Global Green Growth Institute

Bridging the Policy and Investment Gap for Payment for Ecosystem Services

Learning from Costa Rican Experience and Roads Ahead

The Global Green Growth Institute

19F Jeongdong Building, 21-15, Jeongdong-gil, Jung-gu, Seoul, Korea 100-784

Global Green Growth Institute

Bridging the Policy and Investment Gap for Payment for Ecosystem Services

Learning from Costa Rican Experience and Roads Ahead

COSTA RICA
GOBIERNO DE LA REPÚBLICA

minae
MINISTERIO DE AMBIENTE Y ENERGIA

FONAFIFO

CATIE
Solutions for environment and development
Soluciones para el ambiente y desarrollo

KOICA
Korea International Cooperation Agency

Table of Contents

List of Figures, Tables and Boxes

Figures

Tables

Boxes

Abbreviations and Acronyms

AFE	State's Forest Administration (*Administración Forestal del Estado*)
BNCR	Costa Rica´s National Bank (*Banco Nacional de Costa Rica*)
CATIE	Tropical Agricultural Research and Higher Education Center (*Centro Agronómico Tropical de Investigación y Enseñanza*)
CDM	Clean Development Mechanism
CES	Certificates of Environmental Services
CI	Conservation International
CNFL	National Power and Light Company (*Compañía Nacional de Fuerza y Luz*)
CO_2	Carbon Dioxide
DCES	Development and Commercialization of Environmental Services
DFI	Development Finance Institution
ES	Ecosystem Services
ESPH	Company of Public Services of Heredia (*Empresa de Servicio Públicos de Heredia*)
FBS	Sustainable Biodiversity Fund (*Fondo de Biodiversidad Sostenible*)
FONAFIFO	National Forestry Financing Fund (*Fondo Nacional de Financiamiento Forestal*)
FSC	Forest Stewardship Council
FUNBAM	Environmental Bank Foundation (*Fundación Banco Ambiental*)
FUNDECOR	Foundation for the Development of the Central Volcanic Range (*Fundación para el Desarrollo de la Cordillera Volcánica Central*)
GAM	Great Metropolitan Area (*Gran Área Metropolitana*)
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIS	Geographic Information System
HNWI	High-Net-Worth-Individuals
ICAFE	Costa Rica´s Coffee Institute (*Instituto del Café de Costa Rica*)
InVEST	Integrated Valuation of Ecosystem Services and Tradeoffs
MAG	Ministry of Agriculture and Livestock (*Ministerio de Agricultura y Ganadería*)
MEA	Millennium Ecosystem Assessment
MIDEPLAN	Ministry of National Planning and Economic Policy (*Ministerio de Planificación Nacional y Política Económica*)
MINAE	Ministry of Environment and Energy (*Ministerio de Ambiente y Energía*)
NDC	Nationally Determined Contributions
NGO	Non-Governmental Organization
NTFP	Non-Timber Forest Products
ODA	Official Development Assistance
ONF	National Forest Office (*Oficina Nacional Forestal*)
PES	Payment for Ecosystem Services
PSA	*Pago por Servicios Ambientales*
REDD	Reducing Emissions from Deforestation and Forest Degradation
REDD+	Extends REDD by Sustainable Forest Management, Conservation of Forests, and Enhancement of Carbon Sinks
RIOS	Resource Investment Optimization System
SDI	Social Development Index
SINAC	National Conservation Areas System (*Sistema Nacional de Áreas de Conservación*)
TEEB	The Economics of Ecosystems and Biodiversity

TFT	The Freshwater Trust
UCC	Costa Rican Compensation Units (*Unidades Costarricenses de Compensación*)
UHNWI	Ultra-High-Net-Worth-Individuals
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States Dollar
VCS	Verified Carbon Standard
WWF	World Wildlife Fund

Foreword

When Costa Rica speaks about sustainable land-use management, the world listens, because it has demonstrated much success in this area. For more than 40 years, Costa Rica has been a pioneer in implementing policies to protect and promote ecosystem services. It has also experimented with various approaches to the design, implementation, and monitoring of financing schemes which further these policies. Twenty years ago, Costa Rica initiated, structured, and implemented an innovative public financing scheme called "payments for ecosystem services" (PES), which along with a Forestry Law enacted in 1995, led to a dramatic increase in its forest cover, from less than 30% in the 1980s to 54% of its territory today. This great success has gained the attention and respect of the international community, particularly given the fact that REDD+ is one of the key components of the Paris Agreement.

The Government of Costa Rica has committed to continue its endeavors to maintain, advance, and strengthen the quantity and quality of ecosystem services aligned with improving the national and global land-use landscape. Given the need to scale up funding for the national PES programs and the land-use conservation sector in general, Costa Rica is exploring opportunities to collaborate with the private sector to fill the gap. This collaboration could result in environmental benefits along with corporate profits, if the investment from the private sector is used effectively in a strategic manner. Also, Costa Rica is keen to share its experiences and lessons learned with other developing countries interested in national or sub-national PES schemes, in an effort to foster South-South cooperation in the context of green growth.

Against this backdrop, this report aims to present a detailed study of Costa Rica's PES scheme. It reviews all major aspects of Costa Rica's PES experience, from program design and implementation to the steps it has taken to open up new avenues of financing. By analyzing what has worked and what hasn't, we seek to provide insights and practical guidelines to readers in developing countries.

This report eloquently summarizes Costa Rica's PES experiences in a manner that is helpful to the readers. Moreover, it promotes our vision of an innovative ecosystem marketplace beyond PES, where public and private actors collaborate dynamically in mutually beneficial ways to value and invest in the ecosystem services, which provide us all enormous economic, environmental, and social benefits. We firmly believe that this green growth approach will bring us closer to a more sustainable future.

Sincerely,

H.E. Dr. Edgar Gutiérrez-Espeleta
Minister of Environment and Energy
Republic of Costa Rica

Mahua Acharya
Assistant Director-General
Global Green Growth Institute

Acknowledgements

This report was solicited by the Minister of Environment and Energy of Costa Rica to GGGI and prepared by lead and co-authors under the overall guidance of Mahua Acharya, Assistant Director-General and Head of Investment and Policy Solutions Division at GGGI.

Lead authors are: Juhern Kim (GGGI), Roger Madrigal, Francisco Alpizar (CATIE), and Silvia Rojas Fernandez (FONAFIFO).

Contributing authors are: Esteban Brenes (WWF – Chapter 4), Ariana Salas (CATIE), and Yoolbee An (GGGI).

The report benefitted considerably from reviews by Oscar Sanchez (FONAFIFO), Jennory Barton (MINAE), Silvia Charpentier (Conservation Finance), Ina Porras (IIED), Felipe Carazo and Laura Valverde (FUNDECOR), and Keven Brough (GGGI). It also significantly benefitted from discussions at two South-South knowledge sharing workshops jointly organized by MINAE, FONAFIFO, and GGGI, in Sarapiqui, Costa Rica on 11-13 November 2016 and Heredia, Costa Rica on 1-2 June 2016.

The report was made possible through the shared leadership and collaboration provided between Ministry of Environment of Costa Rica and GGGI. Sincere appreciation to Patricia Madrigal (Vice Minister of MINAE), Jorge Mario Rodríguez (Executive Director of FONAFIFO), Rodolfo Solano Quiros (Costa Rican Ambassador to the Republic of Korea), and Per Bertilsson (Assistant Director-General and Head of Green Growth Planning and Implementation Division at GGGI). We also thank Jennory Barton (MINAE), Guillermo Chan (FUNDECOR), David Li Fang and Sofia Salas Monge (Embassy of Costa Rica to the Republic of Korea), Chanho Park, Salvador Lopez, Margaret Kim, Jason Lee, Caroline de Bruin, Da Yeon Choi, Bojeong Choi, Yong Sung Kim, Jisu Min, James Seong-Cheol Kang, and Myung Kyoon Lee (GGGI) for their valuable support and guidance for the report and/or workshops. The report benefitted from editorial and design support by Michele Robichaux and Curt Wagner (Skiprock Creative), Ji Young Kim (Super Square), and Cameron Plese (GGGI), under the guidance of Darren Karjama and Daniel Munoz-Smith (GGGI).

The report is a part of GGGI's Policy Solutions program, partially financed by earmarked funding from the Korea International Cooperation Agency. The views and information expressed in this report result from the collective research of the authors and it is not necessarily endorsed in full by their organizations. Organizations are only mentioned for identification purposes.

Executive Summary

Between 2000 to 2010, forests were lost at an average of 5.2 million hectares per year across the globe (FAO 2010). Though the drivers of deforestation and forest degradation vary, agricultural expansion is responsible for an estimated 80% of this loss (Kissinger et al. 2012). As forests are lost so are all of the knock-on economic, environmental, and social benefits of ecosystem services provided by those forests (e.g. sequestrating carbon dioxide, regulating hydrological systems, maintaining soil quality, preventing erosion, and hosting biodiversity). In fact, it is estimated that land-use change (mostly deforestation and forest degradation in the tropics) accounts for approximately 20% of annual greenhouse gas (GHG) emissions when reforestation and afforestation are excluded (Houghton 2013), or about 11% of global emissions when they are included (Searchinger et al. 2013).[1] This is a common occurrence especially in developing countries with high rates of population growth, where land is intertwined with livelihood and governments are forced to make tough choices between competing land uses.

Within this context, payment for ecosystem services (PES) is a powerful tool for enhancing economic, environmental, and social returns from investments in integrated ecosystem management, including forest regeneration, agricultural landscapes, agroforestry, silvo-pastoral systems, etc. It provides financial incentives for ecosystem services that are not usually monetized and paid for in the traditional market. PES schemes internalize externalities by creating new marketplaces for ecosystem services. These schemes provide a new source of income for land management, restoration, conservation, and sustainable agricultural activities. However, implementing and sustaining PES schemes over time is not a simple task.

Costa Rica's PES program is globally recognized as an innovative blend of economic and regulatory instruments. Its stories provide a valuable source of inspiration for other countries looking for effective ways to conserve and regenerate ecosystems, especially generating South-South learning potentials. Starting with a strong rationale for why valuing ecosystem services has significant implication in the economic, environmental, and social context, this analytical report unpacks the lessons learned from the Costa Rican PES experience. Based on an in-depth analysis drawn out of Costa Rican national PES program, this report addresses the key enabling conditions for sustainable PES development and provides a step-by-step guide for policymakers wishing to install similar programs (on either a national or sub-national level). This report also addresses the conservation finance gap, describes the changing landscape of finance, and examines potential solutions, including strategies for attracting private sector investment.

Key findings of the analysis are highlighted as follows.

1 It should be noted that some analysts argue that this 11% emissions number significantly underestimates the mitigation opportunity in restoring deforested lands and degraded forests. This number does not properly credit preservation and restoration of the forest estate as one of the only opportunities the world has to sequester and store carbon at a scale that would impact atmospheric carbon in the short-to-medium term. If the gross emissions from deforestation and forest degradation are considered (rather than the net accounting approach followed by the IPCC), there would be an increased focus on carbon uptake through forest restoration and factors in peatlands and mangrove emissions sources. As a result, the estimate for GHG contributions may approach 50% (Houghton et al. 2015).

Despite the fact that ecosystem services directly contribute to economic growth and human welfare, they are disappearing at an alarming rate due to land-use changes (e.g. the global net forest loss is 5.2 million hectares per year). A major reason for this phenomenon is the fact that these services, by their nature, have traditionally been provided free of charge. Landowners have had little economic incentive to maintain their forested lands. Moreover, in some cases they have been directly incentivized to the contrary. The obvious result is a land-use conversion (e.g. slash and burn agriculture). A green growth approach, in the context of the land-use sector, requires highlighting the crucial functions provided by ecosystem services within the sector and applying market-based solutions for conserving them.

As a pioneer country in the search to decarbonize its economy, Costa Rica has a long-standing tradition of innovation in policy instruments on matters of climate change and natural resources management. Beginning in 1996, Costa Rica broke new ground in the developing world through the institutionalization of a national-level PES program, *Pago por Servicios Ambientales*. This program provides financial compensation to owners of forested lands for the provision of ecosystem services from their lands. These services are categorized into four different functions: carbon sequestration, watershed protection, biodiversity preservation, and scenic beauty. Together with Forestry Law and the National Conservation Areas System (SINAC), the PES scheme has been credited with helping Costa Rica, a country once known for having a deforestation rate of 6%—one of the world's highest—to more than double its forest cover from less than 30% in 1980s to 54% in 2015. Results to date indicate that 1,122,312 hectares have been submitted to the Costa Rican PES program. In addition, 6,478,254 trees have been planted in agroforestry systems, almost 16,000 families have been involved in the program, and over 136,000 hectares of indigenous territories have been placed under PES. These achievements strongly demonstrate the viability and effectiveness of green growth.

Costa Rica has managed to achieve a vibrant, oversubscribed PES system (or set of systems) - a fact which stands in contrast to some other PES systems and of course suggests that it is possible to establish a PES regime that creates positive ecosystem impact while enhancing country wealth. Part of Costa Rica's success has been due to willingness to get underway and to experiment, which suggests that even if policymakers in other places start small, getting started is a worthy goal. Experimentation and incrementalism can help reduce risks, allow policymakers to tailor programs for their own countries social and political conditions, and permit regimes to evolve along with the evolving global landscape for financing such regimes - much as Costa Rica's regime is currently looking at its next phase of evolution and examining different means of accessing global funding pools. This experimentation, however, should only follow where the enabling conditions are understood and optimized to the best of policymakers' abilities.

A PES scheme does not emerge in a vacuum; it requires a set of enabling conditions to be successfully implemented. These are mixed with "command and control" policies (e.g. prohibitions on land-use change, creation of protected areas, etc.); secured property rights over land; a supportive national legal framework; strong management and finance structures; social acceptance; a clear demand for ecosystem services; and, finally, political and social stability. A standard recipe for PES does not exist, as these types of programs should adapt to each country's (and, sometimes, region's) specific needs and realities. PES programs should avoid relying on assumptions. Instead, solid scientific evidence must be gathered as to the relationship between land uses and ecosystem services in their territories. Site-specific information is essential to ensure the delivery of the promised services to the beneficiaries paying for them. The more solid the information underpinning the PES scheme, the less likely financial contributors are to be disenchanted with it. To guarantee sustainability, PES schemes should be flexible, dynamic, and capable of both learning-by-doing and of adapting to changing political, social, and environmental contexts.

Costa Rica has the potential to achieve even more ambitious PES goals by consolidating the program fully into the mainstream economy. However, the country's biggest challenge is to secure long-term financial sustainability

to meet increasing demands, since the current budget accommodates only 42% of applicants. Over the last five years, 79% of the financing for the Costa Rican PES program comes from the fuel tax and 6% from the water fee with only 2% coming from private initiatives. The rest has been covered by donations and debt from international financial organizations. Its current dependency on tax revenue makes the program vulnerable to changing political and macroeconomic conditions. Therefore, the program's finance structure needs to be diversified. To this end, Costa Rica is looking to attract private sector participation. However, given economic invisibility of most ecosystem services in the market, the involvement of private investors is still rare. A strong business case and more innovative financial instruments and products are required to raise awareness and interest within the private sector.

Globally, governmental budget and philanthropic funds for conservation finance are insufficient to combat deforestation. Moreover, these are not expected to increase significantly in the near future. Most countries are unable to raise adequate public funds for the forest sector, and the reinvestment of revenues in forest management has been minimal. Official Development Assistance to forestry only covers about 1% of the estimated total financing need in this sector (Profor 2014). As countries struggle to find the funds necessary to sustainably manage their forests, national decision makers are becoming increasingly aware of the need to find alternative financing mechanisms.

The private sector is a key potential funding source for filling the conservation financing gap. If private investors allocate as little as 1% of their capital to integrated ecosystem management, they can address the foreseeable annual gap for the conservation sector, amounting to USD 200 - 300 billion (Credit Suisse, WWF, and McKinsey 2014). This sector is among the new, emerging, and innovative sources of ecosystem financing that, if tapped properly, could result in benefits for the environment along with profits for businesses. However, large-scale investments by the private sector have not been made to-date, due to factors such as high upfront costs and associated risks. To attract more private forest investment, the public sector must create an environment conducive to investment by ensuring that sound policies are in place.

