comparatively still doing fairly well – apparently a bit better on average than protected areas – but not as well as they might, if some design errors were corrected.

2.6 Conclusions: what works globally in PES?

Our initial question about the determinants of success in using PES as an incentive instrument could analytically be separated into two sub-questions:

- a) what preconditions and enablers need to be in place (if possible, created) for PES systems to emerge in the first place? and
- b) once established, what contextualized design and implementation features warrant the best chances for achieving desirable impacts?

As for the first question of preconditions for PES emergence, we have above highlighted principally three issues. First, a basic economic condition needs to hold: ES users' willingness to pay (WTP) must exceed ES providers' willingness to accept (WTA) ES rewards. This also entails that landowner opportunity costs are not so large that they cannot be 'bought out' by ES buyers, or the public sector agencies representing their interests. On the demand side, it clearly helps that the ES is of high and/or rising value, e.g. due to its spatial specificity, ongoing environmental degradation, or other scarcity-driving dynamics.

Secondly, ES buyer and seller institutions need to work well – be it that ES users self-organize payments at the micro-scale (without excessive free-riding among them), or that central/ local government or municipal utilities (e.g. for urban water users) effectively act on users' behalf.

Finally, ES providers' land tenure and access rights need to be secure, so that they have actual control over natural resource management on the land that is critical for ES supply – a precondition that is often not in place in especially tropical agricultural frontiers where active deforestation processes and land grabbing are occurring, with weak state institutions and poor governance.

As to the second question of boosting sought-for impacts of those PES schemes that have been able to establish themselves, there are also increasingly clear lessons emerging from the literature on PES impact evaluations. First, PES design should include spatial targeting of land areas with high ES densities (e.g. carbon-rich forests, or hotspots of endemic biodiversity) and high ES leverage/ threats (e.g. forests foreseen to be cleared, or erosion-prone lands in a watershed).

A second PES design feature is to not opt for fixed unit-value payments (per-hectare, per household, etc.), but instead diversify payments according to the landowner's estimated provision costs (e.g. high vs. low opportunity costs) and/or ES density and threat (see above). In developing low-income or emerging economies, willingness to diversify payments has for political-administrative reasons been lower than in the Global North (e.g. use of auctions).

Finally, PES schemes are designed to be conditional – ES users (or their representatives) pay only if the contracted service is delivered, or more commonly, if a contingent land-use proxy has de facto been implemented. Conditionality relies on the combination of monitoring compliance and sanctioning incompliance – knowing whether a contract has been breached and doing something about it. In reality, many PES implementers shy away from 'hard' conditionality, on the sanctioning side: even though they are aware of levels of incompliance, they turn the blind eye to avoid political problems or loss of social capital gradually built with the community of ES providing forest and landowners. Ultimately, this can trigger problems of moral hazard, and undermine the credibility of the PES instrument: in the worst case, society could come to perceive PES as an old-style 'soft subsidy' with predominantly farm income-support objectives.

3 Forest ecosystem services in Europe

Marko Lovrić, Jeanne-Lazya Roux and Giorgia Bottaro

3.1 Supply and demand of FES in different parts of Europe

Comprehensive and reliable information on the supply of and demand for FES in Europe is still lacking. The most complete overview of European FES supply is provided in Primmer et al. (2018). They produced Pan-European maps of supply for biomass, bioenergy, soil stabilization, water retention potential, pollination potential, habitat maintenance and protection, soil organic content, carbon storage, experiential and recreational use and symbolic value. In terms of demand, Wolff et al. (2015) provided a summarized systematic review of activities performed in mapping of ecosystem services; but no comparable set of FES demand indicators is currently available. In general, mapping of provisioning FES is the most straightforward compared to mapping the other groups of services. The mapping of regulating FES is usually done through proxies (e.g. soil protection as a function of vegetation per land cover type, environmental zones, snow cover and potential for erosion). Cultural FES are the most difficult to map out, but they can be mapped in many different ways; i.e. by 'classical' modelling (e.g. in the recreation module of InVest recreation and

nature tourism is proxied with the prediction of the spread of person-days for recreation and tourism by natural habitats, accessibility and built features), by social media based mapping (e.g. photo-series analysis), by participatory mapping (e.g. on-line map surveys) or by landscape analysis (e.g. GIScane approach to mapping landscape aesthetics that are defined by analysing landscape structure or the distribution of land use types with the help of landscape metrics). Studies assessing overall supply and demand of individual FES on European level do not exist; rather, they tend to focus on the local level. European-level studies focus mainly on a certain group or a single FES, for example regulating ES (Stürck et al. 2015), pollination potential (Schulp et al. 2014 and Breeze et al. 2014) or flood regulation (Stürck et al. 2014).

One of the key research activities of SINCERE was a European-level survey directed to forest owners and managers (Torralba et al. 2020a), which looked at FES supply, demand, income from, and the profitability and occurrence of FES-focused IMs and at factors supporting or impeding development of these innovations.

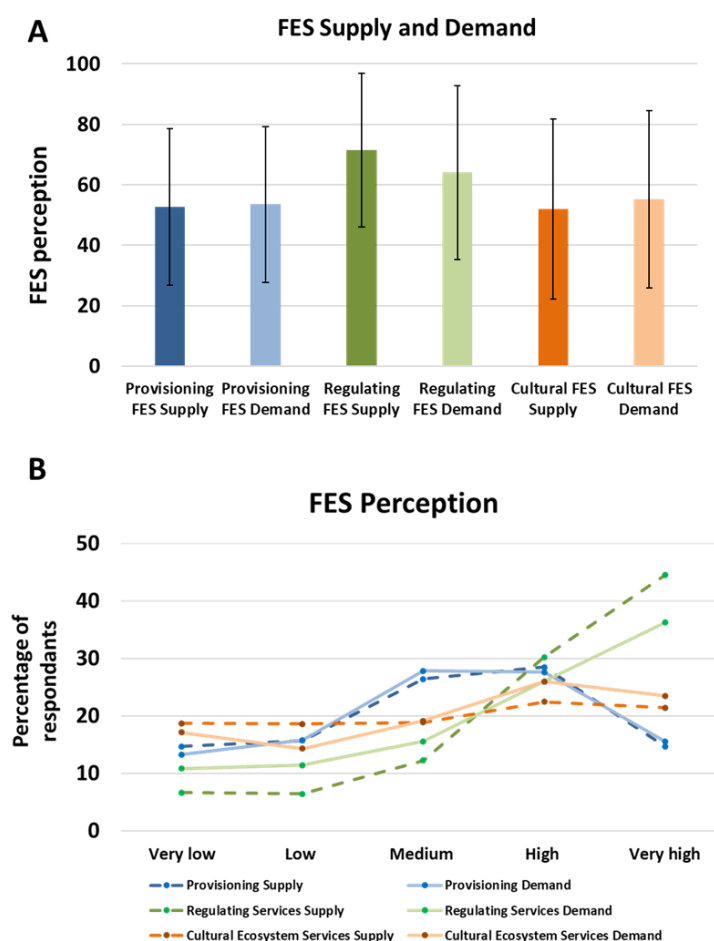


Figure 3.1 A: Average supply and demand for each FES category. Error bars represent standard deviation. B: Percentages of respondents perceiving Supply and Demand of FES as Very low, Low, Medium, High, or Very High. Source: Torralba et al. 2020a.

Figure 3.1 A shows that in general the supply and demand match for the different categories of FES. The demand is highest for regulating FES, and their supply is even slightly higher than the demand. For provisioning and regulating FES the situation is the opposite, their demand is slightly higher than the supply.

Figure 3.1 B further shows that the perceived supply and demand of provisioning FES are aligned across the scale from very low to very high. For regulating FES, people who assess their supply and demand to be on the relatively lower levels, consider the demand to be greater than supply; but as the supply and demand increase, the supply overshadows the demand. The opposite is true for cultural FES; when their supply and demand are deemed low, supply is higher than the demand; but when their values grow, supply is smaller than the demand. Also, there is a strong correlation between supply and demand of individual FES belonging to the same group, and no negative correlation between any FES. In terms of trends, the respondents stated that out of the three FES groups, the societal demand for regulating FES has increased the most in the last twenty years. Vast majority (80% or more) of forest income is associated with supplying provisioning FES, while the rest is equally split between regulating and provisioning FES (Torralba et al. 2020a).

Another survey focused especially on cultural FES (Torralba et al. 2020b); it found no strong trade-offs between supplying cultural FES and identified several underlying types of situations with strong provision of certain FES; (I) provision of multiple cultural FES (sports / exercise, dog walking, bird / nature watching, aesthetic experiences and outdoor education), (II) hunting, (III) farming), (IV) nature-based tourism and (V) fishing.

The responses from the forest manager and owner surveys on FES (Torralba et al. 2020b) were upscaled to European level. The underlying assumption for the upscaling was that forests which share similar characteristics (e.g. biomass, tree species composition, distance to the closest city, same protection status, same country, etc.) have similar FES characteristics. The forest characteristics utilized in the upscaling were above and below ground biomass and carbon, distance to the closest city, population density, evapotranspiration, growing stock, increment, rainfall, slope, soil bearing capacity, country, forest ownership type, terrain ruggedness, protection status and tree species composition. The upscaling was performed through Google's machine learning, TensorFlow (Abadi et al. 2016) within Python programming language and performed on 1 x 1 km spatial resolution covering almost all of Europe's forests (excluding Russia). The upscaling procedure provided results that are valid on a three-point scale (e.g. low, medium, and high supply of FES). On aggregated European level and by FES categories (provisioning, regulating and cultural), the supply of and demand for FES match. On the level of individual FES, the biggest supply – demand mismatch is for non-wood forest products, for which the demand is about 20% higher than the supply. These discrepancies are more pronounced at disaggregated geographical level, but at national level, supply and demand match. However, a clear, statistically significant grouping emerged; one where the mean level of both FES supply and demand are 25% higher (entire Finland, Germany and Denmark, and partially Sweden and Norway, Poland, France and Spain) than what is the case with the rest of the Europe. The forests of the first group have more coniferous species, higher carbon and growing stock and biomass, while the forests of the second group are characterized by more broadleaved species, higher population density, slope, rainfall, terrain ruggedness and are on average closer to a city.

When looking at supply and demand of individual FES, the most interesting difference can be found for healthcare, sports and outdoor recreation. The absolute levels of supply and demand for this FES are highest in the North, followed by central Europe and lowest in the South. However, when the supply is subtracted from the demand to see where a 'surplus' of forest recreation could be found, the results show that there is need for greater supply of recreation in the northern and southern Europe, while in central Europe the supply and demand of forest recreation match. About 80% of the forest income is associated to provisioning FES, while the remaining 20% can be equally split between forest income related to regulating and cultural FES.

When clustering forests based on income-related variables, two types of forests can be distinguished: one group mostly in the North-Eastern Europe (Sweden, Finland, Baltic countries, Poland, Germany, Austria and Denmark) where forest income is almost exclusively related to provisioning FES, and another group (all other countries) where there is a mixture of forest income sources, i.e. it is related to all three types of FES.

This means that currently forest owners and managers in North-Eastern Europe have very little or no economic incentive to secure the provision of regulating and cultural FES which impacts the sustainability of supplying these ES.

3.2 FES related innovations in Europe

An inventory of European cases where Innovative Mechanisms (IM) for supporting the supply of FES have been implemented gathered 105 cases (Bottaro et al. 2019). The IA cases are primarily developed by private (41%) and public (37%) organizations that operate on local (38%), regional (24%) and national (20%) scale. A vast majority (85%) of the cases has been operating for more than a decade. A large share (87%) of them is still active. Little over half (57%) are exclusively in forests, followed by agricultural land (22%), meadows (20%), wetlands (17%) and other (7%) places. The IMs are predominantly (68%) located in one location, half of which are in rural areas (Bottaro et al. 2019). An earlier study has found that the IMs were mainly found in temperate oceanic (46%) and Mediterranean regions (31%). A smaller number of cases were located in temperate continental (12%), alpine (6%), and boreal regions (5%) (Lindner et al. 2010).

In 39 instances the IMs targeted provisioning FES, in 100 instances regulating and in 39 instances cultural FES. Most of the IMs targeting provisioning FES focused on timber production (13) and non-wood forest products (9). More than half of the IMs targeting regulating FES focused on habitat protection (32) and various specific regulating FES (35). From the IMs targeting cultural FES, most focused on forest aesthetics (28), and educational (18) and recreational (17) services. The IMs are most frequently developed by private forest owners and managers (37%) and public forest owners (22%), and the demand for these IMs originates from the civil society (36%) and private companies (18%). The final beneficiaries of the services promoted by these IMs are civil society (41%), local communities (17%) and forest owners (16%). Almost half (45%) of the IMs support an already existing FES. A smaller number supports an already existing FES in a different spatial context (22%), or the provision of a new FES by an already existing mechanism (17%), or the provision of a new FES by a new mechanism (16%) (Bottaro et al. 2019).

A European wide survey to forest owners and managers (Torralba et al. 2020a) collected information on FES-focused innovations that they have developed. In terms of innovation types developed (Figure 3.2), the most prominent categories were change in forest management to improve / sustain biomass production (21%) and new technology for biomass production (14%). Innovations related to new transboundary cooperation (4%) and new technology for other ecosystem services (3%) were rare (Torralba et al. 2020a).

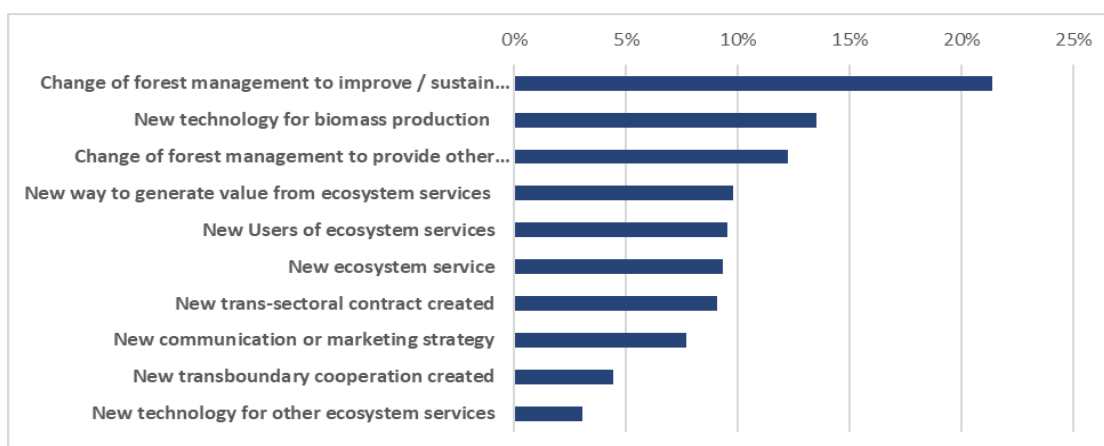


Figure 3.2 Types of FES-focused innovations reported by forest owners and managers. Source: Torralba et al. 2020a.

Figure 3.3 below shows which factors affected the development of FES-focused innovations and what kind of roles they had. The most important supporting factors for innovation development are individual leadership and innovation culture; both of which are internal to the innovating organization. The most supporting external actors are private sector and businesses, and the most inhibiting external actors are policymakers. The most inhibiting factors are regulatory framework and low profitability before the innovation. While profitability cannot be influenced externally, regulatory framework can, making it the key factor that requires future attention, if one aims to further upscale the development of FES-focused innovations (Torralba et al. 2020a).

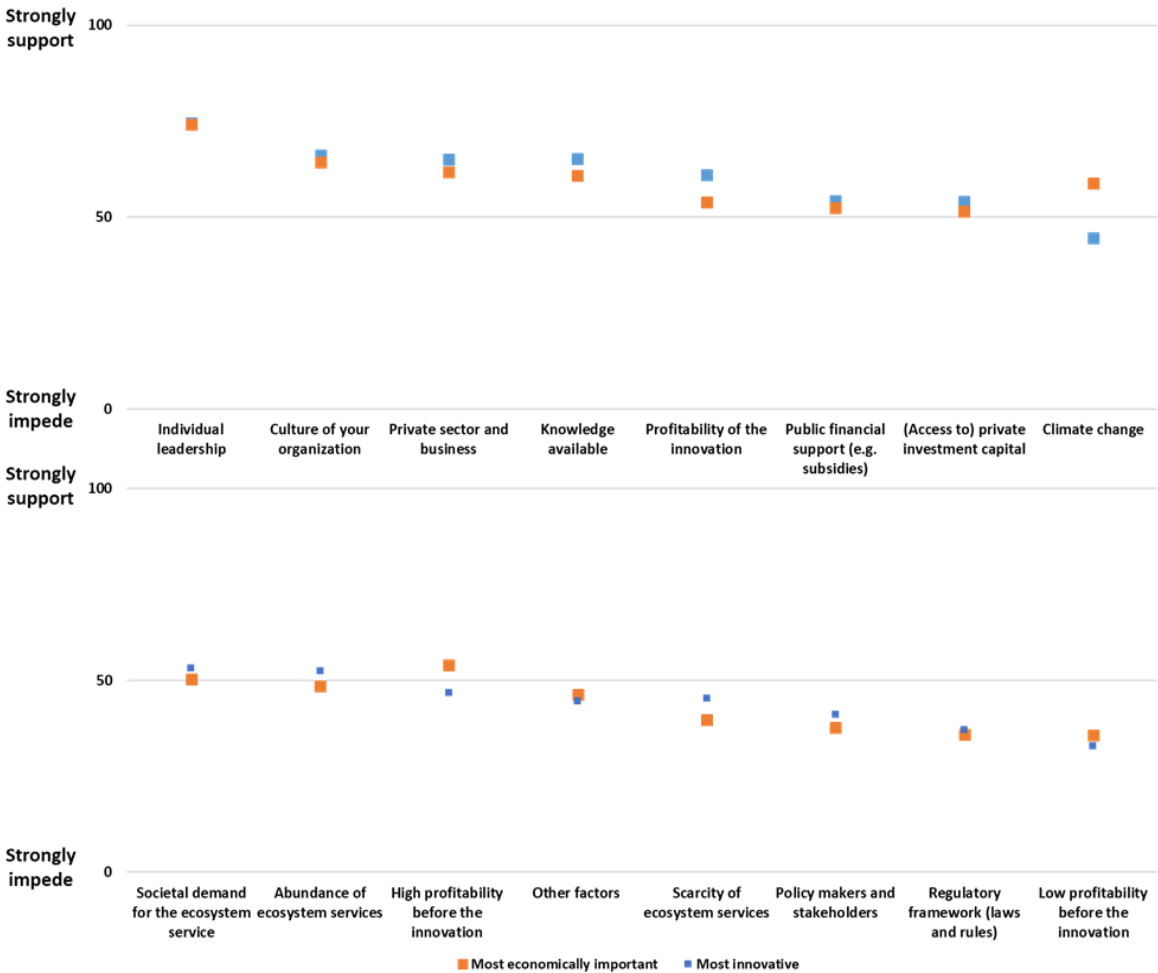


Figure 3.3 Supporting and inhibiting factors for development of FES-focused innovations. Source: Torralba et al. 2020a.

