

LIFE ProForPES

Promoting effective forest PES through the EU financial and state aid programs

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WP2 “Framework for assessment of PES-related mechanisms”

TASK 2.1 Research framework to guide data collection, data analysis and interpretation

Executive summary

The LIFEProForPES project has set its aim to systematically evaluate the outcomes of past and ongoing European Union (EU) projects funded by the European Commission. Its goal is to capitalise on the achievements of these projects, which involve extensive networks of partners from policy, administration, business, NGOs, and civil society groups at both the European and international levels. The overarching objective is to enhance the sustainability of forest ecosystem services (FES) provision in Europe and generate insights into the feasibility and scalability of the most innovative and successful projects.

We have constructed our theoretical framework based on the critical analysis “Evaluating the outcomes of payments for ecosystem services programmes using a capital asset framework” by Hejnowicz et al. (2014). This study systematically compiled, consolidated and analysed PES literature, which describe specific PES projects and the ‘measured outcomes’ of these projects. Moreover, the researchers collected observed barriers to PES uptake and the potential opportunities for enhancing PES projects success. Their approach builds on work by Wunder et al. (2008), Daniels et al. (2010) and Pattanayak et al. (2010) but, on top of that, they adopted a Capital Asset Framework (CAF) approach, to introduce a new means by which PES project management interventions can be systematically appraised.

Essentially, the theoretical framework consists of three different parts: Part 1 aims at deconstructing PES arrangements, namely project operational and implementation arrangements, the project design and institutional arrangements, and the project financial and funding arrangements. Part 2 deals with the Capital Asset Analysis of PES outcomes. More specifically, this second part investigates the i) Human and Social Capital; ii) Natural Capital; iii) Financial Capital; and iv) Institutional Capital. Part 3 identifies the barriers and the opportunities for improving PES projects’ design and implementation.

The data collection process will involve three distinct steps:

- Firstly, we will utilise an Excel spreadsheet to gather data from 200 PES cases sourced from the aforementioned databases. Our objective is to extract information related to the operational and implementation arrangements of each project, as well as details regarding project design and institutional setups.
- Simultaneously, to maximise the amount of data collected, we will distribute a survey to the focal points of the PES projects included in our Excel file. The survey will consist of four sections: i) Project Arrangements, ii) Project financial and funding arrangements, iii) Capital Asset Analysis, and iv) Challenges and Opportunities. Upon completion of the survey, we will inquire if the participants would be available for a brief semi-structured interview. This will allow us to delve deeper into specific aspects of the project that may require further exploration.
- The third and final step involves conducting interviews to conduct a more comprehensive analysis of certain aspects of the presented PES projects, which may not have been fully investigated through the databases or the survey. It is crucial to acknowledge that interviews will be conducted solely if there is sufficient availability of time and resources.

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Abbreviations

BOKU	Universitaet Für Bodenkultur Wien
EFI	European Forest Institute
ETIFOR	Etifor SRL
HNEE	Hochschule Fur Nachhaltige Entwicklung Eberswalde
UNIPD	Università degli Studi di Padova

1. Introduction

In Europe, approximately 35% of the total land area is covered by forests (Korhonen and Stahl, 2020). These forest ecosystems play a crucial role in providing a wide range of forest ecosystem services (FES) (García-Nieto et al., 2013; Orsi et al., 2020). FES refer to the various goods and services, both tangible and intangible, that forests provide and benefit society as a whole. The positive impact of FES on human well-being has been widely acknowledged (MEA, 2005; IPBES, 2018). The demand for FES is also increasing due to factors such as population growth and the growing recognition of forests' significance in addressing environmental, climate, and biodiversity challenges (EC, 2021). Moreover, the emergence of the Covid-19 pandemic has raised awareness about forest ecosystems and the benefits they offer for human health. As a result, the demand for FES has further increased (Sauter et al., 2019). This includes a greater emphasis on FES that were previously undervalued, such as cultural benefits (Grima et al., 2020; Ugolini et al., 2020) and biodiversity-related services (as exemplified by initiatives like the 3 Billion Trees Pledge within the Biodiversity Strategy). While the demand for FES is high, there are challenges to their provision due to the negative impacts of global warming (IPCC, 2021) and the growth of the global population (Roser et al., 2013). These factors pose threats to the sustained provision of FES.

The growth of the global population leads to an increased human pressure on natural resources (Maja and Ayano, 2021), including forest ecosystems that are already vulnerable to extreme events and external factors due to global warming. As a result, the resilience of forests decreases, leading to forest degradation and limiting their capacity to provide forest ecosystem services (FES) (Mina et al., 2017). This has led to a growing disparity between the demand and supply of FES in recent decades (EEA, 2015). Despite the implementation of various policy and economic measures to encourage FES provision, forest owners and managers continue to face challenges in managing their forests to deliver these services (Ezzine-de-Blas et al., 2016). One significant issue that European policies need to address in order to align the demand and supply of FES is the recognition and reward system for forest owners for the benefits they provide.

In Europe, different approaches have already been implemented to support non-marketable and bundled FES. These include the establishment of collaborative forest owner associations (e.g., Bowditch et al., 2020), the adoption of more sustainable and nature-friendly forest management practices (e.g., Krumm et al., 2020), and the introduction of sustainability certifications and payment for ecosystem services (PES) schemes (e.g., Prokofieva and Wunder, 2014). PES, in particular, has emerged as one of the most widely implemented market-driven instruments to support FES provision, involving both private and public actors.

Despite the progress made, there are still several unresolved issues that hinder the effective implementation of payment for ecosystem services (PES) and PES-like schemes. Firstly, most PES-related analyses have primarily focused on the supply of forest ecosystem services rather than addressing the need to incentivize the demand side and explore innovative ways to reward forest owners. This gap needs to be tackled for a more comprehensive and balanced approach. Secondly, although a considerable amount of scientific literature exists on PES, there is still a lack of deep understanding regarding the contextual and scale-related factors that contribute to their success. To ensure the effectiveness of PES, it is crucial to gain a better understanding of these factors and their influence on the outcomes of such schemes. Thirdly, PES design has been predominantly influenced by traditional actors, and the type of land ownership structure often limits the scope of PES. Exploring how forest associations, alternative organisational models, and other stakeholders can be integrated within PES and PES-like schemes could enhance their application and effectiveness. Lastly, at the European level, various strategies and trends offer promising opportunities for the development and strengthening of PES and PES-like schemes. For example, the introduction of green and scope taxes encourages a transition to more sustainable sectors. However, these strategies often lack efficiency as they frequently fail to incorporate the concept of circularity and reinvest the generated green taxes into natural capital. Furthermore, the implementation of PES and PES-like schemes often remains limited to pilot projects or independent studies without sufficient support and coordination at the national or international level.

In conclusion, addressing these open issues is crucial for the effective implementation of PES and PES-like schemes, including the need to incentivize the demand side, consider contextual and scale-related factors, explore alternative actors and ownership structures, and ensure coordination and support at the national and international levels.

To address this gap, the LIFEProForPES project has set its aim to systematically evaluate the outcomes of past and ongoing European Union (EU) projects funded by the European Commission. Its goal is to capitalise on the achievements of these projects, which involve extensive networks of partners from policy, administration, business, NGOs, and civil society groups at both the European and international levels. The overarching objective is to enhance the sustainability of forest ecosystem services (FES) provision in Europe and generate insights into the feasibility and scalability of the most innovative and successful projects.

The specific objectives of the LIFE ProForPES project are the following:

Objective 1: To select and enhance knowledge about existing forest payment for ecosystem services (PES) and PES-like schemes in the EU. This objective will be accomplished through three stages: Firstly, the development of a theoretical framework to guide data collection, analysis, and interpretation. Secondly, the creation of a European-based database containing a minimum of 200 PES/PES-like projects, out of which 30 cases will undergo in-depth analysis, and approximately 50 key stakeholders will be interviewed. Lastly, conducting a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of the aforementioned 30 projects.

