



# **Payment for Ecosystem services (PES)**

**Scaling up PES to meet global environmental  
and climate crises**



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## **G20 Environment and Climate Sustainability Working Group - ECSWG**

### **Payment for Ecosystem Services (PES): Scaling up PES to meet global environmental and climate crises**

This technical paper is a result of discussions during the Environment and Climate Sustainability Working Group (ECSWG) meetings in 2024, supplemented by written inputs of the G20 member states, engagement with civil society, and technical support from experts. The Brazilian Presidency strived to address all feedback received including from G20 member states, but the paper remains the sole responsibility of the Brazilian government.

#### **EXECUTIVE SUMMARY**

The G20 Payments for Ecosystem Services (PES) Technical Paper highlights the urgency of scaling up PES to address the global environmental and climate crises. This paper serves as a call to action for G20 Member States to increase economic incentives for nature conservation, restoration and sustainable use, with a focus on PES as a promising market-based instrument.

Key recommendations include:

1. Promoting institutional support: Strengthen legal frameworks and integrate PES into national policies. Recognize ecosystem and biodiversity protection as strategic national and regional priorities, including addressing climate change mitigation and adaptation.
2. Leveraging financial resources: Mobilize financial resources from diverse sources, including public, private and blended funding, to ensure the long-term sustainability of PES schemes. For ecosystem services with global benefits, promote international transfer mechanisms such as the Tropical Forest Forever Facility proposed by Brazil at COP28.
3. Engaging the private sector: Encourage private sector involvement in PES by integrating ecosystem services into company sustainability strategies and corporate social responsibility initiatives. Highlight the mutual benefits of investing in ecosystem conservation, including for business operations.
4. Incorporating Indigenous Peoples and local communities: Ensure fair participation and benefit-sharing with Indigenous Peoples, local communities and vulnerable groups, recognizing their critical role in ecosystem stewardship. Respect their rights and ensure voluntary participation in PES schemes.

5. Enhancing monitoring and cooperation: Develop cost-effective monitoring systems using the best available science and traditional knowledge. Strengthen international cooperation to facilitate knowledge exchange, reduce transaction costs and increase resource flows to countries providing critical ecosystem services.

Ecosystems provide society with multifaceted services at the local, regional and global levels. These services include habitats for biodiversity, climate regulation, water purification and cultural values. Despite national-level actions to protect nature, the degradation of ecosystems and loss of biodiversity continue. While necessary, regulations and command and control alone are insufficient to promote ecosystem conservation, regeneration and sustainable use. PES can promote nature conservation, restoration and sustainable use at the local, regional and global levels, contributing to global environmental and climate sustainability goals.

PES schemes typically offer direct payments to individuals, communities, businesses and initiatives to ensure the provision of ecosystem services. PES is based on a “provider-receiver” principle, providing payments to increase the relative profitability of conservation measures and sustainable land-use practices, thus helping close the nature finance gap. PES schemes can be implemented at local, national and global scales depending on the characteristics of the offsite benefit and on who enjoys and is willing to pay for the services.

Ensuring sustainable funding for PES schemes remains a significant challenge, particularly when considering global ecosystem services benefits such as climate regulation. Developing innovative financing instruments, creating new markets for ecosystem services, and building awareness among users and beneficiaries can help address this challenge. International payment systems should be encouraged for the ecosystem services enjoyed globally such as climate regulation and biodiversity protection. The Tropical Forest Forever Facility is a promising avenue.

PES schemes need to assess and consider local interests, ensure the provision of ecosystem services is voluntary, and guarantee payments and other PES program benefits reach the real stewards and providers of ecosystem services. Local communities and Indigenous Peoples are crucial in maintaining and sustainably using ecosystems. The role of these ecosystem stewards needs to be recognized and respected, and they need to be compensated adequately. Moreover, ensuring their rights over the natural resources they manage is crucial, including with the facilitation of payments.



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Monitoring the provision of ecosystem services or the agreed rules of resource management is challenging but critical to developing trust in PES programs and ensuring payers continue to finance payments. Investing in research and development to find cost-effective ways to measure and monitor the provision of ecosystem services using the best available science and traditional knowledge is vital.

Ecosystem and biodiversity protection and sustainable use require strategic and integrated actions not only at the local or private levels but also at regional and national levels. Therefore, national integrated conservation policies and instruments are critical to scaling up PES. Thus, it is necessary to strengthen institutional capacities at the national and subnational levels to manage broad PES programs. Experience from Mexico and Costa Rica has demonstrated that in order to gain scale, PES needs to be embedded in national policies, as seen in Mexico's national PES program and Costa Rica's integration of PES into its national environmental policy, both of which have led to significant advancements in ecosystem conservation and sustainable land management.

## Introduction

Payments for Ecosystem Services (PES) schemes aim to incentivize the conservation, restoration and sustainable use of ecosystems and biodiversity by rewarding natural resource stewards, including private landowners, Indigenous Peoples, local communities and others, for the provision of ecosystem services. PES schemes have gained in popularity over the past decade as they match ecosystem stewards with ecosystem services beneficiaries through voluntary, non-regulatory approaches. By internalizing positive externalities, PES can efficiently improve conditions for both providers and beneficiaries (Salzman *et al.* 2018; van Noordwijk *et al.* 2012). Furthermore, PES can be integrated into broader strategies for addressing climate change, promoting nature conservation and advancing circular economy practices, although its effectiveness depends on context-specific design and implementation. Indigenous Peoples and local communities play a critical role in providing ecosystem services and should be fully integrated into PES schemes.

### PES as a tool to address market failure

Ecosystem services such as clean water provision, natural disaster protection (e.g. from flooding and erosion) and climate regulation through carbon storage are public goods that significantly benefit society. However, these benefits are typically not paid for by those who enjoy them (Salzman *et al.* 2018). In addition, activities that conserve and restore these services, like regenerative agriculture or protected area management, are rarely financially rewarded despite their substantial social and environmental benefits.

Traditional market mechanisms often fail to regulate the supply and demand of ecosystem services, significantly when these services benefit a wide range of users at regional and global scales, as seen with climate regulation and biodiversity conservation. This market failure arises because the providers of ecosystem services—often local and regional resource managers, including those on private lands and in public protected areas—do not receive compensation for the benefits they deliver. These benefits are enjoyed broadly by society without payment, creating little incentive for resource managers to engage in sustainable practices (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [IPBES] 2019; Deutz 2020; Dasgupta 2021).

PES schemes seek to correct this market failure by altering the economic incentives faced by resource stewards. By providing financial rewards for conservation and sustainable management practices, PES schemes make these behaviors economically competitive with alternative land uses that might otherwise lead to degradation. This incentivization ensures that



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private actions align more closely with public environmental benefits, fostering sustainable resource management.

**Prior G20 actions on PES and connections to other G20 work streams**

The G20's engagement with PES has been growing gradually since 2008, reflecting the increasing importance of natural capital in global economic policy. There has been a trend towards including the value of natural capital in economic decision-making, specifically in sustainable finance, green growth and climate resilience efforts.

G20 initiatives have emphasized the need for integrating ecosystem service values into broader policy and economic strategies. For example, the G20 Global Infrastructure Hub has explored ways to integrate natural capital into infrastructure planning, recognizing the importance of ecosystem services in maintaining the resilience and sustainability of infrastructure projects.

Table 1 summarizes the PES synergies with ongoing G20 work streams under the Brazilian Presidency. Detailed information about the working groups and their relation to ecosystem services is provided in Annex 1.

Table 1: PES synergies with ongoing G20 work streams under the Brazilian Presidency

Work stream	Synergy with PES	How PES can help
Sustainable Finance Working Group	Promotes nature-based solutions as one of its four pillars.	Provides financial incentives for conservation and restoration, enhancing biodiversity, carbon sequestration, and water protection.
Global Initiative on Bioeconomy	The bioeconomy should lead to the conservation and restoration of ecosystem services as stated in the high-level principles.	Incentivizes conservation, enhances biodiversity, supports sustainable practices, creates economic opportunities, promotes social inclusion, fosters food security and nutrition, aligns regulations and markets.
Taskforce on a Global Mobilization against Climate Change (TF-CLIMA)	Promotes ambitious action and finance to address the climate emergency, and	Provides financial incentives for practices enhancing ecosystem resilience and adaptation, and climate change mitigation, including through

	recognizes the intrinsic links between nature and climate.	carbon sequestration and avoided emissions from ecosystems such as forests.
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### Ecosystem services and their economic values

Ecosystem services are the direct and indirect contributions of ecosystems to human well-being (TEEB 2010). The concept of ecosystem services has gained significant traction in recent decades, becoming an integral part of worldwide environmental and biodiversity-related policies to internalize nature's value into decision-making processes (Costanza *et al* 2017). Ecosystem services include providing food and water, regulating services like flood and disease control, cultural services providing spiritual and recreational benefits, and supporting services that maintain conditions for life on Earth. It has been found that Indigenous Peoples and local communities significantly contribute to maintaining ecosystem services (Ding *et al.* 2016).