3.3 European policy framework for FES provision

The policy environment that supports FES provision and development of related innovations was analyzed by a three-step approach including (I) a bottom-up analysis of SINCERE's innovation case-study areas, (II) top-down analysis of interviews with EU-level stakeholders and (III) focus-group discussion with participants from both local and EU-levels that focused on possible solutions to overcome the hindering factors identified in the earlier steps and possible solutions to support innovation and multiple FES provision (Roux et al. 2020).

The bottom-up analysis of SINCERE case-studies showed that cases that focus on market-based instruments and user-fee based payments, such as the Belgian cases, Peruvian and the Danish one, received a high level of interest from stakeholders, were highly ambitious and capital intensive. In order to work they need to be supported by the core sectoral policies and can be hindered by the lack of national policy coordination, and for example incompatibility to state aid rules. The cases that focused at improving markets for existing marketable services (Switzerland, Italy II) were characterized by strong leadership and an organizational culture that supported innovations. The problems with these cases related to policy coordination with other sectoral policies (e.g. taxation) and market barriers. Cases that focused on changes in the legislative framework or were based on donations (e.g. Russia, Finland, Croatia) all needed strategic policy-level support to foster uptake and further development of the mechanism (e.g. EU-policy level support or strategic political support on the level of Russian Federation).

The top-down approach included in-depth interviews with forest policymakers and stakeholders at EU level (including representatives from the European Commission, state and private forest owner associations, forest industry and nature conservation and environmental non-governmental organizations and groups). The interviews confirmed the existence of two major coalitions with respect to EU forest policy: a pro-forest use coalition and a pro-conservation coalition (see Sotirov et al. 2021). Although these two coalitions have fundamentally different ideas on how and why forests should be managed, used and protected, there was a consensus amongst both groups that the provisioning of FES should be supported more. Both coalitions agree that indeed more research (e.g. H2020 projects) is directed to this topic and that more focus is being placed on the multiple services that forests provide. Despite the progress made at EU level, both coalitions state that there is still much room for improvement. The interviews revealed that more transparent data on forests and research and knowledge on FES and the potential of FES innovations is needed. Furthermore, there is a need for improved coordination at EU level between the different sectoral policies affecting forests, as well as between the different policy actors.

Suggestions by respondents for how to better coordinate policies for FES provisioning included: the need to clarify the competencies and responsibilities of European Commission and member states in relation to forest relevant issues, the importance of solving the coordination-related issues also at the national level, the implementation of more comprehensive research on FES valuation and related issues such as forest management, the improvement of the dialogue between the actors from the two coalitions (conservation actors vs forest use actors), and the importance of adopting a holistic approach that supports multifunctional FES. The pro-conservation coalition sees potential in the Green Deal for offering such a holistic approach. The pro-forest use coalition rather fears that the Green Deal is causing more divides and trade-offs. Furthermore, both coalitions agree that FES should be better supported financially at EU level (i.e. a payment scheme). For the pro-forest use side, such a scheme should be market-based and voluntary. For pro-conservation side, it should be in the form of EU-subsidies for which specific terms and conditions exist.

The focus group discussion reiterated that improved coordination on forest issues and forest related policies is needed at EU level. The dominant theme of the discussion was the possibility to have an EU-wide payment for ecosystem services scheme. Although there was no consensus amongst the participants whether such payments should be market-based or subsidies, voluntary or conditional, they all agreed that the regional differences in the EU pertaining to forest area and governance capacities should be considered. It was proposed to have a set of EU-wide overarching principles and indicators for such a payment scheme, but that sufficient regional flexibility should be provided.

Another interesting outcome of the focus group discussions relates to an EU knowledge sharing platform. Such a platform should equip FES providers with the possibility to share knowledge, best practices and challenges with other service providers as well as with EU policymakers. The platform would thus serve to inform both practitioners and policymakers of the potential of FES and related innovations and could contribute to a bottom-up policy making process.

The challenges identified during the top-down approach and the focus group can thus be summarized in the three lines of arguments of EU forest policy as described by Wolfslehner et al. (2020): 1. The two major coalitions at EU level and their respective perceptions on forests, 2. The different views on the appropriate level of forest policy making, and 3. The differences in perspectives of forest management across Europe.

During the SINCERE final conference, the increasing recognition of FES was highlighted. In the past, FES was seen as a “pleasant side-effect” (externality) from forests; however, anything that was valued, was connected to timber. The potential of FES is now receiving more attention. Recent EU forest-related policy documents and policy debates are increasingly emphasizing FES. Furthermore, the societal demands and expectations for FES are evolving with different responses to these dynamic demands. Debates are also moving in the direction of financial incentives for the provisioning of these services. However, the increased focus and changing demands also raise challenges, such as trade-offs amongst FES, disagreements pertaining to policy goals (even leading to a polarization) and which actions are needed to achieve policy coherence, and uncertainties pertaining to the existence and durability of funding. Therefore, increasing knowledge generation and communication is needed for creating a broader understanding of FES and of the potential and challenges of FES provisioning. For supporting the provision of FES and developing policies and mechanisms to this end requires cross sectoral coordination and bringing together different stakeholders at the local, national and at EU level in a manner that allows top-down approaches and policies to support and facilitate bottom-up ideas, innovations and processes (<https://sincereforests.eu/creating-innovative-mechanisms-for-forest-ecosystem-services-what-does-science-tell-us/>).

4 Brief description of the IAs/IMs

Nathalie Pipart, Eirini Skrimizea, Constanza Parra and Bart Muys

The SINCERE case studies, referred from now on as Innovation Actions (IAs), explore new means to enhance Forest Ecosystem Services (FES) in ways that benefit forest owners and managers, as well as serving the broad needs of society. Working with key stakeholders (local and supra-local), the IAs employ different IMs that offer incentives to provide relevant FES. SINCERE focused on twelve IMs (originally thirteen, but one of the two IMs tested in Croatia was discontinued) in nine (9) countries. Here, we briefly present the profiles of the IAs, and their IMs grouped according to the 4 types of business models (IMs) used (i.e. changes in legislative frameworks, market-based instruments to improve the provision of public goods, user-based payments for ecosystem services and donation-based payments for public goods). At the end of this chapter, the IAs are organized into a synthesis table presenting their technical characteristics, namely IMs, the targeted ecosystems and stakeholders included and addressed, according to input received by the practice partners.

4.1 Group I: Changes in legislative framework

Spain/Basque Country – Creating a new legal framework for forests addressing ecosystem services provision in Bizkaia County

The main long-term objective of this IA is to create a new legal framework for forest and forestry that incorporates the concept of ES into the regional forest legislation, to improve the provision, valuation and monitoring of ES and to provide the resources to pay for ES provision. The IA focuses on two FES: water quality and quantity, and landscape as social and recreational service. It also includes research to establish correlation between management actions and the improvement of these ecosystem services. The IM consists of creating and implementing subsidies to pay for the provision of these ES in the annual subsidy call of the Bizkaia Province.

Russia – Providing multiple ecosystems services by forest renters

This IA aims to develop mechanisms for multi-purpose forest management, introducing the concept of ES and multi-purpose forest use into the current forest renting system which currently only provides leases for a single ES. The overall objective is to change management priorities from wood harvesting to multi-purpose forest management. The IA includes the monitoring of ES in a pilot project Club GREY HORSE in order to draw legislative recommendations for the development of the IM. To increase the economic efficiency of forest use while maintaining a balance between all ES, the IM introduces a multi-purpose lease for a forest plot into the Forest Law.

4.2 Group II: Market-based instruments to improve the provision of public goods

Denmark – Reverse auction pilots for biodiversity protection

This IA aims to inspire changes to existing public grant schemes for biodiversity protection on privately owned land by demonstrating in practice how a competitive bidding process can improve the coordination of nature conservation efforts, cost-effectiveness, and ownership among landowners. The IM is a reverse auction where forest owners respond to a fairly open call by offering biodiversity conservation measures that they decide themselves. In the offer, they describe the measure in terms of actions, imposed restrictions and the price they ask for implementing it.

Belgium/Flanders (1/2) – Reverse auction pilot for forest ecosystem services in rural and peri-urban areas (Habitat restoration)

This IA tests reverse auctions as a funding mechanism to stimulate the generation of much needed FES (i.e. wildlife population control, habitat restoration in forested hunted areas) and an alternative to subsidy schemes in a densely populated and urbanised region, Flanders. This alternative approach could lead to more cost-efficient use of the limited financial resources and support initiatives that are considered important to the relevant stakeholders and society as a whole. The reverse auction IM was implemented as two pilot projects targeting hunting areas. The IM consisted of a discriminatory price auction for the restoration and improvement of habitats in forests, particularly game species habitats.

4.3 Group III: User-based payments for ecosystem services

Belgium (2/2) – Reverse auction for wild boar population control

This IA tests the reverse auction that could provide a funding mechanism to stimulate the generation of much needed FES (i.e. wildlife population control, habitat restoration in forested hunted areas) and an alternative to subsidy schemes in a densely populated and urbanised region, Flanders. This alternative approach could lead to more cost-efficient use of the limited financial resources and support initiatives that are considered important to the relevant stakeholders and society as a whole. The reverse auction IM was implemented as two pilot projects targeting hunting areas. The IM in this category of user-based payment called for the creation of shooting strips on corn fields next to forest edges to heighten the visibility of wild boar for hunters and reduce damages to crops.

Croatia (1/2) – One-time concession permits for increasing the health functions of peri-urban forests in protected areas

This IA provides an innovative way of evaluating health as a benefit from FES. The goal is to develop several scenarios for payments of those services, while empowering future management of the protected area. The IM of one-time concession permits is being implemented in the Medvednica Nature Park. The one-time concession permit is a tool to monitor all sport events in the park area and to ensure that these are held in a sustainable way respecting the nature protection rules. It is also a tool to raise funds to maintain and build new infrastructure.

Italy/Etifer – Forest-habitat biodiversity payment scheme

This IA sets up a partnership between the regional park and local poplar plantations with the double objective of increasing the sustainable management of the plantations while increasing funding for restoration of crucial areas within the regional park. The IM includes a Payment for Biodiversity Conservation Scheme that brings together park authorities, and poplar farmers under the common framework of FSC® (Forest Stewardship Council) certification; it also includes the timber processing industries to secure a continuous demand of FSC certified wood and to explore the possibility to establish a premium price for it. The IM reduces management and certification costs and facilitates certification for traditional poplar farmers, organising them into a certification group, while benefitting the natural environment of the Regional Park.

Italy/Borgo – The Mushrooms of Borgotaro IGP

The 'Mushrooms of Borgotaro IGP' are produced in the woods of the Tuscan-Emilian Apennines. The IA was first implemented in 1964 with the creation of the Consorzio Comunale Parmensi (CCP) to organize the commercialisation of recreational permits for wild mushroom collection. In the framework of SINCERE the IA is renewed through the development of an IM which consists of a new online platform or application to improve the commercialisation of the permits and the pickers' experience. The main goal of this IM is to expand the type of users and demands (to reach younger customers, to orient pickers to areas specific to their permit category, and to improve the security of visitors).

Switzerland – Funeral forests

Traditionally, there are several places in the Swiss forest where people seek spiritual strength from nature, so-called 'places of power'. In the last decade, a new form of ES-based business has emerged in some regions in Switzerland – Funeral Forests, mostly including non-forest-actors who pay a small rent to the forest owner. This IA explores how managing forests to be used as spiritual forests could benefit both the forest and the forest owner. The IM aims at raising awareness of the importance of Cultural Ecosystem Services (CES) and motivating forest owners and managers to supply these services and to manage forests appropriately. The IM is market-based, and its idea, concept and implementation come from the forest owner.

Peru – Paying for watershed services to cities

This IA focuses on how a fee on the water bill in the city of Cusco can be used to improve hydrological services around the Piuray watershed in collaboration with local communities. The objectives are to implement ecosystem-based interventions in watersheds for improving water security, involve multiple stakeholders in decision-making and share intervention costs and benefits in a fair manner, and provide an opportunity to improve relationships between upstream communities and a downstream urban water company. The IA includes the pilot implementation of a PES that rewards the local communities for the work improve hydrological services. The IM aims to serve as a learning site for other PES schemes in the country.

Spain/Catalonia – Forests for water

This IA has two main objectives: i) the inclusion of forests and forestry in a joint strategic planning instrument, and ii) the participatory design of a local Forest Fund. To address these objectives, the IA explores the implementation of an IM, a PES scheme focused on forests and water. This IM focuses on strengthening governance for joint forest-water strategic planning and on finding new resources to support forest owners to provide water-related services.

4.4 Group IV: Donation-based payments for public goods

Croatia (2/2) – Increasing health functions of peri-urban forests and their acknowledgement in protected areas through donation boxes

This IA provides an innovative way for evaluating health as a benefit from FES. The goal is to develop several scenarios for payments of those services, while empowering future management of the protected

area. The donation boxes were implemented in the Medvednica Nature Park to raise money for new content and infrastructure to support human health and wellbeing. During the implementation period, this IM proved problematic. Visitors were not willing to donate, while there were also incidents of vandalism. As a result, donation boxes will be used only as an information tool, to inform visitors on FES.

Finland – Paying for landscape ecosystem services

This IA proposes a PES system in which forest owners are compensated for voluntarily enhancing the provision of landscape and recreational values in their forests. A model for piloting this IM is developed in the Ruka-Kuusamo tourism area in Finland. It consists of a planning process to select valuable forest areas in terms of biodiversity, landscape and carbon stock and a pilot project to collect and distribute funds to implement forest management changes to support the provision of ES in these valuable areas. The funds for the IM are collected from visitors and tourists and tourism entrepreneurs through a media campaign.

