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D4.1 Assessing the upscaling potential of SINCERE IAs using a Theory of Change structure

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Authors

Lundhede, Thomas Hedemark, Sven Wunder, Pia Katila, Bo Jellesmark Thorsen.

Executive summary

This deliverable provides an analysis of the upscaling potential for all the Innovative Mechanisms (IM) tested across the innovation action cases (IA). The deliverable draws upon all the material collected from and provided by our partners in the different IAs as part of the work for deliverable 3.1, 3.3/3.4 as well as on new feedback and discussions with those partners in relation to this particular analysis and deliverable.

The analyses in this deliverable draw upon a PES-adapted Theory of Change framework first suggested and applied in recent papers by Wunder et al. (2020, 2021) and Börner et al. (2020). It furthermore draws upon well-known concepts from the public economics and policy literature, using the framework Ostrom (2003) developed based on earlier debates by Samuelson (1954) and Musgrave (1959), among others.

The Theory of Change is a logical framework enabling us to consider in a structured manner how step-by-step inputs, such as resource needs, jointly form treatments with intermediate outputs, targeted outcomes, and longer-term impacts. The framework can also be used for the reverse, normative planning: for a set of targeted impacts and outcomes, what intermediate outputs will need to be generated, with what treatments and inputs?

Case country	The IM focus	The IM scalability
Denmark	Cost-effective biodiversity protection through reverse auctions	The IM is scalable to other areas and other FES provided that funding is available
Belgium I	Reverse auction on wild boar regulation actions	The IM proved unsuccessful, perhaps because of high coordination costs
Belgium II	Cost-effective habitat protection through reverse auctions	The IM is scalable to other areas and other FES provided that funding is available
Croatia	Payment for recreational services and infrastructures for group activities	The IM is scalable to relevant legal contexts where sufficient demand exists
Finland	Voluntary contributions by recreational users to maintain and enhance landscape values	The IM is scalable, but the voluntary donation mechanism is a challenge for upscaling
Switzerland	Payment for the right to bury the ashes of deceased in the forest	The IM is scalable to other countries where legislation allows the service
Italy I	Off-set payments for biodiversity improvements to allow FSC certification	The IM is scalable but contingent on FSC approval of the specific local contexts
Italy II	Improving commercialisation of mushroom picking	The IM is scalable to other FES and areas like any online marketing application
Peru	Payment for improved watershed management to enhance water provision	The IM is scalable to other similar up-stream-downstream cases
Basque country, Spain	Changes in forest law and regulation to enable PES schemes	The IM is not scalable, but similar legal constraints may exist elsewhere
Catalonia, Spain	Payment for improved forest management to enhance water provision	The IM is scalable to other areas where similar conditions exist
Russia	Changes in forest law and regulation to enable better FES management	The IM is not scalable as the features of the Russian forest law are unique to the country

Table 1: A short summary of conclusions on the upscaling potential for all the SINCERE cases. The upscaling potential is assessed on four different sub-themes, see chapter 3 for details of the analyses.

While most IMs pursue their outcomes and impacts through a specific treatment, e.g. a reverse auction mechanism (Danish and Belgian cases), water fees (the Peruvian case) or permits for specific services (cases in Croatia, Switzerland and Italy), there are also IMs that target key inputs needed for

such mechanisms. This includes the Finnish and one of the Croatian efforts trying to secure fundraising for public goods through donation structures, and the Russian and the Basque cases working to improve the legislative framework to allow better management of and compensation for forest ecosystem services.

We discuss the potential for upscaling along four different lines. *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. *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. *Upscaling in scope:* In a similar fashion, the specific IM design may be suitable for upscaling to other ecosystem services. *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. We summarize the findings in Table 1, but refer to the relevant subsections of Chapter 3 below for the detailed analyses and conclusions.

In a further analysis (see chapter 4), we identify commonalities across the different innovation cases and discuss how we can understand the challenges they address, drawing upon the framework of Ostrom (2003). For the IMs targeting changes in regulatory frameworks, we discuss which market failures they seek to correct, in part at least, and discuss how they follow one of the potential pathways pointed out by Musgrave (1959). We also discuss how the IMs applying market-based instruments to improve forest ecosystem service provision, although being largely successful in SINCERE, still crucially depend on funding being available for improving the provision of the public goods they target. These IMs do not in themselves secure this funding. The two last subsections of the analyses in Chapter 4 relate exactly to the challenge of securing funding for the ecosystem service provision. Two cases in SINCERE targeted this challenge for public goods and the results revealed how inherently difficult it is to design and implement successful voluntary instruments to raise funding for public goods. Provided a supportive distribution of exclusion rights and suitable socio-ecological contexts, it is much more tractable to design IMs that attract payments from users of private or club-good type of forest ecosystem services. Several SINCERE cases demonstrate this in relation to recreational and water services, non-wood forest products and services like mushroom picking and burial services.

We conclude this report by summarizing some observations of relevance for policy as well as further research. First, we stress how the distribution of rights, including exclusion rights, matter substantially for what market-based instruments may be successfully developed and implemented for enhancing the provision of forest ecosystem services, when these services potentially can be provided as private or club goods and services. We also highlight the gains made by market-based IMs for cost effective coordination of efforts across forest owners in providing biodiversity and habitat protection - true public goods. For these public goods, but notably also some climate mitigation benefits, the infeasibility of exclusion and the non-subtractability (that means, a person can enjoy the benefit of the good without any effect of the benefit another person can derive from the same good) effectively hamper the development of effective and transparent market-based instruments that can raise the necessary funding for enhanced provision. This is an area, we argue, in need of further research.

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1. Introduction

This deliverable provides an analysis of the upscaling potential for all the Innovative Mechanisms (IM) tested across the innovation action cases (IA) in SINCERE. The deliverable draws upon the material collected from and provided by our partners in the different IAs as part of the work for deliverables 3.1 and 3.3/3.4 as well as on feedback and discussions with those partners in relation to the present analysis and deliverable.

The analyses in this deliverable draws upon a PES-adapted Theory of Change framework first suggested and applied in recent papers by Wunder et al. (2020, 2021) and Börner et al. (2020). It furthermore draws upon well-known concepts from the public economics and policy literature, using the framework Ostrom (2003) developed based on earlier debates by Samuelson (1954) and Musgrave (1959), among others.

In the first section of Chapter 2 of this report, we explain how we understand and use the Theory of Change framework in relation to the IMs, using examples from across the SINCERE project. We present a slightly altered version of the framework compared to Wunder et al. (2020, 2021) and Börner et al. (2020), inspired by the findings and experiences from SINCERE, which, in relation to several IMs, highlighted the crucial role of credible funding. In the second section, we present Ostrom's (2003) general framework and connect it to the challenges addressed in SINCERE. Chapter 3 includes a thorough analysis of each IM, and introduction of the specific Theory of Change framework for each IM and based on that a discussion on the potential for upscaling the specific IM. The upscaling potential is addressed along four lines: i) National geographical upscaling, ii) Upscaling to other schemes or effort types, iii) Upscaling in scope and iv), Upscaling to other countries. In chapter 4, we discuss commonalities across the innovation cases and the challenges they address, drawing upon Ostrom's (2003) framework. Finally, in chapter 5 we conclude by summarizing some observations of relevance for policy as well as further research.