Objective 2: To enhance the integration and promotion of PES and PES-like schemes within the EU financial and state aid frameworks. This objective will be achieved through two steps: Firstly, assessing the existing gaps and potential within the EU financial framework that need to be addressed in order to enhance European FES. Secondly, describing the gaps and potential within the state aid framework that need to be filled to improve European FES.

Objective 3: To encourage the adoption of forest PES and best practices within the current and future EU funding periods and state aid regulations. This objective will involve three steps: Firstly, providing operational policy and business guidelines and recommendations for future funding programs. Secondly, evaluating and refining the provided guidelines/recommendations through multi-criteria and multi-stakeholder assessments by consulting relevant stakeholders at the EU level. Lastly, promoting, communicating, and disseminating the final results of the project to policymakers and the scientific community.

Through the pursuit of these objectives, the LIFEProForPES project aims to contribute to a more comprehensive understanding of forest PES and PES-like schemes in the EU, facilitate their integration into financial and state aid frameworks, and promote their widespread adoption to enhance FES provision.

This report will present the theoretical framework (TF) specifically developed to achieve **objective 1**, which will be key for achieving the remaining two objectives.

The remaining part of this report is organised as follows: Chapter 2 will introduce the various components of the theoretical framework developed to evaluate Payment for Ecosystem Services (PES) projects. The goal is to offer guidelines and recommendations for enhancing scheme design, application, and implementation by considering their impacts on social, environmental, financial, and institutional capital assets (Hejnowicz et al., 2014). In Chapter 3, we will delve into the timeline allocated for the completion of task 2.1, providing a detailed explanation of the schedule we had to deliver the assigned tasks.

2. Theoretical Framework

The utilisation of market-driven incentive (MDI) mechanisms to address the obstacles associated with landscape and ecological preservation, climate change mitigation, wetland rehabilitation, and biodiversity safeguarding is on the rise (Gómez-Baggethun et al., 2010; Muradian and Rival, 2012; Pirard, 2012). This indicates a fundamental change in national and international policies concerning the use of natural resources (Farley and Costanza, 2010; Pokorny et al., 2012). The emergence of MDIs has been justified based on their ability to rectify market inefficiencies, mitigate information disparities, furnish decision makers with price indicators, and bridge the financial gap in conservation efforts (Gomez-Baggethun and Ruiz-Perez, 2011; Pirard, 2012). Despite these endorsements, apprehensions persist. There is a restricted comprehension of the circumstances in which payment for ecosystem services (PES) programs accomplish enhancements in the flow of ecosystem services (ES), promote sustainability in natural resource management, or foster sustainable means of subsistence.

The legitimacy and appropriateness of constructing PES theory based on Coasean principles have encountered challenges due to the intricacy, uncertainty, and asset specificity associated with managing ecosystem services (Farley and Costanza, 2010; Kosoy and Corbera, 2010; Muradian et al., 2010; Vatn, 2010; Muradian, 2013). Some argue that achieving win-win outcomes for conservation and development is feasible with well-designed projects (Pokorny et al., 2012; Kinzig et al., 2011), while others consider this perspective overly optimistic considering the influence of various contingent factors (Redford and Adams, 2009; Muradian et al., 2013). Indeed, numerous practical obstacles can hinder the implementation and achievement of success in such projects. These obstacles encompass various aspects, including the design of the scheme and payment structure (e.g., Engel et al., 2008; Kelsey Jack et al., 2008; Kemkes et al., 2010; Adhikari and Boag, 2012); methods of implementation (e.g., Engel and Palmer, 2008; Zhang and Pagiola, 2011); the management of trade-offs resulting from the need to balance efficiency, effectiveness, and equity (e.g., Borner et al., 2010; Pascual et al., 2010; Narloch et al., 2011); organisations' arrangements and willingness to cooperate (e.g., Muradian et al., 2010; Vatn, 2010); spatial targeting, monitoring, participation, and compliance (e.g., Wünscher et al., 2008; Wendland et al., 2010); the adequacy of property rights (Lockie, 2013); and social and well-being outcomes (e.g., Bulte et al., 2008; Pattanayak et al., 2010; Daw et al., 2011). Considering that the adoption of PES will persist, it becomes imperative to jointly evaluate both the environmental and social effects to ensure the long-term validation and effectiveness of PES (Kelsey Jack et al., 2008; Farley and Costanza, 2010; Brouwer et al., 2011).

We have constructed our theoretical framework based on the critical analysis "Evaluating the outcomes of payments for ecosystem services programmes using a capital asset framework" by Hejnowicz et al. (2014). This study systematically compiled, consolidated and analysed PES literature, which describe specific PES projects and the 'measured outcomes' of these projects. Moreover, the researchers collected observed barriers to PES uptake and the potential opportunities for enhancing PES projects success. Their approach builds on work by Wunder et al. (2008), Daniels et al. (2010) and Pattanayak et al. (2010) but, on top of that, they adopted a Capital Asset Framework (CAF) approach, to introduce a new means by which PES project management interventions can be systematically appraised.

The CAF initially emerged as an assessment tool for rural livelihoods, emphasising the interplay between individual and community assets and highlighting the role of collective action in promoting local empowerment and fostering development (Carney, 1998; Bebbington, 1999; Rudd, 2000; Green and Haines, 2008). The CAF establishes connections among the socio-ecological context, institutional structure, the impacts of changes in capital assets and their resource flows, and potential economic or political interventions guided by the values of actors or society (Rudd, 2004). It has been applied in diverse research contexts such as, among others, evaluating opportunities for poverty reduction through compensation-reward schemes for ecosystem services (van Noordwijk et al., 2007), identifying barriers to the adoption of agricultural greenhouse gas mitigation

measures in rural communities (Dulal et al., 2010), and assessing capacity-building needs for tourism development in gateway communities adjacent to protected areas (Bennett et al., 2012).

Our theoretical framework aims to gauge the effectiveness of PES projects as tools for environmental management by assessing their influence on social, environmental, financial, and institutional capital assets.

At the individual level, human capital encompasses abilities, knowledge, expertise, and well-being (Rudd, 2004; Brondizio et al., 2009; Behrman, 2011; Winters and Chiodi, 2011; Bennett et al., 2012; Moav and Neeman, 2012). On the other hand, social capital pertains to the social structures and relationships that facilitate the transmission of norms and trust based on reputation (Bebbington, 1999; Rudd, 2000; Adler and Kwon, 2002; Brondizio et al., 2009). Natural capital encompasses the elements of ecosystems, including their structure, functioning, and the provision of ecosystem services to humans. It also accounts for the impact of PES programs on land management practices and any resulting changes (Costanza and Daly, 1992; Daily, 1997; van Noordwijk et al., 2007). Financial capital refers to the economic resources available to households and communities, including the flow of funds for conducting activities and ensuring fair distribution and equity (Rudd, 2004; Bennett et al., 2012). Lastly, institutional capital refers to the aspects of resource governance, institutional transparency, and accountability.

The objective is to establish an evaluation methodology for PES studies, along with their associated projects, that facilitates improvements in scheme design, application, and implementation. Furthermore, we will identify the barriers encountered in the adoption of PES and explore potential avenues for enhancing the success of PES projects.

Essentially, the theoretical framework consists of three different parts: Part 1 aims at deconstructing PES arrangements, namely project operational and implementation arrangements, the project design and institutional arrangements, and the project financial and funding arrangements. Part 2 deals with the Capital Asset Analysis of PES outcomes. More specifically, this second part investigates the i) Human and Social Capital; ii) Natural Capital; iii) Financial Capital; and iv) Institutional Capital. Part 3 identifies the barriers and the opportunities for improving PES projects' design and implementation.