Increasingly, innovative financial vehicles (e.g. impact investments) are drawing attention. By applying a pay-for-performance model to forest restoration, upfront costs are shifted to private investors with beneficiaries such as utilities repaying investors based on the success of pre-arranged (or agreed upon) outcomes. The public sector backs up a certain percentage of financial returns by providing a guaranteed loan. This kind of arrangement aims to create positive environmental and social impact, while generating competitive financial returns. Standardized metrics that ensure verifiable outcomes have to be generated. Diverse institutions, such as NGOs, private banks, and public entities will have to work jointly and take over new roles.

As a key first step for this endeavor, we suggest that environment ministers constitute a working group that works with all external stakeholders, such as finance ministers, the business/finance community, and IOs/NGOs to define how the value of nature can be more strongly embedded in investor guidelines, taxation policy, CSR/CSV, and profitable financial products, and to define distinctive roles to collaborate with each other. This kind of activity can help “prime the pump” and get information flowing - a critical piece of the enabling conditions that will allow PES experiments to take place and flourish.

Land Use, Green Growth, and PES

A green growth approach, in the context of the land-use sector, requires highlighting the crucial functions provided by ecosystem services within the sector and applying market-based solutions for conserving them.

Overview

Land is a complex resource that contributes directly (as a factor of production in the agricultural and forestry industry) and indirectly (through ecosystem services) to economic growth. In particular, land is a pre-requisite for the agriculture sector, which is a primary economic activity for many developing countries. In countries with a GDP between USD 400–1,800 per capita, agriculture accounts for only 20% of GDP. The figure is higher (34%) for countries in sub-Saharan Africa (The World Bank 2007).

Forest products – including timber, pulp, charcoal, and non-timber forest products – also contribute to economic growth. For example, the estimated economic value of industrial timber, pulp production, and non-timber forest products amounted to USD 694 billion (NCE 2014). A 2011 study of the Netherlands' Hoge Veluwe forest estimated the economic value of ecosystem services provided by the forest to be around EUR 2,000 per/ha/year, more than three times higher than the per hectare-value generated by nearby agricultural land.[2] In the Greater Mekong Sub-Region, ecosystem services provided by forests and wetlands contribute to between 20% – 55% of the total wealth of surrounding riparian countries (McCartney and Rebelo 2015).

The loss of forest resources undermines the viability of agricultural practices in the developing world.[3] The sustainable management and development of land – especially forests – is therefore critical for economic

growth in developing countries.

Forest ecosystems provide shelter, food, jobs, water, medicine, and income security to more than one billion people. In Indonesia, for example, non-timber forest products (NTFPs) play an important role in the livelihoods of poor rural communities: 76% of rural household income is derived from forests and ecosystem services (Green Facts 2015). In Guyana, the forest sector provides jobs for an estimated 15% of the total labor force (FAO 2014). Forests are also a key element in poverty reduction.

Often the poorest and most vulnerable communities are the most heavily dependent on forest ecosystem services, and they are also the most affected when deforestation occurs. In some emerging economies, it has been estimated that ecosystem services and other non-marketed goods provided by forests account for over half of the so-called "GDP of the poor" (i.e. the effective GDP or total source of livelihood of rural and forest-dwelling poor households). The Economics of Ecosystems and Biodiversity (TEEB) initiative estimates that between 89% and 75% of the "GDP of the poor" in Brazil and Indonesia, respectively, are based on the services provided by ecosystems. Over 90% of the world's poorest people depend on forests for their livelihoods. Some populations are entirely dependent on forests (e.g. indigenous forest communities) while the livelihoods of others are nonetheless intrinsically linked (TEEB 2010).

Between 2000 and 2010, the global rate of forest expansion remained stable, while net forest loss was 5.2 million hectares per year. All of the benefits of ecosystem services provided by forests (e.g. sequestrating carbon dioxide, regulating hydrological systems, maintaining soil quality, and preventing erosion) are reduced when deforestation occurs. Agricultural sector expansion is the main cause of deforestation: the removal of forests for farmland contributes an estimated 80% of global net forest loss (Kissinger et al. 2012). This is a common pattern in developing countries with high rates of population growth, where land is a source of both food and income. Global agricultural land area (including permanent pastures) has grown by about 10% – 477 million hectares – over the last 50 years (NCE 2014). However, if agricultural expansion is not managed in a sustainable manner, the benefits of the farmland created through deforestation is quickly negated by the loss of valuable forest-derived ecosystem services.

Agriculture, forest, and other land uses account for an estimated 20% – 24% of the world's GHG emissions (IPCC 2014) – the second largest source of emissions after energy use. The role of forests as carbon sinks is especially significant in the context of climate change mitigation. In the past few decades, the world's forests have absorbed as much as 30% of annual anthropogenic CO_2 emissions (Bellassen and Luyssaert 2014). In recognition of their importance, the international community, as recently highlighted in the Paris Agreement at COP 21, has also designed mechanisms under the UNFCCC to reward developing countries that are committed to halting deforestation and forest degradation.

The link between the environment and development becomes even more evident in developing countries, where much of the world's tropical forests, as well as, the world's poor, are located (Pattanayak et al. 2010). Adequate management of ecosystem services is a step towards the achievement of the Sustainable Development Goals; for instance, healthy, well-managed, and diverse ecosystems and resources can play a significant role in mitigating environmental challenges, improving livelihoods everywhere, and fostering inclusive growth (UNDP 2016).

2 The Hoge Veluwe forest is one of the largest and most well-known protected areas in the country. The services included in the valuation study included wood production, supply of game, groundwater recharge, carbon sequestration, air filtration, recreation, and nature conservation (Hein 2011).

3 Forests form the basis of a variety of industries including timber, processed wood and paper, rubber, and fruits. However, they also contain products that are necessary to the viability of rural agricultural communities. These products include fuel and fodder, game, fruits, building materials, medicines, and herbs (Sousson, Shrestha and Uprety 1995).

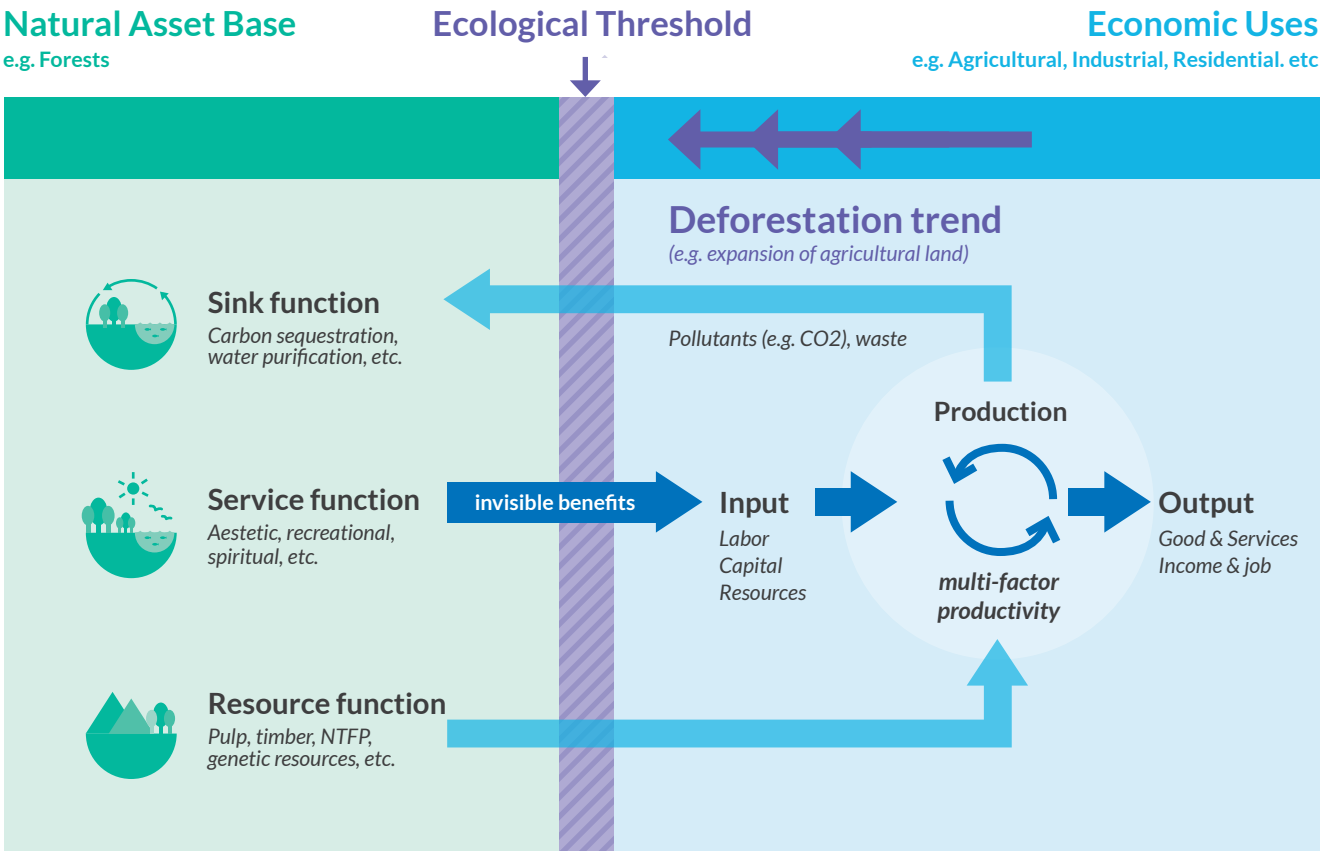


Figure 1. Conceptual framework of land use and green growth

Source: OECD 2011 (modified by GGGI)

Simply put, as can be seen in Figure 1, land performs two major functions: (1) it is a locus of economic activity, such as food production, residential/commercial development, and urban infrastructure; and (2) it is a natural asset base, providing ecosystem services. The value of ecosystem services provided by this natural asset base has not been properly measured. As such, these types of services have been largely ignored in legislative and policy decision-making processes. The high-level picture of the land-use sector, then, is one where there is an increasing demand for land for economic activities, which result in the loss of natural asset bases.

Taking a green growth approach involves fighting the rising trend of land degradation by shedding light on crucial, but often neglected or hidden, functions provided by the natural asset base (e.g. natural filtration of water). Since the current economic system does not reflect the proper value of ecosystem services in monetary terms, it cannot be relied upon to protect those ecosystems.

The green growth approach requires specific and innovative policy interventions that will create an economic environment more favorable to ecosystem services. This includes creating incentives for agricultural companies, landowners, and smallholder farmers/forest dwellers to manage their affairs in a manner compatible with the retention and improvement of ecosystem services. Doing so requires communicating the true value of ecosystem services, the creation of innovative policies and financial mechanisms, and the establishment of a solid institutional base. This is a conceptual starting point for installing a payment for ecosystem services scheme.

Valuation of Ecosystem Services

Economic growth and the welfare of human beings are strongly associated with the benefits provided by ecosystems (e.g. carbon sink, hydrological regulation, prevention of soil erosion, etc.). In broad terms, these benefits are what are known as ecosystem services (MEA 2005). These services affect human welfare through different channels, such as health and the provision of basic materials, as indicated in Figure 2.

Changes in the services offered by ecosystems may

affect many aspects of human life, thus generating an impact on human well-being (see Box 1 for an example). Based on available scientific evidence, it is clear that humanity is highly dependent on the flow of benefits coming from forests, as well as, agroforestry systems and wetlands. Unfortunately, the permanence of this flow of services is threatened by the overexploitation and disruption caused by the advance of the agricultural frontier, inadequate agricultural and forestry practices, and intensive use of natural resources in general, all of which are coupled with deficiencies in institutional frameworks and public policies. If this situation remains unaddressed, the benefits that future generations may derive from ecosystems will be substantially diminished, exacerbating poverty in most regions of the world (MEA 2005).

One of the main drivers of ecosystem loss and degradation has been the lack of economic incentive for landowners to devote resources to its provision and maintenance due to the fact that that ecosystem services have historically been free of charge by their nature.[4] Because many ecosystem services are not traded in markets, they do not generate market signals

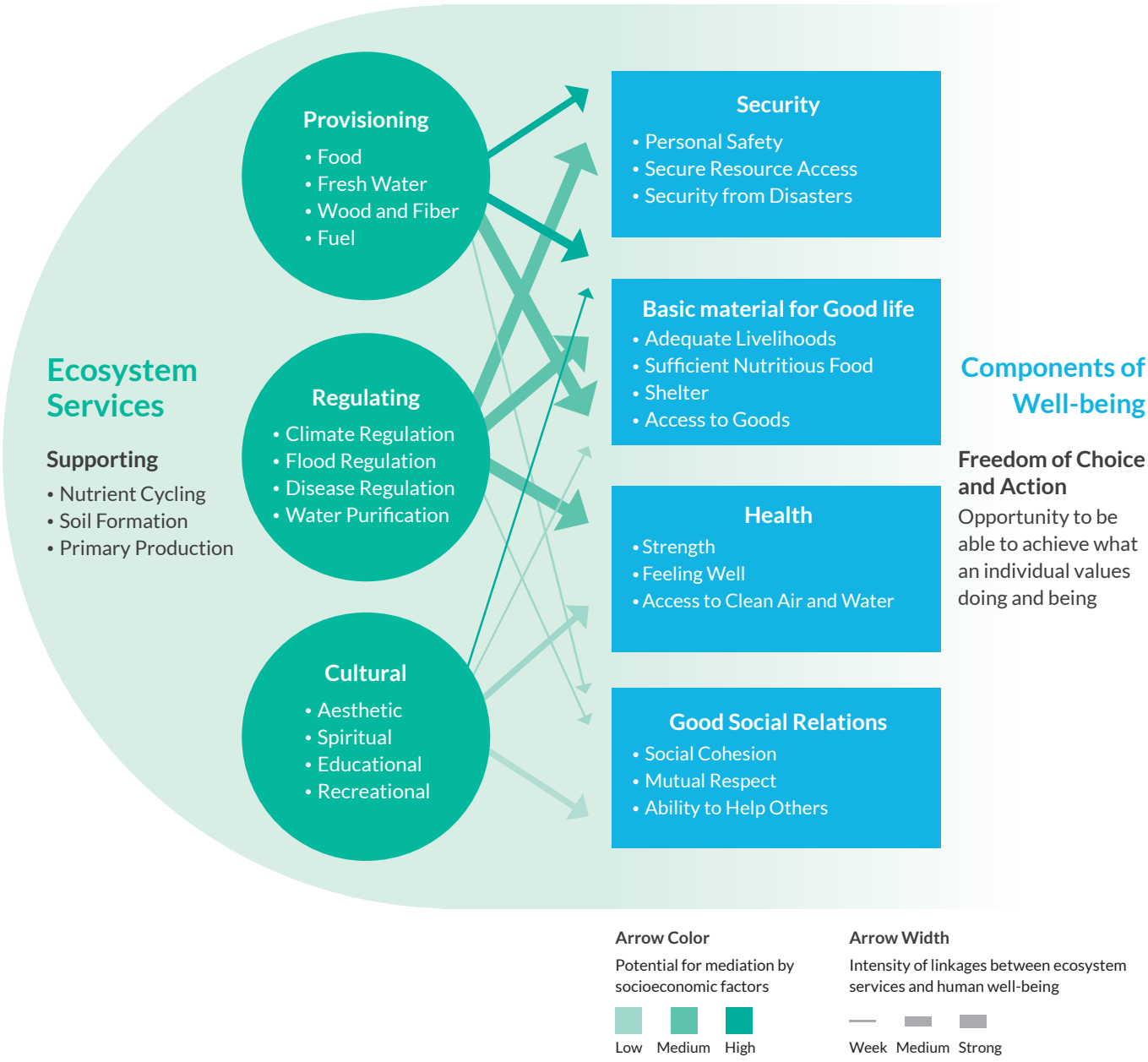


Figure 2. Classification of ecosystem services

Source: MEA 2005

4 Market failures, particularly externalities, public goods and lack of property rights, are identified by the Millennium Ecosystem Assessment (MEA 2005) as the core conceptual underpinnings supporting the economic argument for ecosystem degradation.

that could otherwise contribute to a more efficient allocation and sustainable use. From an economic perspective, most ecosystem services are regarded as (positive or negative) "externalities": the unintended side effects of the consumption or production decisions of an economic agent. These "side effects" will, in turn, affect the consumption and production decisions of other agents. For instance, when landowners decide to convert a forestland into a cropland, they take into account the profitability of these alternatives. However, landowners generally do not consider the long-term effect of this land-use change on the flow of ecosystem services. As a side effect of the decision taken by the farmer, other agents will be affected and will then have to change their way of consuming or producing (negative externality). For example, if the owner of a forested parcel located in a recharge area of a watershed decides to convert their land, this change will likely affect the hydrological cycle and hence, the quantity and quality of water enjoyed by people, farms, or companies downstream. If the landowner decides to maintain the forest cover, a flow of positive externalities will continue to be generated but the landowner will not receive income from alternative economic uses, such as

Box 1

How do coffee crops benefit from the forest?