2. Theoretical frameworks applied

2.1 Theory of Change framework for the upscaling analysis

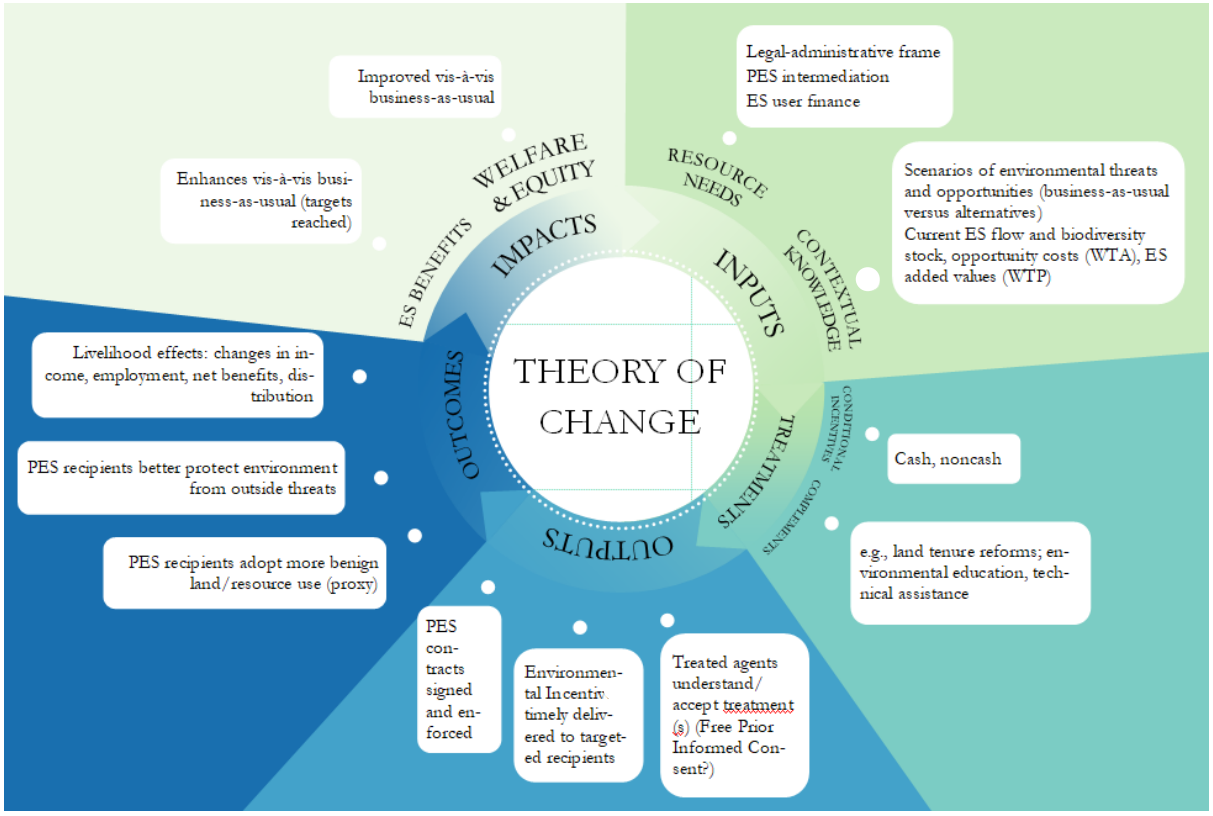

Figure 1: Adapted Theory of Change framework

In this deliverable we discuss and assess upscaling potentials of the innovative mechanisms (IM) applied in the different Innovation Actions (IA). The analyses of each IM are structured by a Theory of Change framework inspired by recent papers by Wunder et al. (2020, 2021) and Börner et al. (2020). We make one major change to the use of the Theory of Change framework, an innovation, and that is to present it in a circular fashion, which is evident if one compares our Figure 1 here with that of e.g. presented in Wunder et al. (2020). This allows us to highlight the interconnected relationship between the availability of financial resources, funding, for the payments to be made and the actual value creation through the targeted changes in e.g. forest management. The value to society is the welfare economic argument for why the financing should be in place and why the provision of ecosystem services should be enhanced. It is thus the reason for someone to be willing to provide this financing for their own benefit or for the benefit of someone else, revising in the process also the business-as-usual baseline that is (implicitly or explicitly) applied. As we shall see in our analysis, closing this circle is a key challenge for several of the IAs and for upscaling potential.

As demonstrated by Wunder et al. (2020) the Theory of Change framework (Weiss 1997) allows for a well-structured description of instruments like the ones analyzed in SINCERE. It allows for and forces structured thinking about the linkages between the causal chain elements of inputs, treatments, output, outcomes, and impacts. We use it to describe the importance of the framework conditions (the inputs) faced by each IM, the thinking and ambition of the IM with respect to enhancing forest

ecosystem services provision – that is the chain from treatment to impact, and the challenges that upscaling of the IM will face along this chain.

The SINCERE IAs are distributed across several European countries and for that reason alone, the IMs face different regulatory *input* frameworks on key parameters (Nichiforel et al 2018). Their focus also differs: some on (semi-)public lands, some target forest owners. But most importantly, they differ in the way financing – a crucial input here – is brought about during (and after) the project. What they mostly have in common, however, is a well-developed knowledgebase and access to knowledge providers. In all cases, there is a clear understanding of the socio-ecological system in focus, the changes sought for and the theory of change to bring it about.

The *treatment* is the IMs' active part, e.g. the auction contracts in the Danish and Belgian cases, the offer of contracts on forest burial sites in Switzerland or the donation or payment mechanisms for recreational services in Croatia and Finland. The treatment should, if effective, bring about an *output,* that is, the land owners, forest users or others targeted in the IM 'check in' and agree to engage with the instrument, the treatment, and effectively implement it. The results on the ground (land and resource use proxies) are the *outcomes* of the treatment. In those IA cases that made enough progress within the relatively brief project period, these included areas set aside for biodiversity, changes in forest management, burial sites put into use, and so on. The *impacts* are the longer-term welfare economic gains from e.g. improved biodiversity conservation potentials, the benefits enjoyed by recreational users of the forests or cost-effectiveness gains for forest owners.

Analyzing the IAs along these steps allows us to highlight the preconditions for making upscaling possible. We discuss upscaling along the following lines. First, *national geographical upscaling*. 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, *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 across European member states in the distribution of rights between the private forest owner, the forest users/beneficiaries and the state.

2.2 Understanding the market failures addressed by the IMs

The purpose of most of the IMs pursued in the different cases across SINCERE is to correct, at least in part, a failure of conventional markets to deliver socially optimal amount of forest ecosystem. The ability of any given mechanism to do that depends for a great deal on the characteristics of the ecosystem service in question, and the regulatory framework specifying property and use rights. Both of these are key inputs into the Theory of Change framework.

In our analysis, we draw upon well-known concepts from the public economics and policy literature, using the framework Ostrom (2003) developed based on earlier debates by Samuelson (1954) and Musgrave (1959), among others. 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 categories are depicted in Table 2 below.

	Subtractable	**Non-subtractable**
Exclusion feasible	**A:** Private goods	**B:** Club goods
Exclusion infeasible	**C:** Common-pool resource	**D:** Public goods

Table 2: Based on Ostrom (2003) we show some basic properties of goods and services relevant for understanding the basis for, success and potential of different FES targeting innovative mechanisms.

Among forest ecosystem services, marketed goods like wood and non-wood forest products are *private goods*, and hence in cell A. Both goods are subtractable (i.e. if x use the wood, it is not available for y) and provided sufficiently strong institutions, exclusion from (legal) consumption is possible.

However, regulations define property rights for landowners (Nichiforel et al. 2018): for instance, goods that are in one country a private good may in others not be, because no exclusion rights have been assigned. That affects the potential for upscaling different IMs as discussed below, also in SINCERE. If a forest ecosystem provides goods or services that are subtractable, but in a context where exclusion is not feasible, then these goods or services have the characteristic of a *common pool resource*, cell C in Table 2. In some countries, this may be true for e.g. picking mushrooms, if the right to this is assigned to all and access to the forest floor is allowed, too. In cases with heavy non-exclusive recreational use, externalities such as congestion, noise etc. caused by recreation may render other ecosystem services, such as peace and quietness, to common pool resources.

Many forest ecosystem services are non-subtractable. If only some limited form of exclusion is feasible, we may consider them *club goods*, cell B in Table 2. Examples of such goods or services are recreational services marketed for specific user groups in countries where some regulatory limitations on recreational uses are in place, e.g. for horseback riding or different sports activities, provided these exclusion rights can be sanctioned.