Based on the established theoretical framework, data will be gathered from four prominent European Union (EU) wide networks and projects, namely SINCERE, InnoForEST, Nobel project (H2020), and the PESFOR-W COST action network, focusing on forest Payment for Ecosystem Services (PES). These projects have investigated various aspects of forest ecosystem services with the goal of innovatively enhancing their provision through PES approaches. Here are the specific objectives of each project:

- The PESFOR-W COST action network primarily concentrates on consolidating PES practices to meet the objectives of the EU Water Framework Directive.
- The InnoForEST H2020 project explores the biophysical and institutional contextual conditions necessary to introduce novel payment schemes/financing approaches and networks/actor alliances, especially for forest ecosystem services (FES) that are not yet connected to traditional market approaches. The project studies the factors that foster or hinder governance innovations and develops assessment methods to design pathways towards more sustainable provision of FES.
- The H2020 SINCERE project aims to advance innovative mechanisms such as business models and policies for providing FES and align them with the necessary policy framework to incentivize their adoption.
- The Nobel project seeks to understand the capacity of European forests in providing FES and develop strategies to meet stakeholders' expectations regarding their provision.

In summary, these projects investigate various dimensions of forest ecosystem services, aiming to introduce innovations in their provision through PES approaches while considering contextual conditions, governance innovations, policy frameworks, and stakeholder expectations.

The data collection process will involve three distinct steps:

- Firstly, we will utilise an Excel spreadsheet to gather data from 200 PES cases sourced from the aforementioned databases. Our objective is to extract information related to the operational and implementation arrangements of each project, as well as details regarding project design and institutional setups.
- Simultaneously, to maximise the amount of data collected, we will distribute a survey to the focal points of the PES projects included in our Excel file. The survey will consist of four sections: i) Project Arrangements, ii) Project financial and funding arrangements, iii) Capital Asset Analysis, and iv) Challenges and Opportunities. Upon completion of the survey, we will inquire if the participants would be available for a brief semi-structured interview. This will allow us to delve deeper into specific aspects of the project that may require further exploration.
- The third and final step involves conducting interviews to conduct a more comprehensive analysis of certain aspects of the presented PES projects, which may not have been fully investigated through the databases or the survey. It is crucial to acknowledge that interviews will be conducted solely if there is sufficient availability of time and resources.

To put it concisely, the data collection process will involve extracting information from PES projects using an Excel spreadsheet, administering surveys to project focal points, and conducting interviews as a supplementary means of investigating project details that were not adequately covered by the previous methods.

It is crucial to emphasize that the indicators utilized in the analysis of PES arrangements, the application of the CAF, and the investigation of barriers and opportunities are the same indicators employed by Hejnowicz et al. (2014). These indicators build upon the work of Wunder et al. (2008), Pattanayak et al. (2010), and Daniels et al. (2010). For the sake of clarity, we have provided definitions only for those indicators that may have multiple interpretations.

The following three sub-chapters will describe the different parts of our Theoretical Framework. Specifically, I) Deconstructing PES arrangements; II) Capital Asset Analysis; and III) Barriers and Opportunities.

2.1 Deconstructing PES arrangements

It is crucial to first illustrate our adopted definitions of:

- PES;
- PES-like schemes;
- Ecosystem Services;
- Class of Ecosystem Services.

For this project, we define PES as: “(1) voluntary transactions (2) between service users (3) and service providers (4) that are conditional on agreed rules of natural resource management (5) for generating offsite services.” (Wunder, 2015). The conceptualisation of PES-like is less linear. Indeed, a clear definition of this

concept does not exist. As PES-like schemes are intended, those marketable approaches that partially respond to the PES definition by Wunder (2015), not complying with all the 5 criteria.

For the definition of Ecosystem Services (ES), we opted for what the Millennium Ecosystem Assessment defines as “the benefits people derive from ecosystems”. Besides provisioning services or goods like food, wood and other raw materials; plants, animals, fungi and micro-organisms provide essential regulating services such as pollination of crops, prevention of soil erosion and water purification, and a vast array of cultural services, like recreation and a sense of place.

The Millennium Ecosystem Assessment (MEA) was initiated in 2001 in response to the call made by the United Nations Secretary-General Kofi Annan in 2000. Its primary objective was to evaluate the impacts of ecosystem change on human well-being, as well as to establish a scientific foundation for implementing actions that would promote the conservation and sustainable utilization of these systems while benefiting humanity. The MA brought together the expertise of over 1,360 global experts. Their comprehensive research, comprising five technical volumes and six synthesis reports, presents an up-to-date scientific evaluation of the state and trends of ecosystems worldwide, along with the vital services they provide, such as clean water, food, forest products, flood control, and other natural resources. Moreover, the assessment offers a range of options for restoring, conserving, or enhancing the sustainable use of ecosystems.

The categories are the following:

- **Provisioning** of material and energy needs;
- **Regulation & Maintenance** of the environment for humans;
- **Cultural**, the non-material characteristics of ecosystems that affect physical and mental states of people, that is their cultural significance.

Provisioning services encompass the tangible goods that are produced by ecosystems and utilised by people. This category includes various items such as food crops and biofuels, fish caught for human consumption, forest nuts and berries gathered as food, trees harvested for timber, and herbs used for medicinal purposes. These services directly contribute to meeting human needs for sustenance and resources.

Regulating services refer to the ways in which ecosystems influence the flow and functioning of larger systems, subsequently impacting human well-being. Examples of regulating services include vegetation that affects the rate at which rainfall infiltrates into underground water sources (aquifers) and subsequently flows into rivers, thus influencing the timing of water availability. Additionally, strips of vegetation along waterways can act as natural filters, absorbing pollutants and improving water quality for downstream communities. Certain types of vegetation help prevent erosion and maintain arable land, ensuring its long-term productivity. Forests play a crucial role in carbon sequestration, mitigating climate change impacts on a global scale. Furthermore, trees planted alongside highways can remove particulate pollution from the air, leading to lower asthma rates and improved health for nearby residents.

Cultural services encompass the non-material enjoyment and utilisation of the environment. This category includes recreational activities such as rafting, hiking, and fishing, which are made possible and enhanced by the presence of woodlands and waterways with specific characteristics. Additionally, cultural services encompass spiritual uses, where individuals seek to connect with nature for specific spiritual or aesthetic reasons, recognizing the inherent value of natural environments beyond their tangible benefits.

In summary, the classification of ecosystem services helps us understand and appreciate the diverse ways in which ecosystems contribute to human well-being, ranging from the provision of tangible resources to the regulation of essential ecological processes and the intangible cultural and spiritual experiences derived from nature.

For deconstructing PES arrangements, specifically the project operational, implementation, design and institutional aspects, we will collect data on the following:

- Country(ies) of implementation
- The year when the project started
- ES considered
- ES category
- Program size
- ES buyer
- ES direct beneficiary (ies)
- ES provider/seller
- Project initiator
- Intermediary
- Conditionality
- Monitoring

Ecosystem Service Buyers recognize the value of these services and are willing to pay for or invest in their preservation, restoration, or sustainable management. They may include government agencies, businesses, non-profit organizations, or even individuals who seek to maintain or enhance specific ecosystem services for their own use or for broader societal benefits. For example, a city government might be an Ecosystem Service Buyer by investing in the protection of a watershed to ensure a clean and reliable water supply. Similarly, a company operating in the tourism industry might purchase carbon offsets or invest in reforestation projects to mitigate its carbon footprint and support climate regulation services. Overall, Ecosystem Service Buyers play a crucial role in incentivizing the conservation and sustainable use of ecosystems by recognizing the importance of these services and taking actions to support their preservation or restoration.

An Ecosystem Service beneficiary refers to an individual, community, or entity that directly or indirectly benefits from the goods and services provided by ecosystems. Ecosystem service beneficiaries can be diverse and can include individuals, communities, businesses, and even entire societies. For example, farmers benefit from the provisioning service of fertile soils for agricultural productivity, cities benefit from the regulating service of urban green spaces that mitigate air pollution and reduce the urban heat island effect, and people in general benefit from the cultural services of natural landscapes for recreation and relaxation. Recognizing and understanding the beneficiaries of ecosystem services is crucial for effective ecosystem management and conservation efforts. It helps policymakers, land managers, and communities make informed decisions regarding the sustainable use and protection of ecosystems to ensure the continued provision of these valuable services.