4.5 Technical characteristics: IMs, ecosystems targeted and relevant stakeholders

Table 4.1 Technical Characteristics per type of IM used

Cases	Innovative Mechanisms	Ecosystems or services targeted	Providers (sellers)	Users (buyers)	Stakeholders involved in MAG process
Group I: Changes in legislative framework					
Spain/Basque Country	Legal framework for embedding forest management for water, landscape and timber services	All ES with focus on water quality, water quantity, landscape and timber	Depends on the service provided. Public administration or private owners, initiatives...	<ul style="list-style-type: none"> ▪ The whole society, the foresters, the owners, the farmers, etc. 	<ul style="list-style-type: none"> ▪ Foresters ▪ Farmers ▪ Landowners ▪ Associations ▪ Public administration ▪ University/research partners
Russia	Legal framework to enable the provision of multiple ecosystem services by forest renters. There is no single mechanism described	Not pre-limited. Four were mentioned: regulating ecosystem services, cultural, provisioning, biodiversity	Forest tenants	<ul style="list-style-type: none"> ▪ In general: society at large, local residents. More specifically, the users of the specific ES that forest tenants will include in their forest management 	<ul style="list-style-type: none"> ▪ Forest tenants ▪ Local authorities/ municipalities ▪ Nature conservation organizations ▪ Local residents
Group II: Market-based Instruments to improve the provision of public goods					
Denmark	Reverse Auction	Biodiversity protection	Forest owners	Society in general through public administration	<ul style="list-style-type: none"> ▪ Forest owners ▪ Environmental nongovernmental organisations (ENGOS) ▪ Foresters
Belgium/Flanders (1/2)	Discriminatory price auction	Habitat restoration in forested hunting areas	Forest owners (habitat restoration)	<ul style="list-style-type: none"> ▪ Hunters (Hubertus Vereniging Vlaanderen) ▪ Public administration Flemish Agency for Nature and Forest (ANB) 	<ul style="list-style-type: none"> ▪ Public administration Flemish Agency for Nature and Forest (ANB) ▪ Farmers (Boerenbond) ▪ Hunters (Hubertus Vereniging Vlaanderen) ▪ Private forest owners (Aanspreekpunt Privaat Beheer – Natuur en Bos) ▪ Research partners
Group III: User-based payments for ecosystem services for ecosystem services					
Belgium/Flanders (2/2)	First rejected price reverse auction	Wildlife Population control (buffer strips between forests and agricultural lands)	Farmers (for buffer strips) in agreement with the hunter's operating on their fields	<ul style="list-style-type: none"> ▪ Hunters (Hubertus Vereniging Vlaanderen) ▪ Public administration Flemish Agency for Nature and Forest (ANB) 	<ul style="list-style-type: none"> ▪ Public administration Flemish Agency for Nature and Forest (ANB) ▪ Farmers (Boerenbond) ▪ Hunters (Hubertus Vereniging Vlaanderen) ▪ Private forest owners (Aanspreekpunt Privaat Beheer – Natuur en Bos) ▪ Research partners

Croatia (1/2)	One-time concession permits	Social and ecological FES (health, vacation, recreation, tourism, biodiversity, climate)	Not specified ('whole population') Public administration of the park (P.I.N.P. MEDVEDNICA) and private owners	Organizations, companies, associations and all who organize events in the area of Medvednica Nature Park	<ul style="list-style-type: none"> Public administration of the park (P.I.N.P. MEDVEDNICA), Research partners (Institute for Development and International Relations - IRMO), Civil society, Associations (Croatian Mountain rescue service), Business (hotels, resorts, web service providers)
Switzerland	Payments for burial sites, funeral forests	Different cultural ecosystem services within the categories "physical experience", "cognitive experience" and "emotional-spiritual experience"	Forest owners	People wishing to bury their loved ones' ashes in the forest	<ul style="list-style-type: none"> Forest owners Companies Users Local authorities Citizens
Italy/Etfor	Forest-habitat biodiversity payment scheme (certification poplar plantations)	The ecosystems involved are fluvial forests, such as willows, rushes or mixed lowland forest, and other natural riparian habitats, such as wetlands	The Regional Park	Owners of the poplar plantations	<ul style="list-style-type: none"> Forest Stewardship Council (FSC) members Poplar growers and associations Poplar industries Park and regional authorities Freelance forestry professionals
Italy/Borgo	Consortio Comunalie Parmensi (CCP) will implement an app-based tool to improve the commercialisation of recreational wild mushroom picking permits	Recreational use of mushrooms	CCP (forest owners and managers)	Recreational wild mushroom pickers	<ul style="list-style-type: none"> CCP members Recreational and professional wild mushroom pickers association Buyers and processors of wild mushrooms Organization dealing with tourism Municipal authorities
Peru	Paying for watershed services to cities	Water and soil regulation services, also considering other services where tradeoffs are possible, such as agricultural production	Local communities of the Piuray Watershed (with supervision of the urban water utility company SEDACUSCO)	SEDACUSCO and urban water users in Cusco. Local communities may also benefit, depending on the modalities of the IM	<ul style="list-style-type: none"> Urban water utility SEDACUSCO The micro-watershed management committee The municipality Local communities of the Piuray Watershed
Spain/Catalonia	Integration of forestry in the Urbanistic Masterplan (PDU) of the Rialb water reservoir	Water quality and regulation	Integration of forestry in the Urbanistic Masterplan (PDU) of the Rialb water reservoir	Different typologies of water consumers (farmers, municipalities, individuals), industries and businesses	<ul style="list-style-type: none"> Public administrations and politicians at the municipal level Forest owners Research partners
Group IV: Donation-based payments for public goods					
Croatia (2/2)	Donation boxes	Socio ecological FES (health, vacation, recreation, tourism, biodiversity, climate)	Not specified ('whole population') Public administration of the park (P.I.N.P. MEDVEDNICA) and private owners	Visitors	<ul style="list-style-type: none"> Public administration of the park (P.I.N.P. MEDVEDNICA), Research partners (Institute for Development and International Relations - IRMO), Civil society, Associations (Croatian Mountain rescue service), business (hotels, resorts, web service providers)

Finland	Paying for landscape ecosystem services	Landscape values and biodiversity, additional services can include biodiversity protection, carbon sequestration and storage	Private forest owners	<ul style="list-style-type: none"> ▪ Tourism entrepreneurs ▪ Visitors ▪ Local inhabitants (Potential: municipality)	<ul style="list-style-type: none"> ▪ Forest owners ▪ Tourism enterprises ▪ Municipality and local government ▪ Forest industry ▪ Environmental NGOs ▪ Local population ▪ State government and ministries
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5 Lessons learned and upscaling potential

Thomas Lundhede and Bo Jellesmark Thorsen

5.1 Lessons learned from the 12 cases

This chapter relies to a large degree on the sections from the SINCERE Deliverable 4.1 (Lundhede et al. 2022), where we discuss and analyze commonalities and potentials for upscaling the 12 different IM. Furthermore, we discuss how their upscaling potential may be assessed following the grouping that has been laid out in the previous chapter. We build this analysis on the Theory of Change framework presented in Chapter 1 alongside the theoretical framework on different types of goods and services as outlined by Ostrom (2003). In that framework, she categorizes different goods (or services) according to two key aspects: The degree of rivalry or subtractability in consumption and the degree to which exclusion is feasible, i.e. exclusion of some from benefitting or consuming the good or service. The analysis on commonalities and potentials is based on a more detailed assessment of the upscaling potential for each case where four different dimensions are considered; i) national geographical upscaling ii) Upscaling to other schemes or effort types iii) Upscaling in scope and iv) upscaling to other countries.

5.2 IMs targeting the legislative framework

The Russian case and the case from the Basque country target changes in national or local regulatory frameworks aiming at increasing incentives for a more socially optimal provision of forest ecosystem services. However, the two IMs differ in ways important to understand their potential to be successful. In the Russian case, the IM targets current lease practices, which it seeks to improve by including the option for leases to include more than one ecosystem service at the time, allowing for better forest management and enhancing the provision of already marketed, *private goods*. Thus, this is a system, where currently the use right leasers are “authorized users” or at best “authorized claimants” as defined by Ostrom (2003). The proposed changes in the regulatory framework will add aspects to leases that will make them closer approximates of the overall objective function expected from a full ownership. The IM also argues for changes in the forest law that will allow for payments for forest ecosystem services that do not lend themselves to markets and points out that further work is needed to secure funding sources for such instruments. In this last aspect, the Russian IM is closely related to the efforts and targets of the Basque IM that focuses on local regulations and aims to change them in ways that will better support the development of payment for ecosystem services schemes in the future.

In a Theory of Change framework, both of these IMs target the regulatory framework that is a key part of the “Input” cf. Figure 1 in Chapter 1. This is no surprise from a theoretical nor practical point of view. As already pointed out by Musgrave (1959) one obvious avenue to pursue in addressing market failures and to improve the provision of goods supplied in sub-optimal levels is to redesign legislation, e.g. to redistribute rights of exclusion, to restrict forest owners’ management or to place responsibility at the authorities for providing positive incentives for provision. Thus, *at a generic and conceptual level, the IMs can be upscaled*, but clearly not simply copied. This because targeting changes in laws and regulations will always be specific to the local or national regulation in question.

5.3 Market-based instruments to improve provision of public goods

The IMs implemented in SINCERE’s Danish and one of the Belgian cases target improved biodiversity conservation measures and thus pure public goods, that are non-subtractable and where exclusion is not feasible or even wanted. They are concerned with designing instruments that will ensure forest owner participation, yet also a degree of cost-effectiveness induced through the competition inherent to the IMs’

reverse auction design. Notably, they obtain access, in different ways, to experimental funds used for implementing the experiments and thus to some extent remain unchallenged on a crucial input element and assumption in our Theory of Change: That financing sources are available. For public goods, this funding cannot be coerced reliably through markets, as the lack of exclusion options will induce incentives to free ride for us all. The optimal provision and mechanisms for funding public goods are key questions from which the public economics and financing literature emerged (Samuelson 1954, Musgrave 1959).

From a Theory of Change perspective, these IMs are successful in improving the provision of forest ecosystem services and appear to be also able to take advantage of the heterogeneity of forest owner preferences and opportunity costs as documented in the literature (Broch and Vedel 2011, Vedel et al. 2015). They appear also successful in involving forest owners in sharing their knowledge and using it to provide quality improvements in outcomes. As such, they have performed well and as contracts are in place, they will deliver on outcomes and impacts. *The design and ideas of these IMs can clearly be upscaled provided funding is available* for the forest ecosystem services in focus of future upscaling activities.

5.4 User-based payments for ecosystem services

Six SINCERE innovation actions have designed IMs that aim to extract payments from users to providers of forest ecosystem services for enhanced provision of these services. They are all quite different and focus on rather different types of goods.

The simplest case is the Italian IM designed to enhance marketability of an already marketed good: licences to pick mushrooms in specific forest areas. This is essentially already a private good, and the market thus should be able to secure adequate payment for the socially optimal provision of mushroom picking. Note, however, that the reason this is a marketed good in some countries and not others is not only adequate supply and demand, but that forest owners can legally exclude users from the resource. If that is not possible, mushrooms would be a common pool resource instead. Thus, the assignment of exclusion rights (Ostrom 2003) is part of what enables straightforward market solutions in this particular case. In the Swiss case the IM targets the selling of burial rights in the forest. This is already a marketed good in some countries in Europe, where this is allowed, and in no country do forest users have a right to bury the ashes of their family in the forest without a permission from the forest owner. Thus, the forest owner holds the exclusion rights for this use and can, if allowed, sell the use and related services to interested users. In the Croatian case, one IM targeted payment for group-based and organised recreational activities. Again the ability to collect payments/fees hinges on the legal basis for extracting a payment for these activities but is not possible when such activities are included in the general access rights. Similar user based recreational services can be found in various forms across all of Europe, designing payment vehicles for them depends on the way property and access rights are distributed – and of course adequate supply and demand. We find payments for hunting rights, for horseback riding and many other activities. This is another example that shows how the delineation of rights of access and rights of exclusion work to enable market-based solutions. *These IMs are scalable to any context where a similar distribution of rights exist.*

The Peruvian IM case targets a classic coordination problem between potential upstream providers of an ecosystem service, cleaner water, and down stream users. The water resource is a kind of club good in that exclusion can be enforced by the group of users or their water authority. This and the added complication that the supply is affected by upstream landowners, who have no incentive to enhance supply, allow for an instrument that coerce water users to pay more to fund efforts by upstream landowners to enhance water ecosystem services. *This form of IM is scalable to similar upstream-downstream user-provider cases* and may e.g. be relevant also for regulating flood damages along European rivers if landowners can be compensated for changing to land uses that can mitigate rain floods.

The Catalan case is also a PES scheme. The relationship between forest management and provision is not as clear as in the classic Peruvian case but is here aided by the CLIMARK framework that calculates and thus demonstrates the relationship. The forest owners are incentivised to adopt certain management strategies that will enhance water provision in terms of quality and quantity through payments from a Forest and Water Fund. Payments to the fund come through beneficiaries, but not as coerced payments. *This IM can be scaled to cases with similar conditions in relation to forest management and is dependent on documenting a relationship between management and provision.* Scalability could also cover other FES such as carbon storage or biodiversity conservation.

Finally, the Belgian wild boar auction and Italian certification off-setting schemes both aim to enhance ecosystem services by increasing coordination among several users and providers. In the Belgian case, the hunters fee fund is used as a source of funding for auctioning contracts on wild boar regulation between farmers, forest owners and hunters. The ecosystem service targeted is reduced crop damage caused by the wild boar population, and the mechanism attempts to fund the coordination among these groups and compensate the costs that occur to farmers for setting aside land as hunting strips allowing hunters better access to shot and regulate the wild boar population. While an interesting case, the practical experience that very few bids were submitted suggest that the costs of coordination among the agents were too high in relation to their potential gains. *The scalability of this IM is likely questionable, but it should be noted that similar challenges exist in several countries where wild boar, deer or geese damage crops around forests and nature areas.* Other approaches need to be developed and studied.

The second Italian case aims to coordinate among buyers of FSC certified wood, poplar growers that find it too costly to meet biodiversity protection requirements in the FSC certification scheme on their own land, and a national park where funding for additional biodiversity conservation actions can be put to use. Biodiversity conservation is itself a public good, and the FSC certification scheme a market-based instrument that targets enhancement of this ecosystem service. The IM, however, targets the service provided by the national park to the poplar growers, which is, to offer off-setting biodiversity conservation actions at lower cost and/or of better quality than possible on the poplar growers' land. This enables the poplar grower to obtain the FSC certificate and the related wood market benefits. *This IM can be scaled only to similar cases and is dependent on the FSC organisation accepting the instrument.*

5.5 Donation-based payments for public goods

Two of the SINCERE's cases proposed and implemented IMs that targeted enhanced provision, including infrastructure, of recreational services that had the characteristics of public goods. These are the Finnish case and the Croatian donation box case. The Croatian National Park serving as the case area for SINCERE and access to the park can be safely assumed to be a public good.

In the Finnish case, the general rights of access cover private and public forests and recreational access to even private forests is a public good (though of course access to any specific site will be costly in terms of transport and time). Recreationists and tourists cannot, however, influence the landscape and environmental quality in private forests and there are large differences in the quality between recreational landscapes in commercial forests and national parks. Most private forest are mainly managed for timber production. There is, however, a high recreational and tourism use pressure along with the demand for attractive natural landscapes near tourism destinations and larger cities surrounded mainly by private forests. In these locations there are frequent conflicts linked to intensive forest loggings and therefore, incentives to enhance landscape and biodiversity values in private forests are needed.

In both cases, securing funding through voluntary donations based on mild persuasion and nudging proved very difficult. In the Finnish case key problems included regulations stating that only non-profit organizations can collect funds for this type of purposes, and it proved difficult to find an organization to take the active

lead in collecting and governing the funds. In the Croatian cases, the donation boxes were misused for other purposes and abandoned. These experiences are of course unfortunate, but the difficulties in using donations would indeed be predicted from theory (Ostrom 2003).

From a Theory of Change framework perspective, these treatments represent an attempt to target a lack of funding for enhancing and improving recreational services. Thus, they are targeting the fact that one of the basic inputs for the Theory of Change to work is not in place. They are not alone in having used donation methods for such ends. In fact, these are commonly used by e.g. conservation societies or similar public good oriented organisations. They are used as an additional source of funding for public good provision but are rarely sufficient. As such, these IMs can be upscaled to almost any relevant context, but their inherent shortcomings will remain, and most likely imply that they will not be able to be upscaled in terms of funding.

5.6 Perspectives of upscaling potential

The SINCERE project has focused on bringing research based innovative new instruments into practice. Innovations have ranged from pursuing changes in legislative framework, enabling better FES provision practices with various instruments that enable enhanced and cost-effective provision and target new user-pays ecosystem services, to enhancing markets for already marketed non-wood forest products. Here we discuss some of the perspectives of upscaling potential as found in Lundhede et al. (2022).

The distribution of rights, including rights of exclusion, is crucially important for the development of any market-based activities for the consumers or users of forest ecosystem products or services. If rights to use are held by e.g. the public and the forest owners cannot exclude people from acting on their rights, the forest owner will have no possibility to develop a marketed service or product. The public use and benefit from the good or service as it is and have no incentive to pay for an access they cannot be excluded from. We clearly see the effect of such distribution of rights in several IM cases (e.g. the Croatian donation boxes and the Finnish donation case). It should be noted that it may be optimal for the society to have this distribution of rights, i.e. it may produce the largest amount of welfare. It may, however, also imply losses in some cases. For example, in case of congestion, externalities or similar for service users, the forest owner has no incentive to develop services to reduce such negative effects for users, or other services that would enhance the provision of the particular service or good. In other cases, one could imagine the forest owner to limit access to the service, e.g. by reducing the quality or number of paths or roads in the forest. The owner will have an incentive to limit public access if it reduces the indirect costs from the public's use or allows the owner an access advantage, e.g. for non-wood forest products.

If, on the other hand, the forest owners have a right to exclude users from certain products or services, then an option to developed marketable services based on that right exists. This we know from numerous marketed products and services, but the importance of this becomes very obvious when we see how some IMs for recreational services or similar uses of the forest can be turned into user pays services in some cases, but not in others. Again, such a distribution of rights may, or may not, be socially optimal. Exclusion will imply that fewer people benefit from the service but will provide an incentive for the forest owners to enhance the quantity and quality of the service for those paying for access or rights to use it.

These examples show that the way a society decides to distribute rights will affect the potential for innovation in market mechanisms that in turn would enable an enhanced provision of ecosystem services against a payment. It may be socially optimal to grant exclusion rights to forest owners for some goods and services, but not for others, depending on the nature of these goods as well as (potential) the supply and demand for the goods and services under each relevant rights scenario. Therefore, an important practical finding in SINCERE is that it may be crucial and worthwhile to question if the current legislative design in any particular country or region, that establishes the patterns of demand and supply potentials, is well suited to support FES provisioning.

Coordination for cost effectiveness is a crucial aspect of IMs applying market-based instruments for allocating efforts to the suppliers able to provide goods and services at the offered or resulting prices. In SINCERE several IMs targeted designs to improve coordination among market agents and allocate efforts to where services could be provided at the lowest costs. This included both the Italian off-set case and the three different reverse auctions tested in the Belgian and Danish IMs.