The Common International Classification of Ecosystem Services has standardized the categorization of ecosystem services, making it easier to incorporate them into international literature and policy frameworks. Organizations such as the United Nations and the World Bank Group have widely adopted this classification system in their environmental assessments and valuations.

### Scales of ecosystem services provision: From local and regional providers to local, regional and global users

Ecosystem services provide myriad benefits at local, regional and international levels. Locally, ecosystem services contribute to food security and water supply, directly supporting the livelihoods and lifestyles of communities through resources such as fish, fruits and freshwater. Regionally, services like flood mitigation and disease control help maintain public health and safety while supporting economic activities like agriculture and tourism, which are critical to local economies. Forests and oceans offer climate regulation, carbon sequestration and biodiversity conservation, benefits that transcend borders and are vital for global climate stability and ecological resilience. Thus, ecosystem services are indispensable, underpinning many essential functions and processes that benefit society at every scale (Figure 1).

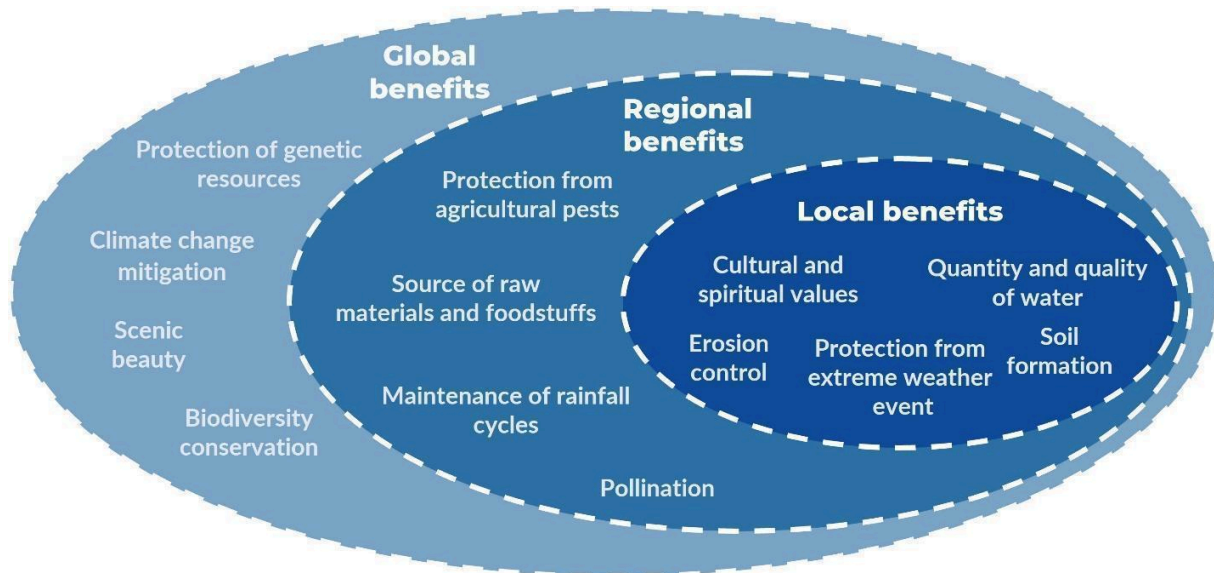









Figure 1: PES benefits society at the local, regional and international levels (Seehusen and Prem 2011)




Recent studies show that over half of the world's gross domestic product (GDP) relies on high-functioning biodiversity and ecosystem services (SwissRe Institute 2020). The World Bank Group (2021) emphasizes that natural capital constitutes a significant portion of the wealth in low-income countries. The Global Land Outlook of the United Nations Convention to Combat Desertification (UNCCD) (2022) underscores how healthy ecosystems support various industries and enhance economic stability.

Brander *et al.* (2024) underscore the immense economic significance of ecosystem services and the importance of economic valuation in quantifying ecosystem benefits. The authors present a global synthesis of economic values for ecosystem services provided by 15 terrestrial and marine biomes. They gathered data from over 1,300 studies, yielding over 9,400 value estimates in monetary units, all of which have been compiled in the Ecosystem Services Valuation Database. These studies provide critical monetary estimates that inform policy and decision-making processes, ensuring that environmental benefits are recognized and adequately integrated into economic frameworks. Table 2 summarizes ecosystem services mean values for different ecosystems, as presented in Brander *et al.* (2024) and other literature (see Annex 2).



Table 2: Ecosystem service values for different ecosystems (Brander *et al.* 2024; Deutz *et al.* 2020; Dasgupta 2021)

Ecosystem service		
	<b>Food production</b>	<b>Inland wetlands</b> have an average value of 6,791 Int\$/ha/year, driven by the significant food production in these wetland areas, contributing to food security.
	<b>Climate regulation</b>	<b>Tropical and subtropical forests</b> play a crucial role in climate regulation, with an average value of 1,375 Int\$/ha/year. They are important for carbon sequestration, significantly contributing to climate change mitigation.
	<b>Moderation of extreme events</b>	<b>Mangroves</b> stand out with an average value of 14,388 Int\$/ha/year. These ecosystems provide critical protection against coastal flooding and storms, improving resilience.
	<b>Recreation and tourism</b>	<b>Coral reefs</b> have an average value of 6,271 Int\$/ha/year. These ecosystems are particularly appreciated for their tourism and recreational activities, contributing to local and global economies.
	<b>Waste treatment</b>	<b>Rivers and lakes</b> provide an essential service in maintaining water quality, with an average value of 3,189 Int\$/ha/year.
	<b>Existence, bequest values</b>	<b>Coral reefs</b> have the highest average value of 18,793 Int\$/ha/year. This high non-use value reflects global appreciation and concern for the preservation of these unique ecosystems.
	<b>Pollination</b>	In areas of <b>intensive land use (agriculture)</b> , the pollination service has an average value of 8,993 Int\$/ha/year,

		reflecting the high economic dependence of agriculture on pollinators for productivity.
	<b>Air quality regulation</b>	<b>Urban and industrial areas</b> have an average value of 10,384 Int\$/ha/year and their green spaces provide significant benefits in air quality improvement.
	<b>Aesthetic information</b>	<b>Coastal systems</b> offer substantial aesthetic and cultural values, with an average value of 723 Int\$/ha/year. Although lower compared to other services, it underscores the importance of coastal landscapes for human well-being and cultural identity.
	<b>Water supply</b>	<b>Rivers and lakes</b> are essential in providing freshwater resources, with an average value of 8,618 Int\$/ha/year.

### Threats to ecosystem services and their economic impacts

Despite the immense value of ecosystem services to society, the loss of ecosystems—and the corresponding decline in the services they provide—is significant and accelerating. For example, despite the vital role of forests in maintaining biodiversity, storing carbon, regulating water cycles and conserving soil functions, the *Global Forest Resources Assessment* (Food and Agriculture Organization of the United Nations 2020) estimates a loss of approximately 420 million hectares of forest globally since 1990, leading to significant greenhouse gas emissions and loss of biodiversity.

The Amazon rainforest, a critical provider of tropical forest ecosystem services, is at risk of reaching a tipping point that could lead to large-scale collapse. Flores *et al.* (2024) estimate that by 2050, 10 to 47 per cent of Amazonian forests could be exposed to multiple disturbances, triggering significant losses in these ecosystem services and exacerbating regional and global climate impacts.

The degradation of forests and other ecosystems also impacts services such as the regulation of natural hazards. For example, the 2019-2020 Australian bushfires led to widespread habitat

destruction, reducing the capacity of affected ecosystems to regulate air quality and mitigate climate extremes.

Species extinction, driven by land-use change, climate change and other anthropogenic factors, threatens the ecosystem service of maintaining genetic diversity. The accelerating rate of species loss, as documented by IPBES (2019) (see Figure 2), has direct consequences for ecosystem functionality, impacting services such as pollination, nutrient cycling and disease regulation.