An ecosystem service provider, sometimes referred to as an **ecosystem service seller**, is an entity or organization that offers or supplies ecosystem services to beneficiaries in exchange for some form of compensation. These providers play a crucial role in the emerging field of ecosystem services markets and payments for ecosystem services (PES) programs. Ecosystem service providers can take various forms depending on the specific context and the type of ecosystem service being provided. They can include individuals, communities, private businesses, non-profit organizations, government agencies, or even indigenous groups. Here are a few examples:

- **Farmers:** Farmers can be ecosystem service providers by implementing sustainable agricultural practices that promote soil conservation, water quality improvement, or biodiversity enhancement. In some cases, they can receive financial incentives or payments for implementing such practices.
- **Forest owners:** Forest owners can offer ecosystem services such as carbon sequestration, water regulation, or biodiversity conservation through sustainable forest management. They can participate in carbon offset markets or receive compensation for preserving or restoring forests.

- **Wetland restoration companies:** Companies specializing in wetland restoration can provide services related to wetland creation, enhancement, or conservation. They can offer services like water filtration, flood control, or wildlife habitat restoration and receive compensation for their efforts.
- **Conservation organizations:** Non-profit organizations focused on conservation can act as ecosystem service providers by managing protected areas, restoring habitats, or implementing conservation projects. They may receive funding from government agencies, philanthropic organizations, or through mechanisms like conservation easements.

In some cases, ecosystem service providers may directly negotiate contracts or agreements with beneficiaries to sell ecosystem services. In other cases, they may participate in market-based mechanisms or government-led programs that facilitate the exchange of ecosystem services for compensation. The concept of ecosystem service providers recognizes the value of ecosystem services and provides incentives for those who manage or protect ecosystems to continue their beneficial actions. It helps create economic opportunities for sustainable land and resource management while promoting the conservation and restoration of ecosystems.

In a Payment for Ecosystem Services (PES) project, an **intermediary** is an organisation or entity that acts as a facilitator or intermediary between the buyers of ecosystem services and the providers who deliver those services. Intermediaries play a crucial role in connecting and coordinating the various stakeholders involved in the PES transaction. The primary function of an intermediary is to bridge the gap between the demand and supply sides of ecosystem services by facilitating the exchange and negotiation process. Here are some key roles and responsibilities of intermediaries in PES projects:

- **Matchmaking:** Intermediaries identify potential buyers and providers of ecosystem services and facilitate their engagement. They help bring together individuals, organizations, or agencies interested in purchasing ecosystem services with landowners, farmers, or other entities capable of providing those services.
- **Contracting and negotiation:** Intermediaries assist in the development of contractual arrangements between buyers and providers. They help negotiate the terms, conditions, and payment mechanisms for the ecosystem services, ensuring that the agreements are fair and mutually beneficial.
- **Technical support:** Intermediaries may provide technical expertise and support to both buyers and providers. This can include assistance with project design, ecosystem service valuation, monitoring and verification, and the implementation of best management practices.
- **Payment facilitation:** Intermediaries help facilitate the flow of payments between buyers and providers. They may establish financial mechanisms or platforms to ensure timely and secure transactions, including the collection of funds from buyers and the distribution of payments to providers.
- **Monitoring and verification:** Intermediaries may be involved in monitoring the performance of the PES project, ensuring that providers are meeting the agreed-upon conditions and delivering the expected ecosystem services. They may conduct on-site visits, collect data, or coordinate with third-party experts for independent verification.
- **Capacity building:** Intermediaries often engage in capacity building activities to enhance the knowledge and skills of both buyers and providers. This can involve training programs, workshops, or information sharing to ensure that all parties understand their roles and responsibilities in the PES project.
- **Communication and awareness:** Intermediaries play a role in promoting PES projects and raising awareness among potential buyers, providers, and the wider public. They engage in outreach activities, dissemination of information, and communication campaigns to highlight the benefits of PES and encourage participation.

Intermediaries can take different forms, including non-profit organizations, government agencies, private companies, or community-based organizations. They provide expertise, coordination, and support to facilitate

the successful implementation of PES projects, ensuring that the transactions between buyers and providers are effective, fair, and mutually beneficial.

In the context of a Payment for Ecosystem Services (PES) project, **conditionality** refers to the set of requirements or conditions that a provider must meet to receive compensation or payment for the services they provide. These conditions are typically established by the buyers or funders of the ecosystem services and are designed to ensure that certain outcomes or actions are achieved.

Conditionality is implemented to ensure that the desired ecological or social objectives of the PES project are met effectively. It helps to establish accountability and incentivize providers to adopt and maintain practices that support the provision of ecosystem services. The specific conditions can vary depending on the goals and design of the PES project, as well as the ecosystem services being targeted. Here are a few examples of conditionality in PES projects:

- **Compliance with best management practices:** Providers may be required to implement specific land management practices, such as sustainable agriculture techniques, forest conservation measures, or soil erosion control methods. Compliance with these practices ensures the provision of desired ecosystem services, such as water quality improvement or biodiversity conservation.
- **Monitoring and reporting:** Providers may need to monitor and report on specific indicators or metrics related to the ecosystem services they are providing. This could include tracking water quality parameters, biodiversity surveys, or carbon sequestration measurements. Regular reporting helps to assess the effectiveness of the project and ensures transparency and accountability.
- **Maintenance and restoration:** Providers may be obligated to maintain existing ecosystem features or undertake restoration efforts. For instance, in a wetland conservation project, providers may need to preserve wetland areas, prevent drainage, or engage in wetland restoration activities.
- **Long-Term commitment:** PES projects often require providers to commit to maintaining certain land uses or practices over an extended period. This ensures the long-term provision of ecosystem services and provides assurance to the buyers or funders.
- **Compliance with legal and regulatory requirements:** Providers may need to comply with relevant laws, regulations, or permits related to land use, environmental protection, or conservation. This ensures that the PES project operates within the legal framework and adheres to established standards.

Conditionality is typically outlined in the contractual agreements or agreements between the buyers and providers in a PES project. These conditions are enforced through monitoring, verification, and regular assessment of compliance. Providers who meet the conditions are eligible for compensation, while non-compliance may result in reduced payments or termination of the contract. By implementing conditionality, PES projects aim to ensure the effectiveness and integrity of the ecosystem services being provided, thereby maximizing the benefits to both the environment and the stakeholders involved.

Monitoring in the context of Payment for Ecosystem Services (PES) refers to the systematic collection, assessment, and tracking of data and information to evaluate the performance and outcomes of the PES project. It involves measuring the ecological, social, and economic parameters related to the provision of ecosystem services and assessing whether the project is achieving its desired objectives.

Monitoring serves several purposes in PES projects:

- **Performance evaluation:** Monitoring allows project managers and stakeholders to assess the effectiveness of the PES project in delivering the intended ecosystem services. It helps determine whether the project is meeting its goals and whether the desired outcomes are being achieved.
- **Compliance assessment:** Monitoring ensures that providers are meeting the conditionality requirements established in the PES agreements. It helps determine whether providers are

implementing the required practices, maintaining the agreed-upon land uses, or fulfilling other obligations.

- **Adaptive management:** Monitoring data provides valuable insights into the functioning of the ecosystem and the effectiveness of project interventions. It allows for adaptive management, enabling project managers to make informed decisions and adjust strategies as needed to improve project outcomes.
- **Transparency and accountability:** Monitoring promotes transparency by providing objective and verifiable data on the performance of the PES project. It enhances accountability by demonstrating to buyers, funders, and stakeholders that the project is delivering the expected results.
- **Learning and knowledge generation:** Monitoring data contributes to the knowledge base on PES effectiveness, ecosystem services, and the relationship between conservation actions and outcomes. It helps identify best practices, lessons learned, and opportunities for improvement in future PES projects.