Despite that fact that nearly 60% of the ecosystem services in the world are being degraded or used in an unsustainable way (MEA 2005), there remain many examples of the vital relationship between nature and human beings. For instance, coffee plantations located near forests received more visits by more bee species, and experienced both higher coffee yields and higher coffee quality than coffee fields situated further away from forests (Ricketts 2004). Coffee is a very important cash crop in many developing countries. In Costa Rica, coffee cultivation is an integral part of the country's history and national identity. Coffee plantations extend across the country's mountain range, covering an area of over 93,000 hectares and including 50,671 producers (NAMA Facility 2014). The coffee sector employs 8% of Costa Rica's work force.

Side note: The coffee industry's intensive use of nitrogen-based fertilizers and resource-intensive processing practices are responsible for 25% Costa Rica's agricultural emissions, and 9% of its overall GHG emissions. These are the reasons that led Costa Rica to commit itself to designing and implementing a Nationally Appropriate Mitigation Action (NAMA) specifically tailored to the coffee sector – The NAMA Café Costa Rica. The core activities supporting the initiative include 1) increasing tree coverage on coffee farms by approximately 50%; 2) promoting the use of smart fertilizers; and 3) promoting energy savings technologies in coffee processing. The aggregate emission reduction potential of the initiative amounts to 1.85 million tons of CO_2 over 20 years.

crops. It is important to emphasize that in this example, the landowner's decision would also have impacts worldwide. For instance, deforestation contributes to climate change and hence, negatively affects the well-being of millions of people and the development of sustainable patterns of economic growth. The economic analysis of how private gains might deter societies from reaping the benefits of ecosystems is found in Box 2 and Figure 3.

Given the limited capacity of market prices to provide signals as to the type and quantity of ecosystems

Box 2

Private gains vs. Public loss

This graph shows three approaches for deciding between clearing coastal land for a shrimp farm and preserving mangrove ecosystems. The leftmost (private profits) approach is the current "real life" economic evaluation, including policies that buttress shrimp farming through subsidies. Here, shrimp farming is vastly more profitable than sustainable harvesting of mangrove ecosystem services. The middle approach represents the "true" market value of the shrimp farms by excluding the support of subsidies. Here the shrimp farm is still more profitable than maintaining mangroves, but the margin between the two is considerably smaller. Here, when considering public benefits of mangroves, the mangroves may become more appealing than shrimp farming. Finally, the rightmost approach considers ecosystem services via the expense of restoring the mangroves after shrimp farming has thoroughly degraded the ecosystem in five years. This expense pushes shrimp farming far into negative territory. Considering all the public benefits of mangroves, in other words their ecosystem services, demonstrates mangroves to be far more economically valuable than is clear in private profits. The primary takeaway of this exercise is that the valuation of ecosystem services can lead a more informed decision of policymakers by revealing hidden values which are not paid for in the traditional market.

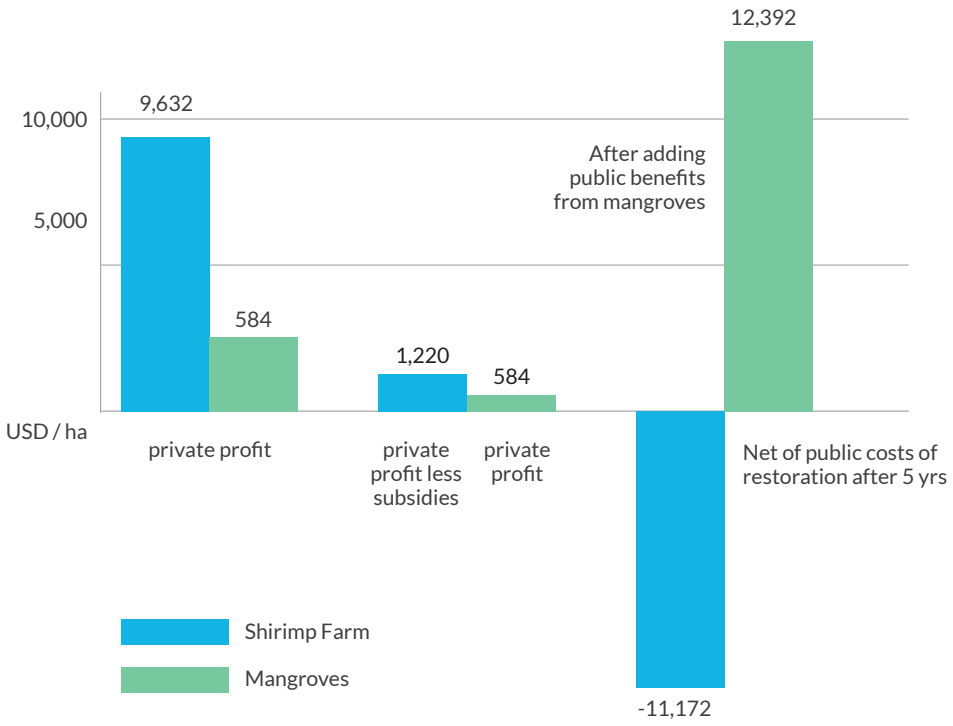


Figure 3. Example of extended cost-benefit analysis (shrimp farm v. mangrove) in Thailand Source: Barbier 2007

services to be generated, a critical concern of policy makers is how to assign an accurate value to ecosystem services. Such a value would be necessary in guiding market transactions and decision-making processes at all relevant levels. In other words, putting a monetary value on the environment may help nature conservation by guiding investment decisions in both the public and private sectors.

For instance, if a government is unaware of the value of a forest to its tourism industry, then it will invest too little in its conservation. Even worse, in these circumstances governments may create or maintain policies that generate perverse subsidies affecting forests and ecosystems in general, such as subsidies promoting extensive cattle ranching or generous land titling policies based on land conversion. Since monetary expressions are easily understood, facilitating the comparison of diverse goods and services, an economic valuation of the costs and benefits of ecosystem services is critical to most investment decision analyses.[5]

Policy Options

Decision makers have an extensive tool-kit of policy options for protecting and restoring ecosystems, but optimal policies are heavily context-specific. Traditionally, there are two main types of direct regulations in pursuit of conservation objectives: 1) the expropriation of land for the creation of protected areas, and 2) legal limitations or prohibitions on land use (e.g. prohibitions on the conversion of forests into other land uses). These policies can produce good results if the government has the resources (to buy the land) and the institutional mechanisms (to properly manage protected areas and to verify compliance with prohibitions). However, these capacities are generally limited in developing countries. In addition, such restrictions can represent significant costs for some landowners, particularly those associated with foregone profits (i.e. opportunity costs). In essence, these types of regulations require landowners to subsidize the production of ecosystem services for the benefit of the entire society.

The deficiencies of these direct regulations, coupled with the scant allocation of fiscal resources in government budgets, has spurred interest amongst conservationists in exploring innovative alternatives such as the use of "market instruments" over the last two decades (Motta et al. 1999). Rather than imposing restrictions on decision making, as is the case with direct regulations, market instruments seek to change the relative profitability of different land-use options, providing monetary incentives favoring landowner decisions that guarantee a flow of ecosystem services to societies.

The fundamental idea is that these incentives can serve as signals and as direct support mechanisms for the sustained use of better farming and/or forestry practices. Direct payments, such as those associated with PES schemes, are examples of market instruments. Under these programs, landowners are compensated for the services that their forestlands provide (e.g. carbon sequestration, protection of water resources, etc.) by the government (national government-funded PES programs) or by users of specific ecosystem services. Landowners are free to decide whether to participate in the program or not, after considering the payment and contractual conditions offered.

Despite their innovative approach, PES schemes are difficult to put into practice. One of the key reasons for this difficulty is that most of these programs lack sustainable long–term financing (Blackman and Woodward 2010). To meet the financial needs, many PES programs depend primarily on national tax revenues (e.g. fuel tax) and/or international assistance, both of which are vulnerable to changing political and macroeconomic conditions. The prospect of including the private sector in conservation and PES is a rising topic in the search for financial sustainability. For example, breweries that depend on forest hydrological

5 In the absence of markets, this valuation can be performed using different methodological tools to assess the economic values of ecosystem services (see Table 2 in next chapter for details).

services might make payments that enable government administrators to underwrite PES contracts with upstream land managers. These investments can go beyond corporate social responsibility, if companies perceive them as business opportunities supported by empirical data, rather than just a moral obligation or environmental stewardship.

The policy tools described above (direct regulations and market approaches) are not necessarily mutually exclusive. On the contrary, in many cases, they are complementary to each other. Finding balance is a task under constant review in each country. In addition, PES programs promote green growth, aiding in the achievement of the sustainable development goals in a variety of ways, including lowered carbon emissions, increased resource efficiency, and reduced poverty. In brief, PES programs require targeted public expenditure and private participation to ensure their successful implementation.

Objective of this Study

Notably, Costa Rica's national PES program is regarded as one of the most long-standing experiences around the world. It has inspired other countries to develop their own national programs (México and Ecuador, for example) and sub-national or local programs.[6] Based on the Costa Rican experience, this report aims to analyze enabling conditions for PES development in order to provide insights to potential PES developers in other developing countries. However, this report is not a repetition of the exhaustive analyses of the Costa Rican PES program developed in recent years.[7] Instead, it aims to build upon the Costa Rican experience by reviewing critical aspects of the steps involved in the design, implementation, and maintenance of a successful PES program with a specific emphasis on how—at every step of the process—these programs must adapt to the changing finance landscape.

It is important that policymakers understand the specific context and distinct conditions that have facilitated the development of the Costa Rican PES program before attempting to replicate it. PES schemes (particularly at the national level) do not emerge in a vacuum; rather, they require a set of context-specific enabling conditions in order to succeed. Amongst the most important of these are a judicious mix of command and control policies (e.g. prohibitions on land-use change), secured property rights, a national legal framework, a capable and accountable management structure, social acceptance, demand for ecosystem services, and political and social stability.

PES financial sustainability is emphasized because it is one of the most important challenges for successful implementation and survival of these initiatives. Indeed, even the Costa Rican program has been facing a barrier to financing, limiting its potential for achieving more ambitious conservation and development goals. The looming question is how to achieve long-term financial sustainability to meet increasing demands for program participation while creating the right incentives that will attract highly-valued land where the risk of losing ecosystem services is the highest. Much of this goal could be achieved by means of a more profound diversification of income sources and through the active participation of the private sector. However, these goals require significant changes in measuring and selling ecosystem services to potential buyers. This includes the development of innovative financial mechanisms that represent new land-use asset classes, and, ultimately, shifting the traditional, donor-driven conservation finance model to an investor-driven one. Moreover, the need for this shift applies not only to PES schemes *per se*, but to all land-use sector programs involving the management of ecosystem services.

6 In addition, this innovative policy has interested many prominent scholars around the world and has been the central focus of several peer-reviewed articles and special issues in academic journals such as World Development, Ecological Economics, the International Journal of the Commons, and the Journal of Sustainable Forestry.

7 Other recent reports that analyze in depth the Costa Rica's PES program are Porras et al. 2013,FONAFIFO, CONAFOR and MINAE 2012.

Guide for Developing PES

A PES scheme does not emerge in a vacuum; it requires a set of enabling conditions to be successfully implemented. As "one-size-fits-all" institutional design does not exist for PES, this guide highlights the need to be versatile in response to a dynamic context.

Conceptual Framework for PES

The critical components of PES are the demand and supply of ecosystems services, and the intermediary agency under a specific governance structure that sets rules for transactions and manages the functioning of the scheme. These components apply to the instalment of national/sub-national and voluntary PES schemes. This conceptual framework is summarized in Figure 4. On the supply side, sellers of ecosystems are landowners (be they individuals or communities) demonstrating tenure of land capable of generating ecosystem services deemed valuable to a portion or the whole of society. In anticipation of a monetary payment (conditional and defined in contractual terms), landowners will implement sustainable land-use practices (cause) that are expected to increase or protect the delivery of one or a bundle of ecosystem services (effect). The demand side is built around the beneficiaries of ecosystem services, which, depending on the types of services provided, might be a local community (e.g. households in need of clean drinking water) or society as a whole (e.g. citizens around the globe benefiting from climate change mitigation). Conceptually, these beneficiaries will pay the sellers of ecosystem services for their provision. The intermediary collects these payments using diverse mechanisms such as fees, taxes, and donations. In addition, this entity is in charge of guaranteeing the delivery of ecosystem services through the implementation of monitoring, reporting and verifying (MRV) mechanisms. In this regard, costs must be also assessed by the intermediary.

As discussed in the previous section, it is unlikely that a PES market will emerge autonomously. This is when a third party comes into play, such as a governmental agency, a private company, or an NGO serving as the intermediary brokering supply and demand for ecosystem services. These entities intervene to create the necessary governance and operational structure defining and enforcing rules for selling ecosystems services (e.g. define criteria for PES payments), monitoring compliance with contractual relationships, and developing strategies to secure a sustainable finance structure, among other important tasks.

Two critical and distinctive features of PES schemes are:

- Conditionality of payments: A PES program differs from traditional environmental subsidy programs in that PES payments are conditional upon the fulfillment of certain conservation-focused obligations. These obligations are specified by a contract and are monitored regularly (Wunder 2006).