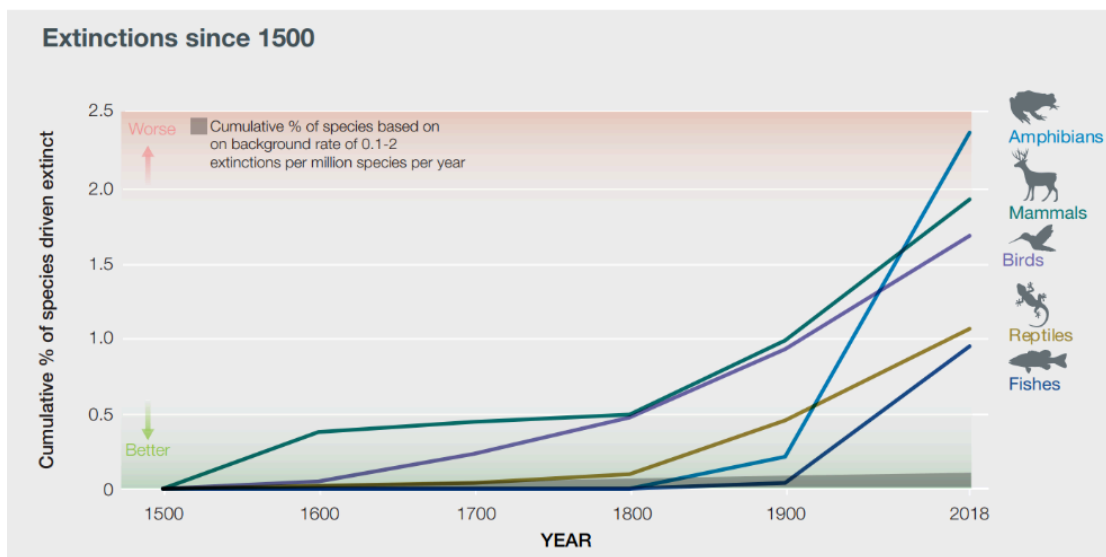


Figure 2: Species extinction has been growing exponentially since the 20th century (IPBES 2019)

The economic impacts of ecosystem service loss are substantial (Table 3). Stern (2007) estimates that unabated climate change could reduce global GDP by up to 20 per cent annually, mainly due to the loss of critical ecosystem services such as climate regulation and water supply. SwissRe (2020) estimates widespread ecosystem change could reduce global GDP by 11-14 per cent, reflecting the economic importance of services like biodiversity conservation and soil fertility. The World Bank Group projects that accelerated biodiversity loss could result in a global GDP loss of US\$2.7 trillion by 2030. The UNCCD (2022) warns that with 40 per cent of the planet's land degraded, the world is risking US\$44 trillion in economic losses. Riemer *et al.* (2023) estimate that the current agri-food system's negative impacts could cost US\$19.8 trillion. Climate tipping points could intensify existing risks, leading to a socio-environmental crisis.

Table 3: Estimated economic impact of ecosystem degradation

Cause	Effect	Economic impact	Source
2°C to 2.6°C temperature rise	Widespread ecosystem change	<b>11-14 per cent global GDP loss</b>	SwissRe (2020)
Accelerated biodiversity loss	Ecosystem services collapse	<b>US\$2.7 trillion global GDP loss by 2030</b>	World Bank (2021)
40 per cent of the planet's land is degraded	Half the human population is affected	Risking <b>US\$44 trillion global GDP</b>	UNCCD (2022)
Current agri-food system	Negative impacts like food waste and agriculture subsidies	<b>US\$19.8 trillion estimated</b>	Riemer <i>et al.</i> (2023)

Increasing the collective capacity to address these threats is urgent and of the utmost importance. This can be done through investments in biodiversity conservation, ecosystem restoration and adaptive systems. Therefore, governments should implement economic instruments such as PES and seek to do it at a large scale through national policies and institutions instead of through piecemeal projects.

Providing ecosystem services has high costs. In addition to the direct costs of implementing conservation measures, the opportunity costs of conservation must be considered. These represent the economic benefits that are foregone when land is used for conservation rather than for other potential activities such as agriculture, livestock or urban development. These opportunity costs can be significant, as they often involve sacrificing immediate income-generating opportunities for the long-term preservation of ecosystem services. Therefore, policies supporting conservation need to address both the direct and opportunity costs to ensure that resource stewards are adequately compensated for their contributions to ecosystem and biodiversity protection.

The substantial financing gaps in conservation efforts further highlight the need for innovative mechanisms like PES, which can alter economic incentives and encourage conservation behaviors that align with broader environmental goals.

Addressing these challenges requires significant financial resources. The Forest Declaration Assessment Partners (2023) estimate that US\$460 billion annually is needed until 2050 to effectively combat deforestation and support sustainable forest management. This aligns with broader estimates by the Convention on Biological Diversity's Panel on Resource Mobilization, which suggests that between US\$631 billion and US\$895 billion annually is required to achieve ambitious biodiversity conservation targets by 2030. The gap between current funding and these projections underscores the importance of additional resources and innovative financing mechanisms (Annex 4).

While PES cannot singularly close the overall conservation finance gap, it represents a targeted and effective mechanism to align local land-use decisions with the value of ecosystem services. When implemented alongside other financial instruments and conservation strategies, PES schemes can substantially contribute to sustainable ecosystem management and the preservation of biodiversity. By providing direct financial incentives for the conservation and restoration of specific ecosystem services, PES helps internalize environmental values into economic decision-making, promoting behaviors supporting local livelihoods and global environmental objectives.

## **PES**

PES schemes are strategic economic instruments designed to incorporate ecosystem services into public and private decision-making processes. By compensating for the benefits provided by ecosystems, these schemes incentivize conservation, restoration and sustainable land-use practices. Through financial payments, PES programs enhance the relative profitability of sustainable practices, making them more competitive than unsustainable alternatives and encouraging a shift towards a more sustainable economic model.

PES programs vary widely in their design, reflecting differences in the scale of demand for ecosystem services, the source of payments, the activities being incentivized, the metrics used to assess service quality, the payment size and the type of scheme employed. The effectiveness of a PES program depends crucially on thoughtful design, including aspects such as stakeholder engagement, precise monitoring and enforcement mechanisms and adaptive management to respond to changing environmental conditions (Engel *et al.* 2008).

## Scales of PES implementation

Depending on the spatial scale of the benefits provided (as discussed in the Section on Scales of ecosystem services provision), PES schemes can be financed and implemented at different levels (Smith *et al.* 2013), including:

- Global: Ecosystems such as tropical forests are pivotal in mitigating climate change by absorbing and storing greenhouse gases through carbon sequestration. Prominent examples of global PES schemes are Reducing Emissions from Deforestation and Degradation (REDD+) initiatives. Through REDD+, developing countries that are willing and able to reduce emissions from deforestation and forest degradation against a reference level can be compensated by developed countries and the private sector. However, PES schemes like REDD+ face challenges with methodology (particularly on how to define the reference level) and scale (whether to implement at project, jurisdictional or national scale), and with ensuring equitable distribution of payments.
- Regional / national: Programs such as Brazil's Bolsa Verde and Bolsa Floresta show how PES can be implemented at the regional or national level. These government and public-financed schemes pay landholders to adopt more environmentally sensitive practices.
- Local: At the local level, PES schemes often involve downstream water users paying for upstream watershed management. These schemes tend to be financed through public-private partnerships or solely by private entities, for example when a water utility compensates upstream landholders for adopting sustainable practices. Indigenous Peoples and local communities frequently play a critical role in these local PES schemes as they are often the primary stewards of the land. Their traditional knowledge and sustainable practices contribute significantly to the conservation and restoration of ecosystems. For example, Indigenous Peoples and local communities may manage watersheds that provide essential ecosystem services, ensuring that these services are maintained for the benefit of downstream users. Another example is the provision of recreational opportunities, where national parks like Yellowstone and Yosemite in the United States of America or Kruger National Park in South Africa offer services such as hiking and birdwatching. These local PES schemes often rely on close cooperation between stakeholders to ensure that both service providers and beneficiaries are engaged and compensated.

## Providers of ecosystem services

The foundation of PES is that individuals or entities such as landowners, Indigenous Peoples, local communities or natural resource managers are compensated in exchange for a steady supply of ecosystem services—or, more frequently, for management practices designed to improve ecosystem services. PES thus offers a way to assign a monetary value to ecosystem services such as climate regulation, water quality maintenance and wildlife habitat provision that previously lacked a price tag, thereby integrating them into the broader economy.

## Financing PES: Local, regional and global sources

Payments for PES schemes typically come from those who benefit from the services, which may include individuals, communities, businesses or government entities acting on behalf of various stakeholders. However, identifying these beneficiaries and potential payers presents significant challenges.

One key difficulty lies in defining who benefits from the ecosystem services, as the benefits are often diffuse and can vary greatly depending on the local, regional or global scale. For example, while local communities may directly benefit from improved water quality or forest conservation, the broader benefits, such as carbon sequestration and climate regulation, extend to a global audience. This diffuse nature can make it difficult to pinpoint specific beneficiaries who are both willing and able to contribute financially.

Moreover, the value of ecosystem services is not always immediately apparent to potential payers, especially when benefits are long-term or indirect. This can lead to reluctance or unwillingness to participate in a PES scheme, as stakeholders may not fully recognize the connection between their contributions and the benefits received. Additionally, varying levels of engagement, awareness and financial capacity among potential payers further complicate the process of securing funding.