Monitoring in PES projects typically involves the collection of both quantitative and qualitative data. It may include ecological measurements such as water quality parameters, biodiversity assessments, or carbon sequestration rates. Social indicators such as changes in livelihoods, community perceptions, or equity considerations may also be monitored. Economic aspects, such as the cost-effectiveness of the project or the value of the ecosystem services, can also be assessed. Monitoring methods can vary depending on the specific objectives of the PES project and the ecosystem services being targeted. It may involve field surveys, data collection through remote sensing or satellite imagery, interviews or questionnaires with stakeholders, or a combination of these approaches. By regularly monitoring the project, PES initiatives can track progress, ensure compliance, adapt management strategies, and provide evidence-based information to support decision-making and continuous improvement. For investigating the project financial and funding arrangements, we will collect information on the following:

- External Donor Support
- General Project Costs
- Characteristics of PES project
- The scale on which the PES operates

2.2 Capital Asset Framework Analysis

This section aims to evaluate the effectiveness of Payment for Ecosystem Services (PES) programs as environmental management tools, based on their impacts on social, natural, financial, and institutional capital assets. As already explained in the previous section, at the individual level, human capital encompasses skills, knowledge, experience, and health (Rudd, 2004; Brondizio et al., 2009; Behrman, 2011; Winters and Chiodi, 2011; Bennett et al., 2012; Moav and Neeman, 2012). Social capital refers to the social structure and relationships that contribute to the flow of norms and reputation-based trust (Bebbington, 1999; Rudd, 2000; Adler and Kwon, 2002; Brondizio et al., 2009). Natural capital encompasses the structure, function, and flow of ecosystem services (ES) provided to humans, as well as the impact of PES programs on land management practices and potential changes resulting from these programs (Costanza and Daly, 1992; Daily, 1997; van Noordwijk et al., 2007). Financial capital pertains to the wealth of households and communities, the availability of funds for carrying out activities, and the equitable distribution of payments (Rudd, 2004; Bennett et al., 2012). Lastly, institutional capital refers to aspects of resource governance, institutional transparency, and accountability.

By considering the outcomes of PES programs on these various capital assets, we can assess the effectiveness of these programs as tools for environmental management.

For **Human and Social Capital Measured**, we are going to investigate whether the PES project has a negative or positive impact on the following:

- Food security
- Poverty level
- Living standards
- Access to social services
- Access to ecosystem services

Measuring living standards as an outcome in Payment for Ecosystem Services (PES) projects is crucial because it provides insights into the overall well-being and quality of life of individuals and communities. Here are several reasons why living standards are important to consider in PES projects:

- **Human Well-being:** Living standards encompass various dimensions of well-being, including access to basic needs such as clean water, food, shelter, education, healthcare, and social services. PES projects that contribute to improving living standards directly impact the overall quality of life and happiness of individuals and communities.
- **Employment and Economic Development:** PES projects often create employment opportunities, particularly in sectors such as sustainable agriculture, eco-tourism, and natural resource management. By measuring living standards, PES projects can assess their contribution to local economic development, job creation, and income generation, leading to improved living conditions.
- **Social Equity and Inclusion:** Measuring living standards in PES projects helps evaluate whether the benefits of ecosystem services and associated interventions are distributed equitably among different social groups. It enables the identification of potential disparities and the design of strategies to ensure inclusiveness and equal access to benefits.
- **Health and Safety:** Living standards include aspects related to health, safety, and access to essential services. PES projects that protect ecosystems, enhance water quality, reduce pollution, and promote sustainable land management indirectly contribute to improved health outcomes and a safer living environment for communities.
- **Long-Term Sustainability:** PES projects focus on the conservation and sustainable use of ecosystems. By measuring living standards, it becomes possible to assess the long-term viability and resilience of communities, considering aspects such as resource availability, environmental stability, and the ability to adapt to change.

By including living standards as an outcome in PES projects, stakeholders can holistically evaluate the social, economic, and environmental impacts of their initiatives, ensuring that the benefits of ecosystem services contribute to the well-being and sustainable development of the communities involved.

In the context of Payment for Ecosystem Services (PES) projects, **access to social services** refers to ensuring that the communities or individuals involved in the provision of ecosystem services have access to necessary social services alongside their participation in the project. It recognizes the importance of social well-being and equitable distribution of benefits within PES initiatives. While PES projects primarily focus on the provision of ecosystem services and the associated economic transactions, it is essential to consider the social dimensions and impacts on the communities involved. Access to social services in PES projects ensures that the well-being, rights, and needs of the local communities are addressed. Here are a few aspects related to access to social services in the context of PES projects:

- **Social infrastructure:** PES projects should consider the availability of social infrastructure in the project area. This includes access to healthcare facilities, schools, clean water, sanitation, transportation, and other essential services necessary for community well-being.
- **Livelihood support:** PES initiatives should consider the potential impact on local livelihoods and address any negative consequences. Adequate support should be provided to ensure that communities have access to alternative income-generating opportunities or compensation if their traditional livelihood practices are affected.
- **Social equity:** Access to social services should be ensured for all members of the community, including marginalized groups or vulnerable populations. Measures should be in place to prevent any discrimination and to promote inclusivity and equity in benefit-sharing mechanisms.
- **Capacity building:** PES projects should invest in capacity building programs to empower local communities. This includes providing training, education, and skill development opportunities that enhance their ability to participate effectively in the project and access broader social services.
- **Social safeguards:** PES projects should integrate social safeguards to prevent any negative social impacts and ensure the protection of human rights. This includes engaging in meaningful consultation with local communities, respecting their traditional knowledge and practices, and considering their cultural values and aspirations.
- **Participatory processes:** PES projects should promote participatory decision-making processes that involve local communities in project design, implementation, and monitoring. This ensures that their voices are heard, their priorities are considered, and they have a say in the distribution of benefits and access to social services.

Overall, in the context of PES projects, access to social services acknowledges the importance of considering the social well-being and rights of the communities involved. It seeks to ensure that the benefits derived from ecosystem services are shared equitably and that local communities have access to essential services that contribute to their overall quality of life.

In the context of Payment for Ecosystem Services (PES), **access to ecosystem services** refers to the ability of individuals, communities, or organizations to benefit from the goods and services provided by ecosystems. It encompasses the recognition, utilization, and enjoyment of ecosystem services by those who directly or indirectly rely on them for their well-being and livelihoods.

Access to ecosystem services in PES projects involves several aspects:

- **Recognition:** It involves acknowledging the presence and value of ecosystem services in a particular area. Recognizing ecosystem services helps stakeholders understand the importance of natural resources and the benefits they provide.
- **Availability:** Access to ecosystem services requires that these services are present and accessible within a given region or landscape. It involves the existence of ecosystems that can provide the desired services, such as forests for carbon sequestration or wetlands for water purification.
- **Distribution:** Access to ecosystem services should be distributed in an equitable manner, ensuring that all individuals or communities have fair opportunities to benefit. This includes avoiding the concentration of benefits in certain groups while neglecting others.
- **Utilization:** Access to ecosystem services involves the ability to utilize and derive benefits from the services. It may require knowledge, skills, and appropriate infrastructure to effectively utilize ecosystem services for livelihoods, health, or other purposes.
- **Governance and institutions:** Access to ecosystem services is influenced by the governance and institutional frameworks in place. Effective governance ensures that access is regulated, rights are protected, and conflicts are resolved in a fair and inclusive manner.
- **Payment and compensation:** In PES projects, access to ecosystem services may be linked to payment or compensation mechanisms. Providers of ecosystem services receive financial or non-

financial incentives for their efforts in conserving, managing, or restoring ecosystems. These mechanisms aim to support and incentivize continued access to ecosystem services.

Ensuring access to ecosystem services in PES projects is essential for equitable and sustainable resource management. It involves engaging local communities, indigenous groups, and other stakeholders in decision-making processes, respecting traditional knowledge, and considering the needs and aspirations of different user groups. By recognizing and facilitating access to ecosystem services, PES projects can contribute to the well-being of both nature and human communities.