- Existence of a contractual relationship: Contracts for ecosystem services are necessary to the

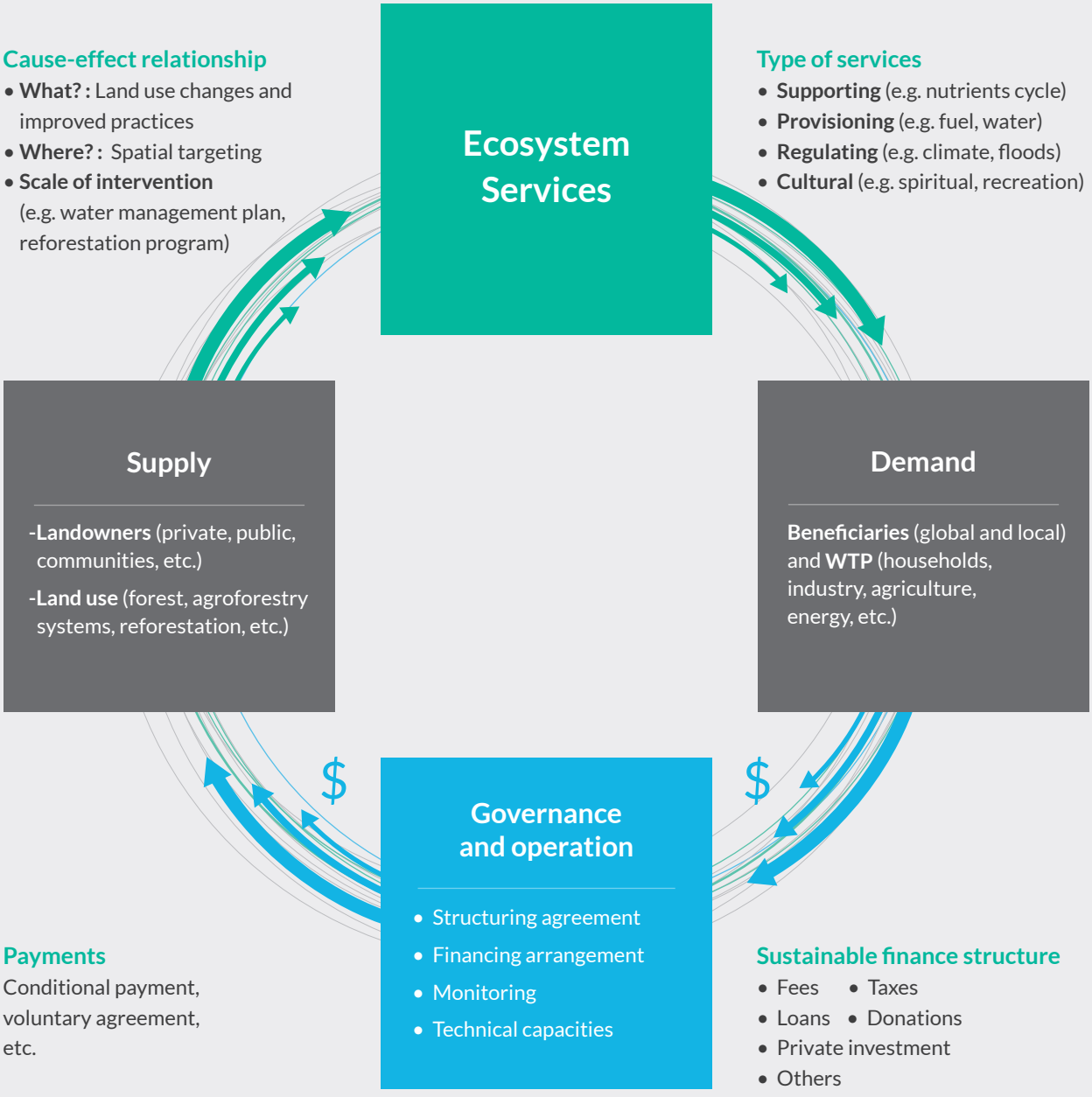


Figure 4. Conceptual framework for PES

credibility and fulfillment of landowner obligations. They must also include penalties for non-compliance (Wunder 2006).

Aside from conservation outcomes, in some cases, poverty reduction can be an additional PES scheme benefit, as the poor often live in rural areas where intact ecosystems remain (Porras et al. 2014, Pattanayak et al. 2010). While PES programs were not originally designed to achieve social or poverty reduction goals, the fact that these programs are well positioned to do so makes them suitable for inclusion in both social and environmental campaigns. For example, PES programs could play a meaningful part in national strategies aimed at supporting indigenous communities and female heads of household. Additionally, international aid agencies have acknowledged the win-win nature of PES schemes in poor countries, as these countries supply unique ecosystem services and have the potential to do so competitively, due to the relatively low opportunity cost of their land. Unfortunately, impact assessments of PES programs pursuing both of these objectives have shown mixed results to date – in certain countries, forested land is mostly held by relatively wealthier landowners (Robalino et al. 2014, Pattanayak et al. 2010). However, more specific criteria encouraging the participation of marginalized people could substantially improve the achievement of goals in this direction (Porras et al. 2013).

Developing PES: 4-Step Approach

Because PES programs must address social, economic, and environmental issues simultaneously, their design and implementation is a complex process. For this reason, it is necessary to promote an integral and adaptive approach that maximizes the odds for success. The prosperous development of a PES program depends on the capacities and flexibility of the governance structure supporting it to learn from rigorous evaluations and accountability procedures.

Many international agencies, central governments, municipalities, and other relevant stakeholders, are interested in developing PES schemes. However, the lack of an appropriate methodology for designing, implementing, and evaluating these schemes might reduce their efficiency and financial sustainability in the long run. To bridge this gap, the following methodology (summarized in Figure 5) is designed to guide policy makers and practitioners in developing robust PES programs at either a national or local scale. It has been developed and tested in different settings (Mercado et al. 2016, Alpízar and Madrigal 2009, Madrigal and Alpízar 2008, Campos et al. 2007).

This is a step-by-step guide for the successful development of PES schemes. This guide highlights the need to be versatile in response to a dynamic context. As PES may not work the same way over time, and as "one-size-fits-all" institutional design does not exist for PES, these types of programs should be able to innovate and adapt to changes. At its broadest conceptual level, this methodology includes four interconnected steps: A) Objective Setting and Assessment of Enabling Conditions; B) Structuring and Design; C) Implementation; and D) Evaluation.

Each of the above components can be unpacked into multiple methodological components. How far up or down a component hierarchy should proceed depends on the local context, the objectives being pursued, and the particular development stage of the program. Further, these steps are not necessarily sequential or static. The Costa Rican experience indicated that, on the contrary, the approach should be versatile in response to a dynamic context. Developing some of these components, particularly step 2 (structuring and design) and step 4 (evaluation) require complex technical skills. This report does not present details in this regard, but advise users of this methodology to work with a team of collaborators with skills in GIS, land use, applicable legislation on land tenure, and zoning restrictions to fully design and implement PES.[8]

8 For more detailed and technical explanation see Campos et al. 2007, Madrigal and Alpizar 2008, Alpízar and Madrigal 2008, Madrigal 2011, Mercado et al. 2016.

This report recommends that national or sub-national governments interested in developing a PES scheme use this methodological tool as a guide and as a set of principles for the successful implementation and long-term sustainability of such programs. However, this approach does not provide a prescription for PES success. Rather, it needs to be recognized as a tool to understand the local context in which PES is intended to operate and how this policy may help improve outcomes or, conversely, make them worse. As PES may not work the same way over time, and as "one-size-fits-all" institutional design does not exist for PES, the program should be designed flexibly enough for administrators to innovate and adapt to unexpected changes.

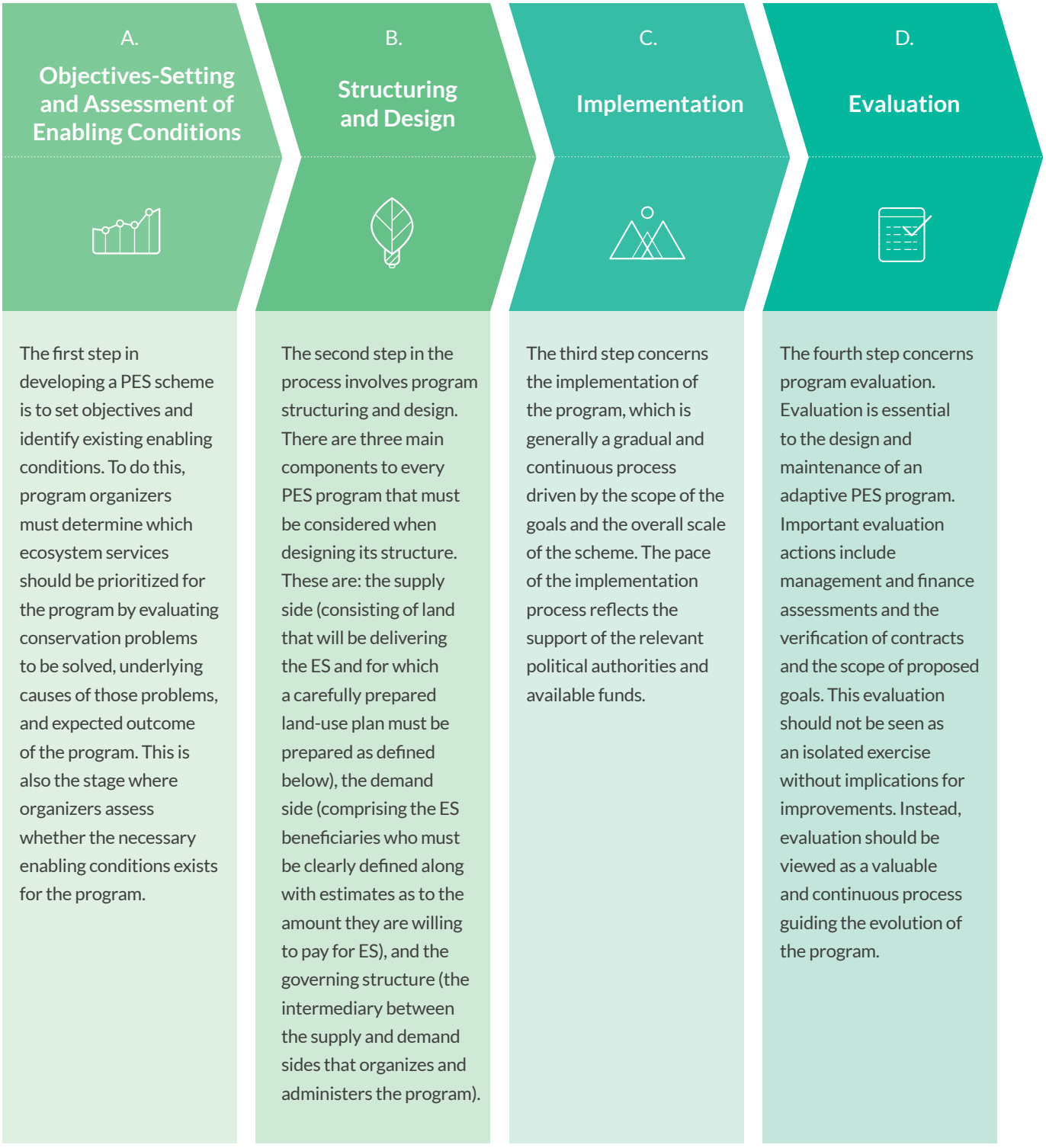


Figure 5. Integral and adaptive approach for developing PES programs

Step 1: Objectives-Setting and Assessment of Enabling Conditions

The first step in analyzing the viability of PES implementation involves setting program objectives and diagnosing enabling conditions. This endeavor should be carried out as an initial step analyzing the program's convenience from a contextual perspective. This rapid appraisal should attempt to shed light on desired program objectives, as well as the main challenges that need to be overcome for its successful implementation. This exercise, ideally with the participation of key (experts and local) stakeholders, should answer the following questions:

What kind of problems need to be solved?

What are the underlying causes of the problems?

What is the expected outcome of PES implementation?

What would the financial structure of PES be?

Answers to the above questions should help initially determine which ecosystem service should be addressed as a PES priority. This is important because PES can focus on single or multiple environmental objectives and can include the provision of one or a bundle of ecosystem services. As mentioned previously, PES objectives may also include poverty reduction and other social goals. A clear definition of objectives from the very beginning will lead to clear communication with investors and society as a whole about how program outcomes will be generated, and the means by which these outcomes should be attained.

It is important that this exercise questions the appropriateness and effectiveness of PES programs in comparison to other policy tools (Persson and Alpízar 2013). There is no a priori reason to think that a PES program is the most effective way to achieve certain environmental goals. PES should be considered as one of several available policy tools for creating a positive impact on conservation, not as an end goal in itself. Moreover, the Costa Rican case has also shown that PES tends to function better when other policies complement rather than obstruct PES.

One of the critical purposes of this initial step is to assess the existence of enabling conditions for PES development. Using the case of Costa Rica as a benchmark, it is possible to enumerate some of these critical conditions. In particular, the lessons learned from Costa Rica indicate that a PES scheme does not emerge in a vacuum: it requires property rights (i.e. land tenure security), political stability, absence of perverse incentives, and the gathering and sharing of information, among other key contextual elements. Many of these conditions are a direct result of governmental intervention. Therefore, in cases where these conditions do not exist at desired levels, the government should take an active role in creating a necessary environment to implement the scheme. Some of the conditions that need to be evaluated are briefly summarized in Table 1.

Table 1. Enabling conditions for PES

Condition	*Why does it matter?*
Legal environment	A broad legal framework for PES is critical to provide a solid and reliable basis for transactions. For instance, national laws on water and forestry should favor ecosystem services transactions.
Existence of complementary policies	The simultaneous use of PES and "command and control" measures (e.g. regulations on private land-use) is usually preferred to the individual application of these instruments. Further, PES can offset, at least partially, the costs imposed by direct regulations on certain landowners. Thus, if PES is inserted as a supplement to direct regulation, it is possible to achieve environmental objectives in a more effective and fair way, given a more equitable distribution of costs and benefits of conservation in society. For instance, prohibitions to deforest means that the opportunity costs of forest are -at least on paper- zero. This can make the PES more competitive.
Political and social environment	In some cases, political feasibility may be more important than technical data supporting PES. This is particularly true, if the program relies heavily on governmental funds (e.g. taxes). Political support for PES is difficult to achieve in most countries, where the environmental sector lacks the political traction needed to ensure allocation of meaningful funding from central budgets.
Absence of perverse incentives in public policies	It is necessary to minimize conflicts and competing interests of public policies in general with the objectives pursued by PES schemes. For instance, some direct subsidies and credit loans favored extensive agricultural activities in Central America (Harvey et al. 2005) and shrimp farming in Thailand (Barbier 2007). These policies promote incentives in a different direction than those generally pursued by PES.
Land tenure security	Land ownership titles are a pre-requisite in most well established PES schemes, because of the need to define a contractual relationship between landowners participating in the program and the intermediary force. However, land tenure insecurity is widespread in most Latin America and worldwide. The weaker tenure security is, the greater the difficulties in implementing a PES at a particular site. Clearly, public policies play a decisive role for supporting PES initiatives by improving land tenure security. This entails improvements in land registry systems (e.g. digital modernization) and in courts resolving land ownership conflicts.
Availability of information	The information available for PES development is usually scarce (e.g. poor understanding of the relationship between land-uses and ecosystem services). This reduces effectiveness and confidence in meeting the proposed goals. In many circumstances, lack of critical information could challenge the development of PES, because investors and societies in general would not want to put money into initiatives that render uncertain benefits.

Step 2: Structuring and Design

After a positive assessment of enabling conditions is made, it is necessary to conduct a more profound analysis to delineate the foundations for PES operation. At this step, it is necessary to have clearly identified relevant ecosystem services in both biophysical and economic terms, and to develop the most suitable and least costly governance structure for mobilizing finance to link demand and supply. If markets for ecosystem services are to ultimately produce welfare improvements, they need to be designed carefully, providing the right incentives. Following Figure 4 (conceptual framework for PES), this requires a rigorous study of the supply and demand sides of the market as well as an assessment of the governance structure needed to manage the program efficiently. For each of these components, there are a variety of intertwined activities that must be completed in order to reach the critical milestones.

Supply Side

Sustainable PES schemes are ones that clearly deliver on their promises, so there is a need to make sure that the investments in land-use change and improved management actually deliver the ecosystem services they promise. Otherwise, it is extremely difficult to convince governments, private sector entities, and civil society in general to contribute to these programs.

In an ideal world, accurately measuring the relationship between land use and service could predict with certainty the percent increase in ecosystem services that would result from a given action on the land. However, in the majority of cases, scientists are far from committing to such statements.[9] Consequently, most efforts to design PES schemes must accept this uncertainty, leading to provisions being made to compensate in cases where uncertainties are great. That is not to say that efforts to better understand these relationships should therefore be suspended.

CHECKLIST:
Supply Side

- ☑ Define an intervention plan prioritizing the types of land uses and practices that will generate the required ecosystem services
- ☑ Determine the location of prioritized land uses and associated property rights
- ☑ Define the amount to be paid to landowners for the generation of ecosystem services
- ☑ Estimate the cost and timeframe of the intervention plan

Rather, despite the fact that few tools exist presently for understanding the true relationship between land use and ecosystem services, PES schemes must strive to gather as much information on this topic as possible (see Box 3 introducing an exemplary methodology called InVEST).