The first of these explored the willingness to pay of plantation owners for FSC certification and used this to allocate some of the certification efforts to an agent better suited for providing the biodiversity benefits required for certification. Thus, the IM improved coordination on what was still a market driven transaction. The reverse auctions, on the other hand, targeted public goods and relied on funding from public sources to test their different designs. The practical findings from these experiments are that given proper design i) landowners will happily engage in a cost effectiveness competition for the enhanced provision of biodiversity and habitat protection. Furthermore, ii) landowners will offer their own suggestions on the type of effort if allowed. Finally, iii) price competition may lead to considerable cost reduction potentials in the competition design.

The Achilles heel for the upscaling potential of these instruments remain the ability of regulators or others to aggregate or explore the willingness to pay for FES.

Funding public good provision is the target of a few of the IMs pursued in SINCERE. The presence of sufficient funding is a fundamental input in the Theory of Change for any IM targeting enhanced provision of FES and the resulting impacts and benefits. If this funding is for some reason not in place, it severely constrains IMs' design and their likely effectiveness. Therefore, the efforts in e.g. the Finnish and Croatian cases are understandable and commendable. Their design encouraged the users and beneficiaries of public good type FES to support, to donate, towards enhanced quality and provision of FES on the basis of the welfare gains they get. For public goods, however, the users are hard to identify, they cannot be excluded, and they can benefit from the good without hurting the ability of others to benefit. All these features imply low social pressure and no incentive to donate. Instead, there is a clear incentive to free ride on the provision, and that others will be donating in spite.

Thus, even in SINCERE the core challenge of accruing funds for the enhanced provision of hugely important key public goods like biodiversity protection remains unresolved. While none of the cases in SINCERE targeted carbon sequestration, similar complications are likely to arise. In both cases, the marginal benefits of enhanced provision to society are likely larger than the marginal social costs of that enhanced provision, due to the market failures implied. In some cases around the world, we find prominent examples of regulatory structures that, at least in part, resolve this market failure. Regulation requiring private sector actors to ensure off-setting of any damage to specific habitats are in large a major driver of private funding for biodiversity related (though in general not biodiversity improving) off-set schemes (OECD 2020), whereas institutions like the emissions trading system (ETS) are driving private investments in climate change mitigation in all the ETS-covered industries. Outside of such clear legal structures, we also see increasing attention from private interests in funding biodiversity protection and climate mitigation activities. The European Union has recognized the need to encourage this, yet also to ensure that such funding is directed to efforts that actually have a relevant impact, hence the evolving EU taxonomy for sustainable activities and financing. These efforts, however, also point to obvious gaps in the existing funding structures.

Further theoretical and empirical research is urgently needed to cover these gaps. Emerging private markets for nature restoration and/or carbon sequestration efforts are in many cases opaque, poorly regulated, lack transparency and sufficient monitoring, reporting and verification structures. There is an urgent need for a coherent theoretical and empirical research effort that can answer a number of essential questions for these markets. These include, but are not limited to, i) the contextual conditions for efforts and impacts to be entirely or partly additional, including accounting structures and relations to international policy goals and

agreements. li) the issue of permanence and time profile of impacts and how this may be accounted for through mechanism design. lii) the issue of how private agents may report on their activities in these markets and to what degree it makes scientifically and socially sense to count the resulting impacts against other e.g. regulatory obligations of these agents.

Answering these and many other questions is important when targeting and guiding private funding towards value creating actions and away from empty activities that are quickly labelled as greenwashing.

5.7 Upscaling potential for each case

In the following section, we case by case, show the upscaling potential as presented in Lundhede et al. (2022) where each case is assessed on four different dimensions; First, *national geographical upscaling* is assessed. Several of the IAs are of limited scale and local testbeds in the respective countries, and we discuss their upscaling to a larger geographical scale within the same focus. *Upscaling to other schemes or effort types* is relevant in some cases. The IM may have a generic feature that can be adapted to e.g. other regulatory schemes targeting the same ecosystem service through other types of efforts. *Upscaling in scope*: In a similar fashion, the specific IM design may be suitable for upscaling to other ecosystem services. For example, the reverse auction mechanisms applied for biodiversity in SINCERE may also have value for reducing emissions from carbon rich agricultural soils. Finally, and in part including the previous forms of upscaling, *upscaling to other countries* is discussed. This is not always straightforward even if in many EU countries, the regulatory framework allows paying conditional environmental protection subsidies to landowners, e.g. under the CAP's second pillar, for undertaking specific actions and efforts or for abstaining from profitable actions on their land. However, as shown by Nichiforel et al. (2018) there is still considerable variation in the distribution of rights between the private forest owner, the forest users/beneficiaries and the state across European member states.

5.7.1 The Spanish case, Basque country – enable PES schemes through change of law

National geographical upscaling: The premises of the IM here rest on the fact that the local government of Bizkaia has exclusive competences to develop its own forest strategy and regulations within the national legal framework about forestry. A similar structure could either be incorporated in national forest legislation or by other local governments in Spain if something similar is not present. As such, they may learn from and adapt to the process undertaken in the Spanish case.

Upscaling to other schemes: Given the format and focus of the IA, it is not obvious that there are other related existing regulation and instruments in place addressing the same services that may adopt aspects of this IM.

Upscaling in scope: Depending on the specific implementation of the IM, it may be that the approach can be upscaled to include other FES of value for the wider society, e.g. recreational values or climate change mitigation or adaptation efforts. The more general approach of securing that ecosystem services are and can be accounted for in regulation could perhaps also be relevant for other local domains in the region, e.g. agriculture.

Upscaling to other countries: The general mechanism in this IM, a change in the current legislation, is conceptually related to the Russian case, though the actual changes differ according to context. In a similar way, the potential for upscaling to other countries depend on their current legal frameworks and whether they include or not provisions for accounting for FES in practical regulation and instruments.

5.7.2 The Russian case – enabling better FES management

National geographical upscaling: The IM is aiming at altering the national legislation that regulates forestry management in Russia and national upscaling therefore is implied.

Upscaling to other schemes: If the principles of the Russian legislation that allow different users to hold use-rights to different forest uses on the same piece of land is duplicated in other resource use laws in Russia, then the principles pursued here may be considered in these other domains too.

Upscaling in scope: The IM in itself represents an upscaling in scope for the individual user and leaser, as they would in principle be able to focus on the full scope of FES in the management of the leased forest. This expansion of scope will need the support of auxiliary instruments enabling payment for ecosystem services that the leaseholder cannot obtain compensation for in the market.

Upscaling to other countries: The upscaling potential to other countries will depend entirely on differences in the national legislations and how use and ownerships rights are defined on both private and state-owned forests. As existing studies document (Nichiforel et al. 2018), most EU countries have legislation that is quite different from the Russian case, which limits the relevance.

5.7.3 The Danish case – reverse auction on biodiversity

National geographical upscaling: The IA only targeted a limited area and with a limited funding, but the great interest from landowners' side suggests that yes, there is in principle a potential for upscaling such an instrument to the entire country. The only, but critical, limitation for such an upscaling is the amount of available funding, either from the Danish government or from private nature protection agents.

Upscaling to other schemes: While the Danish government agencies declined to use the reverse auction instrument directly in some of their existing schemes, they follow the project and the impacts. The government and notably several politicians remain interested in improving the cost effectiveness of environmental protection measures. Thus, there is a potential for extrapolating the lessons learned to other biodiversity protection schemes, notably those with a high resemblance to the IM here, for instance a scheme of setting forest aside for biodiversity.

Upscaling in scope: While the instrument employed targeted biodiversity protection in forests, the specific reverse auction design may be suitable for upscaling to other ecosystem services. For example, Denmark and other countries in Europe face a major challenge of reducing emission from carbon rich agricultural soils. This usually requires reduced management, perhaps increased inundation, and various other site-specific actions. The potential funding available for such actions in Denmark alone will be in the several 100 million € in the coming years. In modified forms, the instrument may also be worthwhile in e.g. land use change actions related to reduced nitrogen loads and the Water Framework Directive.

Upscaling to other countries: In many EU countries, the regulatory framework allows paying conditional environmental protection subsidies to landowners, e.g. under the CAP's second pillar, for undertaking specific actions and efforts or for abstaining from profitable actions on their land. Upscaling to other countries would require that the national regulations allow other instrument designs, e.g. like the instrument here. Biodiversity issues receive increasing attention in the EUs regulatory framework, and more funds can be allocated from the nation states' share of e.g. CAP funds, if they choose to do so. Alternative sources of funding, e.g. sustainable financing, are nascent and could grow to become important in some countries. In principle funding could thus also be available for upscaling. Forest ownership and regulatory frameworks vary considerably across countries (Nichiforel et al. 2018) and can limit the supply of relevant forest areas. If regulation already requires high levels of biodiversity protection on public and/or private land, options for additional gains are reduced. Thus, the largest potential for upscaling for impact may be in countries where two conditions are fulfilled; i) the current regulations leave considerable management decision space for the forest owner, and ii) where the private forest owners own a non-trivial part of the biologically valuable forest land.

5.7.4 The Belgian cases – reverse auctions on wild boar and habitat protection

National geographical upscaling: The IM targeting the wild boar only targeted a limited area in Flanders where data showed evidence of wild boar presence. While it failed in the case test, the underlying idea is fundamentally sound, but the instrument likely needs to be revised to reduce uncertainty and coordination costs on the side of the bidders. Essentially, the instrument is trying to incentivize coordination among the actors. Thus, while upscaling the current design to larger areas in Flanders or Belgium is likely not feasible, it is not impossible that a revised instrument could be more successful. With a permanent and closely linked funding instrument, it might be worthwhile to pursue.

The IM targeting the habitat improvement focused on a larger area (Flanders as such) and was more successful. It was limited by the funding available for the experiment, but perhaps also by the number and size of bids made. The potential to upscale the IM in Belgium will be contingent on availability of financing, as is also the case in the Danish case. Instrumental in that could be an assessment of cost-effectiveness relative to the existing subsidies available.

Upscaling to other schemes: In the Belgian case, there are existing schemes in place, some of which are quite closely linked to the IM. The habitat reverse auction could potentially be upscaled to other schemes. If the ecosystem services are sufficiently homogenous, a first rejected price like applied in the wild boar buffer strips auction, may be suitable. If heterogeneity needs to be handled, a discriminatory pricing version may be better. Here the lessons learned could be rather like those of the Danish case, in fact.

Upscaling in scope: The two IMs are different in respect to the required level of coordination among participating actors prior to bidding. In the habitat version, the interaction is between the auction holder (a government agency, e.g.) and the landowner as the bidder. This is a simple design, and it may be upscaled to other related ES schemes in Belgium and elsewhere; much like the Danish reverse auction. Again, the specific case may imply a need to consider variants of the instrument.

The failed wild boar reverse auction case remains interesting because it attempts to resolve a coordination issue within wildlife management that has many parallels elsewhere and attempts to do so through a competition between internally coordinated groups. There are significant challenges with the management of red deer in mixed forest and agricultural landscape in some places in Europe, and along migration routes, similarly there are problems with large geese populations. Coordination measures for watershed management, e.g. nutrient management in relation to the Water Framework Directive also require coordination across agents, and again one could envision this to happen where groups of actors compete with other groups of actors on providing cost effective measures.

Upscaling to other countries: The similarity in the fundamental design and Theory of Change for the Belgian and the Danish cases implies that the upscaling potential to other countries rely on the same general observations. These include that in many other EU countries, the regulatory framework allows paying conditional environmental protection subsidies to landowners, e.g. under the CAP. Provided that national regulations allow other instrument designs, e.g. like the instrument described here, the basis for upscaling should be in place. Variations in ecological contexts, forest ownership and forest regulatory frameworks across countries (Nichiforel et al. 2018) may limit relevant supply of FES. If regulations already require high levels of biodiversity protection on public and/or private land, options for additional gains are reduced. Like the conclusion in the Danish case, the largest potential for upscaling for impact may be in countries where current regulations leave considerable management decision space for the forest owner, and where the private forest owners own a significant part of the biologically valuable interesting forest land. This corresponds to the “high risk-high gain” case from Wunder et al. (2020).

5.7.5 The Croatian case – payment for recreational services

National geographical upscaling: The IA is implemented under national legislation and should easily be reproduced in similar parks and nature areas throughout Croatia and could benefit from the lessons learned in the IA. The implementation process should aim for outlining implementation plans and involve multi actor groups in order to raise awareness and, not the least, acceptance of the use of permits.

Upscaling to other effort types: Selling permits is quite generic and can be applied to other efforts also targeting recreation, e.g. activities where the users (and payers) would benefit from the administration and dispersal of the activities. This could for instance include mountain biking, horseback riding or forest camping.

Upscaling in scope: The instrument used in the Croatian IA targeted primarily recreation with potential spillover effects to biodiversity. The use of the instrument on other FES does not appear straightforward.

Upscaling to other countries: For this IA to be implemented in other countries, the legal fundament for public and private forest owners to be able to demand payment for specific forest use must be in place. It is our assessment that this is possible in most, if not all, EU countries. It is also our assessment based on literature and previous research that such instruments are in place in some countries for some activities. The Italian IA selling permits for mushroom picking is an example.

5.7.6 The Swizz case – payment for burial sites

National geographical upscaling: Deposition of human ashes is not legal in a number of other regions in Switzerland and before considering a national upscaling of the IM, the underlying legal framework must be in place. Descriptions of the analyzed aspects and best practice examples from this IM will be beneficial in undertaking upscaling to other regions within Switzerland.

Upscaling to other schemes: Given the format and focus of the IA, it is not obvious that there are other related existing regulation and instruments in place addressing the same service that may adopt aspects of this IM.

Upscaling in scope: The current IM have only addressed the option for burials of urns containing human ashes. Coffin burials are often regulated differently, e.g. they may require a nearby chapel to be allowed or may simply not be allowed outside current designated graveyards. Addressing this is one potential for increasing scope. The burial service is one of several possible cultural experiences the forests may offer, as a scene for experiences that are otherwise often performed in churches or official buildings. For example, scope expansions could address weddings and baptisms/naming ceremonies in forests. These may in many cases be less regulated for obvious reasons but may need some form of supporting infrastructure (tents, baptismal font).

Upscaling to other countries: The underlying legal framework for distributing or deposition of human ashes might vary from country to country and as this IM involves rather sensitive matters for the buying parties, conflict with more informal norms and cultural traditions should be examined before implementation. However, similar business models do already exist in a number of countries both within the EU and beyond, which demonstrates both a certain demand for this particular FES and acceptance of the underlying IM. Therefore, upscaling is essentially already happening and activities like this has been ongoing in e.g. the UK and Denmark for decades.

5.7.7 The Italian case, Ecopay Connect – off-set payments for biodiversity

National geographical upscaling: The IM only targeted specific plantations and regional parks in a limited area of Italy. Building on the experiences from the process of engaging the different actors, this IM could be

upscaled to other plantations throughout Italy, and also target e.g. private forest owners as ecosystem service providers. However currently, even if the demand for certified wood products in Italy is increasing, the participating poplar plantations have experienced problems in obtaining the expected price premium for the certified products. A national upscaling therefore requires that the recognition and thus demand for certified products increases to boost the increase of the supply and to spread the mechanism.

Upscaling to other schemes: The IM bears similarities with a number of off-setting schemes, e.g. carbon off-setting where companies pay for reduction in carbon emissions to compensate for their own emissions or biodiversity offsets schemes where landholders are paid to offset land for biodiversity purposes. In that respect the IM here is related to a family of instruments. The perhaps easiest upscaling option is to consider if the other forest certification scheme, PEFC, would be willing to accept similar off-setting or substitution arrangements, notwithstanding the differences between the two certification schemes casts doubt on the possibility to develop a scheme with PEFC standard.

Upscaling in scope: As mentioned, the principles in this IM are related to other off-setting schemes that target other ecosystems and ecosystem services, e.g. wetland banking and off-set schemes, and new are being developed in relation to carbon sequestration and climate mitigation services. For all of these, their feasibility, validity and performance often depend crucially on the overall legal framework within which they are to function. When they go beyond legal requirements, more attention is needed to procedures ensuring transparency and credibility of the transactions and their environmental impacts. Crucial in these are additionality and permanence of the services provided.

Upscaling to other countries: The demand for biodiversity protection is ubiquitous and in the broad sense this IM has potential for upscaling in many other countries, especially countries that trade on markets where the FSC certification is valued. The additionality of the IM could be a concern, i.e. whether from the sellers' part the transaction represents an actual improvement in ecosystem service delivery with the required scale, permanence, etc. Therefore, the link between the certification and the actual conservation should be clear and strong in order to avoid discussions about greenwashing etc., and the protection provided by the supplier needs to be documented in a way that allows for assessing what additional FES provision the contracted exchange implies.

5.7.8 The Italian case, Borgotaro – improving commercialisation of mushroom picking

National geographical upscaling: If similar structures of selling paper permits for mushroom picking exist in other regions of Italy, the IM has potential to be upscaled to other forests and regions in Italy. The development of the online application has already taken place and is well tested within the groups of actors/users and as such the entry costs for another implementation appear low. Such a platform has a number of generic features and would need little adjustment, e.g. changes in terms of the underlying spatial data that supports the availability of mushroom picking sites.