To effectively finance PES schemes, proponents must carefully identify and engage ecosystem service users at all scales, ensuring that all potential sources of funding have been explored. This involves analysing users based on their number, reliance on the service in question, the extent of the benefits they might secure, their willingness to participate in the scheme, and their capacity to contribute financially. By addressing these challenges, PES schemes can better align incentives and secure the necessary funding to sustain vital ecosystem services.



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### **Institutional arrangement**

The institutional arrangement of a PES program must specify the agents involved, that is, the provider groups, paying users and public management bodies required to ensure the PES program's execution, as well as the intermediate operational and financial agents (Figure 3). Ecosystem services are provided by different classes of territories such as private lands, Indigenous lands, traditional community lands and protected areas, which, depending on the degree of conservation and land-use management, enable the generation of certain services. Service providers are determined depending on these classes of territories. On the other hand, users can be located on a global scale, such as industries, sectors and populations benefiting from climate regulation and biodiversity protection. Users can also be at the regional and local scale, for example through dependence on hydrological regulation services. To enable the arrangement between these agents, financial and operational intermediary actors are essential, whether for the constitution of funds or for technical and monitoring assistance. The political recognition of the benefits provided by ecosystem services at the global scale is essential to enable international PES funding schemes.



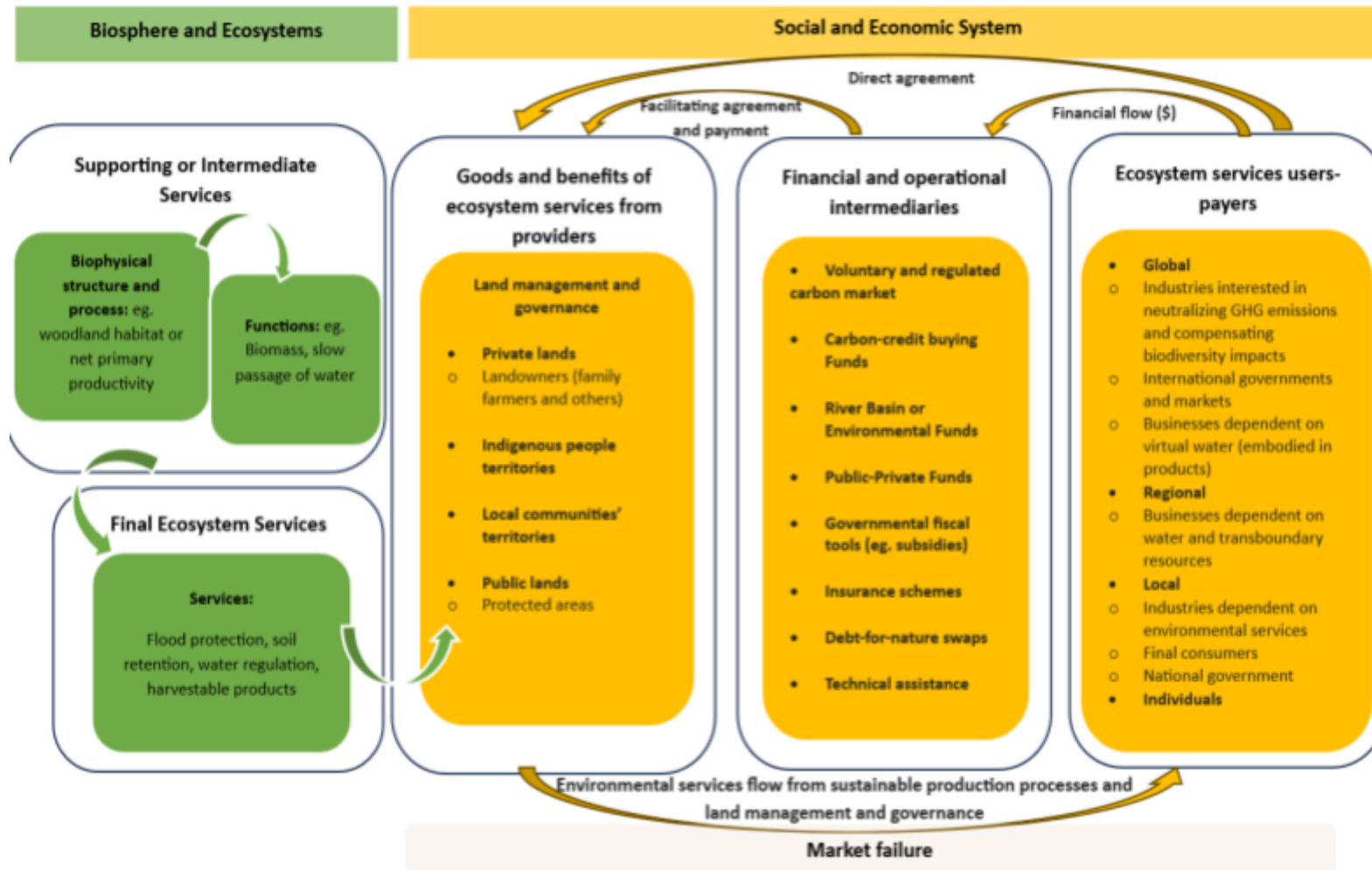


Figure 3: Institutional arrangements and actors involved in PES schemes

A core cost of PES programs is the payment provided to resource stewards. There are four economic principles on which payment amounts can be determined: ecosystem services value, participation costs, opportunity costs and rewards. These categories represent ways to find a starting point for negotiating the payment size. Although economic utility theory supports basing PES payments on opportunity costs, payment amounts have not been determined this way in many cases but have been determined through a combination of political pressures and budgets (Muñoz-Piña *et al.* 2008). To provide a clearer picture of the costs associated with delivering ecosystem services, Table 4 provides an overview of estimated costs for different countries, focusing on forest conservation as an illustrative example. The data from various sources highlights the financial requirements necessary to maintain and enhance ecosystem services through PES schemes.

Table 4: Estimated costs of providing ecosystem services through PES programs

Region/country	Ecosystem service	Annual cost (US\$)	Source
Amazon basin (Brazil, Peru, Colombia, etc.)	Forest conservation	US\$5.7 billion	Forest Declaration Assessment Partners (2023)
Indonesia	Peatland restoration and forest conservation	US\$4 billion	Bhomia and Murdiyarso (2021)
Central Africa (Congo basin)	Forest and biodiversity conservation	US\$5 billion	Streck <i>et al.</i> (2023)
Costa Rica	Forest ecosystem services	US\$35 million	Rojas and Aylward (2003)
Mexico	Watershed and forest conservation	US\$400 million	Muñoz-Piña <i>et al.</i> (2008)

These estimates underscore the substantial financial commitments required to sustain ecosystem services globally. As these figures indicate, the costs of providing ecosystem services through PES programs are significant and vary widely by region, depending on the type and

scale of the services being conserved. Mobilizing the necessary resources will require a concerted effort by governments, the private sector and the international community to preserve these essential services for future generations.

The principles to determine PES payment amounts are:

**Value of ecosystem services (demand-side):** The premise of PES schemes is that resource stewards, or those providing ecosystem services, ensure or help ensure the provision of valuable benefits to society. In turn, society, in some form or another, is willing to pay for these benefits. The monetary value of ecosystem services can be calculated based on the measurable benefits that payers receive such as reduced water treatment costs due to watershed conservation or the cost of climate change impacts that could be avoided through conservation. The conservation value could also be revealed by purchasers' willingness to pay, for example, to protect biodiversity.

**Participation costs (supply-side):** Participating in a PES program may entail time or monetary expenses to comply with program rules. Providers may need to adopt specific land-use or management practices such as planting trees or preventing fires and may also need to provide proof of conservation or restoration behaviors. To encourage participation, payments must theoretically exceed these costs.

**Opportunity costs (supply-side):** Another critical premise of PES schemes is that by compensating resource stewards, they will choose conservation over other "opportunities" that would degrade ecosystems. To shift the economic equilibrium from degradation to conservation, payments need to approximate resource stewards' opportunity costs—the foregone income from other economic activities (Kosoy *et al.* 2007; Wünscher *et al.* 2008). In cases where resource stewards lack other economic opportunities, participation or compliance costs would represent the minimum opportunity costs.

**Rewarding good behavior:** In situations where resource stewards do not have competing economic opportunities or are already conserving ecosystems without PES, payments can be viewed as a reward for good behavior or as a form of recognition. The reward amount is often determined by the program's budget or what administrators deem fair. In these cases, payments are not assumed to induce additional conservation but may help prevent or slow changes to land-use behaviors. This is particularly important to ensure that Indigenous peoples and local communities benefit from PES.

Evaluations of PES programs have shown that resource stewards will join PES programs even when offered payments lower than their opportunity costs (Balderas Torres *et al.* 2013), indicating that either a) resource stewards have a preference for conservation and will accept lower incomes because they prefer to conserve for a variety of non-economic reasons (Jones *et al.* 2019; Kosoy *et al.* 2007) or b) that resource stewards are not giving up other opportunities, i.e. conservation is not additional and would have happened without the program, or that resource use can be “leaked” to other areas.