Depending on the type of ecosystem service, the complexities involved in establishing a cause-effect relationship between land use and services will likely vary from one case to the other. This requires targeting specific lands, if certain ecosystem services are the central focus of a PES scheme. For instance, one of the relatively simpler cases is the global service of carbon sequestration. For carbon sequestration, the recommendation is straightforward: to increase vegetation cover with species capable of sequestering carbon at high rates, and to avoid deforestation and land-use changes that result in increased carbon emissions. Although it is not a simple task, one could measure the carbon content in plant biomass and associated soils (e.g. tons of carbon per hectare). Furthermore, carbon sequestration is a service that can be provided regardless of the location of a farm. This issue has a direct link to implementing the Nationally

9 Given that ecosystems are inherently complex, understanding how each particular ecosystem works is very limited. Furthermore, given that ecosystems are highly dynamic, characterized by discrete changes from one status to another, and with a high exposure to unexpected random events, it is very likely that the amount of information and analytical capacity to establish such a clear and quantitative dose-response relationship will be quite limited (Limburg et al. 2002).

Box 3 What is InVEST?

InVEST is a free, open-source modeling software designed to map and value the services provided by ecosystems. InVEST allows decision makers to evaluate quantified tradeoffs associated with alternative management elections, optimizing resources as it identifies areas where investments in natural capital can enhance human development and conservation. The toolset includes eighteen distinct ecosystem service models considered for terrestrial, freshwater, marine, and coastal ecosystems, as well as, several "helper tools" to assist in finding and processing input data, and with understanding and visualizing outputs.

InVEST models are spatially-explicit (with the aid of maps) and return results in either biophysical terms (e.g. tons of carbon sequestered) or economic terms (e.g. net present value of that sequestered carbon). InVEST models account for both service supply (e.g. living habitats as buffers for storm waves) and the location and activities of people who benefit from ecosystem services (e.g. location of people and infrastructure potentially affected by coastal storms). The modular design of InVEST provides an effective tool for balancing environmental and economic goals of governments, non-profits, and private companies, among other entities.

InVEST
integrated valuation of ecosystem services and tradeoffs

Source: InVEST 2016

Determined Contributions (NDCs).

On the other hand, the provision of hydrological services is far more complex.[10] The generation of these services is site-specific, depending on specific hydrological and hydrogeological conditions. Besides, these hydrological services might require distinct treatments depending on the emphasis on water quality or availability.

To ensure success, a carefully prepared land-use plan should be at the core of every PES scheme. This plan should begin by identifying which lands will deliver the most in terms of ecosystem services, and which lands should be converted into uses more compatible with ecosystem services. This plan should clearly define the land uses that need to be changed or improved (according to land-use capacity and land-use zoning) and should be organized into programs and projects with an outline of the potential structure for the implementation for each. Importantly, this plan should include a detailed study of the property rights held by landowners with parcels located in prioritized lands. In all cases, though, we need to make sure that the proposed land-use and management practices are clearly defined and understood by all participants involved. These practices should be realistic and suitable for the farms involved. Nobody can expect that farmers will adopt a technological package that makes no sense to them, or that is impractical given the particular circumstances of their farms. For this reason, it may be desirable to compliment some PES schemes with technical assistance programs.

10 The case of biodiversity conservation is also complicated. Not only is there not enough information discussing vegetative cover and biodiversity, but also the protection of biodiversity is a highly site-specific service and depends on the location of the plot within the landscape. Two different hectares with the same vegetation might have dramatically distinct relevance with respect to biodiversity, depending on their location, connectivity, and the composition of the landscape. Linking this to a suitable prioritization of protection of areas based on, for example, connectivity and proximity to biodiversity-rich or highly threatened areas can justify making a payment to land owners in those areas, assuming an acceptable value of biodiversity can be established. In this regard, defining an appropriate unit of measurement for improvements in biodiversity should be stated. Without such indicators, PES schemes are subject to concerns regarding their effectiveness in achieving conservation objectives.

As a final step, it is necessary to estimate the cost and timeframe of the intervention plan. Given that the intervention plan will be executed over time, it is important to define the plan's timeframe and budget (which must be compatible with the demand for ecosystem services). The estimation of costs of the intervention plan will assist in determining both the total costs of implementation and the amount to pay landowners participating in PES. In situations where a land use must be protected (e.g. conservation of forest) or completely abandoned (e.g. agricultural activities in highly vulnerable areas), the opportunity cost of the land should be calculated (see more on methods for economic valuation methods in Table 2). In some areas, the opportunity costs might be relatively high due to highly profitable alternative activities, while in others, the opportunity costs might be relatively low. Therefore, areas with special attributes for ecosystem service provision and low opportunity costs are those in which PES is likely to be most cost effective.

Demand Side

As financial sustainability is the Achilles' heel of most PES programs, identifying and measuring the demand for ecosystem services is critical. This information

Table 2. Economic valuation methods for ecosystem services (ES)

Method [11]	Potential Use
Replacement or avoided costs (Freeman 1993). A decrease in natural provision of ES might require investment in new technology or additional inputs to compensate for the loss. The sum of these expenditures is an approximation of the value of ES in this case.	This method can be employed either to measure the costs of ES (the implementation of soil conservation practices, for example) or of the benefits ES provides (the avoided cost of buying bottled water to be "defended" against water contamination, for example, can be considered a benefit from a watershed improvement).
Changes in productivity (Freeman 1993). A decrease in ES might inevitably have an impact on the production capacity of an economic agent, thereby reducing profits. This reduction is a measure of the costs of deteriorated environmental conditions or of the benefits of improved conditions. In other cases, ES requires the abandonment of an economic activity (e.g. cattle) or full conservation of land (e.g. forest). In these cases, the estimation of the opportunity cost (the cost of the best possible alternative in which land could be used) is needed.	This method requires real information about market prices. It is a particularly common practice to estimate the costs of land-use changes (opportunity costs) and the cost of conserving forests and other ecosystems. In some industrial or agricultural cases, changes in productivity can be used to estimate how variations in a baseline of ES affect private profitability. Estimation of opportunity costs usually entails serious problems due to the lack of accurate and easily accessible data.
Contingent valuation (Whittington 2002, Mitchel and Carson 1989). This is a survey-based method in which respondents face a hypothetical scenario describing a good or service and a particular setting in which it is to be provided. The respondent is asked to state his or her willingness to pay (WTP).	This method is widespread because it can be used in a broad range of situations, including those where no prior experience or information is available. In particular, it is well suited for estimating the benefits of potential watershed interventions.

11 Textbooks (e.g. Freeman 1993) can provide a more comprehensive list of economic valuation methods. There is a broad field of applications of these methods, however, one interesting source for resources and materials on corporate water management, water tools for business, and business water valuation case studies is The World Business Council for Sustainable Development (WBCSD) (at http://www.wbcsd.org/home.aspx).

should be the basis for designing the financial structure of the program, and hence, its temporal and spatial scale. The estimation of available funds is relatively simple if the funding source is an external grant or loan. However, other situations may be more complicated. For instance, in cases where it is necessary to estimate a potential beneficiary's willingness to pay for PES, an economic valuation technique should be applied to calculate the total amount one could collect from the population benefiting from the proposed improvements (see Table 2).

Intuitively, it is reasonable to think that the greater the spatial and temporal scale of the intervention plan, the more compromised the financial viability of the scheme will be. Therefore, greater management efforts and innovative financing opportunities are needed. Importantly, the determination of beneficiaries' willingness to pay for PES (i.e. the maximum amount of money than can be collected in a certain period) is context dependent. For example, the sustainable management of a watershed providing drinking water to a populous city will have a much larger economic value than that of a watershed with few people. In the case of the populous city, an ambitious, large scale PES scheme would be appropriate (e.g. the Catskills watershed for New York City, Daily 1999), whereas for the isolated watershed, alternatives to PES might be more suitable.

In general, the identification of the specific demand, expressed in a steady flow of funds from beneficiaries, is a more complicated task than identifying ecosystem service providers willing to participate voluntarily in the scheme. In many cases, this asymmetry has led the government to intervene directly in financing PES schemes. In these cases, the government acts as the representative of a particular group of beneficiaries. This governmental contribution is valuable, particularly at the early stages where it is necessary to building credibility and enhancing available management capabilities.

However, if they are not supplemented by alternative income sources, these government-financed PES schemes are vulnerable to political changes, and their medium to long-term financial sustainability is uncertain.

CHECKLIST:
Demand Side

- ☑ Define the budget available and the finance structure for the program
- ☑ Identify the beneficiaries clearly
- ☑ Estimate how much beneficiaries must be charged in order to finance the scheme

The beneficiaries of different ecosystem services are likely to be different. The first obvious distinction is their location. Some ecosystems provide global ecosystem services, while others are more regional or local in nature. Carbon sequestration is a prime example of the former. If the plan is to sell carbon sequestration, it is important to look to members of the international community as potential beneficiaries and buyers of carbon offsets. On the other hand, if the emphasis is on selling site-specific and user-specific ecosystem services such as hydrological services, the best strategy is to look for local or on-site beneficiaries, such as hydro-electrical and water companies.

From the previous discussion, it is clear that information plays an important role in determining who the beneficiaries are and how much they are willing to pay. In some cases, those affected by reductions in ecosystem services lack the awareness that a beneficial change is possible if they are willing to contribute to ES financing. In such circumstances, the intermediary must inform potential beneficiaries of the possible solutions and costs, as well as, the potential risks of inaction. It is also necessary to provide beneficiaries with more accurate information as to the types and quantities of ecosystem services being provided. Moreover, clear, quantitative data demonstrating the costs and benefits of ecosystem services is essential for attracting private sector investment.

Governance Structure

The governance structure refers to the organizational body administering the PES scheme (i.e. the intermediary or bridge between supply and demand). This includes the management of personnel, payments, and agreements, and making all necessary operation and strategic decisions. The governance structure must also have the capacity to promote and navigate a legal and regulatory framework amenable to PES. This administrator could be a private organization, a governmental entity, or any semi-public organization operating at a national or local scale. The selection of intermediary type should reflect the social and political conditions of the country or location surrounding the PES program. The program's scale (i.e. spatial and temporal dimensions of the proposed intervention) and the type of ecosystem service involved will also be driving factors in the choice of intermediary. For example, carbon sequestration programs work well as nationwide initiatives, while hydrological services require a local-scale approach.

It is important to note that transaction costs are likely to increase with the size of the organization, particularly with respect to operating costs (salaries, monitoring costs, legal costs related to PES contracts, etc.). On the other hand, the costs of establishing an organization (e.g. legal costs) might be fixed irrespective of its size. Accordingly, a case-specific analysis is required to determine the most appropriate type of institution. The creation of parallel organizations and additional legal regulations, as in the case of the Costa Rican scheme (see next chapter), is also not necessarily required for a program's success. A governance structure can easily be formed within a municipality or as a subunit of a water or electricity company. Moreover, operational costs might be reduced if the PES scheme can leverage the structure of an existing organization. If an organization has well-recognized accounting and auditing practices, for example, or is already well known and respected by potential investors or beneficiaries, much could be gained from attaching the PES scheme to it.

The most basic program aspects coordinated by the intermediary are the following:

CHECKLIST:
Governance Structure

- ☑ Determine the intermediary and its governance structure
- ☑ Structure contracts and establish mechanisms for its compliance
- ☑ Construct operational PES manual defining: enrollment rules, monitoring, payment amounts and charges, etc.
- ☑ Minimize administrative costs and participation barriers
- ☑ Establish strategy to secure long-term financing

- **Legal:** The intermediary will harmonize the relationship between the PES program and the legislative landscape in which it sits. This involves identifying rules that interfere with PES or that may required for its proper functioning, and either modifying the program or advocating for legislative reform accordingly.

- **Institutional:** The intermediary will supervise contract matters, such as, agreement templates and signing; contract compliance; and participation of third party alliances. In doing so, it will seek to maximize process transparency while minimizing administrative costs and barriers to participation.

- **Payments, Participation, and Operational Rules:** The intermediary will define and manage (modifying as necessary) all technical aspects of the PES scheme, for example: land use, priority areas, service provider payments, beneficiary fees, and enrollment rules.

- **Accountability and Outreach:** As transparency is essential to program success, the intermediary will manage program auditing and the dissemination results.

- **Finance Structure and Market Development:** As we stressed before, one of the governance structure's key responsibilities in ensuring the survival and success of the PES scheme is to develop strong and diverse sources of income. These could include a combination of voluntary and non-voluntary contributions from local and global beneficiaries, and can be in the form of taxes, water fees, donations, loans, and specific agreements. Moreover, to ensure financial sustainability, the PES plan should be grounded on the following pillars: clear communication of the benefits PES provides to beneficiaries; gaining private investor trust through transparency and accountability principles; minimizing of PES transaction costs; and establishing a balanced diversification of income sources. These will be discussed in the following chapters.

The "rules of the game" for the PES program, as defined by the intermediary, should be stipulated in an operation manual. This will assist in the facilitation of transactions and support the overall transparency of the operation. This manual will clearly describe the institutional structure; program objectives; finance structure and sources of income; enrollment rules for landowners, including technical criteria for priority areas; and monitoring and evaluation plans (including on-site monitoring to ensure conditionality of payments defined by contracts).

Finally, given the experience now accumulated regarding the implementation of PES schemes worldwide (most notably in Costa Rica), there are key aspects that the intermediary must address to increase their ability to contribute towards achieving the desired outcomes (Pattanayak et al. 2010, Sills et al. 2008, and Wunder et al. 2008). PES operational rules must avoid the creation of perverse incentives. In particular, they must avoid leakage and baseline alteration (e.g. this could occur when landowners enroll only part of the land to receive payment but deforest in other areas not under contract). In addition, the intermediary should pay attention to low enrollment gaps in areas where ecosystem services' potential is high but payments are significantly below opportunity costs. Adequate monitoring and sanctioning are also crucial to guaranteeing contract compliance.

Although a PES scheme does not address poverty reduction explicitly, an effort should be made to guarantee that PES does not exacerbate poverty and/or introduce further social and economic inequities. The periodical evaluation of results will provide critical information to the intermediary regarding the achievement of social and environmental goals, as well as the need to introduce changes in order to be more effective.

Step 3: Implementation

The implementation of a PES program is generally a gradual and continuous process driven by the scope of the goals and the overall scale of the scheme. For example, it could take years to enroll an entire population of potential landowners selling ecosystem services or covering the whole of a prioritized watershed area. The pace of the implementation process reflects the support of the relevant political authorities and available funds. However, the fact that this process is gradual is not necessarily a negative thing. Rather, it can be an opportunity for learning-by-doing and for generating credibility and management capacity.

In the initial stages of PES development, the amount and quality of technical criteria may vary. It could be minimal or larger, in order to establish baselines for the compliance, especially when public funds are allocated for payments. However, this does not necessarily have to delay the commencement of a PES program. Rather, the intermediary should follow an adaptive approach, gathering information as time goes on regarding which land uses to pay for and where payments should be prioritized in the following years. In addition, the intermediary must be judicious in weighing the costs in obtaining such information (e.g. hydrogeological studies) and the benefits of improving technical criteria. Nevertheless, as contributors demand more value for their investments, it will be necessary to develop better metrics for measuring ecosystem services, along with effective criteria for targeting areas where the value of

ecosystem servies is the highest.

The initial implementation of a PES scheme might rely on international donations, loans, and governmental budget. As already discussed, while this support may be critical to start the program, continued heavy dependence on these income sources jeopardize the future of most PES programs. The incorporation of the private sector into the finance structure is a sound strategy to minimize this dependency and to progressively increase the scope of the program (e.g. increasing the hectares of forest under protection or defining longer term contracts with landowners).

Finally, it is important to comment further on administrative costs (e.g. managing contracts, monitoring compliance). A PES scheme with high operating costs will have less money available for payments. It will also have fewer opportunities to broaden its provider base. There is no rule of thumb as to what the amount of these costs should be. FONAFIFO, for example, had operational costs for the Costa Rican PES of around 15% of its annual budget from 2010 to 2014. Other offices within the Ministry of Environment and Energy, however, absorbed some operational costs. Most of the funds should go directly to the providers, and access to the scheme should not become a barrier to running the funds. Intermediaries must also balance reducing administrative costs with other key aspects of the program, such as the participation of smallholders.