Upscaling to other schemes: Given the format and focus of the IA, it is questionable if there are other related existing regulation and instruments in place addressing the same service that may adopt aspects of this IM.

Upscaling in scope: Contingent on the existing legal framework allowing permit selling for different forest services, the online application appears to be easily expandable to activities of e.g. mountain biking, horseback riding, specific walking trails, shelter camping etc.

Upscaling to other countries: Selling of permits allowing for use of FES is an ever-present activity and as such the conversion to an online platform offers potential for reducing transaction costs for forest owners. This is demonstrated by e.g. the Croatian case, where the IM also concerns issuing and selling of permits. However, the underlying legal framework and traditional norms must be in place and allow for commercialization of the service, as a number of these services around Europe traditionally are free for the

public to enjoy. However, the demand for the general technological transformation of paper permits or physical meeting-based contracting will be relevant at different scales.

5.7.9 The Peruvian case – payment for improved watershed management

National geographical upscaling: Demand for clean water appears imminent both locally and globally and therefore a national upscaling should be possible, where relations between actions and water provisioning can be established. The financing mechanism, established by a national law on watershed PES, is built into the IM and as such present a sustainable component of the IM. In the context of this law, many drinking water companies in Peru are starting to implement PES schemes and the IM in Cusco can serve as a learning pilot initiative. One key lesson learned is that the success and sustainability of such PES will depend on good interactions and trust among upstream and downstream actors. The lessons learned and obstacles experienced regarding stakeholder conflicts through the implementation of the present IM should be noted and handled carefully in future schemes.

Upscaling to other schemes: The PES scheme is already a well-documented arrangement that covers a number of different schemes, including carbon sequestration, biodiversity conservation etc. and has as such already demonstrated its upscaling potential to other schemes. There are other related instruments in place in Peru to enhance the protection of watersheds and improve watershed services (new PES schemes with drinking water companies, and possibly with other downstream actors) and to conserve carbon (e.g. REDD+ initiatives in the Peruvian Amazon region). These instruments may learn from the current IM and potentially adapt to lessons learned.

Upscaling in scope: The kind of use value based up-stream down-stream design that this IM has is well-known in the PES literature. The principles may play over to other cases with similar structures. The classic irrigation problem along a river is one such case. There may also be upstream-downstream cases, where a time lag rather than a spatial lag creates the upstream-downstream relationship between different, e.g. seasonal, users of a resource.

Upscaling to other countries: The PES scheme has earlier been implemented in a number of situations, especially in developing countries where it presents an effective way to obtain sustainable financing. Also in developed countries similar instruments are applied e.g. by water utility companies paying for afforestation measures on agricultural lands in a watershed or over groundwater reservoirs. The experience of the Peruvian IM has been disseminated in Latin America, where there is a high interest in PES.

5.7.10 The Catalanian case – enhancing water quality and quantity

National geographical upscaling: The demand for better water quality and higher water quantity yields is well known. Furthermore, the lack of forest management is not a problem unique to the case area, a potential upscaling seems possible to more similar cases in Spain or even to a federal or national level, which is also evident from the Basque case. The use of the CLIMARK framework seem to establish the relationship between treatments and FES provisioning and in combination with the certification of treatments it appears to create incentive structures that can secure financing of forest owners and the sustainability of the PE scheme.

The lessons learned in relation to the carefully designed instruments and implementation of the stakeholder involvements might be a key element for successful upscaling of similar PES schemes to other case areas and wider federal or national level.

Upscaling to other schemes: As already noted PES schemes have already demonstrated their upscaling potential as effects are well-documented in the literature. The instrument can be applied in other schemes where similar clearly defined relations between “upstream suppliers of actions” and “downstream beneficiaries” can be found.

Upscaling in scope: The IM has as such already expanded the scope from not just water provision but also potential use for carbon credits and biodiversity conservation. This kind of PES schemes has therefore already demonstrated its upscaling potential.

Upscaling to other countries: As mentioned, PES schemes have been implemented in several situations, especially in developing countries where it presents an effective way to obtain sustainable financing for ecosystem services provision and as such demonstrated its upscaling potential.

5.7.11 The Finnish case – paying for landscape ecosystem services

National geographical upscaling: Forests cover more than 80% of the land in Finland and thus present the typical environment for outdoor recreation and tourism activities. About 60 % of all forests are privately owned and a national upscaling of the IM, where new ways and mechanisms to enhance production of landscape and recreation values are introduced appears relevant and desirable. The present IM present valuable lessons for integrating tourism and commercial forestry needs and interests.

Upscaling to other schemes: Given the format and focus of the IA, it is not obvious that there are other related existing regulation and instruments in place that may adopt aspects of this IM.

Upscaling in scope: In theory, voluntary payments could be upscaled in scope to any FES. As the model is focusing on preserving mature forests in their regeneration stage it is possible to combine the model with biodiversity protection and carbon sequestrations incentives. Most threatened species in forests live in older forests and prolonging rotation period is one of the fastest solutions to sustain carbon storage in boreal forests and continue carbon sequestration. The key is to choose eligible forests that also are located in privately owned forest areas where there is high demand for recreation and tourism use. However, the link between donations and provision might be hard to document and might cause disincentives when not related to services holding direct or indirect use values such as recreation. Nevertheless, there are numerous current initiatives trying to source funding through related mechanisms in several EU member countries (OECD 2020).

Upscaling to other countries: The present IM demonstrates that in order to succeed there is a need for top-level administration and strategic policy support to make voluntary payments - with at best indirect use value rewards - a viable instrument. For upscaling within the EU requires support from EU or national legislation and institutions. This includes support in terms of reliable organizations (e.g. public organizations) being allowed to run this kind of FES schemes and potentially the collected funds being exempt from certain taxes or other restrictions. It may also be helpful to allow donations (e.g. over certain thresholds) to be deductible from personal income tax, which enhances incentives and potentials for income generated through such FES schemes.

5.7.12 Summary of upscaling

In the above, we have presented the findings in Lundhede et al. (2022) and discussed how the different cases in SINCERE share challenges or features depending on the good targeted, and the regulatory and ecological context. We have then, case by case, pointed out barriers and enablers for potential upscaling of each IM on four dimensions related to geographical upscaling, upscaling to other schemes, upscaling in scope and upscaling to other countries. In Table 5.1 below we present an overview of the cases and relate these to the type of IM and their scalability.

Table 5.1 Overview of the IMs and their scalability

IM Case and country	IM Type	The IM scalability
Enable PES schemes through change of law (Spain, Basque country)	Targeting the legislative frameworks	The IM is not scalable, but similar legal constraints may exist elsewhere
Enabling better FES management (Russia)	Targeting the legislative frameworks	The IM is not scalable as the features of the Russian forest law are unique to the country
Biodiversity protection through reverse auctions (Denmark)	Market-based instruments for public goods	The IM is scalable to other areas and other FES provided that funding is available
Reverse auction on habitat protection (Belgium)	Market-based instruments for public goods	The IM is scalable to other areas and other FES provided that funding is available
Reverse auction on wild boar (Belgium)	User based payments for ecosystem services	The IM proved unsuccessful, perhaps because of high coordination costs
Payment for recreational services (Croatia)	User based payments for ecosystem services	The IM is scalable to relevant legal contexts where sufficient demand exists
Payment for burial sites (Switzerland)	User based payments for ecosystem services	The IM is scalable to other countries where legislation allows the service
Off-set payments for biodiversity (Italy)	User based payments for ecosystem services	The IM is scalable but contingent on FSC approval of the specific local contexts
Improving commercialisation of mushroom picking (Italy)	User based payments for ecosystem services	The IM is scalable to other FES and areas like any online marketing application
Payment for improved watershed management (Peru)	User based payments for ecosystem services	The IM is scalable to other similar up-stream-downstream cases
Payment for improved forest management (Catalonia, Spain)	User based payments for ecosystem services	The IM is scalable to other areas where similar conditions exist
Voluntary contributions by recreational users (Finland)	Securing the funding for public goods through donations	The IM is scalable, but not strongly due to the voluntary donation mechanism

6 The Sustainability Self-Assessment in SINCERE: a transdisciplinary exercise

Nathalie Pipart, Eirini Skrimizea, Constanza Parra and Bart Muys

6.1 Introduction to the Sustainability Self-Assessment process

The Sustainability Self-Assessment (SSA) was a transdisciplinary exercise that involved all SINCERE research and practice partners. It included a comprehensive sustainability assessment of the IMs, addressing environmental, social, economic and institutional dimensions, and was based on self-assessment by the IA practice partners with support from the research partners.

The SSA process included an ex-ante sustainability assessment using a screening approach during the IM design stage, and an ex-post sustainability assessment using an optimisation approach during the IM implementation stage. An 'Innovation Action Screening Tool' was designed for the ex-ante sustainability assessment (D3.1, D3.2, D3.3, D3.4). This tool consists of a questionnaire to collect data for the economic pre-feasibility assessment of the IAs and the sustainability self-assessment. The tool served as the starting point for a targeted feedback process with both direct written and oral feedback to IAs partners as well as a joint learning process which culminated at the Co-Design Event of SINCERE (23 January 2019). In this sense, this Innovation Action Screening tool aimed at contributing to the identification and design of each IA and critically assessing the IMs that were considered as part of the innovation actions, encouraging the practice partners to consider important sustainability and economic design issues. Moving into the implementation phase and for the ex-post sustainability assessment (Figure 6.1), a protocol for continuous self-assessment was developed together with all SINCERE partners. This sustainability self-assessment tool is based on a Principles-Criteria-Indicator framework (PCI), which is the most common framework in the context of sustainable forest management. Several iterations between researchers and practice partners (and local stakeholders) led from the screening of main sustainability issues to the first version of the SSA tool. Each iteration consisted of input from researchers about the most relevant issues to be monitored from a research perspective and input from practice partners about the most relevant issues pertaining to each regional IA and experience. For more details on the SSA process see Deliverable 3.4. (Pipart et al. 2021).

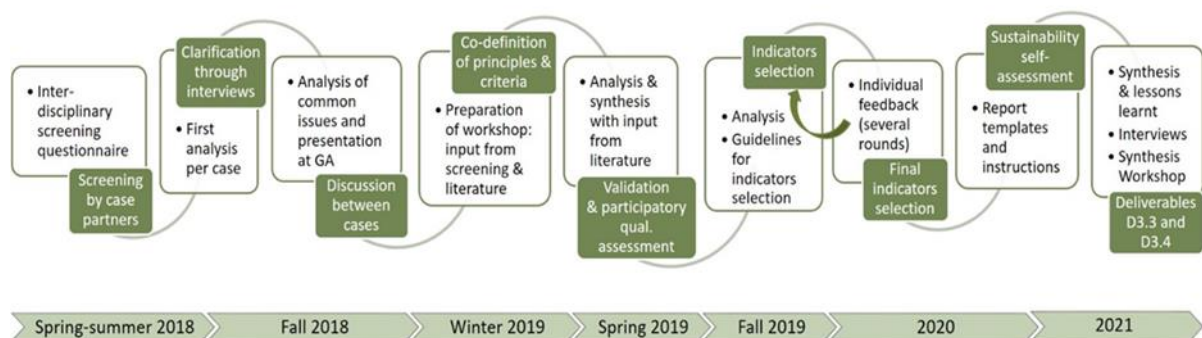


Figure 6.1 Iterations in the process from screening to self-sustainability assessment.

6.2 Reflection and lessons learned from the SSA process

There is an increasing acknowledgement that sustainability issues are complex and ‘characterized by uncertainty, instability, uniqueness and value-conflict’ (Popa et al. 2014), and as such, require new ways of knowledge production and decision-making (Lang et al. 2012). In this respect, transdisciplinarity is crucial for sustainability and it is for this reason that the SSA was designed as a transdisciplinary effort. Although further analysis will be beneficial, considering the completion of the process, the results and the partners’ feedback we deem the SSA as overall successful. As a process, the SSA created important opportunities for collective reflection on the meaning of sustainability in practice in the context of SINCERE, with practitioners and researchers bringing in different experiences, skills, knowledge and positions to the discussion and eventually co-producing knowledge that is directly relevant and applicable for action through experiential learning.

Sustainable forest management has been extensively studied and multiple standards for sustainable forest management exist. Nevertheless, the introduction of the Ecosystem Services (ES) approach and the advancement of Market Based Instruments (MBI) and Payments for Ecosystem Services (PES) in forest governance presents new challenges that we have aimed to address in our SSA approach. The ES approach and the sustainable forest management approach share some common features: both recognize the need for a holistic view, favouring synergies, reducing negative trade-offs and encouraging a balanced delivery of private and public benefits. The ES approach, however, has a stronger focus on valuation. The ES concept is descriptive and normative, and it frames human-nature relations in a specific way, e.g. in terms of demand and supply of ES. As such, the concept of ES inevitably involves judgements about what we value in nature and forests and how, which enhance the need for a collective discussion on these questions. The same logic applies to the IMs that are the focus of SINCERE. The twelve IAs reflect the diversity in forms that PES schemes, understood simply as the ‘principle of paying for the provision of an ecosystem service’, can take in practice. The core features of these mechanisms imply a reflection on ‘what is paid for’ and thus valued by the stakeholders, a reflection which should be done with and by the stakeholders to ensure that the mechanisms’ design fits the local specificities. Beyond mere concerns of social acceptance or accountability, our SSA approach aimed at triggering a reflexive process with and by the local IA leaders and encouraging critical assessments of the processes that they have developed. Our experience confirms that realizing the potential and opportunities of the ‘science–policy–society’ partnerships, increasingly recognized as necessary for a sustainability transition, requires the development of a common language, transparency, and considerable time. It is thus important that future action-research projects such as SINCERE provide enough time for such an endeavour and enough flexibility for co-creation and fine-tuning along the way.

6.3 Reflection on the SSA results, highlights and lessons learned per IA

In terms of sustainability goals, most of the IMs targeted a combination of ecological, economic, institutional, and societal aspects addressing all the four dimensions of sustainability. Most of the IAs reported to have reached a generally positive overall sustainability and the results of the SSA seem to match the main sustainability targets and expectations of the IAs despite the often-uneven performance of the different dimensions. Most of the IAs reported economic and/or managerial aspects as the weakest point in sustainability, referring to issues such as increase in transaction costs, coordination, preparation, marketing, and lack of mid- to long-term financial security. The strongest points across IAs were more diverse, referring mainly to the IMs’ ecological contribution (e.g. improvement of the ecosystem structure and biodiversity), but also to social participation and awareness, but less to economic sustainability. Nevertheless, all IAs had well-defined future actions to address sustainability shortcomings in the IMs’ and seem to dynamically plan their long-term impact. The SSA reports were all very rich in data, but also diverse in terms of the level of

development, the depth of analysis and details in the responses provided, and some IA leaders were more self-critical than others.

In what follows, we present highlights of the SSA results, lessons learned as reported by the IA leaders and the spiderweb syntheses of the SSA per IA (see D3.3 and D3.4). It should be mentioned that the aim was not to compare the sustainability of the different IMs. Instead, the purpose of the SSA was to provide reflective spaces for contemplating the sustainability of each IM in its particular setting, ways of improving it, and to extract some lessons learned.

The Croatian IM targeting donations was terminated due to the theft and vandalism and lack of willingness to pay and was not included in the SSA.

6.3.1 Group I: Changes in legislative framework

Spain/Basque Country – Forest management for timber, landscape and water services

Overall sustainability: Assessed as positive (Figure 6.2).

Strongest point: Successful social participation of the local community in the development of the pilot project.

Weakest point: The financial aspect, the challenges and difficulties related to seeking and securing long-term funding for the payment of the ecosystem services.

Lessons learned:

- The IA highlights that while it is possible to measure the IM's ecological values and even quantify them, it is difficult to achieve a fair and long-term payment.
- If there is debate and dialogue and common understanding, both society and the providers of ecosystem services can 'win'.
- Social and political will is needed to mobilise both public and private sources of funding.
- When drafting a law related to ecosystem services, there must be a participatory process that includes the actors who will be affected at the front line (bottom-up approach).

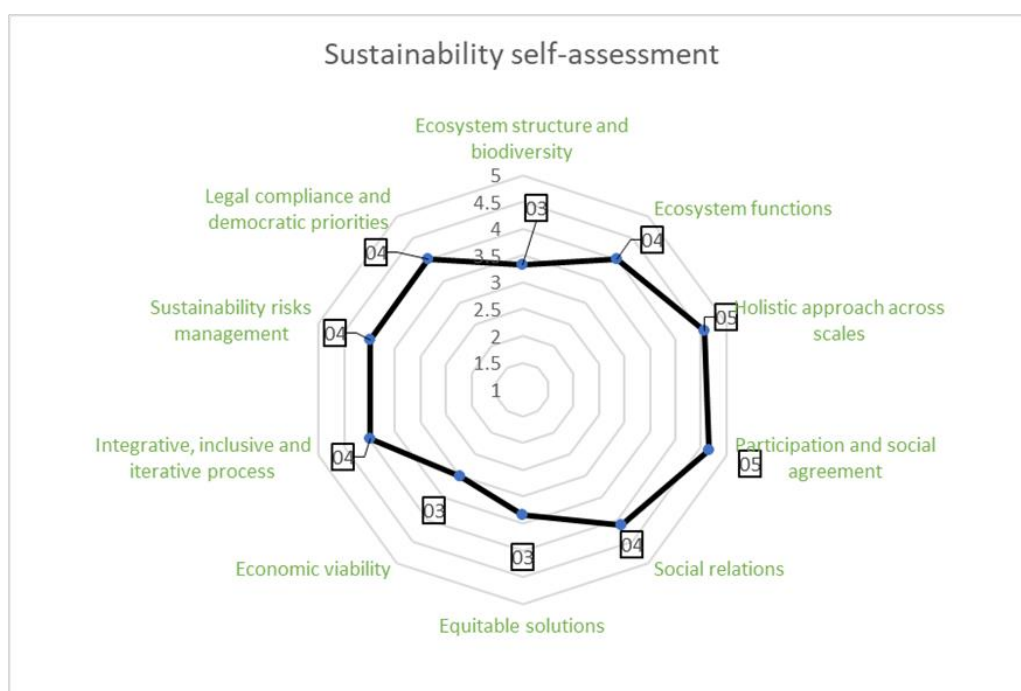


Figure 6.2 Spiderweb synthesis of the sustainability self-assessment for IA Basque country.