Program implementation costs: Managing a PES program requires resources. An agency or regional authority must encourage participation, verify eligibility, administer payments and monitor and enforce compliance. Providers need to understand program rules and conditions, and purchasers or funders require proof or assurance of conservation.

Long-term considerations: Land uses exist in a market equilibrium, which PES programs disrupt, as shown by Wu (2000) for the United States Conservation Reserve Program. Compensating landowners for opportunity costs does not address the underlying drivers of natural capital loss, it merely compensates for them. If the pressures to exploit or destroy natural capital, which reduces the provision of ecosystem services, are not mitigated, payments may need to continue indefinitely (Engel *et al.* 2008). Moreover, if payments are truly incentivizing “additional” conservation, they are likely preventing some activities, such as logging. However, if the demand for timber remains unchanged, logging could simply relocate (“leakage”), or timber prices might rise, creating a greater incentive for deforestation in the long term.

### **PES schemes and case studies**

Various types of PES schemes are differentiated by their funding sources. According to Smith *et al.* (2013), they can be categorized as follows:

- Private payment schemes: These are self-organized private deals in which beneficiaries of ecosystem services contract directly with service providers.
- Public payment schemes: In these schemes, the government directly compensates landowners or resource managers through income transfers to enhance ecosystem services on behalf of the broader public.
- Public-private and international payment schemes: These schemes combine government, private and international funds to pay land or other resource managers for the delivery of ecosystem services.

PES programs have been implemented in different countries and scales. To gather data on these programs, the G20 Presidency conducted a questionnaire to collect case studies from different countries<sup>1</sup>. Examples such as Guyana's PES Model, Mexico's PES National Program and France's ~~Experimenting Public Payments for Environmental Services~~ are presented in [Annex 3](#). The information about providers, users, funding, success factors and challenges in these case studies has been organized according to the three types of schemes mentioned above.

### **PES private funding schemes**

PES private funding schemes are those in which beneficiaries of ecosystem services contract directly with service providers. Actors, such as private organizations and individuals who benefit directly, pay directly for improved ecosystem service provision. When sustainable land management contributes to water provision and soil erosion control, economic activities such as renewable power plants and water supply companies directly benefit (Limb *et al* 2023). In this sense, as private PES scheme case studies, the PES Cultivating Good Water Program implemented by the Itaipu Hydroelectric Power Plant in Brazil and the Pro-Mananciais Program adopted by a Water Supply Company in Minas Gerais, Brazil, are highlighted.

The PES Cultivando Água Boa (“Cultivating Good Water”) Program, implemented by the Itaipu Hydroelectric Power Plant, is a pioneering initiative led by a renewable energy company focused on integrated watershed management, environmental conservation and sustainable development. The program is implemented in 434 municipalities in the State of Paraná and Mato Grosso do Sul, in the Paraná River Basin. Launched to address the environmental challenges posed by deforestation, soil erosion and water pollution, the program provides PES to landowners who engage in conservation activities, offering financial support to offset the costs of sustainable land management, to restore ecosystems and improve water quality. Strong backing from Itaipu Binacional, in collaboration with government agencies, non-governmental organizations and local authorities, ensures the program’s success, while also strengthening environmental governance in the region. The model has received international recognition, including the United Nations "Water for Life" Best Practices Award.

The Pro-Mananciais Program is an initiative led by Companhia de Saneamento de Minas Gerais, the state water and sanitation utility company in the state of Minas Gerais, Brazil, that aims to protect water resources that supply urban and rural areas. The program provides financial

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<sup>1</sup> The mentioning of PES programs by the Brazilian G20 Presidency shall not be construed as an endorsement or an acknowledgment that such initiatives are consistent with World Trade Organization rules and principles.

incentives and technical support to encourage local landowners and communities to adopt sustainable land-use practices such as: a) riparian zone protection and restoration (areas along watercourses) to improve water quality and reduce erosion, and b) reforestation projects that include restoration of natural vegetation around water sources, which helps in maintaining watershed health and water flow regulation. Through conservation activities, community engagement and monitoring, the program aims to ensure the sustainability of water resources and improve water quality in the region.

### **PES public funding schemes**

In many cases, either because ecosystem services are public goods or they resemble a common-pool good, providers and users do not develop market systems, which requires the state to finance and enable PES incentives through policies and programs. This type of incentive can be implemented as direct monetary compensation. Both types of incentive should always be dependent on payments by results considering environmental criteria of behavior change. Governments can implement supportive policies and provide financial incentives for conservation efforts.

As public PES program case studies, the Conservation Reserve Program (CRP) in the United States of America and the Experiment Public PES Project in France are highlighted.

In the United States of America, the CRP has been implemented since 1985 as one of the largest land conservation programs administered by the Farm Service Agency (FSA). In exchange for a yearly rental payment, farmers enrolled in the program agree to remove environmentally sensitive land from agricultural production and plant species that will improve environmental health and quality. Contracts for private land enrolled in CRP are from 10 to 15 years in length. The long-term goal of the program is to reestablish valuable land cover to help improve water quality, prevent soil erosion and reduce loss of wildlife habitat. Since 2021, the FSA has taken steps to improve the program. This included higher payment rates, new incentives and a more targeted focus on CRP's role in climate change mitigation. FSA introduced a new climate-smart practice incentive to reward participants who implement conservation practices that increase carbon sequestration and reduce greenhouse gas emissions. In 2023, the total hectares involved in CRP enrollments was approximately 10 million hectares. Also, FSA issued more than US\$1.77 billion in October 2023 to more than 667,000 agricultural producers and landowners for more than 9.3 million hectares enrolled in CRP in 2023.

## PES public-private and international funding schemes

Given the high costs of providing ecosystem services, including those that provide global benefits such as tropical forests, international funding is crucial for their continued provision. International donors, multilateral organizations and private sector investments play vital roles in financing PES schemes. However, international funding is severely limited. For example, the Paulson Institute estimates that the world is underinvesting in biodiversity conservation financing by approximately US\$700 billion per year (Deutz *et al* 2020).

As public-private PES program case studies, Guyana's PES model, the PES National Program in Mexico and the Water Producer Incentive Program in Brazil are highlighted

Guyana's PES model, started in 2008, is a significant initiative aimed at conserving the country's vast tropical forests while promoting sustainable development. The model is part of Guyana's Low Carbon Development Strategy, which seeks to balance economic growth with environmental protection. Primarily focused on avoiding deforestation and preserving the extensive forest cover that serves as a critical global carbon sink, the model is integrated into the REDD+ framework. This allows Guyana to receive financial incentives from international partners such as Norway in exchange for maintaining low deforestation rates and implementing sustainable land management practices. The project aims to conserve 18 million hectares of forest that stores 19.5 Gt of CO<sub>2</sub>e and removes 154 million tonnes of CO<sub>2</sub>e annually.

Mexico has played an important role in advancing a national PES program. In 2003, the Federal Government through the National Forestry Commission (CONAFOR) undertook the Hydrological Ecosystem Services Program, and in 2004 the Program to Develop Ecosystem Services Markets from Carbon Sequestration and Biodiversity. Over the years, the program has received funding from various sources that include contributions from water users; a yearly budget approved by the legislature, state and municipal governments; and the private sector. All funding is channeled to landowners through the Mexican Forest Fund, a mandate that allows committing resources in five-year contracts with annual payments. Targeted priority areas consider vegetation types and prioritize cloud forests and risk of deforestation, overexploited aquifers, natural protected areas and poor municipalities. The program works on a contract basis between CONAFOR and landowners, with CONAFOR agreeing to make a fixed payment per hectare for a period of five years while the landowner commits to sustainable management practices that maintain or improve the provision of ecosystem services. Payments currently

range from US\$28 to US\$100 per hectare per year, with cloud forests at high risk of deforestation receiving a higher payment.

The Water Producer Program in Brazil, led by the Brazilian National Water and Sanitation Agency (ANA) and financed by watershed basins and environmental funds, is a voluntary PES program to benefit rural producers who, through conservation practices, management and improvement of vegetation cover, will contribute to the effective reduction of erosion and sedimentation, and to increase water infiltration. The amount per hectare to be paid to participating rural producers is always proportional to the environmental service provided. These values vary from region to region, since Water Producer Program projects have the autonomy to define their own valuation methodology. The ANA has a database with 35 projects related to PES and water, with a wide variety of actors involved. The average amount paid per hectare in the Water Producer Program ranges from R\$300 to R\$750 per hectare, and varies depending on the region, the type of conservation action carried out and the specific agreements established for each project. In general, the program provides financial compensation to landowners who adopt sustainable management practices and protect areas important for water conservation.