Finally, if it is infeasible to exclude anyone from benefitting from an ecosystem service, and this benefitting is non-subtractable, then the forest ecosystem service is labelled a *public good* (cell D in Table 2). These include regulatory ecosystem services like biodiversity conservation, watershed regulation and climate change mitigation. Nobody can be excluded from enjoying such services, and their use does not reduce the benefits available to others. This makes it exceedingly hard to coerce user fees or other payments from beneficiaries, due to the inherent free-riding incentives. This class of goods is of particular interest for public economics and policy, and for regulation targeting forest management standards. It is also a key focus of the payment for ecosystem services literature.

3. Theory of Change for IAs and their upscaling potential

3.1 The Danish case - a reverse auction for biodiversity protection measures

3.1.1 A theory of change perspective on the Danish case

In this IA, the intention is to test the use of reverse auctions as an innovate mechanism for allocating incentive payments through a bidding process, thus engaging forest owners in cost-effective provision of biodiversity protection on their lands.

Inputs: Within our overall Theory of Change, this IA is implemented in the context of the existing legal framework and regulations. As in many other European countries, there are existing subsidy schemes for e.g. enhanced protection measures in NATURA 2000 areas, which are menus of flat-rate subsidies, where the subsidy typically depends on conservation efforts. There is also an existing national voluntary measure for setting aside forest for biodiversity against an estimated present value of the production of the forest stand. For both of these, the restrictions imposed by entering these schemes are noted in the cadaster system and hence on the deed of the land in question. This implies that any restrictions on forest use and management will carry over to any prospective new owner of the land. Any deviation from the terms can be identified and sanctioned according to the terms of the scheme in question. The SINCERE IA uses this same legal mechanism as an integrated part of the contracts made with the forest owners.

The existing schemes represent a non-trivial amount of funding from society. The funding for the IA, however, relied on the budget available specifically for the experimental design. The Danish agencies responsible for the above-mentioned schemes did consider, but finally declined, to implement such experiments within the frame of those larger schemes. The IA relied on existing knowledge about the current state of the Danish forests, and which measures may be taken to enhance biodiversity protection (D3.1).

Treatments: The reverse auction was implemented as a discriminatory price auction where the landowners were asked to both design the action to be taken and to set the price, i.e. the payment wanted for implementing the action. Thus, a positive incentive was created. Additional enabling measures were provided as part of the treatment. These included a detailed description of what information to provide in the bid, and access to research-based recommendations about different types of measures to include (Heilmann-Clausen et al. 2020).

Outputs: The reverse auction was designed in collaboration with the Danish Forest Owner Association and launched on their webpage with information campaigns about the page during spring 2020. Thus, the incentives were delivered to the relevant target groups. As a result, 24 different action bids were received amounting to more than € 180,000 – more than three times the available budget announced in the treatment. Thus, competition was ensured.

Outcomes: A detailed assessment, including field visits, were made to assess the cost effectiveness of each relevant bid and the best bids were contracted. These contracts specified the actions to be undertaken by the landowners, they included geocoding of areas, trees to be preserved etc., and registration of the management restrictions in the deed. In all cases the landowner had, at least until to date, managed the contracted areas in a way that provided a relevant potential for biodiversity protection. In all areas, the contracts implied further restrictions on the management and in particular on the future management options. Thus, while no counterfactual is available to provide evidence of additionality in the future, the restrictions and their legal status suggest that additional gains and quality of biodiversity protection will result from the actions. The forest owners setting aside existing

mature forest for biodiversity received compensation in the range 5-15,000 € per hectare for permanent revocation of production rights on the land under contract. For the actions involving more drastic measures, often on agricultural land, the compensations were higher.

Impacts: As the experiment has just reached the contracting phase, it is not possible to determine yet how large any positive impact on the protection of biodiversity will be. The above-mentioned regulatory framework used in the implementation and the use of biological knowledge, biological context, permanence assessments etc. suggests a net positive and additional impact will be achieved. Given the regulatory context and the generally intensive management of Danish land, there is little reason to suspect on-property leakage, as this would imply that other lands were already managed in-optimally already or that management was somehow constrained.

All landowners expressed satisfaction with the agreements, as would be expected given the positive and flexible incentive design. Most landowners whose bid was rejected also accepted the decision and asked if future competitions would be opened. The broader public may of course mainly enjoy the existence values of these actions -- and will only do so if/ when they obtain public information about the experiment. However, the public may experience the impacts from several of the contracted areas as they are open to the public for recreational purposes.

3.1.2 Is there a potential for upscaling the Danish case?

We evaluate the potential for upscaling across the above-described categories.

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 € over 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) current regulations leave forest owners considerable decision space for management, and ii) private forest owners own a non-trivial part of biologically valuable forestland.

3.2 The Belgian case – reverse auctions for wild boar management and habitat protection

3.2.1 A theory of change perspective on the Belgian case

In this IA two different reverse auction instruments were developed for two purposes, respectively, i) wild boar management through encouraging collaboration between farmers and hunters, and ii) habitat protection measures.

Inputs: Like the case in Denmark, the Belgian IA case is also implemented in the context of existing regulations and practices, notably subsidies for environmentally friendly practices in forestry. In particular, in 2017, new legislation opened the option for developing and implementing land use management plans covering several types of land cover (e.g. forest, heathland) and multiple objectives targeting several ES. The management plan is developed through a dialogue between the private owner and the government agencies. The regulatory setup includes a specifically adapted scheme of subsidies. It is not compulsory for forest owners to have a site-specific management plan, except for nature reserves and public owned sites managed for nature conservation and where European conservation objectives need to be reached. The link between this management plan and access to subsidy schemes forms an important background for the instrument design in this IA.

Through the land use management plans and subsidy scheme both forest owners and regulating agencies are familiar with regulation for ES in Belgium. The presence of existing subsidy funding also shows that the demand for ES is backed by at least some level of finance. Specifically, in this IA, it was possible to access a new source of funding for both instruments developed, namely access to the so-called *Jachtfonds* established coincidentally with the start of SINCERE. This can be a long-term source of funding to meet societal demands for FES, if backed by the governing board of the fund.

Also in Flanders, there is ample knowledge available about the environmental potential to increase the FES targeted by the IA and the private owners. Much like in Denmark, forests in Flanders are scattered and mostly small, and generally low on biodiversity supporting structures. The habitat restoration under the second application here will target improvements to increase biodiversity protection and biodiversity potential in the forests. The restoration will have a special emphasis on improving habitat conditions for species that can be hunted, leading to potentially bigger population of specific game species, and functioning as an umbrella (improving habitats for other, rarer endangered species).

For the instrument targeting wild boar management, an important context is the continued increases in the wild boar population, and the impact it has in society, e.g. traffic accidents, carrying porcine diseases, doing damages to crops and affecting recreational activities in several ways. Wild boar also represent a benefit for biodiversity and natural dynamics and for hunting. Controlling the population will be an overall benefit and maintain public support for having wild boar.

Thus, overall the prerequisite inputs should be in place: Adequate knowledge about the ES being targeted, suitable regulatory framework to function up against and suitable funding sources that may also enhance sustainability of the instrument itself.

Treatments: The wild boar reverse auction was implemented as a first rejected price auction where the hunters and landowners (farmers) were asked to coordinate joint offers for setting up buffer-strips on agricultural land along forests that would be used to regulate the boar populations through hunting and would hence reduce damages to crops. The instrument targeted the eastern part of the province of Antwerp, eastern part of Flemish Brabant, and the province of Limburg. In the second sub-case, the reverse auction was implemented as a discriminative price auction, where landowners were asked to describe according to the instructions in the call, the actions and improvements they proposed to make for a pre-set amount (choice between 5,000€, 10,000€ or 15,000€). The instrument targeted all of Flanders. Thus, a positive incentive was created in both cases. Additional enabling information was provided as part of the treatment.