Russia – Providing multiple ecosystems services by forest renters

Overall sustainability: Assessed as positive (Figure 6.3). The various dimensions appear to be performing unevenly but the strongest aspects match the goals and expectations of the IA.

Strongest point: The aim to provide a legislative basis for ecological sustainability, balance between the ES and biodiversity preservation, which in turn can increase the well-being of citizens.

Weakest point: The IM cannot guarantee a complete protection of locals' and small businesses' interests. The development of a legislative basis outside the framework of this IM is necessary to achieve this goal.

Lessons learned:

- Need for additional expertise/considerations (1/2). The IA partners mention that due to their expertise (i.e. the institute mostly studies trees and other flora), the IM has not considered the impact on the biodiversity of other organisms except plants. After this SSA, the IA partners will include at least bird species in their next assessments.
- Need for additional expertise/considerations (2/2). The IA partners mention that the social aspects are not part of their institute's expertise and were developed mostly with the help of the research partners.
- The highly centralized Russian governance and management systems are currently one of the biggest challenges for the IM.

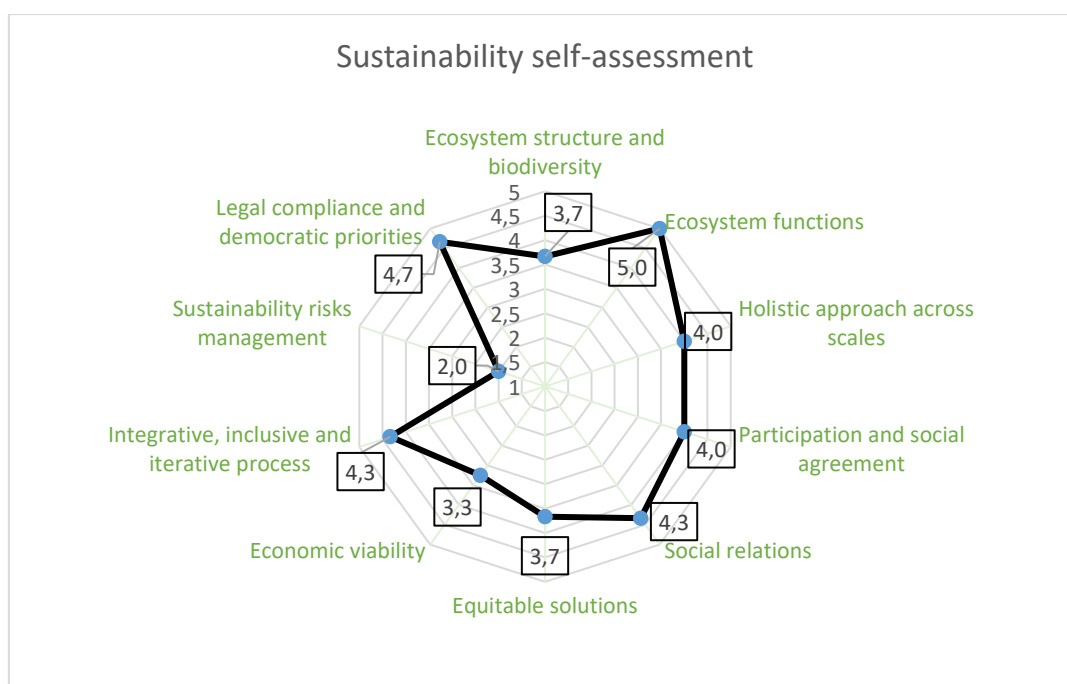


Figure 6.3 Spiderweb synthesis of the sustainability self-assessment for IA Russia.

6.3.2 Group II: Market-based Instruments to improve the provision of public goods

Denmark – Reverse auction for forest biodiversity protection

Overall sustainability: Assessed as positive (Figure 6.4). The limited spatial scale of the individual actions resulted in a lower score for certain ecological and equity aspects.

Strongest point: The (expected) improvement of biodiversity and, having this goal, the IM achieved a high number of bids submitted relative to budget, which meant a high quality in suggested actions as well as high competition on costs.

Weakest point: The IM takes more preparation and competence on the auctioneering side than e.g. flat-rate subsidies delivered on a simple eligibility rule, which can be an obstacle for the upscaling of the IM.

Lessons learned:

- There was big variation in the cost-effectiveness of the ideas proposed by forest owners. The requested price varied substantially across bids and did not correlate with ecological performance. Extra care is needed in the design of the IM when allowing forest owners to co-create the measures undertaken.
- The small scale of each action and the fact that they take place on private forest land, sometimes away from paths and roads providing access, limited the relevance and possibility of assessing community involvement and broader social impacts of the IM implementation.
- The design allowing for variation in offers' type (no standardised action) implies potential gains in cost-effectiveness, but also requires a rigorous selection procedure and selection criteria, which is an important lesson for upscaling.
- The fact that the IM takes a bit more preparation and competence on the auctioneering side than e.g. flat rate subsidies delivered on a simple eligibility rule can be an obstacle for the upscaling of the IM, as it requires that relevant organisations are competent and willing to build capacity to run such IMs.

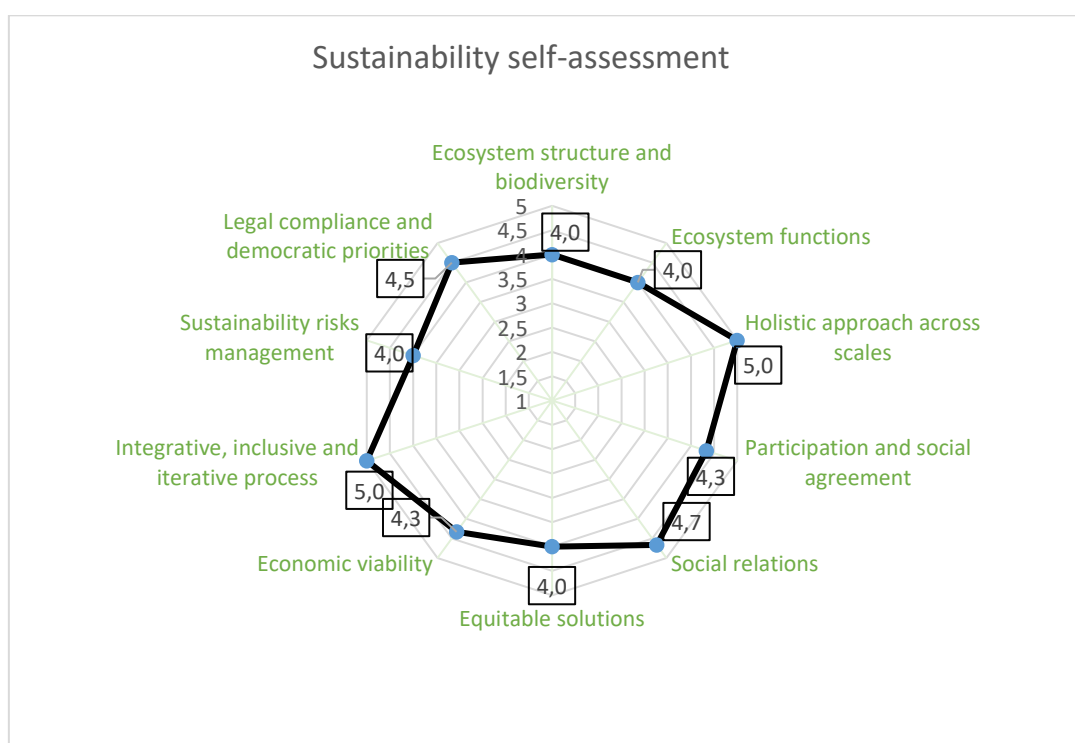


Figure 6.4 Spiderweb synthesis of the sustainability self-assessment for IA Denmark.

Belgium/Flanders – Reverse auction for habitat restoration and improvement in forested hunting areas

Overall sustainability: Assessed as positive (Figure 6.5).

Strongest point: The (expected) improvement of the ecosystem structure and biodiversity.

Weakest point: The limited scope in terms of time, funding, number of FES and participating stakeholders.

Lessons learned:

- The main challenge is the time-scale mismatch between the short duration of the project and the long-term character of ecosystem/biodiversity improvement actions and their impact.
- Testing innovative mechanisms to finance projects requires flexibility and adaptability. Working with public funds (like subsidies) and needing to follow procedures for existing subsidy schemes, make it extremely difficult to be able to act swiftly and adapt rapidly. Public administration is maybe not the ideal setting for this kind of experimental projects.

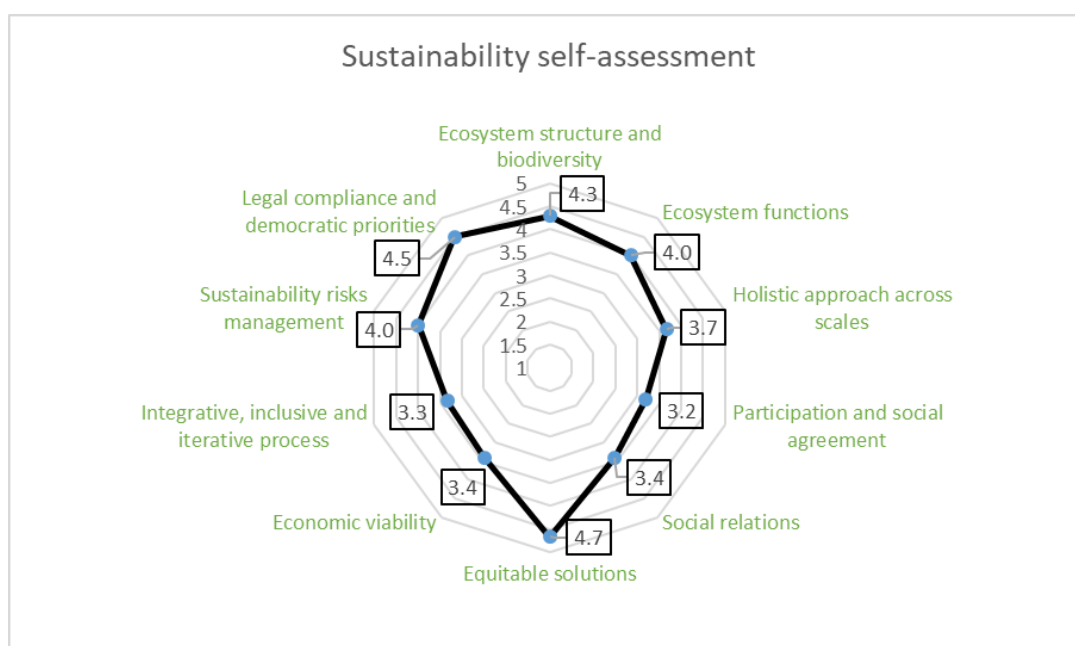


Figure 6.5 Spiderweb synthesis of the sustainability self-assessment for IA Belgium/Flanders (habitat restoration).

6.3.3 Group III: User-based Payments for Ecosystem Services (PES)

Belgium/Flanders – Reverse auction for wild boar buffers

Overall sustainability: Assessed as positive (Figure 6.6) especially in terms of economic and institutional sustainability, which shows that the theoretical design was good.

Strongest point: Seeks to meet a defined goal that is understandable and acknowledged by all stakeholders, and to address an existing and explicit need in finding simpler alternatives to traditional subsidy mechanisms.

Weakest point: The cost-efficiency of the mechanism was not proved, and the IM did not receive institutional approval.

Lessons learned:

- The integration of ecological concerns into the design of the IM is a challenge since too strict restrictions for the wild boar buffers would lead to disengagement of the farming sector.
- Despite the interruption of the wild boar buffers pilot, bringing the stakeholders together has allowed to create a dialogue and cooperation on a potential solution to this sensitive issue that would be acceptable to all stakeholders. Although the auction mechanism itself had to be cancelled, hunters and farmers remain convinced of the necessity of the IM's goal to support the creation of buffer zones around the fields.
- This experiment of the reversed auction by first rejected price needs upscaling in order to provide sufficient results for further evaluation.
- Experimenting with public funding is a challenge. Specific budget should be allocated for the experiment itself, instead of trying to embed the experiment within existing (traditional) subsidy mechanisms.

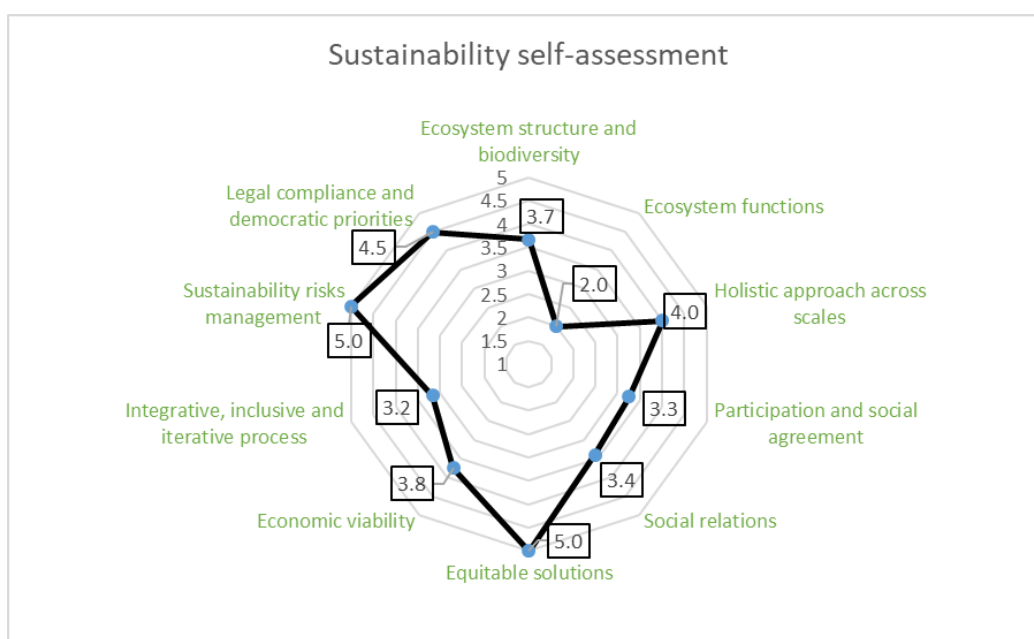


Figure 6.6 Spiderweb synthesis of the sustainability self-assessment for IA Belgium/Flanders (wild boar buffers).

Croatia – One-time concession permits

Overall sustainability: Assessed as positive with different sustainability dimensions performing generally evenly (Figure 6.7).

Strongest point: The contribution in raising awareness about FES and Medvednica being a protected area (rather than a city park).

Weakest point: Unexpected threats of COVID-19: there are a lot more visitors than normally in the park, and their behaviour cannot be controlled which leads to concentration of visitors.

Lessons learned:

- Some level of monitoring is necessary to coerce all organised activities to ask for one-time concession permits. Without monitoring, some will undertake organized activities without asking or paying. Rangers patrolling the park can ensure the use of permits and sanction groups who have activities without a permit, but the number of rangers is too small to cover the park efficiently.
- Awareness-raising to change mindsets is still a challenge, as visitors do not perceive the nature park as a protected area but as a city park (thus do not see the need to pay concession). This is being addressed through social media and local radio campaigns.