### **The Tropical Forest Forever proposal: An investment fund to pay countries for their performance in conserving and restoring tropical forests**

At COP28 in Dubai, Brazil introduced to the global community a proposal to establish a facility that would reward tropical forest countries for protecting their natural tropical forests, based on verified performance in keeping or increasing forest cover. By providing an explicit payment for verified conservation and restoration of tropical forests, the Tropical Forest Forever Facility will address a significant market failure, placing a value on the ecosystem services that those forests render such as water management, biodiversity preservation, soil protection, nutrient cycling, continental and global climate regulation and climate resilience. Correcting this market failure will also help reduce poverty and advance economic development in forest countries and globally.

The Tropical Forest Forever Facility will offer substantial, long-term payments based on verified performance in maintaining or increasing forest cover, using simple existing monitoring tools. It will provide an additional incentive for forest nations to maintain and increase their forest cover without increasing funding demands on government budgets.



The Tropical Forest Forever Facility proposes to use well-established financial market tools. It will create an investment portfolio funded with low-cost, long-term deposits and other borrowings from governments, sovereign wealth funds, endowments and foundations and other institutional investors. The fund will be invested in a diversified, long-term investment portfolio generating returns materially higher than the cost of the borrowing funding it. These returns, net of the cost of the borrowings funding the portfolio, will be used to reward qualifying tropical forest nations for their performance in maintaining and increasing natural forest cover.

The use of Tropical Forest Forever funds by sovereign nations will be decided nationally. The preliminary proposal is that participating countries should have a transparent and inclusive mechanism to receive and allocate resources, including to those who effectively conserve forests (such as, for example, local communities, Indigenous Peoples and protected area managers).

The proposed fund seeks to establish financial transfers, strategically designed incentives for performance in halting and reversing deforestation and forest degradation. Importantly, while the fund will provide a major incentive for forest nations to conserve and enhance these important resources, it is not intended to be the only solution. It will complement, not replace, other policies and initiatives necessary to achieve this key objective, including REDD+ initiatives, the development of effective carbon credit markets and changes in agricultural policies and practices.

The Tropical Forest Forever Facility is a bold and ambitious initiative to mobilize resources for tropical forest conservation on a global scale. By financing PES programs and other conservation initiatives, the fund would play a crucial role in protecting the world's remaining tropical forests and securing their invaluable ecosystem services for future generations, while maintaining the cultural diversity of the peoples that live there.

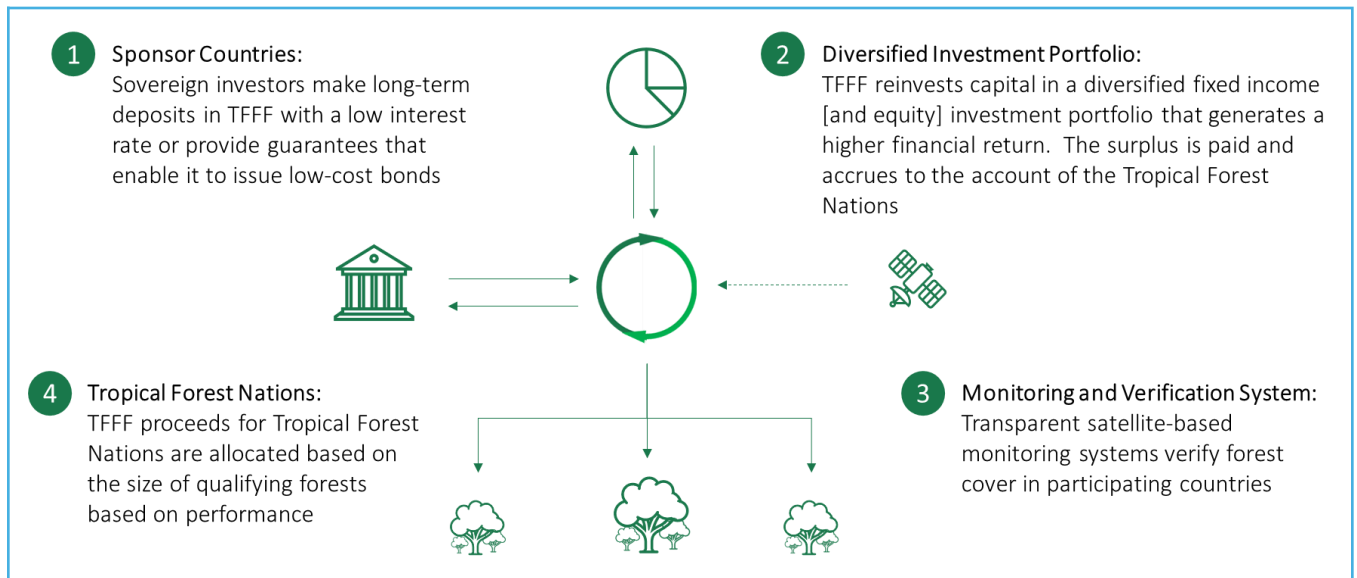


Figure 4: Enhancing international cooperation for PES implementation

Strengthening international cooperation is vital for the successful scaling up of PES schemes globally. Through enhanced knowledge exchange and technical collaboration among G20 countries, collective efforts can improve capabilities in ecosystem service monitoring, valuation and the application of best practices. This collaboration can significantly reduce transaction costs associated with PES and increase resource flows to countries that ensure the provision of critical ecosystem services.

Scaling up international mechanisms such as REDD+, carbon markets and the Tropical Forest Forever Facility is essential to mobilize the necessary resources for global conservation efforts. These mechanisms not only provide financial incentives for ecosystem services but also create a platform for countries to share experiences, innovate and adopt best practices in PES implementation.

Moreover, empowering local communities and Indigenous Peoples through international cooperation is crucial for the long-term success of PES schemes. By providing opportunities for knowledge exchange and capacity building, international collaboration can ensure that these communities are active participants in the global effort to conserve and restore ecosystems. This empowerment not only supports the equitable distribution of benefits but also strengthens the resilience and sustainability of ecosystem service provision.

## Challenges and lessons learned

Despite the potential of PES schemes, several challenges still need to be solved with their establishment and successful implementation. These challenges relate to increasing demand, lack of willingness to pay for ecosystem services, securing sustainable and long-term funding, accurately identifying and measuring ecosystem services, overcoming high transaction costs, incorporating social and equity criteria, and creating enabling institutional and governance conditions.

### Market internalization of multiple ecosystem service values

One of the core challenges PES programs seek to overcome is the internalization of the ecosystem service values into market transactions. In many cases, the benefits of ecosystem services are public goods, leading to low willingness to pay among potential buyers. This is often due to the diffuse nature of the benefits, which makes it difficult for individual beneficiaries from market transactions to see the direct value of their contributions. In this sense, establishing values to be internalized by markets involves addressing numerous economic and regulatory hurdles, considering the lack of buyers willing to pay for these services.

### Engaging the private sector in PES implementation

The private sector plays a crucial role in successfully implementing and scaling PES schemes. By integrating ecosystem services into their sustainability strategies and corporate social responsibility initiatives, businesses can contribute to the long-term conservation of natural resources while managing risks associated with resource depletion and environmental degradation.

Sectors heavily dependent on natural resources such as agriculture, forestry and energy stand to benefit significantly from investing in PES. These investments not only help mitigate environmental risks but also enhance the resilience of supply chains, reduce operational costs and improve brand reputation. For example, companies engaged in agroforestry can use PES to incentivize sustainable land management practices that ensure the long-term availability of essential resources like water and soil.

To encourage private sector participation, governments and international organizations should create enabling environments that incentivize businesses to invest in PES. This can include tax

benefits, subsidies and access to green financing options. Moreover, PES can be integrated into broader corporate risk management strategies, in which businesses recognize the mutual benefits of sustainable resource use and ecosystem conservation. This integration can drive more substantial private sector contributions to global conservation efforts and help bridge the existing funding gap for ecosystem services.

### **Financial sustainability**

Securing sustainable and long-term funding for PES schemes is a significant challenge. Low willingness to pay for ecosystem services, donor fatigue, changing political priorities and economic downturns can all impact funding availability. Increasing financial support for PES programs may require innovative approaches such as legislative measures, the creation of new markets and raising public awareness. For example, Costa Rica's PES program has successfully leveraged domestic and international funding sources to ensure long-term financial sustainability. Similarly, Guyana's Low Carbon Development Strategy has evolved from relying on international public finance to integrating with voluntary and compliant carbon markets, investing revenues in local and national low-carbon development priorities.

Reliable payments are essential to ensure that service providers make land use changes that often involve significant costs, including political ones. For example, reducing deforestation typically requires halting profitable agricultural activities conducted by politically influential entities (Leite-Filho *et al* 2021). Compensation for tropical forest conservation has historically been limited, unreliable and associated with high transaction costs, making it difficult to incentivize meaningful change.