Step 4: Evaluation

Program evaluation is essential to the design and maintenance of an adaptive PES program. Important evaluation actions include management and finance assessments and the verification of contracts and the scope of proposed goals. These allow for the detection of necessary adjustments that will improve the overall effectiveness of a PES program, enhancing the dynamic nature of the program. Therefore, evaluation should not be seen as an isolated exercise without implications for improvements. Instead, evaluation should be viewed as a valuable and continuous process guiding the evolution of the program.

Evaluation should include the regular review of processes and outcomes. This will aid in the identification of the main obstacles and opportunities towards achieving the proposed objectives (e.g. protection of forests, sustainable agriculture). In some cases, evaluation findings may dictate that program objectives be reformulated towards the achievement of more ambitious targets. To facilitate meaningful, consistent, and transparent evaluation procedures over time, baseline process and outcome indicators should be established during the initial phase. Qualified experts can supplement these internal evaluation procedures with external evaluations. The PES scheme's credibility, in terms of financial management and goal achievement, depends on the quality of the evaluation process and the disclosure of its results. This continuous assessment will also provide new information regarding the relationship between land uses and ecosystem services (e.g. more precise scientific information to target payments in certain locations).

Contract verification is another critical component of a continuous evaluation process. To this end, on-site monitoring, complemented by other means (e.g. GIS), is essential. Through these means, the intermediary can verify which participants are adequately satisfying their contract obligations and are, thus, eligible to receive payment. In addition, mechanisms identifying the number of participating providers and the total hectares or number of trees registered according to payment category will help demonstrate achievements in the protection of certain land uses.

However, the focus of PES program evaluation should be on the delivery of services rather than on land uses. As discussed in the previous chapter, land uses are not equal to ecosystem services, and the delivery of these services often depends on quality and location of land. Without proper identification and measurement of the cause-and-effect relationship between land use and ecosystem services, it is difficult to determine the exact quantities of ecosystem services delivered under PES schemes. Minimizing this weakness is critical for convincing investors and beneficiaries that their monetary contributions are spent efficiently. There is, however, a trade-off between increased precision and

costs of measuring impact. PES has to have a balance between the costs of measuring impact and the potential revenues generated by the ecosystem services.

Employing statistical evidence in the evaluation process enables the intermediary to identify whether a PES program has achieved additionality (i.e. land-use changes that would not have occurred otherwise) or any other goals (e.g. social outcomes).[12] This type of quantitative analysis on the effectiveness of PES also offers the hard evidence needed to give policy makers greater confidence in scaling up the program (Pattanayak et al. 2010). Further, these evaluations might help define better criteria for targeting PES and, hence, improve its overall effectiveness (e.g. focus payments in areas under greatest deforestation threat). However, other possible effects of a PES program should be identified. These include tracking the number of participating groups or individuals that, in the absence of the program, would not have received any income from protecting an ecosystem (e.g. indigenous communities); or cases in which the programs assist in the regulation or improvement of land tenure security.

12 Assessing the impact of a PES program involves the identification of a counterfactual, which refers to the situation of what would have happened at a site in the absence of the program. Unfortunately, this task cannot be accomplished in practice because once a plot is participating in the program (treatment), it is impossible to know with certainty what would have happened in the same place in the absence of the program. It is also inherently very difficult because the allocation of precise amounts of conservation to a specific program of incentives requires describing a credible counterfactual scenario, an even more difficult task if those enrolled in the program come from very different social, economic and biophysical circumstances, and may be affected by other policy measures or broader economic factors, including other parallel programs or pre-existing incentives (Daniels et al 2010, Pagiola 2008). However, there are a number of statistical techniques (e.g. matching techniques) that allow conclusions about the causality of the program, using appropriate comparisons between similar groups of treated and untreated observations.

Lessons Learned From Costa Rica: Structuring, Practicing, and Financing

Results to date indicate that 1,122,312 hectares have been submitted to the PES program in Costa Rica. In addition, 6,478,254 trees have been planted in agroforestry systems, almost 16,000 families have been involved in the program, and over 136,000 hectares of indigenous territories have been placed under PES.

Objectives and Enabling Conditions

The success of Costa Rica's national PES program has been influenced by several enabling conditions. These include a supportive national legal framework, a set of complementary public policies, land tenure security, and a favorable political and social environment. Many of these conditions are a direct result of government interventions over several decades.

Several laws, regulations, and conventions (both national and international) have provided legal support for Costa Rica's national and local PES initiatives (see Box 5 on ESPH). During the 1990s, Costa Rica's environmental sector experienced great changes due to new legislation favoring natural resource conservation and creation of organizations strengthening the sector. The foundation of PES was preceded by the ratification of several international conventions (e.g. Convention on Biological Diversity 1993, Rio Declaration on the Environment and Development 1992) that in turn, in 1994, influenced the amendment of Article No. 50 of the Political Constitution of Costa Rica, which "guarantees citizens a healthy and ecologically balanced environment". Thereafter, Costa Rica's national PES scheme was formally established in 1996 through an amendment to the Forestry Law (Law 7575), and implemented in 1997.

Some historical context is relevant at this point (Rojas and Aylward 2003, Rosa et al. 2003). As Figure 6 on the next page indicates, from the 1940s through

today, Costa Rica suffered significant changes in forest cover, experiencing a dramatic decrease until the late 1980s when the country's forestland started to recover significantly. These changes were caused by a variety of complex internal and external factors. Externally, the most important negative driver of change was associated with high meat prices, which in turn generated strong incentives for land conversion in the country. However, this was also a result of governmental policies facilitating credit for extensive cattle ranching, providing land titling to those who cleared the forest for agricultural purposes. In the late 1980s, these internal and external incentives started to disappear and, instead, the government started to promote legislation favoring the environment, and forestry, in particular. Between 1979 and 1985, the Costa Rican government launched a program of allowing income tax deductions for reforestation costs and implementing soft loans for forestry. Then, in 1986 the government decided to use direct subsidies for reforestation and the management and protection of natural forest.

The enactment of Law 7575 in 1996 marked two fundamental changes in the way the state could intervene in the management of natural resources. Firstly, it interrupted the paternalistic subsidy scheme favoring the forestry sector, shifting to an incentive system that conditioned financial reward on compliance with specific conservation measures and land-use improvements. This element of conditionality is one of the hallmarks of a PES scheme, where the supplier receives compensation only if s/he has complied with contractual obligations. Secondly, Law 7575 clearly states that the funding source of the scheme will be a tax on fossil fuels (nowadays 3.5% of the fuel tax goes to FONAFIFO to finance PES), reflecting the notion that the program is based on the basic economic principle of internalization of externalities, wherein "the polluter pays."

Over the past decades Costa Rica has openly encouraged its tourist industry, promoting its natural beauty and consolidating a National System on Protected Areas (around 25% of the country is under some category of protection). In this regard, the steady and strong increase of the country's ecotourism has shaped the perception of forest landscape as an economic asset. These positive incentives, in addition to Law 7575's prohibition on land-use change, are

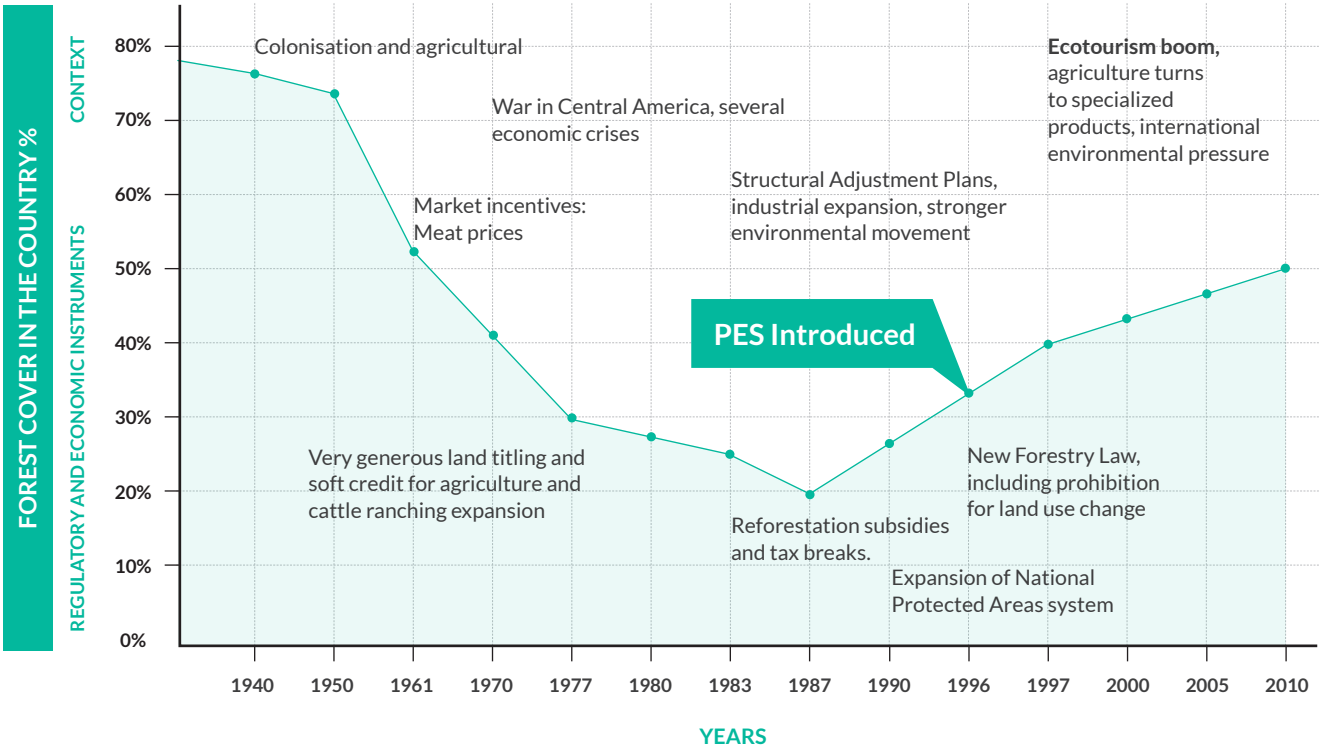


Figure 6. Forest cover evolution and policy milestones

Source: Adapted from Porras et al. 2013

key factors promoting a more sustainable use of ecosystems in the country, reflecting Costa Rica's increasing interest in protecting its environment.

Because PES payments are conditional on the fulfillment of certain contractual obligations over time, land tenure security is a fundamental requirement. Therefore, to the extent that the level of this security is low, the scale of the program could be affected, potentially disqualifying marginalized segments of the population. In general, land property rights in Costa Rica are very well defined and supported by national laws. However, at the initial stages of the program, one of FONAFIFO's enrollment requirements for program participation was the demonstration of formal land property titles. This requirement excluded individuals who only had possession rights (e.g. some indigenous communities, or peasants who obtained land through the agrarian reform). Following its interest in promoting rural development and reducing social exclusion, FONAFIFO modified this requirement, permitting less strict forms of land ownership in the program. This is one example of how enrollment rules have evolved over time. It also highlights the fact that, if the program pursues social outcomes, enrollment rules should be carefully defined in order to prevent the exclusion of marginalized groups.

The objectives of Costa Rica's PES program have also evolved over time. In the beginning, the program's primary goal was to protect four ecosystem services defined by Forestry Law 7575. These were the mitigation of GHG emissions; water protection for urban, rural or hydroelectric use; biodiversity conservation; and the preservation of scenic beauty. Law 7575 defines ecosystem services as those services "provided by forests and forest plantations and which have a direct impact on the protection and enhancement of the environment". However, this definition was later modified to include ecosystem services from other land uses, such as agroforestry. The inclusion of agroforestry systems as eligible PES land uses (Decree No. 30748-MINAE-2002, Decree No. 32750-2005) was a key step in recognizing their role in ecosystem generation, particularly in mitigating GHGs and protecting biodiversity. The decision was based on research results from various Costa Rican universities, including CATIE and the National University.

It should be noted, additionally, that this fundamental change in the project objectives was also designed to promote rural development. The introduction of a maximum number of planted trees per landowner (3,500 trees) sought to expand the program's outreach. As a result, the program has seen an increase in adoption by small farmers, indigenous communities and farmer cooperatives.

While Costa Rica's PES program was not initially designed as a poverty mitigation mechanism, in 2004 it included criteria aimed at promoting the development of disadvantaged areas and minorities. These criteria included a requirement that participating farms be located within counties (municipalities) having a Social Development Index [13] (SDI) lower than 40%. This prerequisite reflects a reorientation of program objectives towards aiding in the relief of poverty. This measure, however, has been questioned for the innate limitation SDI has. Therefore, there is a need to strengthen robustness of the SDI (Porras et al. 2013). Nonetheless, even with the limitations it possess, SDI is currently the only index associated to social ranking that is valid on a nation-wide scale in Costa Rica.

Structuring: Main Components of National PES Program

The main conceptual components of FONAFIFO'S PES scheme are presented in Figure 7. On the supply side, the sellers of ecosystem services are small and medium private landowners. Participating sellers sign a contract whereby they commit to implementing one of the funds land-use modalities on their farms in exchange

13 The SDI is a composite index constructed by the Ministry of National Planning and Economic Policy of Costa Rica in order to rank the 81 municipalities of the country based on eight indicators of various dimensions of social development, among which health, nutrition, education and housing. The SDI is 0 to 100, the latter being the value that shows greater social development.

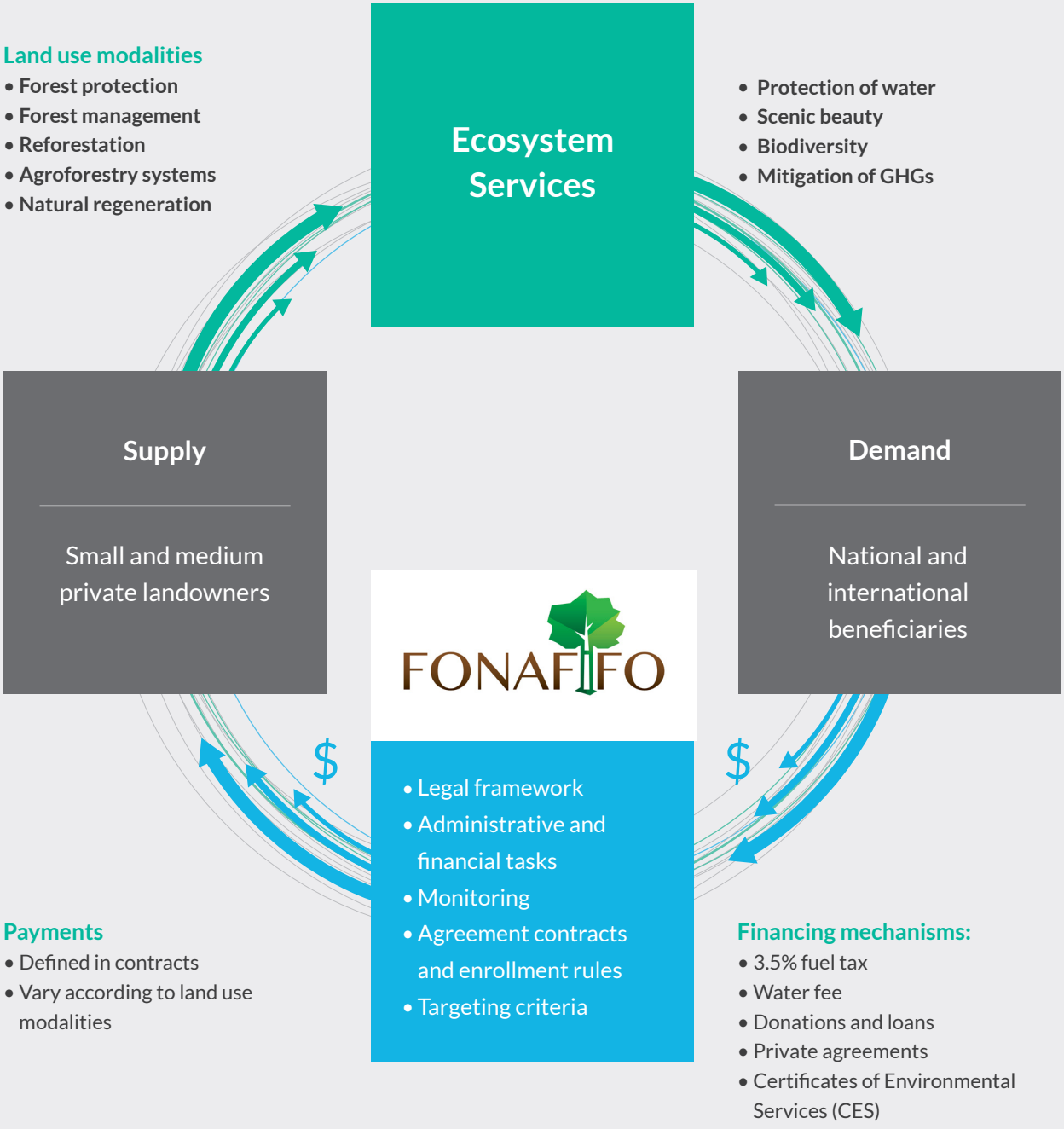


Figure 7. Conceptual framework: Main components of FONAFIFO's PES program

for monetary payment from FONAFIFO. The land uses currently included in the program are forest protection, forest management, reforestation, agroforestry systems, and natural regeneration. These land-use protection practices generate ecosystem services for different purposes, such as water protection, scenic beauty, increasing biodiversity, and mitigating GHGs. The program beneficiaries include national and international parties who pay for these services. On the national side, Costa Rican inhabitants, through the central government, contribute mostly through fuel-tax payments and a water fee (Canon de Agua). In addition, private companies fund the scheme through private agreements by which they acquire environmental certificates in exchange for their contribution. On the international side, international cooperation agencies provide donations and loans. Lastly, FONAFIFO acts as the third party intermediary between the supply and

demand for ecosystem services. FONAFIFO intervenes to provide the PES governance and operation structure that defines and enforces the rules for selling ecosystem services (e.g. establishing payments according to the different land modalities). This intermediary is also responsible for monitoring contractual compliance and developing strategies to secure a sustainable finance structure.