Outputs: The two reverse auctions were implemented independently. For the wild board auction, too few bids were received to be able to select any for contracting, as competition was considered too low to live up to current regulation on potential over-compensation. The IA team assessed that transaction costs of setting up and running the IM have been large. compared to the impact of the potential contracts if signed and implemented. It is an open question, from the assessment, if part of the costs are fixed costs, and hence less important at larger scales. It should be noted, however, that the wild boar instrument required coordination between at least the farmer farming the land, the owner of the land (if not the same as farmer), and the hunters; and potentially also nearby forest owner(s). Uncertainty of benefits (apart from the payment) may also have played a role for the low participation rate. This case included considerably more interaction and related higher transactions costs than what was called for in e.g. the Danish case or in the Belgian habitat case. The instrument also looked very different from the existing flat rate schemes. Turning to the reverse auction targeting habitats, enough bids were received to make final contracts (15) with a few landowners or managers regarding improvements in habitat quality. These bids entailed much less coordination and hence the transaction costs were lower, and the instrument looked more like an auction-based version of existing flat rate schemes.

Outcomes: In the case of the wild boar IM, no outcomes were achieved due to the insufficient number of bids offered. The targeted outcomes were buffer strips on agricultural land between forest and cropland, which could enhance options to shoot crossing wild boars. Regarding the reverse auction for enhancing habitat quality, 15 contracts have been signed and land management changes will be made according to them. Again, while no counterfactual is available to provide evidence of future additionality, the restrictions imposed by the contracts suggest that additional gains and habitat quality to the benefit of biodiversity will result from the action.

Impact: Similar to the Danish reverse auction case, there is still no specific measurable impacts. In the wild boar case, the failure to attract sufficient bids means the targeted impacts will not be obtained. Regarding the habitat improvement auction, the above-mentioned regulatory framework for implementation and the use of biological knowledge in designing the auction etc. suggest that a net positive and additional impact will be achieved for habitat quality. As in the Danish case, there is little reason to suspect on-property leakage.

3.2.2 Is there a potential for upscaling the Belgian case?

We evaluate the potential for upscaling across the categories described in Chapter 2.

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 potentially also by bids made. The potential for upscaling 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 here, may be suitable. If heterogeneity needs to be handled, a discriminatory pricing version may better. Here the lessons learned could be rather similar to 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. The lesson learned from this case is likely, that such IMs need to consider if and how transactions cost can be reduced through design

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 relies 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 for 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).

3.3 The Croatian case - health functions of peri-urban forests in protected areas

3.3.1 A theory of change perspective on the Croatian case

This IA focuses on valorization of recreational functions of the Nature Park Medvednica in Croatia through direct payments for recreational activities and/or donations towards facility management.

Inputs: The IA is implemented in the context of an existing and new national legislation, which endorses and governs a permit system for the use of FES in relation to sports and recreation activities. The legislation was adopted shortly before the implementation of the IA and demonstrates how national policies might support FES. The legislation also emphasizes the top-level support for valorization of FES in Croatia. Nature Park Medvednica is managed by a public entity under the Ministry of Economy and Sustainable Development of the Republic of Croatia.

A large number of diverse stakeholders uses the Nature Park Medvednica. The annual number of visitors is estimated at about 1 million per year (of which 90% are domestic) which underlines the demand for the services that the Nature Park Medvednica provides. At present, there is no entry fee for entering the area, and anyone has been able to organize larger events and gatherings within the park, which in some occasions has caused conflicts between users. Investments in recreational facilities and operation of the park has no sustainable funding.

Treatments: The IA involves the issuing of one-time concession permits related to sports and recreation events allowing for larger groups to meet and organize events in the park. The concession permits were implemented in 2019. The IA also involved the introduction of voluntary donation boxes for users to donate towards improvement and maintenance of the recreational facilities, but these failed as a funding source. The resources collected through selling concession permits will be collected in a fund. Given the size of the Nature Park Medvednica, monitoring compliance might be an issue.

Outputs: The process of introducing the IA has involved several meetings with groups of stakeholders. Through these, the general awareness about the benefits that Nature Park Medvednica provides for well-being and health through recreation, as well as through the FES in general, has been improved. Thus, the effect of the treatment is to prepare and have the acceptance from user groups for having to pay for using the park for larger events.

Outcomes: The use of mandatory concession permits have enabled the public institution to disperse large groups away from peak visitor zones in the park, thus reducing conflicts between user groups. Furthermore, the issuing of permits has generated funds for investing in recreational infrastructure, such as a Nordic walking trail. The establishment of such trails might incentivize users to exercise more, and thus have an impact on public health. The IA also involved monitoring of damages to soil, flora and fauna and tracking of visitors. This knowledge allows the public institution to prescribe conditions where an activity can be carried out in order to reduce the impact on certain critical areas when issuing permits.

Impact: The IA will have an impact on the recreational value of Nature Park Medvednica, both in terms of *per se* better recreational opportunities for different user groups, but also in terms of reduced conflicts between users, which in turn will enhance the recreational experience for all. This might in return lead to increased demand for the parks recreational services. If the change in recreational infrastructure motivates more people to use the park for e.g. exercising, the IA will potentially have an impact on public health.

3.3.2 Is there a potential for upscaling the case?

National geographical upscaling: The IA is implemented under national legislation and therefore similar initiatives could be implemented 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. It could be considered when e.g. the users (and payers) would benefit from access rights they do not otherwise have or from additional effort put into e.g. riding or biking tracks and spatial dispersal of the activities to reduce conflicts. This could for instance include mountain biking, horseback riding or forest camping, to the extent that users experience a welfare gain.

Upscaling in scope: The instrument used in the Croatian IA targeted primarily recreation with potential spillover effects to biodiversity. The use of the instrument vis-à-vis 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 additional services or access rights beyond what is already legally available for forest users. It our assessment based on previous research and reviews that such market-based provision of services beyond current rights are in place in some countries for some activities.

3.4 The Finnish case – Paying for landscape FES in Ruka-Kuusamo

3.4.1 A theory of change perspective on the case

This IA concerns a payment for ecosystem services where private forest owners are compensated for 'production' of landscape services, e.g. landscape amenities and biodiversity protection. The payment is intended to come from recreational users and others through voluntary donations.

Inputs: Ruka-Kuusamo is a forested area of semi-natural indigenous species. It is one of the major nature-based tourism areas in Finland visited by about one million visitors per year. More than 80% of the area is privately owned by small, non-industrial owners, whose income depends on timber sales. There is a local/national demand for the recreational services provided by the forest owners, but no sustainable funding exists to compensate forest owners for the opportunity cost of delaying or avoiding clear cutting of specific sites to enhance recreational and amenity values.

Money collection in Finland needs special permits from Finnish authorities and the collector needs to fulfill certain requirements, e.g. to be a public entity, in order to avoid taxation of the collected funds.

The Ruka-Kuusamo area is characterized by a low population density with a high share of the population being dependent on FES, including recreation with a high share of the population being employed in the tourism sector.

Treatments: The measure in this IA that enables FES is a payment for ecosystem service provision where the primary groups who benefit from recreational use of Ruka-Kuusamo are encouraged to contribute voluntarily to landscape preservation, which has spillover effects on biodiversity and carbon storage. The collected funds are used for compensating forest owners who have mature forest stands e.g. near hiking routes for the opportunity cost related to avoiding clear felling and the following heavy soil preparation or for the conversion to continuous cover forestry.

Payments are voluntary and the temporal distance between the donation and the conservation action might be a disincentive as ensuring compliance/monitoring is difficult for the individual donor. However, it has to be expected that the potential donors will object if the implementation, i.e. the landscape features they have paid for, is not materializing over time.

By use of inventory data and other spatial data, the IM contributes to coordination of ES production with a focus on the balance of public/private benefits of the relevant FES.

Outputs: The IM involved an awareness campaign with an estimated outreach of about 1.5 million people who, through social media, became aware about the IM and possibly recognized to a larger extend the FES provided by the area.

Furthermore, the IM also enhanced a dialogue between forest users and owners through participation in MAG meetings where a scientific philosophical basis for dialogues on nature and environment-related issues were provided.

Outcomes: The IM collected about 1,000€ within the project lifespan, resulting in conservation of landscape amenities on about three hectares of forest land. As the population in the area is highly dependent on tourism, the IM might have long term impacts on the local employment and income generation if it continues to collect funds and increase in scale.