### **Mobilizing financial resources for PES implementation**

Scaling up PES schemes globally requires a concerted effort to mobilize financial resources from diverse sources, including domestic and international, public, private and blended funding. Ensuring long-term financial sustainability is critical for the continued provision of essential ecosystem services like climate regulation and biodiversity protection.

Innovative financing instruments such as markets for ecosystem services offer promising avenues to attract private investment in conservation efforts. The Tropical Forest Forever Facility is an attempt to establish a large-scale international transfer system to provide performance-based payments for forest conservation and restoration through a blend of public and private finance.

## **Social and equity considerations**

Ensuring that PES schemes are equitable and that benefits are fairly distributed among stakeholders, including marginalized communities, is crucial. If managed carefully, PES programs can avoid exacerbating existing inequalities. Local community participation, particularly in tropical areas, is essential for the success of PES schemes. For example, Ecuador’s Socio Bosque program provides payments to Indigenous communities for forest conservation, emphasizing community involvement and equitable benefit-sharing and leading to positive social and environmental outcomes.

## **Land tenure issues**

Land tenure issues are a significant challenge for PES programs, particularly in regions where land ownership is unclear or contested. Secure land tenure facilitates PES schemes as it ensures that resource stewards can legally engage in conservation activities and receive payments. Without clear land tenure, the benefits of PES programs may not reach the intended recipients, and the long-term sustainability of conservation efforts could be compromised.

## **Monitoring ecosystem services**

Conditionality is a crucial feature of PES schemes, requiring that payments be contingent upon providing ecosystem services. However, identifying and monitoring ecosystem services presents significant challenges. Ecosystem services are complex and often difficult to quantify accurately. While some argue that PES programs would be more efficient if payments were conditional on monitored ecosystem service delivery, this requires cost-effective monitoring methods (Wunder 2014).

Today, most PES contracts monitor agreed-upon resource use proxies expected to provide the ecosystem service rather than the service itself, which may be difficult to define. Using these proxies could be an avenue for scaling up PES. Technological innovations, such as remote sensing and satellite imagery, can also help reduce monitoring costs and improve the accuracy of ecosystem service measurements.

## **Advancing cost-effective monitoring and natural capital accounting**

Developing cost-effective monitoring systems is essential for the successful implementation of PES schemes. These systems ensure that payments are made based on the actual provision of

ecosystem services or compliance with agreed resource management rules. Leveraging the best available science, including remote sensing and satellite imagery, can significantly reduce monitoring costs while improving the accuracy and reliability of ecosystem service measurements.

In addition to technological advancements, integrating traditional knowledge into monitoring processes can provide valuable insights, particularly in regions where Indigenous and local communities have long-managed and sustained ecosystems. These communities possess a deep understanding of their environments that can enhance the effectiveness of monitoring systems and ensure that they are culturally appropriate and locally relevant.

Furthermore, promoting natural capital accounting, as proposed by the System of Environmental-Economic Accounting, is critical to supporting the measurement and monitoring of ecosystem services. By incorporating natural capital values into public and private sector decision-making, these methods help quantify the value of ecosystem services and ensure that they are adequately protected and sustained. Governments and international organizations should foster science and research innovation to continuously improve methods for identifying and quantifying ecosystem services, ensuring that PES schemes remain effective and efficient over the long term.

### **Defining payment levels**

Assessing the monetary value of ecosystem services is inherently challenging and often controversial. Different valuation methods yield different results, leading to uncertainties in determining appropriate payment levels. For example, methods may provide estimates of net value, gross value, welfare value, exchange value, realized value or potential value, each with its own assumptions and limitations. Despite these challenges, valuation is critical for recognizing and accounting for the benefits that society receives from nature, thus creating a basis for financing their protection or compensating for their degradation.

### **Transaction costs**

High transaction costs related to implementing, monitoring and verifying PES projects can reduce their overall effectiveness and efficiency. Streamlining administrative processes and leveraging technology can help reduce these costs. For example, digital platforms and automated monitoring systems can lower the costs of enrolling participants, processing payments and verifying compliance.

## Institutional and governance issues

PES schemes require supportive policies, legal frameworks and adequate institutional capacity to be implemented effectively and to ensure compliance with PES agreements (Castro *et al* 2023). However, these frameworks are underdeveloped or absent in many regions, hindering PES development. In Mexico, for example, CONAFOR oversees the implementation of the national PES program, ensuring compliance and providing technical support to participants. This institutional framework has been critical to the success of PES in Mexico.

While the challenges associated with implementing PES schemes are significant, they are manageable. Around the world, successful PES programs have demonstrated that these challenges can be overcome with the right mix of political will, stakeholder engagement and innovative financing mechanisms. For example, countries like Costa Rica, Mexico and Guyana have shown that by building strong institutional frameworks, leveraging both domestic and international funding sources and ensuring equitable participation, PES programs can deliver substantial environmental and socio-economic benefits. Moreover, technological advancements and increasing global awareness of the value of ecosystem services are creating new opportunities to enhance the effectiveness and efficiency of PES programs. By learning from these examples and tailoring PES schemes to their unique national contexts, G20 countries can play a pivotal role in scaling up conservation efforts globally, contributing to sustainable development and climate resilience.

## Recommendations to scale up PES

G20 countries are encouraged, considering their national circumstances, to adopt and scale up national and global PES schemes as a powerful tool to halt and reverse the loss of ecosystem services. This can be achieved by promoting institutional support, adopting PES as national policy, leveraging finance through innovative mechanisms, ensuring inclusive participation and enhancing international cooperation. Specific areas for G20 policy coordination on PES schemes include:

### 1. Promoting institutional support and transformation

It is recommended to strengthen institutions for PES implementation and advance legal frameworks to support the emergence and governance of PES. Public policies and regulatory frameworks that facilitate PES should be prioritized, and PES should be integrated into national policies. Governments should prioritize public policies and regulatory frameworks that facilitate the growth and sustainability of PES programs. Ecosystem and biodiversity protection require strategic and coordinated actions at regional and national levels. PES-related measures should be embedded within broader policy objectives, particularly those related to climate change mitigation and adaptation strategies.

### 2. Leveraging financial resources

It is recommended to mobilize financial resources from domestic and international, public, private and blended sources to scale up PES schemes globally, ensuring the long-term provision of essential ecosystem services like climate regulation and biodiversity protection. The development of innovative financing instruments such as green bonds and markets for ecosystem services should be encouraged, as well as exploring innovative international transfer systems, including the Tropical Forest Forever Facility, to increase global finance for ecosystem services.

### 3. Engaging the private sector

It is recommended to encourage the private sector to integrate ecosystem services into their sustainability strategies and corporate social responsibility initiatives. Sectors heavily dependent on natural resources should be incentivized to invest in ecosystem services as part of their risk



management strategies, recognizing the mutual benefits of sustainable resource use and ecosystem conservation.

#### 4. Integrating Indigenous Peoples, local communities and vulnerable groups

It is recommended to ensure that Indigenous Peoples, local communities and other vulnerable groups are integral to PES schemes by recognizing their critical role in ecosystem stewardship. Fair benefit sharing and respect of their rights should be guaranteed, including the right to free, prior and informed consent over natural resource use. Ensure that PES participation is voluntary and that Indigenous Peoples and local communities can access grievance mechanisms and active representation in decision-making processes.

#### 5. Advancing cost-effective monitoring systems

It is recommended to develop cost-effective monitoring systems to assess the provision of ecosystem services or compliance with agreed resource management rules, utilizing the best available science and traditional knowledge. Innovation in science and research to improve methods for identifying and quantifying ecosystem services and integrating traditional knowledge into these processes should be fostered. Natural capital accounting methods should be developed to support the measurement and monitoring of ecosystem services and their incorporation into public and private sector decision-making.

#### 6. Enhancing international cooperation

It is recommended to strengthen international cooperation to promote knowledge exchange and technical collaboration among G20 countries. This collaboration should enhance capabilities in ecosystem service monitoring, valuation and best practices, ultimately reducing PES transaction costs and increasing resource flows to countries that ensure the provision of ecosystem services. International mechanisms for PES such as REDD+, carbon markets and the Tropical Forest Forever Facility should be scaled up, and communities empowered by providing opportunities for knowledge exchange and capacity building. Collective efforts in these areas can lead to significant global impacts.

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MINISTÉRIO DAS  
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## Annexes

### Annex 1: Aligning PES with other G20 work streams

Table 1 summarized the synergies that PES has with ongoing G20 work streams under the Brazilian Presidency. This section provides more detailed information.

### Sustainable Finance Working Group

The Sustainable Finance Working Group (SFWG) has four action pillars: 1) Optimizing the operations of the international environmental and climate funds to deliver sustainable finance; 2) advancing credible, robust and just transition plans; 3) analysing implementation challenges related to sustainability reporting standards, including for small and medium enterprises and emerging markets and developing economies; and 4) financing nature-based solutions.