For **Natural Capital Measured**, we are going to investigate whether the PES project has a negative or positive impact on the following:

- Forest Area
- Protected areas
- Deforestation
- Agricultural intensity
- Sustainable agricultural practices
- Sustainable land-use change
- Biodiversity

For **Financial Capital Measured**, we are going to investigate whether the PES project has a negative or positive impact on the following:

- Household income
- Material wealth
- Financial benefits for poorer landowners
- Diversification of income streams for PES participants

For **Institutional Capital Measured**, we are going to investigate whether the PES project has a negative or positive impact on the following:

- Community control over natural resource-use
- Organizations' accountability
- Organizations' transparency
- Organizations' relationships and cooperation
- Legal and regulatory measures
- Involvement of local institutions
- Control of decentralized administration over fund disbursement and contract awards
- Accountability of providers to beneficiaries
- Transparency of the funding chain

Organizations' accountability in the context of a Payment for Ecosystem Services (PES) project refers to the responsibility of organizations involved in the project to answer for their actions, decisions, and performance to various stakeholders. It involves being answerable, transparent, and responsible for the outcomes, impacts, and use of resources associated with the PES initiative.

Accountability is crucial in PES projects for several reasons:

- **Stakeholder trust:** Accountability helps build and maintain trust among stakeholders, including funders, buyers, providers, and affected communities. Organizations are held accountable for fulfilling their commitments, ensuring that the project is implemented according to agreed-upon terms and delivering the expected outcomes.

- **Ethical conduct:** Accountability ensures that organizations adhere to ethical standards and principles in their actions and decision-making processes. It requires organizations to act in the best interests of stakeholders and avoid conflicts of interest or unethical behavior.
- **Compliance with agreements:** Organizations involved in PES projects have contractual obligations with buyers, providers, and other stakeholders. Accountability ensures that organizations fulfill their obligations, such as making timely payments, providing necessary support, and delivering on agreed-upon services or conservation measures.
- **Effective resource management:** Accountability includes responsible management of financial, human, and natural resources associated with the PES project. Organizations are accountable for using resources efficiently, effectively, and transparently to achieve the intended objectives and maximize the benefits for stakeholders.
- **Performance assessment:** Accountability involves being accountable for the performance and outcomes of the PES project. Organizations are expected to monitor, evaluate, and report on the project's progress, results, and impacts, allowing stakeholders to assess the effectiveness and efficiency of the project.
- **Legal and regulatory compliance:** Organizations involved in PES projects need to adhere to relevant laws, regulations, and guidelines. They are accountable for complying with legal requirements related to land use, environmental protection, financial transactions, and other aspects relevant to the project.

Accountability in PES projects can be demonstrated through various practices, including:

- Clearly defined roles, responsibilities, and performance expectations for organizations involved in the project.
- Regular reporting on the project's financial, social, and ecological performance to stakeholders.
- Mechanisms for receiving and addressing complaints, grievances, or feedback from affected communities and stakeholders.
- Independent verification or auditing of project activities and outcomes to ensure accountability and transparency.
- Engaging in participatory processes that involve stakeholders in decision-making and performance assessment.

Ultimately, organization accountability in PES projects helps ensure that organizations are responsible and transparent in their actions, leading to the effective implementation of the project and the equitable distribution of benefits. It contributes to the overall credibility, legitimacy, and success of the PES initiative.

Organisations' transparency in the context of a Payment for Ecosystem Services (PES) project refers to the openness, accountability, and disclosure of information by the entities involved in the project. It involves providing clear and accessible information about the objectives, processes, performance, and outcomes of the PES initiative.

Transparency is crucial in PES projects for several reasons:

- **Accountability:** Transparency ensures that organizations involved in the PES project are accountable to stakeholders, including funders, buyers, providers, and affected communities. It allows for scrutiny and evaluation of the organization's actions, decisions, and use of resources.

- **Trust building:** Transparency helps build trust among stakeholders by promoting open and honest communication. When organizations are transparent about their activities, it fosters confidence and credibility in the project, encouraging participation and cooperation.
- **Informed decision making:** Transparency provides stakeholders with the necessary information to make informed decisions. It allows them to understand the project's objectives, benefits, risks, and potential impacts, enabling them to engage effectively and contribute to decision-making processes.
- **Participation and engagement:** Transparency facilitates meaningful participation and engagement of stakeholders. By sharing information and involving stakeholders in the project's development and implementation, transparency ensures that diverse perspectives are considered and that decisions reflect the interests of affected communities.
- **Learning and improvement:** Transparency supports learning and continuous improvement in PES projects. By openly sharing project data, monitoring results, and lessons learned, organizations can identify areas for improvement, share best practices, and contribute to the collective knowledge on PES implementation.

Transparency in PES projects can be demonstrated through various practices, including:

- Disclosure of project objectives, criteria, and selection processes for both providers and buyers.
- Provision of clear information on the valuation methodologies used to determine the value of ecosystem services and payment levels.
- Regular reporting on the progress, results, and impact of the PES project, including financial and ecological performance.
- Accessibility of project documentation, agreements, and relevant information to stakeholders, ensuring it is understandable and available in local languages if needed.
- Engagement of stakeholders through consultation processes, public meetings, and opportunities for feedback and input.

Transparency should be upheld throughout the PES project lifecycle, from the initial design and planning stages to implementation, monitoring, and evaluation. It fosters transparency and accountability among all project participants and contributes to the overall effectiveness, legitimacy, and sustainability of the PES initiative.

Control of decentralized administration over fund disbursement and contract awards in a Payment for Ecosystem Services (PES) project refers to the authority and responsibility given to local or regional administrative bodies to manage the allocation of funds and award contracts within the project. Here is an explanation of this concept:

- **Decentralized administration:** Decentralization refers to the transfer of decision-making powers and responsibilities from a central authority to lower levels of governance, such as local or regional administrative bodies. In the context of PES projects, decentralized administration implies that the authority to manage project funds and contract awards is given to these local or regional entities.
- **Fund disbursement:** PES projects typically involve the allocation of financial resources to support the implementation of ecosystem service conservation or restoration activities. The control of decentralized administration over fund disbursement means that the local or regional administrative bodies have the power to distribute or allocate these funds to different stakeholders, such as landowners, communities, or organizations, based on predefined criteria or agreements.
- **Contract awards:** PES projects often involve entering into contracts or agreements with various stakeholders who provide ecosystem services. These contracts define the terms, conditions, and payments for the provision of these services. Control of decentralized administration over contract

awards means that the local or regional administrative bodies are responsible for selecting and awarding contracts to eligible participants or service providers based on specific criteria, such as the quality and quantity of services to be delivered.

The rationale behind decentralized administration in PES projects is to empower local or regional authorities who have a better understanding of the local context, stakeholders, and specific ecosystem service needs. By entrusting them with control over fund disbursement and contract awards, it is expected that decision-making will be more responsive, efficient, and effective, leading to increased local ownership, stakeholder participation, and better alignment with local priorities and realities. It is important to note that while decentralized administration can have advantages, it also requires effective governance mechanisms, transparency, accountability, and capacity building at the local or regional level to ensure the proper management and use of funds, fair contract awards, and overall project success.

The transparency of the funding chain in Payment for Ecosystem Services (PES) projects refers to the clear and accountable flow of financial resources from the ultimate funders or buyers of ecosystem services to the providers who deliver those services. It involves disclosing and making visible the sources of funding, intermediaries involved, and the distribution of funds throughout the PES transaction process.

Transparency in the funding chain is essential in PES projects for several reasons:

- **Accountability:** Transparency ensures that funders, intermediaries, and providers are held accountable for the financial transactions and use of funds in the PES project. It allows stakeholders to track the flow of money and ensure that it is used as intended and benefits reach the intended recipients.
- **Integrity and trust:** Transparency builds trust among stakeholders, including providers, buyers, and the wider public. When the funding chain is transparent, it demonstrates a commitment to ethical conduct, fair practices, and responsible use of financial resources.
- **Confidence and credibility:** Transparent funding mechanisms contribute to the credibility and legitimacy of PES projects. It provides assurance to funders, investors, and participants that their contributions are managed and distributed in a transparent and accountable manner.
- **Informed decision-making:** Transparent funding chains enable stakeholders to make informed decisions and evaluate the overall effectiveness and fairness of the PES project. It allows them to assess the distribution of funds, the allocation of resources, and the impact on providers and beneficiaries.
- **Prevention of corruption and mismanagement:** Transparency in the funding chain helps prevent corruption, fraud, or mismanagement of funds. It provides visibility into financial transactions and discourages any unethical practices that may undermine the integrity of the PES project.