Governance

Since its inception, the Costa Rican PES program has facilitated and promoted the participation of Costa Rica's forest development sector, which includes the National Forest Office (ONF), the National Conservation Areas System (SINAC), and Costa Rica's Association of Agricultural and Forest Engineers. In addition, forest regents (forestry technical facilitators)[14], cooperatives, regional agricultural centers, and non-governmental organizations have been included in the program. Among this diversity of stakeholders, FONAFIFO acts as a financial and executor backbone of the PES program.

Art. 48 of the Forestry Law dictates the composition of FONAFIFO's board of directors. It is made up of two private sector representatives by the National Forestry Office (ONF); a representative of the small and medium-size forestry producers; a representative of the industrial forestry sector; and a representative from each of the Ministry of Environment and Energy (MINAE), the Ministry of Agriculture and Livestock (MAG), and the National Banking System. FONAFIFO had to adapt and develop new managerial and operational skills in order to guarantee the proper management of the investment resources assigned to which it has been assigned. Only in this way has the institution been able to meet the requirements and financial regulations set by the country's Ministry of the Treasury.

FONAFIFO's tasks include the revision and approval of projects and pre-applications, the formalization of contracts and the issuing of payments. To fulfill these tasks, FONAFIFO has eight regional offices located throughout the country. Here, people interested in applying for a PES contract submit the initial documentation. Forest technical facilitators, working freelance or through an NGO, support these regional offices by gathering program data and monitoring landowner contract compliance. In addition, some NGOs assist further by advising farmers, providing training and engaging in other activities aimed at strengthening the forest sector.

Some of FONAFIFO's other critical takes are the definition of enrolment rules for landowners seeking PES payments, the definition of areas of intervention, modalities of payments, monitoring of the compliance of PES contracts and all of the program's financial and administrative management, including the definition of strategies for attracting new funding sources. These activities and their outputs are described in further detail below.

Demand

Taxes represent the dominant source of income to finance the Costa Rican PES budgeted expenditures. Income derived from these sources is referred to an ordinary budget. The ordinary budget represented an average of 69% of FONAFIFO's total budget from 1998 to 2015 (see Figure 8). However, in the period from 2010 to 2015 it represented 79% of the total budget.

The fossil fuel tax[15] is the main source of income to finance PES`s - ordinary budgeted expenditures – 3.5% of this fossil fuel tax proceeds flow to FONAFIFO. However, the collection of the “Canon de Agua” (the water fee collected by MINAE, see Box 4), launched in October 2006, has become a strong inflow of resources

14 Forest regents are professional forest engineers who act as intermediaries between FONAFIFO and the landowner, under the principle of public trust. The forest regents work, sometimes independently and sometimes within an NGO, on contract monitoring and the elaboration and of contract terms to be proposed to FONAFIFO.

15 The fossil fuel tax is a sole tax applicable on fossil fuels. It taxes domestically produced and imported fuel. Rates on the tax are updated every trimester, where the quarterly adjustment cannot be larger than 3%. Currently, the amount of tax to pay varies from USD 0.06 to 0.44 per liter, depending on the type of fossil fuel.

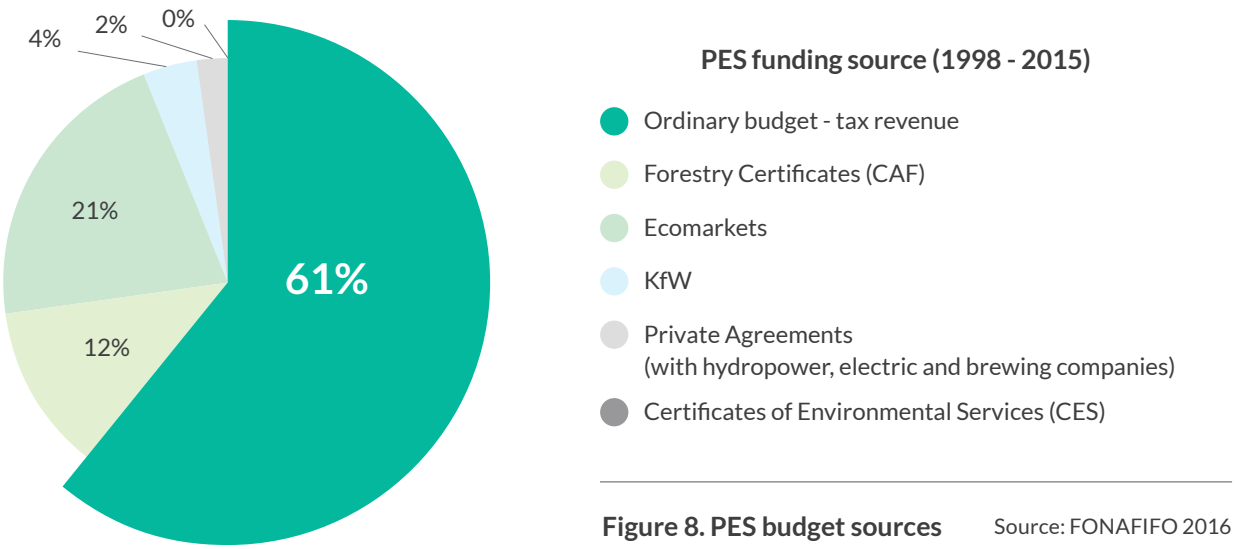


Figure 8. PES budget sources Source: FONAFIFO 2016

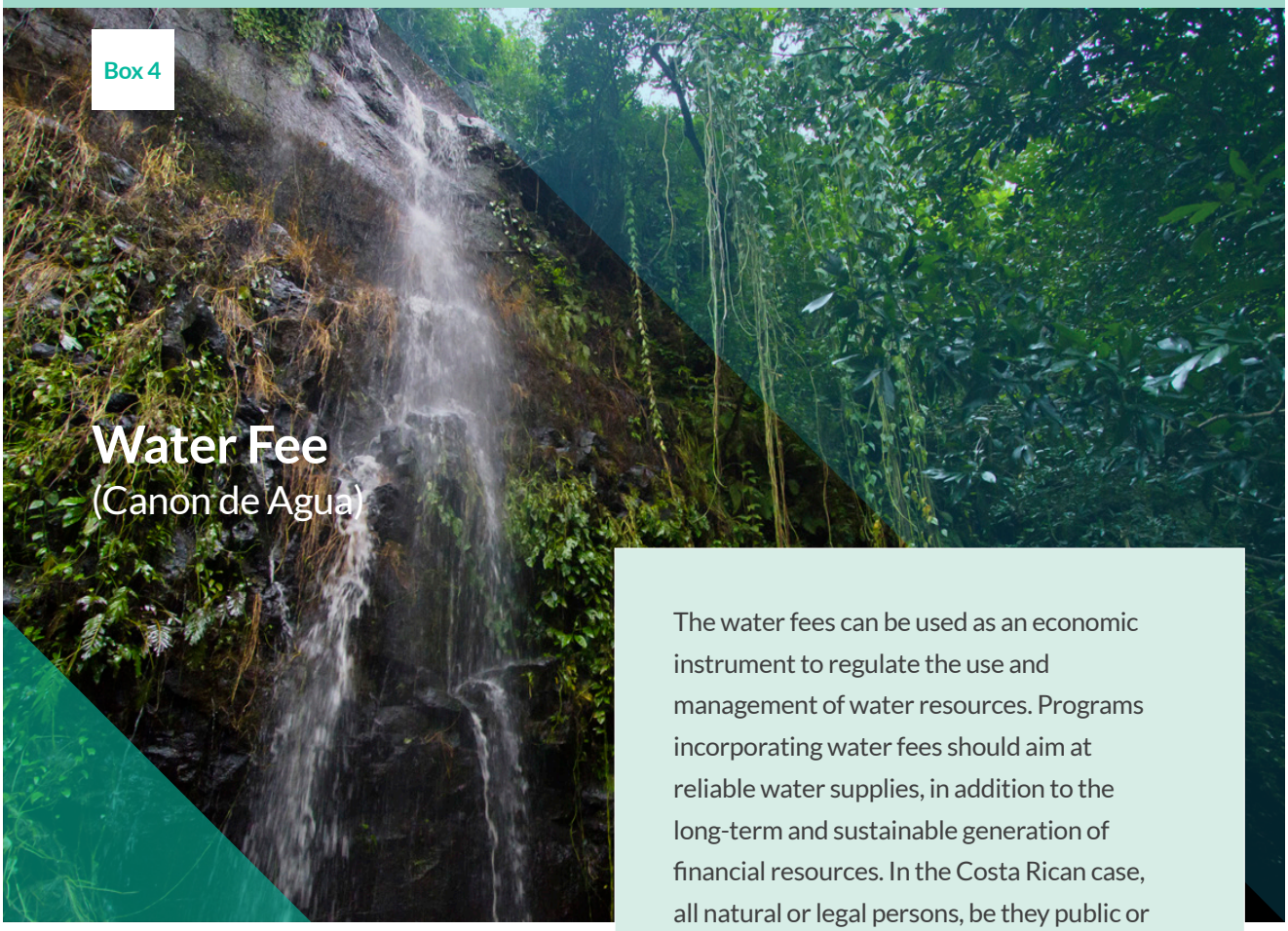
for FONAFIFO as well. The magnitude of this income source has evolved over the years, starting out at only 0.3% of the ordinary budget in 2007, and increasing to around 6% over recent years (see Table 3). By its form, this water fee payment implies that all direct water users recognize the provision of ecosystem services in private and public areas.

In addition, as Figure 8 shows, forestry certifications were another significant source of income (eliminated in 2006), along with the Ecomarkets and KfW projects. Forestry certifications (CAF by its Spanish acronym) were created in 1986 as part of the Costa Rican Forestry Law No 7032. They were nominative trading securities (in Costa Rican currency) seeking to promote forestry activities, such as reforestation and sustainable forest management. These Forestry Certifications constituted transferable economic instruments that could be used for income tax deduction by small and medium-sized landowners. CAF worked as precursors of the Costa Rican PES scheme, later focusing more rigorously on the compliance of conditionality and provision of ecosystem services. In addition, the delivery of the ecosystem services intended by the PES scheme aimed to benefit the country's society as a whole, as opposed to CAF policy, which focused specifically on the benefits for the forestry sector.

The Ecomarkets project was divided into two phases. Ecomarkets I began in 2001 and concluded in 2006, while Ecomarkets II began in 2009 and finished in 2014. Ecomarkets I was a loan consolidation agreement comprising a USD 32.6 million loan from the World Bank, an USD 8 million grant from the Global Environment Facility (GEF), and an USD 8.6 million loan from FONAFIFO. This agreement was fundamental to allocating the resources that financed outstanding obligations from PES contracts formalized before 2001. It has also financed the inclusion of 100,000 hectares of land in the priority areas of the Costa Rican Mesoamerican Biological Corridor. Moreover, it helped increase the participation of women and indigenous people in the program (FONAFIFO 2016). The next phase, Ecomarkets II, involved a USD 30 million loan and a USD 10 million donation from GEF. The purpose of this second phase was to give continuity to Ecomarkets I and to seek projects on Clean Development Mechanisms (CDM) and Reducing Emissions from Deforestation and Forest Degradation (REDD).

The KfW Bankengruppe was also an important funding source, providing EUR10,225,838 in grant funds through 2011. These funds were used to co-finance 70% of the PES in the Arenal-Huetar Norte conservation area (in the Northern region) and the Sarapiquí sub-region (in the Central Volcanic Range conservation area). The Costa Rican government, as a counterpart, provided the remaining 30%. These funds enabled the formalization of 702 contracts, covering an area of 75,604 hectares.

FONAFIFO's actual budget is insufficient to meet the demand of landowners who wish to enroll in the



Box 4

Water Fee
(Canon de Agua)