The conservation actions will lead, everything else being equal, to a small decrease in local supply of roundwood, but the impact on local sawmills will likely be insignificant if any.

Impact: The indirect benefits of FES are enhanced recreation services with a spillover on services such as biodiversity and carbon storage.

3.4.2 Is there a potential for upscaling the case?

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 presents valuable lessons for integrating tourism and commercial forestry needs and interests. However, the limited fundraising success also highlights the inherent weakness in the voluntary donation instrument, which of course threatens a sustainable upscaling.

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. While the main focus here has been use values related to forest recreation, similar approaches could be used for FES of a more public good nature like biodiversity conservation and carbon sequestration. 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. 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.

3.5 The Swiss case – Funeral Forests

3.5.1 A theory of change perspective on the case

The IM is a market based offering of burial sites of human ashes near a specific, demarcated tree and thus directed at enhancing cultural ecosystem services of forests. The direct related effects is the conservation of single trees for a period of 30-50 years and minimal silvicultural treatment of the forest area surrounding the demarcated tree(s).

Inputs: The case area is the forest in the Aargau canton, which occupies an area of around 49,000 ha or 35 percent of the cantonal area. Beech is the most common tree (32%) followed by spruce (26%).

In the Argau canton (region) where the IM has been executed, no legal barriers exist for the deposition of human ashes in the forest. The area is also sufficiently close to populated areas to be relevant as a burial site. Cost of burial sites at graveyards are already a private matter to a large degree.

Treatments: The IM involves forest owners selling burial sites, i.e. ground next to designated trees where next of kin are allowed to bury ashes of a deceased. In return the forest owner will label and conserve the specific tree and the surrounding area for a period of 30-50 years. The enabling measure is as such the relationship between the buyers, i.e. the next of kin and the seller, i.e. the forest owner. Formally, the relationship involves a written contract between the seller and the buyer, followed by a direct payment conditional on the forest owner conserving the specific tree and the surrounding forest area as stipulated.

Outputs: The establishment of a new service, like burial sites, within existing institutions requires an adapted approach, where the potential market actors related to the terms of trade, the services requested and offered. Especially with smaller groups of actors and dealing with sensitive issues new offers can trigger fundamental resistance. The adapted approach used in this IM has been important and paved the way for the acceptance of the IM, and thus for establishing the new local market.

Outcomes: The concrete outcome is that an increasing number of people choose to bury the ashes of their next-of-kin in the forest burial site rather than elsewhere. The next-of-kin and in principle everyone who encounter the burial sites/trees might acknowledge the forest's role as a provider in this form of cultural services. The forest owner benefits from new sources of income as the opportunity costs of conserving trees and modest silvicultural treatment is compensated through the payment for burial sites.

Impact: The IM enhances the provision of cultural FES and recreational users might acknowledge the benefits of conserved old trees and the modest treatment of the surrounded forest area. As the exchange here is entirely voluntary and based on use values, the net impact should be a welfare gain for the buyers, who may appreciate the forest more as a burial site for their relatives and as a place to go to commemorate. A part of this gain is redistributed to the forest owner providing the site and the service, whereas of course the alternative providers lose this business.

3.5.2 Is there a potential for upscaling the case?

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.

3.6 The Italian Ecopay Connect case – PES agreements for poplar plantations

3.6.1 A theory of change perspective on the case

This IA is a public-private partnership where private poplar plantations finance biodiversity conservation in a public park in order to satisfy requirements needed to obtain certification of timber products under the Forest Stewardship Council (FSC) framework. Wood products from certified poplar plantations allows - in theory - for a price premium and for improved market access (Cubbage and Sills 2020).

Inputs: This IA is implemented under the existing national framework and global regulation practices of FSC certification. In Italy, as in many other European countries and beyond, there are national goals for biodiversity conservation, affecting the production of timber from forests. Biodiversity conservation is a public good and hence often relies on public financing. The FSC certification scheme offers certification of forests and forestry on areas that forest owners agree to manage in ways that comply with FSC requirements. These requirements are often over and above what is required under national or EU regulation, more in some countries than others. A necessary input for this IM to work is that the FSC accepts that forest owners can satisfy requirements through offsetting activities on their own land with activities on alternative lands==in this case a publicly owned national park area.

Treatments: The enabling measure in the present IM is a partnership between owners of poplar plantations and the public park, where the former pays the latter for conserving a specific area for biodiversity purposes. The IM has a solid construction with well-defined incentive structures; the poplar plantation owner financing a regional public park to set aside land for biodiversity conservation thereby fulfill part of the requirements needed to obtain the FSC certification of the poplar plantation. The owner may do this to obtain better market access and potentially a price premium on their poplar wood products. The FSC certification involves some degree of monitoring ensuring compliance with the regulations, undertaken by the owner of the certificate and verified annually in the audit by a third party.

Outputs: The IA case partner Etifor facilitated contacts and meetings between poplar plantations and the Park Authorities, which resulted in signed five-year agreements. At this point in time a total of five agreements have been signed, generating funds for about 100,000€. In addition, the FSC certified poplar plywood industries also wanted to contribute to setting aside land and conserving biodiversity by sponsoring the Park, resulting in increased benefits. Thus, the instrument has been accepted by the market exchange actors, i.e. the forest product buyers, the poplar plantation owners, and the public park administration.

Outcomes: The agreements between owners of the poplar plantations and the parks have enabled the creation of 4.4 hectares of natural forest and secured better conditions for about 108 hectares of natural forests. It is important for the additionality and hence value impact of the IM that the area and improved quality of habitats for the benefit of biodiversity is a direct result of the IM and additional to what would be the case under business as usual for additionality to be reached.

Impact: Again, given the time horizon of the project, it is difficult to measure and evaluate the possible effect on biodiversity in the conserved areas. Assuming additionality, the public will be able to enjoy the potential recreational services that originate from the creation of a natural forest and if made aware, they will also benefit from the existence values related to biodiversity conservation. Furthermore, poplar plantation owners likely gain by satisfying FSC requirements at a lower cost than would otherwise have been possible for them. This in turn is what drives their willingness to fund the exchange.

3.6.2 Is there a potential for upscaling the Italian Ecopay Connect case?

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 offsetting schemes, e.g. carbon offsets where companies pay for reduction in carbon emissions in order to compensate for their own emissions or biodiversity offsets schemes where landholders are paid to offset land for biodiversity purposes. In that respect this IM 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 offset 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 offsets schemes that target other ecosystems and ecosystem services, e.g. wetland banking and offset schemes, and new ones are being developed in relation to carbon sequestration and climate mitigation services. Their feasibility, validity and performance often depends 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 of 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. 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.

3.7 The Italian Borgotaro case – improving commercialisation of mushroom picking

3.7.1 A theory of change perspective on the case

This IA involves the development of a new online platform or application to improve the commercialization potential of the existing market for mushroom permits and the mushroom pickers' recreational experience in local forest of Borgotaro.

Inputs: The tool will be implemented in Borgotaro forests in the Taro Valley, Italy. The forests primarily consist of the species chestnut and beech and have been managed as coppice forests for centuries with a 40-year coppice cycle. The legal framework and arrangements on which the IM builds were established in 1964 with the creation of the Consorzio Comunalie Parmensi (CCP) to organize the commercialization of permits for recreational wild mushroom picking. National laws have formally privatized the wild mushroom grown in managed forests, thus making it possible to sell harvesting rights within specific local regulation. The existing permits are paper-based and have to be bought in-person at designated sales points. The market is already well developed with almost 100,000 paying mushroom pickers per year, but the IM rest on the assumption that there is an excess supply of mushrooms that can be targeted by creating or accessing demand from other user groups through lower costs of entry.

The IM is created under conditions where the regional government and the local government have different interests. The IM adheres to existing regulation but is limited by the fact that some of the existing laws regulate the amount of mushrooms a picker is allowed to bag. Environmental NGOs have suggested that increased mushroom picking creates disturbance for flora and fauna and as such comes with a potential expense for the environment.