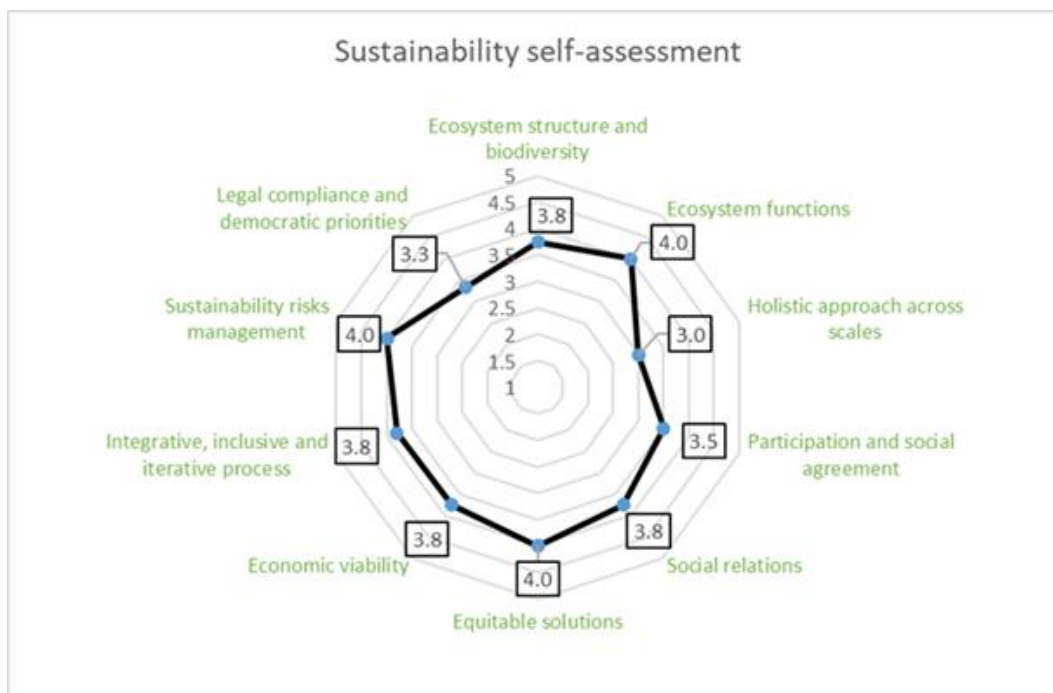


Figure 6.7 Spiderweb synthesis of the sustainability self-assessment for IA Croatia.

Switzerland – Funeral forests

Overall sustainability: Assessed as positive with the results of the assessment matching the main sustainability targets and expectations of the IA at this stage (Figure 6.8). There is a certain weakness in the 'holistic approach' aspect, which has to do with the fact that the offer is very delicate and cannot be easily upscaled to the broader public.

Strongest point: Synergies that seem to be developed between the different sustainability dimensions and interests.

Weakest point: The IM's marketing.

Lessons learned:

- The new customer group and the associated new needs require new skills and approaches.
- There needs to be a solid record of the actual costs. All preparatory work and risk must also be included in the cost calculation.
- The establishment of a new service within an existing institution requires an adapted approach. Especially with smaller forest owners, and when the innovation process is not institutionalised, new offers can trigger fundamental resistance. Here, an adapted approach is very important.

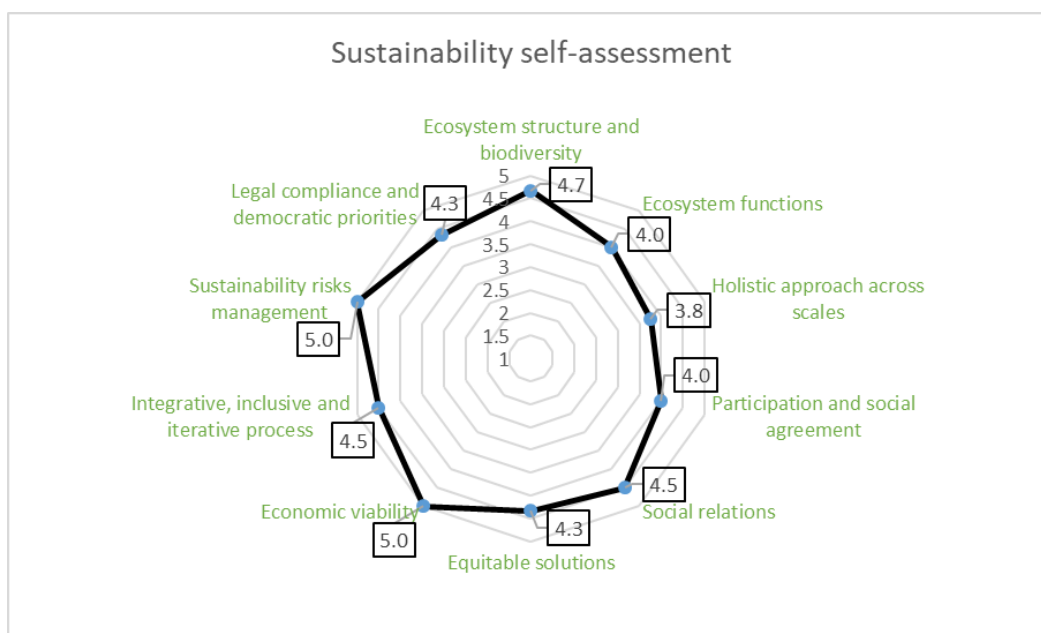


Figure 6.8 Spiderweb synthesis of the sustainability self-assessment for IA Switzerland.

Italy/Etifor – Compensating nature conservation measures

Overall sustainability: Assessed as positive (Figure 6.9). Although the four dimensions perform unevenly, the results of the assessment seem to match the main sustainability targets of the IA at this stage.

Strongest point: The positive environmental impact and the significant income generated for the park.

Weakest point: The cost of FSC certification for small landowners is not sustainable in all cases without other external funds.

Lessons learned:

- The cash flow is significant for the park, for the private owners already certified by FSC, and for the processing companies. Premium price and chain of custody must be improved to have positive economic impacts for small owners.
- The IM is an upscaling of an existing scheme and the development of a feasibility study for three other areas. As such, policies do not represent an important obstacle to the implementation of the IA. The critical point is getting other farmers to join the payment scheme that has proven to work under the given policy setting.

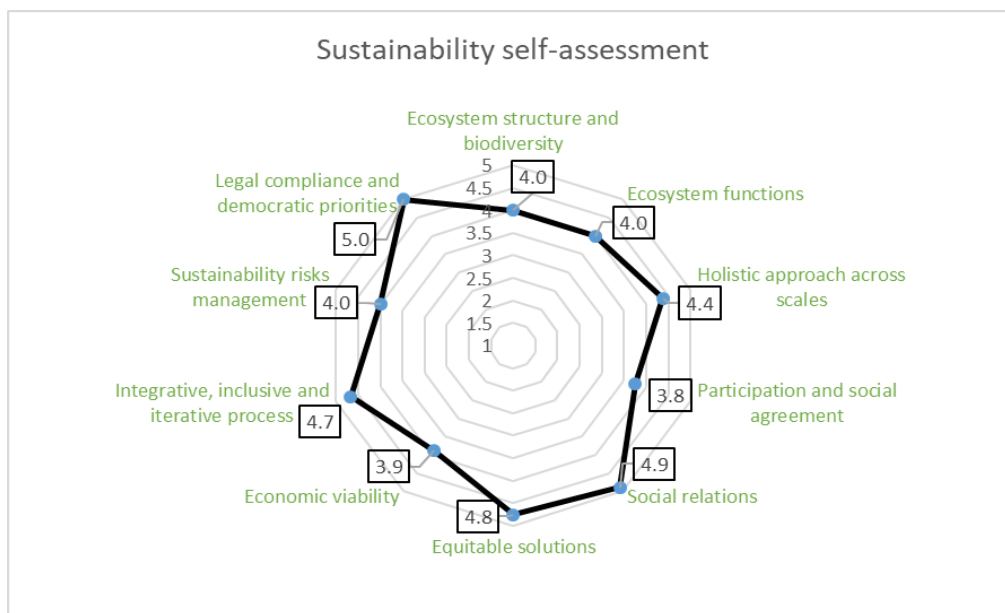


Figure 6.9 Spiderweb synthesis of the sustainability self-assessment for IA Italy/Etifor.

Italy/Borgo – Selling mushroom permits online

Overall sustainability: Assessed as very positive with the results of the assessment matching the main sustainability targets and expectations of the IA at this stage (Figure 6.10).

Strongest point: The raise in demand by mushroom pickers due to a higher chance to pick wild mushrooms in the specific forest in comparison to other areas.

Weakest point: The increase of the coordination costs.

Lessons learned:

- The FES in focus is already a marketed provision good or service and the additional innovation cannot be easily extrapolated to the enhanced payment for FES that are not already marketed.
- The IM deals with historic power struggles as the regional government and the local government (Communale) have different interests.

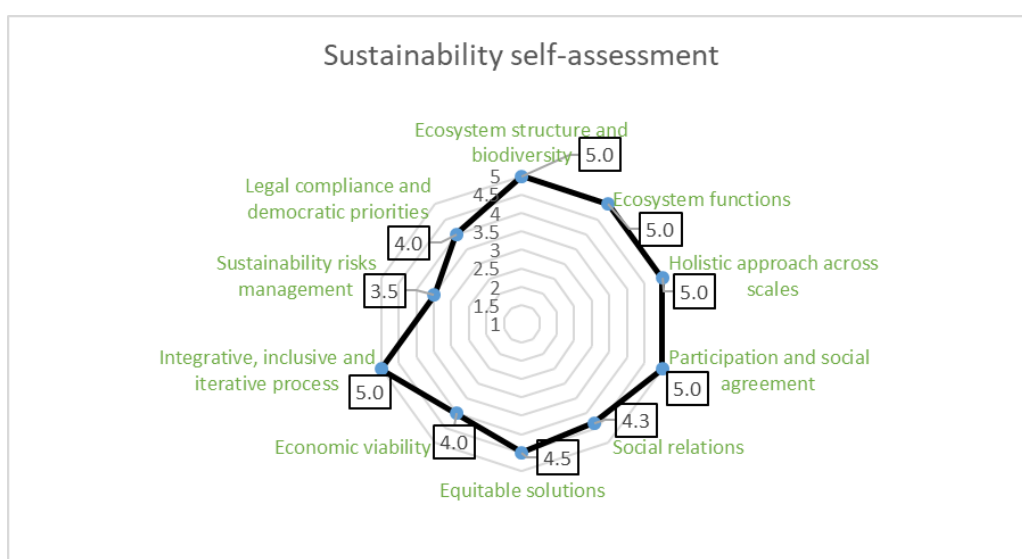


Figure 6.10 Spiderweb synthesis of the sustainability self-assessment for IA Italy/Borgo.

Peru – Paying for watershed services to cities

Overall sustainability: Assessed as positive. The ecological aspects and the legal compliance are strong, whereas the social aspects and some institutional aspects are weak (Figure 6.11).

Strongest point: The budget is ensured through a fee on water bills and that the IM is a learning site for other PES schemes in the country.

Weakest point: The lack of dialogue among stakeholders and the limited inclusiveness in decision-making and benefit-sharing; the relationships between the drinking water company and the local communities have sometimes been tumultuous.

Lessons learned:

- Need to strengthen the social and institutional aspects. There is a need to change the mindset: the IM was designed mostly by engineers with expertise in water management or ecosystem restoration. The IM needs to be improved by the involvement of experts in social and institutional aspects.

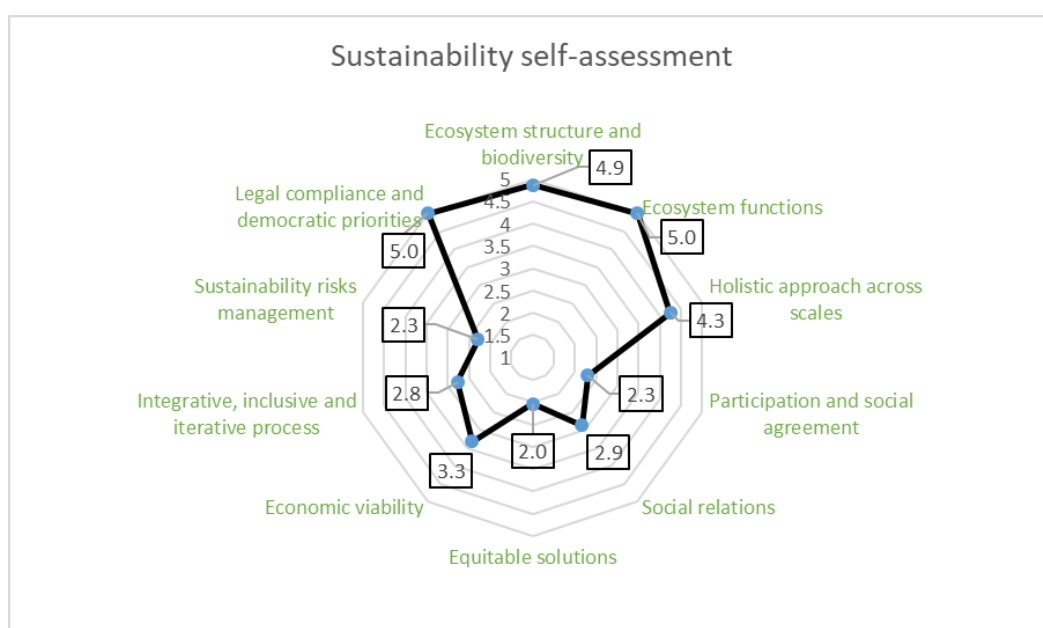


Figure 6.11 Spiderweb synthesis of the sustainability self-assessment for IA Peru.

Spain/Catalonia - Forests and water in Catalonia

Overall sustainability: Assessed as positive, especially in the design phase (Figure 6.12).

Strongest point: The methodology used to calculate the impacts of forestry on the ES is very robust (taken from the project LIFE CLIMARK). The design of the IM has been very participatory and adapted to the needs that arose in the different steps of implementation.

Weakest point: The sustainability risk management is not fully covered in the IM and thus the long-term sustainability of the IM, beyond SINCERE, is not ensured.

Lessons learned:

- The Importance of the landscape scale to enhance impact and address trade-offs between ES.
- The need to consider ethical criteria concerning 'greenwashing'.
- The huge impact of having a well-designed participatory project with clear objectives but, at the same time, high flexibility to adapt the roadmap to the outcomes of this participation.
- Need to have a backup solution, like initial 'seed-money' from which to progressively develop the IM and to secure a minimum yearly amount of money that allows for the Forest Owners Association to contract a third party to search for new investors, to produce new Adaptation and Mitigation Forestry

Project Plans (PROMACCS), to engage new FO, or to carry out the monitoring and the revision of the implementation.

- PES schemes have been proven to be excellent tools (or excuses) to engage different institutions in a long-term discussion and participatory process, as they can provide a very well-defined outcome. This enhances the sense of co-ownership of the tool.
- Monitoring, evaluation and redefining of the IM is time and money consuming and needs proper human resources and capacities.

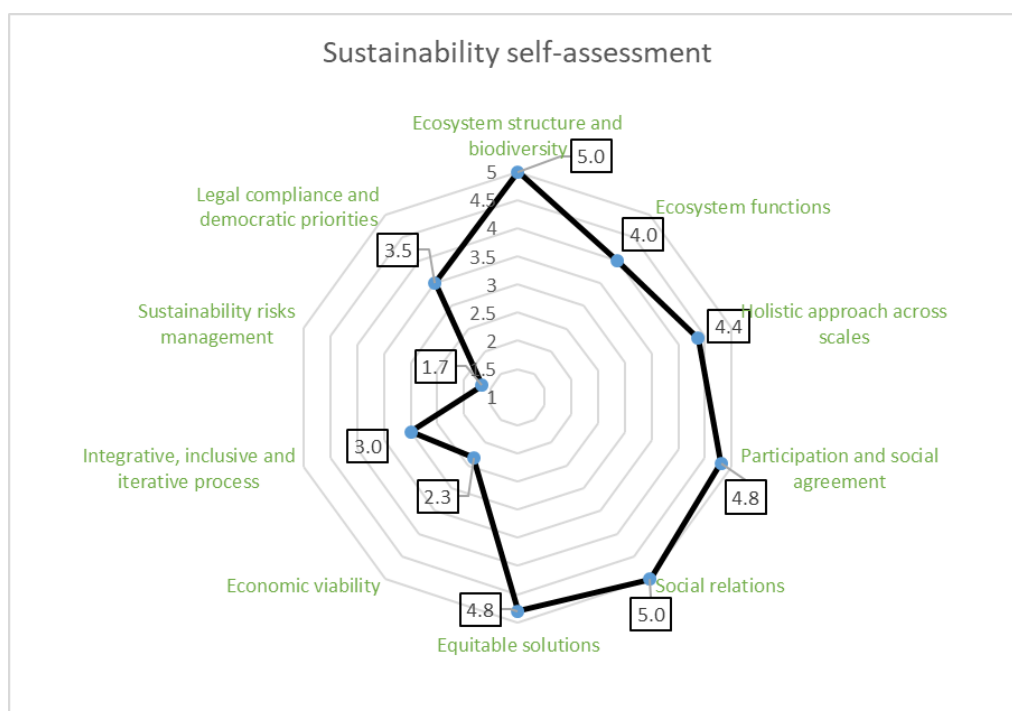


Figure 6.12 Spiderweb synthesis of the sustainability self-assessment for IA Spain/Catalonia.

6.3.4 Group IV: Donation-based payments for public goods

Finland – Paying for landscape ecosystem services

Overall sustainability: Assessed as ‘moderately reached’ with the different sustainability dimensions performing unevenly (Figure 6.13).

Strongest point: i) The value and care for the visual quality of forest landscape, and ii) the efforts made to raise awareness of ecosystem service bundles and values, the holistic approach to stakeholders’ interaction and cost-efficiency of the model.

Weakest point: i) The relatively low willingness of local stakeholders and organizations to commit to the targets of the project, ii) the need to introduce payments for landscape and biodiversity values which have earlier been considered free public goods to customers and, iii) limited ability to handle larger bundles of ES and values holistically.

Lessons learned:

- The multi actor groups (MAG) process proved to be very good for handling ecological issues and related values locally.
- The awareness raising, as a social sustainability action, has an important role in enhancing sustainability.
- Sustainability awareness and its value in business is raising and will change the business culture.