The SFWG notes the significant underinvestment in the provision of ecosystem services and the conservation of biodiversity. At the same time, vast flows of funds go to activities that have a direct negative impact on nature. According to research from the Paulson Institute, the world is underinvesting in biodiversity conservation financing by approximately US\$700 billion per year. Also, it is important to note that according to the 2023 State of Nature Finance report, annual finance flows from public and private sources that have direct negative impacts on nature are estimated at almost US\$7 trillion per year. Realignment of public and private nature-negative finance flows would have a very significant effect and is essential to avoid undermining investments in nature-based solutions. The SFWG explores 12 case studies within crucial nature-based solutions areas: conservation, restoration, bioeconomy, agroforestry and marine ecosystem management.

The SFWG aims to disseminate exemplary strategies for financing nature-based solutions among investors, international financial institutions, policymakers and additional stakeholders (Limb *et al* 2023). Finally, the SFWG calls for more private investment in ecosystem services provision and advocates for tools to achieve that, such as enhancing data, capacity and knowledge on ecosystem services, while calling for regulatory reforms to facilitate nature-based solution investments and for community participation in the design of any nature-based solutions financing instrument, in line with the recommendations in this paper.

In addition to PES, the SFWG explores other instruments to enhance financing for ecosystem services, such as debt-for-nature swaps and risk-sharing tools to facilitate blended finance.

### **Global Bioeconomy Initiative**

Integrating ecosystem services into the G20 High-Level Principles for Bioeconomy is an innovative approach to sustainable development that incorporates social inclusion and economic growth with environmental conservation. PES can complement bioeconomy initiatives by compensating landowners for the public goods they provide when conserving and managing their lands sustainably. PES can enhance the financial return of bioeconomy initiatives and businesses by adding an extra stream of revenue. This is particularly important in bioeconomy initiatives related to the sustainable use of biodiversity and natural resources (such as sustainable forest management or sustainable small-scale fisheries management), which often have below-market financial returns, particularly in the short term.

### **Task Force for the Global Mobilization Against Climate Change (TF-CLIMA)**

TF-CLIMA focuses on two main items: 1) National transition plans and country platforms to scale up climate action, and 2) unlocking financial flows towards the fight against climate change. PES has been successfully applied as a financial mechanism to support climate mitigation and adaptation strategies.

For climate mitigation, PES can incentivize practices that reduce greenhouse gas emissions or enhance carbon sequestration. Examples include reforestation, afforestation and sustainable land management practices that increase carbon storage in different ecosystems. By providing financial incentives to landowners and communities for maintaining or restoring carbon-rich ecosystems, PES directly contributes to reducing the concentration of CO<sub>2</sub> in the atmosphere.

For climate adaptation, PES supports the resilience of ecosystems and communities by financing actions that enhance the capacity of natural systems to withstand climate impacts, such as mangrove and coral reef conservation and restoration, watershed conservation and restoration, inter alia. PES can contribute to verifying that adaptation measures are effectively implemented and maintained through regular monitoring and compliance checks since PES requires regular monitoring to keep payments flowing.

By leveraging PES as a tool for mitigation and adaptation, TF-CLIMA can facilitate the mobilization of financial resources towards effective climate action, ultimately contributing to more resilient and sustainable development pathways.

## Annex 2: Types of ecosystem services

Provisioning services: These include direct benefits people obtain from ecosystems such as food, water, timber, fiber and genetic resources. For example:

- Food: Diverse ecosystems provide fruits, vegetables, fish and livestock. For example, many biomes, such as the Amazon rainforest, support numerous native species that are vital for local food security. Additionally, agrobiodiversity provides regulating ecosystem services that support productive agriculture such as biological pest control, pollination, water flow regulation and soil biodiversity (Power 2010).
- Water: Natural hydrological cycles ensure water for drinking, irrigation and sanitation. The Himalayas, known as the "Third Pole", are a critical water source for millions of people in Asia.
- Medicinal resources: Ecosystems offer compounds of genetic resources of plants and animals with medicinal properties. The Madagascar periwinkle is a source of compounds used in cancer treatment.
- Raw materials: Forests provide lumber, and fibers like wool and cotton are sourced for various uses, from construction to textiles.

Regulating services: These benefits are obtained from the regulation of ecosystem processes, including air quality maintenance, climate regulation, water purification and disease control. For example:

- Climate regulation: Ecosystems sequester and store carbon, impacting local and global climates. Peatlands, for example, are crucial carbon sinks.
- Pollination: Vital for producing fruits, vegetables and seeds, with bees alone contributing billions of dollars to global agriculture (Klein *et al.* 2007).
- Flood regulation: Forests and wetlands absorb and store rainwater. The Sundarbans mangrove forest in Bangladesh plays a key role in flood mitigation.
- Water purification: Natural systems filter pollutants and detoxify water. Wetlands like the Florida Everglades are vital for water purification.

Cultural services: These reflect non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, recreation and aesthetic experiences. Examples include:



- Recreational benefits: Activities like hiking and birdwatching improve mental and physical health. The national parks in the United States of America provide vast recreational opportunities.
- Cultural heritage: Certain landscapes hold significant cultural values. The sacred forests of the Khasi tribe in India are an example of cultural heritage intertwined with nature.
- Educational values: Natural settings serve as living laboratories for learning. The Galápagos Islands are a prime example of natural environments that contribute to scientific research and education.
- Existence value or bequest value: Many people enjoy simply knowing that biodiversity exists and thrives. Furthermore, people may want to ensure that biodiversity continues to thrive for their children and grandchildren to appreciate.

Supporting services: Necessary to produce all other ecosystem services, including nutrient cycling, soil formation, and primary production. They encompass:

- Soil formation: Critical for plant growth and agriculture. The volcanic soils of Hawai'i are incredibly fertile and support diverse agriculture.
- Nutrient cycling: Maintains ecosystem health and service provision. Coral reefs, for example, play a crucial role in nutrient cycling in marine environments.



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## Annex 3: Case studies

[Study Cases Table](#)

## Annex 4: Other innovative financing instruments for ecosystem services conservation

The concept of ecosystem services has facilitated the creation and expansion of other innovative financing mechanisms for ecosystem services conservation. These mechanisms typically involve global ecosystem services benefits, with transactions between local service providers (often landowners) and regional or global beneficiaries (such as businesses, governments or communities) that have an interest in maintaining the services provided by natural ecosystems. Some examples are:

1. Carbon markets: These are perhaps the most widely recognized ecosystem services markets. Carbon trading schemes allow for the buying and selling of emission allowances or credits, where one credit represents the right to emit one ton of carbon dioxide or the equivalent amount of another greenhouse gas. Projects and programs that reduce or sequester carbon such as reforestation, improved forest management and avoided deforestation generate carbon credits, which can be sold on various compliance or voluntary markets globally.
2. Biodiversity banking: Biodiversity banking involves creating credit schemes through conservation actions that protect or enhance biodiversity. These credits can then be sold to organizations that want to compensate for the impact of their projects on biodiversity as an offset mechanism, or to demonstrate a contribution to the conservation and sustainable use of biodiversity. In the case of compensation, Australia's "Biobanking" scheme is a prominent example, allowing landowners to generate and sell biodiversity credits to developers required to mitigate their environmental impacts. Biodiversity banks are usually established with long-term management and conservation commitments, ensuring ongoing biodiversity benefits, whereas biodiversity offsets are project-specific compensatory measures and may vary in their long-term effectiveness depending on the specific measures taken.
3. Water quality trading: This involves the trade of credits between sources of water pollution. Entities that reduce their pollution beyond regulatory requirements can generate credits that can be sold to others who face higher costs of compliance. For example, in the Chesapeake Bay watershed in the United States of America, farmers can generate credits by reducing runoff into waterways that can then be purchased by municipalities or businesses required to meet stricter water quality standards.
4. Wetland and stream mitigation banking: In the United States of America, wetland mitigation banking allows developers who are impacting wetlands in one location to purchase credits from wetland banks that have been preserved, enhanced or restored elsewhere. In Brazil, the Forest Code allows for trade of excess "legal reserve" among private landowners, although the system is not operational yet due to ongoing discussion on the definition of "ecological identity" to



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ensure no net biodiversity loss. This mechanism will ensure no net loss of wetlands by linking economic development to wetland conservation through a market-based approach.

5. Recreational ecosystem services and eco-tourism: Although not a traditional market, eco-tourism operates on a similar principle by preserving natural beauty and biodiversity due to the economic benefits. Landowners or communities receive payments or sustain businesses catering to tourists, creating incentives to maintain ecosystem health. For example, South Africa and Costa Rica have capitalized on their rich biodiversity, attracting eco-tourists and generating revenue that supports local conservation efforts.