The IM does not seem to secure compliance, i.e. avoidance of people picking without a permit, to a different degree than the already existing permit system.

Treatments: The enabling measure in this IM is the technological transition from an old-fashioned paper-based permit system to an online system that allows easy access for all users. Specifically, the online system is developed so that users can access and buy permits through a mobile phone application which at the same time offers maps of the forest and works as a way-finding tool.

Outputs: The main goal of this IM is to target new types of users, and as such create demand by e.g. reaching younger citizens, and thus increase the number of recreational mushroom pickers. The system also facilitates that mushroom pickers can be allocated to designated areas creating a link between the probability of harvest and the price of the permit, thus creating a clear incentive structure to buy permits.

The conversion to an online platform for permit selling also has the potential to reduce the transaction costs for the forest owners.

Outcomes: The online platform offers a possibility for geographical control of the distribution of mushroom pickers. This enables the allocation of mushroom pickers to areas with mushroom production that reflects their payment and keep the concentration of pickers in certain areas low and avoid potential conflicts. A key outcome of the implementation of the IM would be the app downloads and buy-in from users not previously active as mushroom pickers. The download and use by existing mushroom pickers of course also represent a relevant outcome.

The funds generated would potentially provide conditions for further FES provision in the future. Mushroom picking revenues from forest land owned by municipalities are distributed according to written rules. Revenues are either reinvested in the forest management that will allow for specific silvicultural treatments or invested in community projects such as the renovation of forest infrastructure.

Impact: The recreational services delivered by the forest might be enhanced for the mushroom pickers, as ease of access and experience are improved for existing as well as new pickers. As a result of the enhanced value for end users and their willingness to pay for this, the forest owners' income and welfare would be improved too.

3.7.2 Is there a potential for upscaling the case?

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 potentially 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. Thus, the service must offer something that is up and above what is currently the right enjoyed by forest users.

3.8 The Peruvian case – payment for water

3.8.1 A theory of change perspective on the case

This IA is a Payment for Ecosystem Services scheme built around a new fee for water users in the city of Cusco, Peru, to fund the implementation of ecosystem-based interventions in watersheds for improving water security.

Inputs: The IA involves management of the Piuray-Corimarca micro-watershed, located 28 km from the city of Cuzco in Peru and covering an area of approximately 17.6 km^2. More than 80% of the rural households do not have access to piped water and 60% are without electricity. The area's major economic activities include agriculture and livestock, forest activities and tourism activities. The watershed is threatened by pollution from domestic sewage and agriculture and the risk of the lake's decreasing water levels due to drought or water overharvesting. Furthermore, rapid urbanization is leading to pollution and increased demand for water in Cusco. Public funding for water is limited and no sustainable provision exists.

The implementation of the IA is based on new Peruvian laws, which enable municipal water supply and sanitation utilities to pay actors for delivering hydrological ecosystem services. Furthermore, this payment presents a new opportunity to solve conflicts between upstream communities and downstream urban water users.

Implementation is troubled by the lack of a 'governance' platform allowing stakeholders to communicate. This is further accentuated by the existing power asymmetries e.g. between the big drinking water company and the impoverished communities.

Treatments: The PES scheme is the enabling measure that obliges water users in Cusco to pay an extra fee on the water bill. The funds collected are used to improve hydrological services through the planting of trees and the creation of infiltration trenches. The result is allegedly better water quality and regularity for water users. As such, the IM has well-defined incentive structures that should ensure sustainability. The fee was implemented in 2019.

The ecosystem service supply, in terms of more and better water quality, is secured by local communities of the Piuray Watershed jointly with the urban water utility company SEDACUSCO. The water is distributed by SEDACUSCO and sold to urban water users in Cusco.

Outputs: Although the IM has been implemented through a participatory process, the IM did not manage to ensure wider participation and consent of local communities in the decision-making process, beyond providing information. The process has been characterised by diverging objectives among the stakeholders and the legacy of historical conflicts. As such, dialogue among stakeholders, inclusiveness in decision-making and benefit-sharing all need to be improved.

Nevertheless, the IM has achieved the completion of on-the-ground interventions with several communities such as reforestation with native species and the building of infiltration trenches. There are relevant lessons learned regarding important issues for implementation modalities that should be addressed during implementation of similar initiatives and might in the long run present an opportunity to solve conflicts between upstream communities and downstream urban water users and serve as a learning site for other PES schemes in Peru.

Outcomes: The IA has provided the conditions for securing drinking water in the future for the local water users in Cusco, Peru. It is, however, unclear who will benefit from the improved water regulation from the IM beyond that. Local communities have been compensated for their fieldwork (planting trees, digging trenches, etc.), but not for the opportunity cost of the land lost for productive purposes. The current legal framework around hydrological retributions in Peru prevents the water company from paying direct monetary compensations to upstream service providers.

Impact: The IM has taken measures to secure the ecosystem services related to water and soil regulation services. The water users should eventually experience a welfare gain from the improved services, provided these are not captured before reaching them. The IM contributes towards

reforestation in the area and uses only native species for tree plantations and grassland restoration to avoid negative impacts on biodiversity.

3.8.2 Is there a potential for upscaling the Peruvian case?

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-Piuray 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. Another is that the case once again demonstrates the problems of the national legislation prohibiting direct payments/ benefits to the service-providing landowners and communities. 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, and in calling for reforms of the supporting national legislation.

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 upstream--downstream 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 interrelationship between different, e.g. seasonal, users of a resource.

Upscaling to other countries: The PES scheme has earlier been implemented in several situations, especially in developing countries where it presents an effective way to obtain sustainable financing. Also in developed countries similar instruments are applied, such as by water utility companies paying for afforestation measures on agricultural lands in a watershed, although in high-altitude areas reforestation sometimes can have perverse, water-consuming effects. The experience of the Peruvian IM has been disseminated in Latin America, where there is a high interest in PES.

3.9 The Basque case

3.9.1 A theory of change perspective on the case

The Spanish Basque country IA aims to develop a local regulatory framework to include the economic value of services provided by forests as an integral part in the Basque region's forest management strategy. The aim of this is to provide a basis upon which future PES can be designed for the enhanced supply of FES.

Inputs: The IM will be implemented in the county of Bizkaia, which is an autonomous community of the Basque Country in Spain. It consists of a small mountainous area of about 220,000 ha, about 60% of which is covered by primarily *Pinus Radiata* and *Eucalyptus ssp*. forest. A total of 75% of the forests

are privately owned and the remaining 25% is owned by municipalities. More than 30,000 ha are regarded as protected natural areas. The private forests in Bizkaia are owned by more than 10,000 individuals owning plots of typically 5-6 ha in size. It represents a community with a long tradition of forestry, but there is a risk of forest abandonment. The forests play a key role in the water regulation, in the protection of the soils and the fight against erosion.

The autonomy means that the local government of Bizkaia has exclusive competences to develop its own forest strategy and regulations within the national legal forestry framework. The area is dependent on FES in terms of water provision and erosion protection, but no sustainable financing exists to secure its provision. Various restrictions on the use and management of forests are in place, but the current forest and environmental laws are not mutually coordinated.

Treatments: The enabling measure in this IM is the implementation of new legislation that enacts payments for the ecosystem services delivered by the forest. This includes identifying and quantifying FES that typically constitute externalities of forest management, and internalizing them in the management. The IM enables a change in the choice of species and silvicultural methods leading to a more environmentally friendly management. The legislation is still under preparation, but the FES framework aims at generating a clear incentive structure to secure the delivery of FES, thus also securing the necessary funding.

Outputs: In the ongoing process, the IM has ensured the participation of a number of different actors related to the forestry sector (e.g. forest owners, universities, research centres, administrations etc.) in order to obtain a holistic view and to integrate all possible concerns and worries. The IM's output has been a broad ownership to forthcoming changes in regulation frameworks.

Outcomes: If successful, the IM will in the long run enhance the provision of several types of FES, including improved water regulation and decreased erosion risk in the area.

Impact: The effect of the IM will be securing the use values of water provision and reduced erosion. Furthermore, the public recognition of the value and importance of the FES delivered through the management of forests is key for the IM.