To ensure transparency in the funding chain of PES projects, the following practices can be implemented:

- Disclosing the sources of funding and the identities of funders or investors involved in the PES initiative.
- Providing clear information on the financial mechanisms, intermediaries, and payment systems used in the project.
- Requiring financial reporting and disclosure from intermediaries regarding the distribution of funds to providers and other project-related expenses.
- Conducting independent audits or verification of financial transactions to ensure compliance and transparency.
- Engaging in stakeholder consultation and feedback mechanisms to address concerns related to funding transparency.

By promoting transparency in the funding chain, PES projects can enhance accountability, foster trust among stakeholders, and ensure the proper allocation of financial resources to support the conservation and sustainable management of ecosystems.

2.3 Barriers and Opportunities

To identify the barriers and the opportunities for improving PES projects' design and implementation, we are going to ask the respondents whether they agree or disagree with the following statements, used in Hejnowicz et al. (2014):

Barriers

- Transaction costs were a barrier to effective PES project implementation
- Payments being too low to encourage project uptake and contract renewal were a barrier to effective PES project implementation
- Information on the PES project not being accessible to the non-participants was a barrier to effective PES project implementation
- Land-use restrictions/management practices were a barrier to effective PES project implementation
- Poorer households had more difficulties in participating in the PES project
- Property rights were a barrier to effective PES project implementation

Opportunities

- It is important that intermediaries ensure that PES participants are fully aware of the scheme process, practicalities and legalities
- It is important that there is effective organizations' coordination to enhance capacity building and technical assistance
- It is important to enhance poorer household uptake of PES scheme
- It is important to improve payment amount to provide a realistic alternative income stream
- It is important to improve legislation regarding contract requirements
- It is important to ensure more flexibility concerning on-property management and property transfer
- It is important to ensure enhanced spatial targeting of payment schemes
- It is important to increase project permanency
- It is important to improve funding arrangements at local to national levels (e.g., encourage international donors)
- It is important to encourage efforts to incorporate the private sector to enter into voluntary agreements to pay for ES
- It is important to improve monitoring of ESs and their outcomes

3. Timeline

Below, we provide an overview of the timeline that we had for developing the theoretical framework with the project partners.

Event	Date
Steering Committee meeting	21.03.2023
Second meeting with project's partners to discuss the Theoretical Framework	02.05.2023

Third and last meeting with project's partners to discuss the Theoretical Framework	06.07.2023
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The next steps will be carried out in T2.2 and will include the test of the survey among a few case studies, revisions that might appear necessary and then data collection and analysis.

List of references

- Adhikari, B., & Boag, G. (2013). Designing payments for ecosystem services schemes: some considerations. *Current Opinion in Environmental Sustainability*, 5(1), 72-77.
- Adler, P. S., & Kwon, S. W. (2002). Social capital: Prospects for a new concept. *Academy of management review*, 27(1), 17-40.
- Bebbington, A. (2005). Donor–NGO relations and representations of livelihood in nongovernmental aid chains. *World development*, 33(6), 937-950.
- Bebbington, A. (1999). Capitals and capabilities: a framework for analyzing peasant viability, rural livelihoods and poverty. *World development*, 27(12), 2021-2044.
- Bennett, N., Lemelin, R. H., Koster, R., & Budke, I. (2012). A capital assets framework for appraising and building capacity for tourism development in aboriginal protected area gateway communities. *Tourism Management*, 33(4), 752-766.
- Behrman, J. (2011). How much might human capital policies affect earnings inequalities and poverty?. *Estudios de Economía*, 38(1), 9-41.
- Bowditch, E., Santopuoli, G., Binder, F., del Río, M., La Porta, N., Kluvankova, T., ..., Tognetti, R., 2020. What is Climate-Smart Forestry? A definition from a multinational collaborative process focused on mountain regions of Europe Ecosystem Services. <https://doi.org/10.1016/j.ecoser.2020.101113>
- Börner, J., Wunder, S., Wertz-Kanounnikoff, S., Tito, M. R., Pereira, L., & Nascimento, N. (2010). Direct conservation payments in the Brazilian Amazon: Scope and equity implications. *Ecological economics*, 69(6), 1272-1282.
- Brouwer, R. O. Y., Tesfaye, A., & Pauw, P. (2011). Meta-analysis of institutional-economic factors explaining the environmental performance of payments for watershed services. *Environmental Conservation*, 38(4), 380-392.
- Brondizio, E. S., Ostrom, E., & Young, O. R. (2009). Connectivity and the governance of multilevel social-ecological systems: the role of social capital. *Annual review of environment and resources*, 34, 253-278.
- Bulte, E. H., Lipper, L., Stringer, R., & Zilberman, D. (2008). Payments for ecosystem services and poverty reduction: concepts, issues, and empirical perspectives. *Environment and Development Economics*, 13(3), 245-254.
- Carney, D. (Ed.). (1998). *Sustainable rural livelihoods: What contribution can we make?* (p. 122). London: Department for International Development.
- Costanza, R., & Daly, H. E. (1992). Natural capital and sustainable development. *Conservation biology*, 6(1), 37-46.
- Daniels, A. E., Bagstad, K., Esposito, V., Moulaert, A., & Rodriguez, C. M. (2010). Understanding the impacts of Costa Rica's PES: Are we asking the right questions?. *Ecological economics*, 69(11), 2116-2126.
- Daw, T. I. M., Brown, K., Rosendo, S., & Pomeroy, R. (2011). Applying the ecosystem services concept to poverty alleviation: the need to disaggregate human well-being. *Environmental Conservation*, 38(4), 370-379.

Daily, G. C. (Ed.). (1997). *Nature's services: societal dependence on natural ecosystems*. Island press.

Dulal, H. B., Brodnig, G., & Shah, K. U. (2011). Capital assets and institutional constraints to implementation of greenhouse gas mitigation options in agriculture. *Mitigation and Adaptation Strategies for Global Change*, 16, 1-23.

EC (2021). European Commission. New EU Forest strategy for 2030 (2021/572/EC). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions.

EEA (2015). Growing pressures on ecosystems (GMT 8). European Environment Agency. Available from <https://www.eea.europa.eu/soer-2015/global/ecosystems>

Engel, S., Pagiola, S., & Wunder, S. (2008). Designing payments for environmental services in theory and practice: An overview of the issues. *Ecological economics*, 65(4), 663-674.

Engel, S., & Palmer, C. (2008). Payments for environmental services as an alternative to logging under weak property rights: The case of Indonesia. *Ecological Economics*, 65(4), 799-809.

Ezzine-de-Blas et al. (2016) Innovative mechanisms for financing biodiversity conservation: an exchange of experiences between Europe and Mexico. Summary of the key insights for CBD COP13 side event (16 December 2016), Cancun, Mexico.

Farley, J., & Costanza, R. (2010). Payments for ecosystem services: from local to global. *Ecological economics*, 69(11), 2060-2068.

García-Nieto, A. P., García-Llorente, M., Iniesta-Arandia, I., & Martín-López, B. (2013). Mapping forest ecosystem services: from providing units to beneficiaries. *Ecosystem Services*, 4, 126-138.

Grima, N., Corcoran, W., Hill-James, C., Langton, B., Sommer, H., Fisher, B. (2020). The importance of urban natural areas and urban ecosystem services during the COVID-19 pandemic. *PLoS ONE* 15(12): e0243344. Doi: <https://doi.org/10.1371/journal.pone.0243344>

Gómez-Baggethun, E., De Groot, R., Lomas, P. L., & Montes, C. (2010). The history of ecosystem services in economic theory and practice: From early notions to markets and payment schemes. *Ecological economics*, 69(6), 1209-1218.

Gómez-Baggethun, E., & Ruiz-Pérez, M. (2011). Economic valuation and the commodification of ecosystem services. *Progress in physical geography*, 35(5), 613-628.

Hamilton, K., Carroll, N., & Bennet, G. (2013). Charting new waters: state of watershed payments 2012.