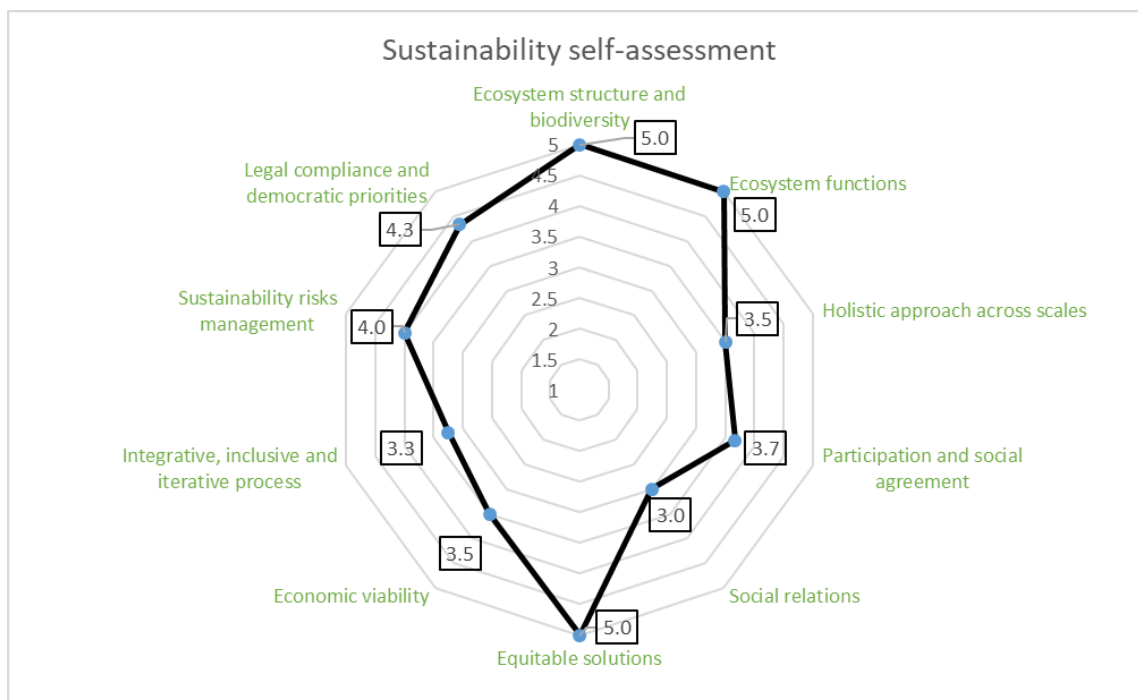


Figure 6.13 Spiderweb synthesis of the sustainability self-assessment for IA Finland.

7 Lessons learned from stakeholder engagement

Irina Prokofieva, Mireia Pecurul and Marc Gramberger

7.1 Multi-actor approach to stakeholder engagement: adaptation of Horizon 2020 guiding principles to SINCERE

SINCERE project falls under the umbrella of Horizon 2020 projects that introduced a novel approach to stakeholder interaction and engagement, namely, **the multi-actor approach (MAA)**. The main argument behind the MAA is that the involvement of a variety of stakeholders with complimentary types of knowledge (e.g. science, practice, policy, etc.) and diverse personal and professional backgrounds in all stages of the project (from planning to execution and demonstration), can not only enhance the development of tailored practical solutions covering real end-users' needs, but also can improve the acceptability and the uptake of innovative solutions by relevant stakeholders by creating co-ownership of results and thereby ensuring the sustainability of the project beyond the initial financing period. This is particularly important in the framework of innovation action projects, which are intended to demonstrate solutions to major societal problems.

The multi-actor approach adapted in SINCERE was designed bearing in mind several main principles:

- Broad stakeholder representation** to ensure that the engaged stakeholders encompass all types of actors with an interest or being affected by forest ecosystem services and forest governance, ranging from public officials and administrators to private-sector interest groups and civil society.
- Co-design and co-generation of knowledge** to bridge gaps between scientific work, practice on the ground and policy recommendations, and to achieve public acceptability for innovative mechanisms. This involved specifically, (1) joint development of innovative mechanisms in innovation action regions; (2) joint formulation of questions for self-evaluation of the innovative mechanisms, (3) joint implementation of innovative mechanisms in the IA regions; (4) joint evaluation of the IA cases; (5) joint synthesis and upscaling of experiences and knowledge.

- c) **Tailor-made participatory approach to stakeholder engagement and knowledge dissemination** based on the identified needs and interests of different stakeholder groups (see Figure 7.1 *Stakeholder groups and their involvement in SINCERE*. MAG stands for Multi-Actor Groups.). These activities involved Multi-Actor Group meetings (MAG) organized in the IA cases, knowledge-sharing activities (Co-Design Event and Internal Synthesis workshop), interviews and focus group discussions, as well as Cross-Fertilization activities involving multiple representatives of the IA cases and external stakeholders. Moreover, SINCERE project also nominated several SINCERE Ambassadors to help with continuous promotion of the SINCERE experiences and practices within the policy arena.
- d) **Continuous evaluation and self-evaluation** of IM implementation and stakeholder interaction to enhance the adaptability of methods and approaches used in SINCERE to local demands and changing circumstances.



Figure 7.1 Stakeholder groups and their involvement in SINCERE. MAG stands for Multi-Actor Groups.

7.2 Stakeholder engagement activities in SINCERE

As mentioned above, the multi-actor engagement in SINCERE relied on different tailor-made participatory processes conducted at different stages of the project and involving different groups of stakeholders at different levels. An overview of stakeholder engagement activities in the SINCERE project is presented in Figure 7.2.

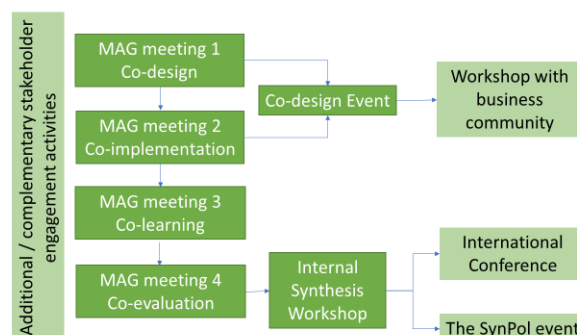


Figure 7.2 Overview of stakeholder engagement activities in SINCERE (developed by Gramberger and Nitschmann 2018 (M2.3) and updated by Irina Prokofieva 2021).

7.2.1 Multi-Actor Group meetings

The most intensive engagement of stakeholders has taken place with the stakeholders directly linked to the innovation actions through **Multi-Actor Groups (MAG)**. These groups comprise of a limited number of stakeholders (approximately 25 individuals) with a particular interest in specific innovation action cases. The purpose of MAGs is to ensure that the practical knowledge and skills of all relevant stakeholders are taken on-board during the various stages of the innovation action process. This is designed to safeguard that the resulting innovation actions and innovative mechanisms are well adapted to local socio-economic and ecological conditions, as well as supported by local and regional stakeholders.

During the course of the project, MAGs have convened four times in each innovation action case, and their meetings have had different foci:

- (1) First MAG meetings focused on the identification and co-design of potential innovative mechanisms for the implementation in the IA case.
- (2) Second MAG meetings focused on co-design of implementation plans, and operationalization of the criteria for IA self-assessment.
- (3) Third MAG meetings focused on co-learning and cross-fertilization activities for the IA.
- (4) Fourth MAG meetings focused on co-evaluation of IA activities and MAA, the potential for upscaling and/or replicating the pilots in other areas, as well as the continuation of activities after the project.

Aside from the formal MAG meetings, innovation action partners have been encouraged to organise additional stakeholder engagement activities if these were deemed necessary to support the development of innovation actions in the region. Such activities took place in certain innovation actions (e.g. Spain/Basque country).

7.2.2 Cross-fertilization activities

The simultaneous implementation of innovation actions in different regions presented an excellent opportunity to benefit from intensive knowledge exchange amongst the partners involved in the innovation actions, the rest of the consortium partners, as well as external experts and SINCERE Ambassadors. During the project, two **Cross-Fertilization Learning Labs** were organized to facilitate the interaction of innovation action partners with other SINCERE partners and external experts as well as experts from the sister project INNOFOREST on 4 different topics:

- (1) Unleashing the potential of small plot holders for forestry innovation,
- (2) Comparing Asian and European perspectives in cultural forest ecosystem services,
- (3) Making the business of Forest Ecosystem Services (FES) work,
- (4) Solution Scanning: Sustainable Provision of FES in Europe.

7.2.3 Knowledge-sharing activities: Co-Design Event and Internal Synthesis Workshop

Alongside direct stakeholder interactions within regional multi-actor groups and cross-fertilization activities within the Learning Labs, two consortium-wide activities were organized involving not only science, practice and business partners from the SINCERE consortium, but also relevant European policy stakeholders, namely a **Co-Design Event** and an **Internal Synthesis Workshop**. The aim of the former event was to provide a platform for interactive knowledge sharing across the Innovation Action cases at the start of the project and to facilitate their interactions with outside stakeholders. The latter event focused on capitalizing on the lessons learned from the implementation of innovation actions and reflecting on the multi-actor engagement process itself.

7.3 Key lessons and benefits of stakeholder engagement activities

Tailored approach to stakeholder engagement in SINCERE has been positively evaluated by the innovation action partners as well as stakeholders involved in the abovementioned processes. Evidence from the SINCERE regional multi-actor processes demonstrates that stakeholders consider such participatory processes very beneficial for the development of customized local solutions to handle FES provision. Specific benefits that were highlighted by SINCERE partners and involved stakeholders included: (1) better understanding of stakeholder's views and perspectives on FES and innovation action context; (2) increased support for the innovation actions; (3) improved dialogue and understanding of ecosystem service concepts among stakeholders; (4) constructive feedback on innovation mechanisms, co-design and co-implementation; (5) improved validity and credibility of the implemented innovative solutions.

Enriched exchange of information and improved understanding of different aspects related to FES provision, use and associated values and trade-offs that are relevant for decision-making is one of the major benefits of deliberate stakeholder engagement efforts. Being able to involve a diversity of stakeholders beyond the 'usual suspects' facilitated the understanding of values, beliefs and attitudes held by different stakeholder representatives and improved the development of innovative solutions in the region. Moreover, they significantly improved mutual trust and reduced historical conflicts frequently associated with competing demands for FES in local settings.

Engaging with stakeholders across sectors and policy levels is key for supporting innovations for the provision of multiple FES. The creation of participatory bottom-up processes at regional level allows to explicitly explore the underlying factors for FES prioritization and to promote learning about FES demand-driven partnerships between forest owners and managers, business, society, policymakers and scientists.

It is important to note that the initial selection of stakeholders for engagement processes – that is, who is included and who is excluded – is crucial for such a fruitful dialogue to emerge. Broad representation, while beneficial from the plurality and inclusiveness perspectives, can at times create open conflicts within the stakeholder groups – especially in situations where the diversity of views is very pronounced and there was no prior record of fruitful interaction. Situations like this highlight the facilitation and mediation skills of the facilitators/coordinators of stakeholder engagement activities, and stress the fact that one of the key benefits of the engagement process is not only the end-result itself, but also the communication and engagement process per se. In some situations, additional meetings – also in a smaller format – can facilitate finding a common ground that can be discussed in a bigger more formal setting.

Existing tradition of using consensus-based approach in decision-making also plays a role, of course. In regions where public policy relies on a consensus-based approach, stakeholder interaction may be smoother and more constructive, than in regions where participatory processes are newer and less familiar. Actors that are not accustomed to engage in participatory processes may end up closing up and not speaking up, which again highlights the importance of skilful facilitation to make sure that everyone can express their opinions and concerns in a safe environment.

Initial selection of stakeholders is also important because different stakeholders have different levels of knowledge about FES and local issues, as well as different opinions about their importance. This brings to the forefront the importance of accessibility of expert and traditional knowledge in a format that can be understood by broad segments of relevant stakeholders. Moreover, this highlights the importance of stakeholder engagement processes for enhancing stakeholders' skills, knowledge and capabilities, fostering the learning aspect of engagement. To put forward a Europe-wide incentive system for FES it's paramount to create a common understanding of the complexity of forest ecosystems and how different forest management regimes can affect the future of our forests by delivering different outcomes. Such understanding needs to exist at all the levels and across all the stakeholders – both those directly involved

in forest management and planning, and those who are only benefiting from FES directly or indirectly. This all requires skilful facilitation of engagement processes, familiarity and commitment to participatory methods, as well as flexibility and adaptability in the face of change and challenges. These are the main pillars of successful engagement activities.

8 Conclusions and the way forward

Sven Wunder and Pia Katila

While there is considerable variation in the supply and demand of different FES among the diverse regions in Europe, overall, the provision of regulating and cultural services does not meet the societal demand for these services. The main forest management objective and income source for forest owners and managers is still wood/biomass production. Yet, the recognition of the crucial role of forests in hosting biodiversity and providing instrumental FES for e.g. mitigating and adapting to climate change and improving human health is further increasing the demand for multiple FES and has accentuated the need to develop incentive mechanisms for enhancing their provision. This is also clearly recognized in the recent EU environmental and economic strategies, particularly the Biodiversity Strategy (2020) and the new Forest Strategy (2021) which foresee the development of payment schemes to forest owners and managers for providing ecosystems services.

The SINCERE project focused on developing and testing innovative instruments for enhancing the provision of FES. The development and implementation of these instruments relied on participatory processes that facilitated close collaboration, co-learning, co-designing and co-evaluation processes involving a variety of stakeholders with different types of knowledge and interests. The tested mechanisms ranged from pursuing changes in legislative framework, market-based instruments to improve forest ecosystem service provision and enhancing markets for already marketed non-wood forest products, to user-based payments and donations for creating funding for supporting the provision of FES. The development and testing of these mechanisms exemplify how across Europe the socio-economic, ecological, and institutional settings vary greatly and challenge the development of a common framework for supporting FES provision. Furthermore, at national scale the often unclear, or even conflicting, regulatory setting restricts or prohibits the development of new economic mechanisms for incentivizing forest owners and managers to supply multiple FES. In this context the distribution of rights, including exclusion rights, is of crucial importance and affects the potential for innovation in market mechanisms that would enable enhanced provision of ecosystem services against a payment. Therefore, for developing mechanisms for enhancing the provision of FES it may be crucial to question and assess the adequacy of current legislative frameworks in any particular country or region.

Lack of information about the demand, supply, and valuation of FES, and connections between different forest management strategies and ecosystem services outcomes, including trade-offs between them, further inhibit the development of these mechanisms. Moreover, different stakeholders, both at the EU and national scales, hold divergent views about forests, their use, management, and conservation. For supporting the provision of FES and developing policies and mechanisms to this end thus requires cross sectoral coordination and bringing together different stakeholders at the EU, national and local levels to find solutions that allow top-down approaches and policies to support and facilitate bottom-up ideas, innovations, and processes for enhancing FES supply through PES or other instruments.

Overall, PES have the potential to be direct, flexible, and effective instruments, providing also fair rewards to landholders, supporting rural incomes. But flaws in design and implementation often limit PES from unfolding that potential. More spatially targeted interventions, payment differentiation and improved

enforcement of conditionality are key to help meeting challenges. This also requires political will to seriously boost environmental objectives, including in PES government-financed schemes that typically respond to multiple stakeholder concerns.

As mentioned, Europe has clearly been a laggard in PES implementation. This is less explained by structural-institutional factors: Europe is in economic structure fairly similar to the USA and Australia, where PES indeed have been used much more. In Europe, the prevalence of large protected areas, extensive regulations, the existence of, in some parts, large state forests and fragmented private forestlands, occupied often by smallholders with a large degree of absenteeism, are certainly part of the explanation. However, arguably there is also insufficient private willingness to pay, with a societal vision that the environment and ES provision are generally a public responsibility, hence with a predominant role for regulatory approaches. This societal legacy has likely limited the perceived need for, and eventual adoption of PES.

However, PES could have an increased future role either through reforms of the Common Agricultural Policy (i.e. new forms of public PES), and/ or through an increased realisation on behalf of private actors that regulation alone is unable to deliver the full suite of ecosystem services that service users and societies need (i.e. new user-financed PES schemes).

For a higher private willingness to pay to materialise, several sub-scenarios could become influential. First, climate change could continue to increase the frequency of weather anomalies and catastrophic events, such as droughts, wildfires, stormflows and flooding, thus also increasing European societies' demand for environmental adaptation and mitigation – perhaps to an extent that financially pressurised public environmental agencies might not always be able to deliver. It would thus become increasingly clear to European citizens that they also need to privately pay for a set of ES that are becoming crucial bottlenecks to their welfare.

In other words, while there are good structural explanations of the current scarcity of PES initiatives in Europe, it is also possible to imagine a series of future game changers – with climate change arguably lining up as a root trigger. For forests in particular, unlike the tropical PES focus on unanimously increasing forest cover, European forest-based, broad-scaled PES would likely look more complex. It would imply to some extent the conservation of open landscapes and mosaics, sometimes even paying for keeping forest regrowth at bay, or to curb biomass accumulation to reduce wildfire risks – all vis-à-vis business-as-usual expansionary forest transition paths, i.e. rural abandonment with spontaneous natural forest regeneration. More research will also be needed to determine which forest landscape reconfigurations could most effectively respond to a new set of environmental challenges, and how economic incentives can best be used to help push for the needed transformations.

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