3.9.2 Is there a potential for upscaling the case?

National geographical upscaling: Notably, the initiative was originally conceived for the entire Basque country. Piloting these ideas more tangibly in Bizkaia thus already constituted a necessary *downscaling* of the original ambition, providing demonstrable proof of concept in the first place. The premises of the current IM 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 Bizkaia 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, the implementers envisage 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.

3.10 The Catalonian case

3.10.1 A theory of change perspective on the Catalonian case

The IA in Catalonia, Spain, consists of two IMs; The inclusion of forest and forestry in a joint planning instrument for the Water reservoir of Rialb and the creation of a Forest and Water Fund that relies on a PES mechanism. The fund involves the creation of a local forest owner association that produces a forest adaptation and mitigation plan, where forestry treatments beneficial for water, biodiversity and carbon are prescribed. Payments from different beneficiaries for water provision will be distributed through the Forest and Water Fund to forest owners that are members of the organization and performs the prescribed treatments.

Inputs: The IMs have been implemented in the Catalonian province of Lleida, in the area surrounding the water reservoir of the Rialb valley. The reservoir is placed in the watershed of the Segre River and surrounded by six municipalities with a forest area share of 88%. The region's forests are primarily owned by private owners (about 80%). In the case area around the Rialb reservoir there are approximately 1,000 forest owners who on average own a forest of 8.2 ha in size. Forest management is rather low and only 36% of private forest land is under a forest management plan. The forests have in general low profitability due to low productivity, complex topography and inaccessibility. This, combined with a general rural population exodus, has led to land abandonment, where former fields naturally are evolving to new forests. The unmanaged forest growth increases the risks of large forest fires, diseases or mortality during drought episodes that negatively affect FES provision, particularly the quantity and quality of water but also biodiversity and climate regulation.

Treatments: The creation of the Forest and Water Fund with the underlying payment for ecosystem services scheme is the measure that enables provision of water. The creation of a forest owner association eases the participation of small forest owners by reducing individual transaction costs. The association is also responsible for creating the adaption and mitigation forestry plan that describes the management (treatments) that will increase resistance and resilience. The impacts on water provision, biodiversity and carbon has been calculated using the CLIMARK framework. The forest management is 'certified' or monitored by the regional public forest agency (Centre de la Propietat Forestal). The targeted buyers of the FES are mainly water utility providers (hydroelectric companies, water provision utilities), but also companies interested in corporate social responsibility. A conditional incentive structure therefore seems to be in place that can support the sustainability of the IM

Outputs: The IMs have been implemented through a strong participatory process stretching over four years. A total of four MAG meetings have involved a high number of participants representing stakeholders from regional and public entities, forest owners, farmers unions and rural associations, locals, nature NGOs, research and water governance. The involvement of the stakeholders throughout the process has secured as an output a good level of shared understanding and objectives and a co-responsibility.

Outcomes: The establishment of the Forest and Water fund and the underlying PES mechanism will potentially be able to generate income for small forest owners who in turn provide better conditions for further FES provision.

Impact: The IA has scheduled forest treatments to be implemented within the next three years on 20 hectares of forestland. These treatments will impact water provision as well as carbon balances and biodiversity to the benefit of the local communities and wider.

3.10.2 Is there a potential for upscaling the Catalonian case?

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 seem 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.

3.11 The Russian case - Providing multiple ecosystems services by forest renters

3.11.1 A theory of change perspective on the case

The Russian IA is drafting new legislation that allows renting forestland for multiple purposes in order to increase economic efficiency and maintain a balance between all ecosystem services.

Inputs: The IM use a case study area of 8,512 ha, situated within Staroustinskoe forestry unit in Voskresenskoe forest district. Russian forests are primarily state-owned, and this is the foundation of forest policy. Forest management is transferred to regional governments. Private users can lease use rights for a period of 49 years, e.g. harvesting rights from the regional governments through a tender system. Currently, a tenant can only rent a forest plot for a single use, thus profiting and managing the forest plot for one forest product or ecosystem service. To utilize other services on the same plot, the tenant must participate in a new tender on same terms with other potential tenants, potentially leading to more than one tenant on the same plot and subsequently to more frequent conflicts

between tenants. The current Russian national forest law has a clear focus on timber production and harvest and does not facilitate payments for several FES.

Treatments: The enabling feature in the present IM is the attempt to change the current legislation, the National Forest Code, to include the concept of ES and allowing payments for FES, and furthermore to include multiple use rights in the tender process for leasing a forest plot. The hope is that this will establish incentives for forest owners to provide FES, or at least allow for an integrated management for all valuable marketable uses by the leaseholder.

In order to facilitate payment for the services, the establishment of a market (e.g. carbon credits) has been envisaged, but also a tax system has been proposed as a means to raise funding for, or to otherwise compensate or pay the forest tenant for supporting the production of FES.

Outputs: So far, the presentation of the ideas drafted to be implemented in the Forest Code has helped raise awareness about FES and multi-functionality in forest management. The proposed implementation has generally been accepted by most of the stakeholders. It might also prevent possible conflicts between the lessees of conflicting FES (e.g. wood harvesting and recreation on the same area).

Outcomes: If the IM succeeds in changing the Forest Code, it has the potential to affect FES provision by creating incentives for an integrated management where focus is not just on timber production. The IM might stimulate forest tenants to preserve and increase the production of multiple FES, e.g. recreational services where forest visitors will enjoy the use values, but also biodiversity and carbon sequestration where the public under certain conditions might benefit from the non-use values. All of this will require that changes in legislation are accompanied by instruments that create the right incentives.

Impact: The IM supports the enhancement of biodiversity and climate change adaptation measures through sustainable forest use and will potentially have an effect on social welfare.

3.11.2 Is there a potential for upscaling the case?

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.

4. Discussing patterns and lessons across IMs

Across the SINCERE Innovation Action cases, 12 different innovative mechanisms have been pursued and implemented. We will discuss and analyze their commonalities and potentials for upscaling as well as how their upscaling potential may be assessed through a rough grouping of the mechanisms into 1) IMs targeting the legislative frameworks, 2) market-based instruments for public goods, 3) donations for public goods, and 4) user fees. As mentioned in the introduction, this deliverable builds on an adapted version of the Theory of Change framework alongside the theoretical framework on different types of goods and services (Ostrom 2003).

4.1 IMs targeting the legislative framework

Two of the IMs target changes in national or local regulatory frameworks aiming at increasing incentives for a socially optimal provision of forest ecosystem services. However, the two IMs differ in ways that are important to understand their respective 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 product/ 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 Russian IM also argues for changes in the forest law that will allow for payments for forest ecosystem services that do not lend themself 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. However, the Basque case is now also being combined with an applied PES pilot project, which can serve as a demonstration of proof of concept. This initial *downscaling* of the effort may help to gain political support for and local experience with the PES concept, which are needed as essential preconditions for eventually establishing a future PES system at a more elevated scale.

In a Theory of Change framework, both IMs target the regulatory framework that is a key part of the "Input" cf. Figure 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, many IMs can be upscaled*, but clearly not be simply copied over. This is because targeting changes in laws and regulations will always be specific to the local or national regulation in question.

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

The IMs implemented in SINCERE's Danish and (one of the) Belgian cases target improved biodiversity conservation measures, i.e. pure public, non-subtractable goods where exclusion is neither feasible nor desirable. They are designing instruments to encourage forest owners' participation, yet also aiming for more cost-effectiveness induced through competition in the reverse auctions. Notably, they obtain access, in different ways, to experimental implementation funds, and thus to some extent remain unchallenged on a crucial 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. Indeed, across the EU several funding

schemes are in place targeting similar public goods, but using much simpler instruments, e.g. flat-rate schemes with little outcome attention and prioritization. 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 securing the potential for improving the provision of forest ecosystem services provided actions and protections are implemented as stipulated in the contracts. This may in turn depend on monitoring of compliance is and remain in place over the coming decades. The IMs also appear to be able to take advantage of the heterogeneity of forest owner preferences and opportunity costs documented in the literature (Broch and Vedel 2011, Vedel et al. 2015), and thus enhance cost-effectiveness of FES provision. 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 so far performed well. *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, and potentially increase cost effectiveness and targeting relative to current flat-rate schemes used in many countries for similar FES.