Hejnowicz, A. P., Raffaelli, D. G., Rudd, M. A., & White, P. C. (2014). Evaluating the outcomes of payments for ecosystem services programmes using a capital asset framework. *Ecosystem services*, 9, 83-97.

IPBES (2018). The regional assessment report on biodiversity and ecosystem services for Europe and Central Asia of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. M. Fischer, M. Rounsevell, A. Torre-Marín, Rando, A. Mader, A. Church, M. Elbakidze, V. Elias, T. Hahn, P.A. Harrison, J. Hauck, B. Martín-López, I. Ring, C. Sandström, I. Sousa Pinto, P. Visconti, N.E. Zimmermann and M. Christie (eds.). IPBES secretariat, Bonn, Germany.

IPCC (2021): Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

Kemkes, R. J., Farley, J., & Koliba, C. J. (2010). Determining when payments are an effective policy approach to ecosystem service provision. *Ecological economics*, 69(11), 2069-2074.

Kinzig, A. P., Perrings, C., Chapin Iii, F. S., Polasky, S., Smith, V. K., Tilman, D., & Turner, B. L. (2011). Paying for ecosystem services—promise and peril. *Science*, 334(6056), 603-604.

Korhonen, K. and Stahl, G. (2020). Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles. In FOREST EUROPE, 2020: State of Europe's Forests 2020.

Kosoy, N., & Corbera, E. (2010). Payments for ecosystem services as commodity fetishism. *Ecological economics*, 69(6), 1228-1236.

Krumm, F., Schuck, A., Rigling, A., 2020. How to balance forestry and biodiversity conservation - A view across Europe, European Forest Institute and Swiss Federal Research Institute WSL. [www document:https://www.wsl.ch/de/publikationen/how-to-balance-forestry-and-biodiversity-conservation-a-view-acrosseurope.Htm](https://www.wsl.ch/de/publikationen/how-to-balance-forestry-and-biodiversity-conservation-a-view-acrosseurope.Htm)

Jack, B. K., Kousky, C., & Sims, K. R. (2008). Designing payments for ecosystem services: Lessons from previous experience with incentive-based mechanisms. *Proceedings of the national Academy of Sciences*, 105(28), 9465-9470.

Maja, M.M., Ayano, S.F. (2021). The Impact of Population Growth on Natural Resources and Farmers' Capacity to Adapt to Climate Change in Low-Income Countries. *Earth Syst Environ* 5, 271–283. <https://doi.org/10.1007/s41748-021-00209-6>.

MEA (2005). Millenium Ecosystem Assessment: Ecosystems and Human Well-Being.

Muradian, R., & Rival, L. (2012). Between markets and hierarchies: the challenge of governing ecosystem services. *Ecosystem Services*, 1(1), 93-100.

Muradian, R., Corbera, E., Pascual, U., Kosoy, N., & May, P. H. (2010). Reconciling theory and practice: An alternative conceptual framework for understanding payments for environmental services. *Ecological economics*, 69(6), 1202-1208.

Muradian, R. (2013). Payments for ecosystem services as incentives for collective action. *Society & Natural Resources*, 26(10), 1155-1169.

Moav and, O., & Neeman, Z. (2012). Saving rates and poverty: The role of conspicuous consumption and human capital. *The Economic Journal*, 122(563), 933-956.

Narloch, U. L. F., Pascual, U., & Drucker, A. G. (2011). Cost-effectiveness targeting under multiple conservation goals and equity considerations in the Andes. *Environmental Conservation*, 38(4), 417-425.

Orsi, F., Ciolli, M., Primmer, E., Varumo, L., Geneletti, D., (2020). Mapping hotspots and bundles of forest ecosystem services across the European Union. *Land Use Policy* 99, 104840.

Pattanayak, S. K., Wunder, S., & Ferraro, P. J. (2010). Show me the money: do payments supply environmental services in developing countries?.

Pascual, U., Muradian, R., Rodríguez, L. C., & Duraiappah, A. (2010). Exploring the links between equity and efficiency in payments for environmental services: A conceptual approach. *Ecological economics*, 69(6), 1237-1244.

Pirard, R. (2012). Market-based instruments for biodiversity and ecosystem services: A lexicon. *Environmental science & policy*, 19, 59-68.

Pokorny, B., Johnson, J., Medina, G., & Hoch, L. (2012). Market-based conservation of the Amazonian forests: Revisiting win-win expectations. *Geoforum*, 43(3), 387-401.

Prokofieva, I., Wunder, S., 2014. Designing economic instruments for ecosystem services. From traditional regulation to economic instruments. In: T. Jellesmark, B.; R. Mavsar; L. Tyrvaenen; I. Prokofieva, and A Stenger (ed) The provision of forest ecosystem services. Volume II: Assessing cost of provision and designing economic instruments for ecosystem services. What Science can tell us No 5. EFI, pp. 59-63.

Redford, K. H., & Adams, W. M. (2009). Payment for ecosystem services and the challenge of saving nature. *Conservation biology*, 23(4), 785-787.

Roser, M., Ritchie, H., Ortiz-Ospina, E. (2013). World Population Growth. Published online at OurWorldInData.org. Sauter, I., Kienast, F., Bolliger, J., Winter, B., Pazúr, R. (2019). Changes in demand and supply of ecosystem services under scenarios of future land use in Vorarlberg, Austria. *Journal of Mountain Science*, 16 (12), pp. 2793-2809.

Rudd, M. A. (2004). An institutional framework for designing and monitoring ecosystem-based fisheries management policy experiments. *Ecological Economics*, 48(1), 109-124.

Sauter, I., Kienast, F., Bolliger, J., Winter, B., Pazúr, R. (2019). Changes in demand and supply of ecosystem services under scenarios of future land use in Vorarlberg, Austria. *Journal of Mountain Science*, 16 (12), pp. 2793-2809

Ugolini, F., Massetti, M., Calaza-Martínez, P., Cariñanos, P., Dobbs, C., Krajter Ostoić, S., Marin, A.M., Pearlmutter, D., Saaroni, H., Šaulienė, I., Simoneti, M., Verlič, A., Vuletić, D., Sanesi, G. (2020). Effects of the COVID-19 pandemic on the use and perceptions of urban green space: An international exploratory study, *Urban Forestry & Urban Greening*, Volume 56, 126888, ISSN 1618-8667

Vatn, A. (2010). An institutional analysis of payments for environmental services. *Ecological economics*, 69(6), 1245-1252.

Van Noordwijk, M., Leimona, B., Emerton, L., Tomich, T. P., Velarde, S. J., Kallesoe, M., ... & Swallow, B. (2007). *Criteria and indicators for environmental service compensation and reward mechanisms: realistic, voluntary, conditional and pro-poor* (No. 37, p. 61). ICRAF working paper.

Zhang, W. E. I., & Pagiola, S. (2011). Assessing the potential for synergies in the implementation of payments for environmental services programmes: an empirical analysis of Costa Rica. *Environmental Conservation*, 38(4), 406-416.

Wendland, K. J., Honzák, M., Portela, R., Vitale, B., Rubinoff, S., & Randrianarisoa, J. (2010). Targeting and implementing payments for ecosystem services: Opportunities for bundling biodiversity conservation with carbon and water services in Madagascar. *Ecological economics*, 69(11), 2093-2107.

Winters, P. C., & Chiodi, V. (2011). Human capital investment and long-term poverty reduction in rural Mexico. *Journal of international development*, 23(4), 515-538.

Wunder, S., Engel, S., & Pagiola, S. (2008). Taking stock: A comparative analysis of payments for environmental services programs in developed and developing countries. *Ecological economics*, 65(4), 834-852.

Wünscher, T., Engel, S., & Wunder, S. (2008). Spatial targeting of payments for environmental services: a tool for boosting conservation benefits. *Ecological economics*, 65(4), 822-833.

Annexes

Annex 1

Excel sheet to be compiled (attached separately).

Annex 2

Survey to be sent to the focal points of PES schemes: available at the link:

<https://forms.gle/8iJ8xG7ecWGuz4LA8>