4.3 Securing the funding for public goods through donations

Two of 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. In the Finnish case, the general rights of access are so liberal and issues of congestion etc. generally so small that recreational access to forest and national parks can be safely assumed to be a public good (though of course access to any specific site will be costly in terms of transport and time). A similar argument appears valid for the Croatian National Park serving as the case area for SINCERE.

In both cases, securing funding through voluntary donations based on mild persuasion and nudging proved very difficult, failing to raise funding of any significance. In the Croatian cases, the donation boxes were misused for other purposes and abandoned. These experiences are unfortunate, though also not entirely unexpected, in the sense that free-riding behaviour often prevails (Ostrom 2003).

From a Theory of Change framework perspective, these treatments represent attempts to target lack of funding for enhancing and improving the recreational services. Thus, they are addressing a shortcoming vis-à-vis one of the basic inputs for the Theory of Change. 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 often imply that they are unlikely to reach the funding scale needed to fully finance the envisages innovative actions.*

4.4 On-site user fees paying for ecosystem services

Three SINCERE innovation actions have designed IMs that aim to extract payments from on-site users to transfer income to providers of forest ecosystem services, incentivizing them to enhance the provision of these services. These transactions can be fairly direct access fees (if you don't pay, you cannot come in and use the service), but they may also involve usage and management provisions over time, in which case they will be contractually phrased. The user fees in our IA vases are focusing on distinct types of goods.

The simplest case is the Italian Borgotaro 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 also whether 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 here.

Second, 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 countries do forest users have a right to bury the ashes of their family in the forest without permission from the forest owner. Thus, the forest owner holds the relevant exclusion rights for this use and can, if allowed, sell this right and related services to interested users.

Third, in the Croatian case one IM targeted payment for group-based and organised recreational activities. Again, the ability to collect 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 exclusion work to enable market-based solutions. *These IMs are scalable to any context where a similar distribution of rights exist.*

4.5 Off-site user payments: PES and offsets

Unlike the case of on-site user fees, we had in SINCERE also four other IM cases where the payments came from beneficiaries using the service potentially far away from the forest. This is a different set-up, since the forest owner then cannot simply deny non-paying users' access. However, if forest owners do not take remote users' interest into account in their forest management, the latter may lose out. This is the most complex externality situation from Table 2 above: a non-subtractable public good where exclusion rights are fundamentally inhibited by a spatial divide between provision and use of a service. These cases closely resemble the market-based instruments from Section 4.2, but beneficiaries are here in 4.5 paying more directly for the provision of services.

First, the Peruvian IM case is a classical watershed PES with a special Andean flavour. It targets a common water coordination problem between potential upstream providers and downstream users of an ecosystem service focused around cleaner and seasonally more stably available water. The water resource is a 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, encourage a PES 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 cases*, such as for regulating flood damages along European rivers if upstream landowners could be compensated for changing practices to mitigate rain floods.

Second, the Catalonian 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 comes 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.

Third, the Italian poplar afforestation case aims to produce FSC certified wood. Poplar growers find it too costly to meet biodiversity protection requirements in the FSC certification scheme on their own land. They hence found a national park where funding for additional biodiversity conservation actions can be put to use instead. 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 offset biodiversity conservation actions at lower cost and/or of arguably 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.* We note the need for attention to additionality, which should be a concern along down-stream part of the value chains building on instrument like this.

Finally, in something of a hybrid case, the Belgian wild boar compensation scheme aims to enhance local ecosystem services by increasing coordination among several users and providers. Here, the hunters fee fund (an onsite access fee) is used as a source of funding for auctioning contracts (a market-based mechanism) on wild boar regulation contracts 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 shoot and regulate the wild boar population. While an interesting case, the practical experience that very few submitted bids suggest that the social complexity and costs of coordination among the agents were probably excessively high, in relation to the potential gains. *The scalability of this IM is thus 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.

5. Concluding remarks and perspectives

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-paid ecosystem services, to enhancing markets for already marketed non-wood forest products. Above we have case-specifically pointed out barriers and enablers for potential upscaling of each IM, and have discussed how they share different challenges or features, depending on the good targeted, and the regulatory and ecological context. The analyses where structured according to the elements in a Theory of Change framework. Here we offer some concluding remarks on these aspects.

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's access, a marketed service or product cannot develop. 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 equitable distribution of access rights, i.e. it may produce the largest amount of social welfare. It may, however, also imply losses in some cases. For example, in case of heavy congestion, strong externalities, inequities and shortages caused by large commercial crowding out small-scale/ local service/ product

users, or similar particular issues , the forest owner will have little 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 amount of paths or roads in the forest. The owner will have an incentive to do this 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. This kind of obstruction to access is illegal in e.g. Denmark, and is frequently sanctioned against. However, ambitions to dig into these forest usage rents through access limitations and fees may often run into severe problems, ranging from monitoring and sanctioning, large transactions costs of enforcing, transaction costs for users, as well as equity concerns of turning a historically freely available access into a commercial service limited to the paying public. There is a danger that public perception of forests will also come to deteriorate as part of such a process of 'enclosure of the commons'.

On the other hand, if forest owners have, and effectively make use of a right to exclude users from certain products or services, then it is clearly an option to develop marketable services. This is quite obvious from our IMs for recreational or similar forest services: some are turned into user-paid services, others not. It may be politically easier to implement access/ usage fees when the users are commercial (e.g. recreational event organizers, large-scale mushroom pickers, tourism operators), rather than charging ordinary citizens making day-to-day non-consumptive uses of the forest (e.g. individual hikers, mountain bikers, occasional small-scale mushroom pickers).

These examples show that how the society decides to distribute rights will affect the potential for innovation in market mechanisms that would enable enhanced provision of ecosystem services against a payment. Therefore, an important practical finding in SINCERE is that it may be crucial to question and assess the adequacy of current legislative frameworks in any particular country or region.

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 offset 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. In the case of offsets, hard questions about substitutability (e.g. of biodiversity equivalents) and additionality (e.g. of already protected, seemingly unthreatened areas) need to be asked, in order to make sure that the alleged IM does not *de facto* become a fig leave for greenwashing.

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 IM 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 based on 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 of these features imply low social pressure and no incentive to donate. Instead, there is a clear incentive to free-ride on the provision, and hope that others will be donating in spite.

Thus, also in SINCERE the core challenge of accruing funds for the enhanced provision of key public goods like biodiversity protection remains unresolved. While none of the cases in SINCERE targeted carbon sequestration, similar constraints likely apply. 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 partly resolve this market failure. Regulation requiring private sector actors to ensure offsetting of any damage to specific habitats is a major driver of private funding for biodiversity related (though in general not biodiversity improving) offset 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. We lack a coherent theoretical and empirical research effort that can answer some essential questions around these markets: Under what contextual conditions will efforts produce impacts that are (entirely or partly) additional? What accounting structures and relations to international policy goals and agreements are most relevant? What permanence and time profile of impacts can we expect under various mechanism designs? How can private agents report on/ credit their activities in these markets? Does it make scientific and societal sense to count the resulting impacts against the regulatory obligations of these agents?

Answering these and many other questions is important for guiding the broader environmental efforts of our societies, including those of targeted private funding, towards achieving high-quality, value-adding actions. This also means steering away from those well-marketized operations that upon closer scrutiny prove to produce business-as-usual scenarios with 'hot-air' outcomes, i.e. with negligible environmental additionality. These alleged innovative mechanisms will then quickly be labelled as greenwashing, giving the economics of ecosystem services a bad name. To the extent that society comes to gradually lose faith in the integrity of such economic mechanisms, it will also increasingly choose to forego 'gains from trade' and tools designed for economic efficiency, making it eventually slower and much more socially expensive to achieve the environmental goals that society is targeting.

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