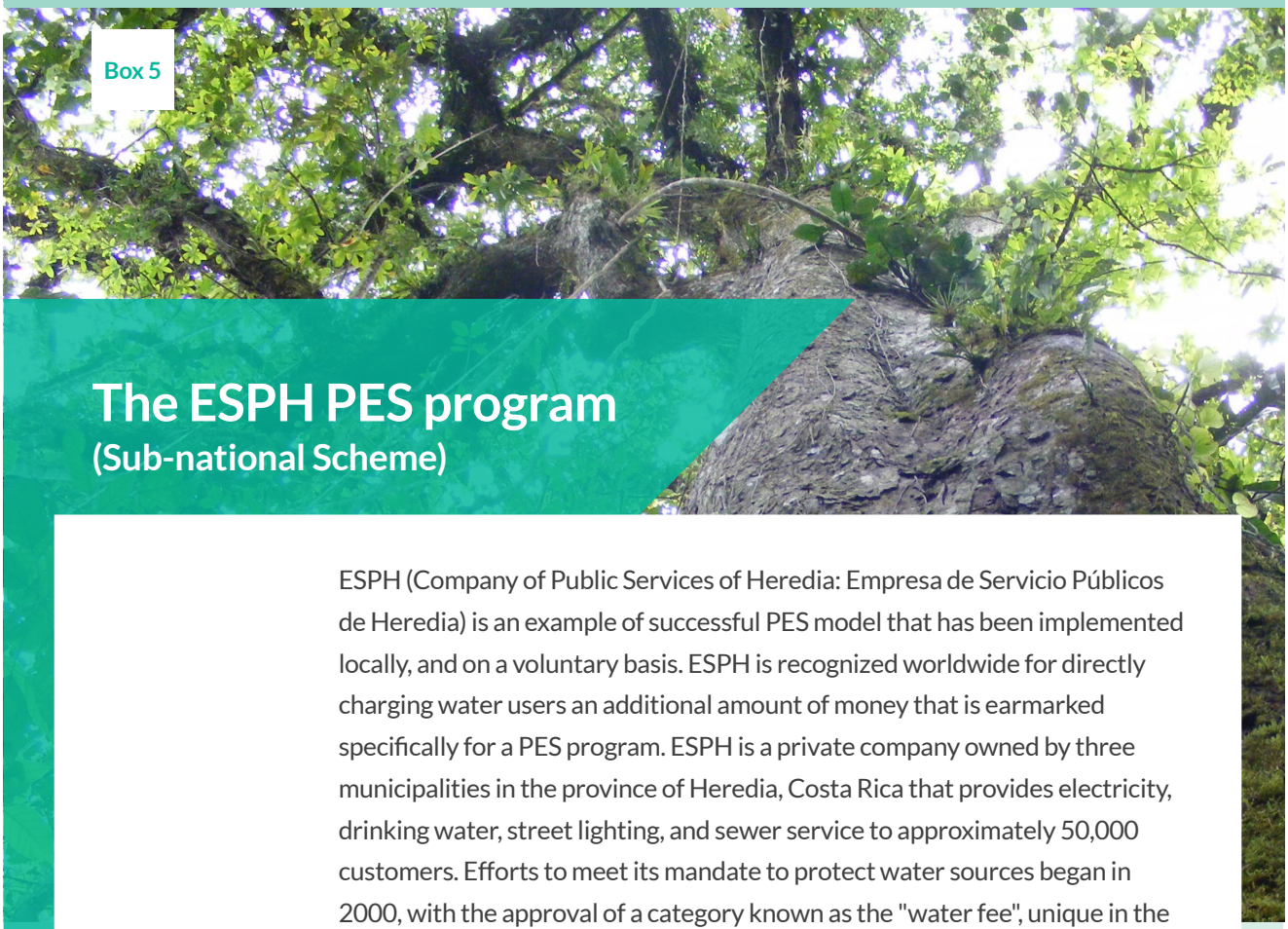
The water fees can be used as an economic instrument to regulate the use and management of water resources. Programs incorporating water fees should aim at reliable water supplies, in addition to the long-term and sustainable generation of financial resources. In the Costa Rican case, all natural or legal persons, be they public or private institutions (including government institutions), are required to pay a water fee. The water fee contemplates the values of water use and water protection. The funding received from this source has facilitated an inclusion of 35,795.3 hectares and 684 PES contracts into the program. In Costa Rica, the Ministry of Environment and Energy (MINAE) manages the collection of this fee. Fifty percent of the total revenue collected goes towards the maintenance of an integrated water management system at the national level, a task carried out by the Water Board of MINAE. Another 25% of the total revenue is invested in the system of protected areas, particularly those within watersheds that generate the fee income. Lastly, the remaining 25% is transferred to FONAFIFO's PES program to finance conservation contracts on private lands located within the watersheds where the revenues are generated.

Table 3. Water Fee as a proportion of FONAFIFO's total budget

Year	Share (%) of the budget
2007	0.26
2008	1.31
2009	0.74
2010	6.00
2011	3.35
2012	10.12
2013	5.82
2014	6.90
2015	5.65

Source: FONAFIFO 2016

Box 5



The ESPH PES program
(Sub-national Scheme)

ESPH (Company of Public Services of Heredia: Empresa de Servicio Públicos de Heredia) is an example of successful PES model that has been implemented locally, and on a voluntary basis. ESPH is recognized worldwide for directly charging water users an additional amount of money that is earmarked specifically for a PES program. ESPH is a private company owned by three municipalities in the province of Heredia, Costa Rica that provides electricity, drinking water, street lighting, and sewer service to approximately 50,000 customers. Efforts to meet its mandate to protect water sources began in 2000, with the approval of a category known as the "water fee", unique in the country at that time. This fee was intended to promote the value of the forest from the perspective of its contribution to the quality and quantity of water resources. All water customers of ESPH are required to pay this volumetric fee (around USD 0.03/m^3), in addition to regular charges covering the operation costs and investments in infrastructure. By law, the money collected must be used only by the ESPH-PES to protect and restore forests at critical areas within the watershed.

By 2013, 47 PES contracts were arranged, representing an area of 1,100 hectares of protected forest, which amounted to a total investment of USD 921,144.33. Despite these advances, one of the main challenges for this initiative is to generate sufficient monetary incentives to landowners to participate since the opportunity costs of land in this area are very high.

Despite some structural similarities with FONAFIFO´s national scheme, ESPH has successfully adapted its PES program to the local context. Differences between the two programs include the following: ESPH acknowledges and pays exclusively for water resource protection services; the minimum area for the inclusion of its PES contracts is 1 ha; the payments made to farm owners are usually double those of FONAFIFO; and ESPH does not limit the owner from establishing additional contracts for selling ecosystem services.

PES program. For instance, for 2015 only 43.69% of enrollment requests were accepted due to budgetary restrictions. To bridge this gap, FONAFIFO has made a remarkable effort to secure funds from private entities. Examples of their diversified strategy to this end include voluntary agreements with hydropower and bottling companies and the use of tools such as the Certificates of Environmental Services (CES). Despite relatively low value in terms of the total current budget, these instruments deserve special attention since they reflect a clear interest in fundraising locally and privately, which can foster a steady and significant income stream in the future.

The private agreements with hydropower, electric and brewing companies finance water resource protection in watersheds where the companies are users of water resources. Each of them pays FONAFIFO

Table 4. New financing alternatives for Costa Rican national PES program

Program	*Item*	*Description*
Living Forest Project	**Certificate**	This program focuses on forest conservation projects in communities or farms located in vulnerable areas with a low development index. It is directed to eco-competitive companies with social and environmental responsibility programs (for instance, as part of a company's environmental management plan), as well as, to companies participating in certification programs. The project is usually contracted for a 10-year period. To date, the Living Forest Project has only been implemented in the Osa Peninsula, where the enrollment of one hectare costs USD 80 per year. The companies participating in this program obtain a (transferable) certificate that backs up their donation. In addition, they are able to receive a deduction in income tax as per the amount of investment made in the project. FONAFIFO also delivers an annual monitoring report, showing the presence of wildlife in the area from 2016 onwards.
Costa Rican Compensation Units (UCCs)	**Carbon Credit (non-tradable)**	UCCs started being implemented in 2008. They are generated in farms benefiting from the PES program under the modalities of reforestation, agroforestry systems, and natural regeneration in Guanacaste, and Costa Rica's Caribbean and North regions. Through this program, individuals and organizations purchase carbon credits, with each unit being equivalent to one avoided, reduced, removed or stored ton of carbon dioxide and costing USD7.50. Purchasers can use these credits to offset emissions that they have failed to reduce. UCCs have the advantage of being measurable and verifiable. They are oriented to organizations that are willing to become carbon-neutral or willing to obtain some other type of environmental certification, as well as, to institutions elaborating GHG inventory or an environmental management plan. The organizations and institutions participating in this program obtain a non-transferable certificate that backs up their purchase. FONAFIFO also delivers an annual report on program results.
Clean Flight Program	**Carbon Credit (tradable)**	This program is aimed at individuals and organizations from the domestic market (Costa Ricans nationals or residents) willing to pay for the GHG emissions generated by their air travels, with one ton of carbon dioxide costing USD7.50. The Clean Flight program serves as a mechanism by means of which participants contribute to the PES program to ensure the continued protection of Costa Rica's forest ecosystems. Individuals and organizations participating in the program obtain a (transferable) certificate that backs up their purchase.

Source: FONAFIFO 2016

approximately USD 40,000 a year for the protection of 1,000 hectares, with renewable contracts lasting five or eight years. Global Energy of Costa Rica, Platanar Hydroelectric, the National Power and Light Company (CNFL), and Florida Ice & Farm (a brewing and beverage production company) are the companies that have participated in these types of agreements to date. In the case of Florida Ice & Farm, FONAFIFO also receives funds from a local PES initiative, ESPH (see Box 5), for the protection of the same area of interest as the brewery company. This contributes to providing higher payments in this particular location.

More recently, FONAFIFO created the Development and Commercialization of Environmental Services (DCES) department for the purpose of obtaining new financing alternatives such as the above mentioned Certificates of Environmental Services (CES) (see Table 4). CES are financial instruments in which companies bought site-specific ecosystem services from landowners. According to FONAFIFO, to avoid cumbersome and lengthy negotiations independently, the CES provided major companies interested in this mechanism advantages by guaranteeing that the ecosystem services would be generated in a specific area of interest, that they could use the CES image their marketing materials, and that their CES investments would be tax deductible.

Supply

The conservation of the ecosystem services defined by Law 7575 is performed through payments allocated to priority areas and under different land-use types, which are established by an Executive Order issued by MINAE. As can be seen in Table 5, these land-use types

Table 5. Type of land use (forestry)

Type		*Definition*
Deforestation		Conversion of forest to another land use or the long-term reduction of tree canopy cover below the 10% threshold.
Afforestation		Conversion from other land uses into forest, or the increase of the canopy cover to above the 10% threshold.
Reforestation		Re-establishment of forest formations after a temporary condition with less than 10% canopy cover due to human-induced or natural perturbations.
Forest protection	**Protected areas**	Areas especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.
	Water resources	Forest area primarily designated or managed for water production, where most human uses are excluded or heavily modified to protect water quality.
Agroforestry		Collective term for land-use systems and technologies in which woody perennials (e.g. trees, shrubs, palms or bamboos) and agricultural crops or animals are used deliberately on the same parcel of land in some form of spatial and temporal arrangement.
Natural regeneration		Natural regeneration of forests is the renewal of a forest crop, by self-sown seed or by coppice of root-suckers (Agriinfo 2016). If new forest trees are established in the relatively near future, the land is classified as forest throughout the regeneration period (and this regrowth is named "reforestation")

Source: FAO 2015, FAO 2000

are: reforestation; forest protection; forest protection for water resources; forest protection for conservation gaps (specific geographical targets); agroforestry systems; natural regeneration; and forest management.

The enrollment criteria have been evolving since the inception of the program. At the beginning, candidates were enrolled on a first-come, first-served basis, until the available budget was exhausted. Later, the program was shifted to a more elaborate protocol that applied an evaluation matrix (see Table 6). Candidates receive scores depending on their landholding classification within different categories, such as "forests located in areas defined within conservation gaps," "forests within indigenous territories," or "forests that protect water resources." While the PES program was not initially designed as a poverty mitigation mechanism, since 2004 score points have been given to farms located within counties (municipalities) with low socioeconomic indicators. Lastly, the candidates with higher scores are selected, conditional on available budget.

PES applications must also meet other criteria that might vary according to the land use or project submitted (e.g. reforestation projects; forest protection; agroforestry systems; natural regeneration; forest management projects). For instance, the minimum area for forest protection projects is two hectares and the maximum area is three hundred hectares per year. For the case of agroforestry systems, the minimum amount of trees is between three hundred and fifty trees per year, while the maximum is ten thousand trees per year. On the other side, the payments and length of contracts associated with each of the modalities or projects differ, as shown in Table 7.

Table 6. Evaluation matrix

	Prioritization criteria	*Qualifying points*
☑	Forests on farms located in areas defined within Conservation Gaps. Forests within the indigenous territories of the country.	**85**
☐	Forests on farms located within officially established biological corridors. Forests that protect water resources.	**80**
☐	Forests on farms located within the protected areas, which have not been bought or expropriated by the state.	**75**
☐	Forests out of any of the above priorities.	**55**
☑	Forests for forest protection complying with the above provisions, where contracts have been signed for PES in previous years, as long as they meet the other requirements set forth in the PES procedures manual and conclude their duration in the same year in which the new application is submitted.	**10 additional points**
☑	Forests on farms located in districts with Social Development Index (SDI) of less than 40% as determined by the Ministry of Planning and Cooperation (MIDEPLAN).	**10 additional points**
☑	Forests in any of the above priorities, with an application to enter PES. These points apply only if the property area is equal to or less than 50 hectares.	**25 additional points**
☑	Forest protection projects handled by organizations with existing agreements with FONAFIFO.	**10 additional points**

Source: Executive Decree N° 39083-MINAE, 2015

Table 7. Payment amounts for the different PES modalities

Modality	*Specification*	*Payment amount per hectare* [16]	*Disbursement period*	*Contract duration*
Reforestation	Reforestation with fast-growing species as *Gmelina arborea*, *Acacia mangium*, *Vochysia guatemalensis* and *Vochysia hondurensis*	USD 1,214.78	5 years	10 years
	Reforestation with medium-growth species as *Tectona grandis*, *Pinus sp*, *Cordia alliodora*, *Vochysia ferruginea*, *Eucalyptus sp and Cedrela odorata*	USD 1,431.11	5 years	16 years
	Reforestation with species not considered in previous descriptions	USD 1,214.78	5 years	Between 10 and 16 years; equal to the species with the longest shift harvest
	Reforestation with native species indicated in Executive Orders from MINAE	USD 2,146.67	5 years	Between 10 and 16 years; equal to the species with the longest shift harvest
Natural regeneration	Natural regeneration with production potential	USD 206.09	5 years	5 years
	Natural regeneration of pastures	USD 206.09	5 years	5 years
Forest protection	Forest protection for conservation gaps in zones identified by FONAFIFO and SINAC	USD 377.00	5 years	5 years
	Water resource protection in areas of importance identified by Water Board MINAE and FONAFIFO	USD 402.13	5 years	5 years
	Forest protection in none of the areas mentioned above	USD 321.71	5 years	5 years
Forest management	Following the standards of Sustainability for Forest Management	USD 251.33	5 years	5 years
Agroforestry systems	Reforestation and Agroforestry blocks less than 10 hectares	USD 1.76 per tree	3 years	5 years
	Agroforestry systems with native species	USD 2.60 per tree	3 years	5 years

Source: Executive Decree N° 39083-MINAE, 2015

16 This calculation was made by applying the yearly average exchange rate for 2015 used by the Costa Rican Central Bank to the Executive Decree N° 39083-MINAE 's yearly budget in colons (Costa Rican currency) where 1 USD = 528.44 colons.

Payments occur annually, upon verification that the landowner has satisfied his/her contract obligations. As mentioned previously, this generally involves continuing the present land use and carrying out specific conservation activities. Monitoring is generally conducted through field visits made by forest regents, who, along with FONAFIFO´s technical staff, are authorized to inspect the property at any time. After inspection and verification that contract obligations have been satisfied, the regent certifies the property. Since the Costa Rica PES program depends heavily on the regents, who are paid by the program participants, FONAFIFO regularly audits selected monitoring reports. Regents are held responsible for any inaccuracies or fraud.

At the beginning of the program, the opportunity cost of the land use in 1996 was used as a reference to establish the amount disbursed to beneficiaries for forest conservation. That opportunity cost was represented by livestock activities. Since then, the amounts of payments have been reviewed and updated according to the inflation rate. They also have included the recognition in the provision of certain ecosystem services, such as water protection and conservation in gap areas. However, the amounts of payments are identical throughout the country regardless of the location of the farm, as only a single criterion is used to estimate opportunity costs. Therefore, it is argued that payments do not reflect true opportunity costs in some instances. To overcome this problem, FONAFIFO is exploring new alternatives, particularly through the design and implementation of reverse auction mechanisms.

Practicing: Implementation and Evaluation

Implementation

As discussed above, the implementation of PES has been a trigger for great positive change in Costa Rica. The program has evolved significantly since its early days, reflecting its capacity to adapt to new opportunities and to feedback from PES recipients, donors, industry experts, and civil society.

Table 8 illustrates the distribution of actual hectares according to each land-use payment category. This information can also help the reader to see how the program has evolved throughout the years by incorporating new modalities.

More than 1.1 million hectares have been enrolled in the program to date, of which about 90% are associated with forest protection. Keeping track of renewed contracts has not been an easy task, as some properties have changed ownership and registration numbers can be sold and subdivided (Porras et al. 2013). The second most important land-use modality is reforestation, followed by forest management and natural regeneration (as shown in Table 8). Payments have been granted throughout the whole country. In addition, around 6.5 million trees were planted in agroforestry systems and more than 15,700 families have been involved in the program. The program has also indirectly generated employment (e.g. wages, forest engineers, notary service, and surveyors). From 1995 to 2015, FONAFIFO counted on a total budget of around CRC186 billion (local currency), which is equivalent to a gross estimate of USD 360 million.[17] Nevertheless, one urgent problem for FONAFIFO is the inability of its current budget to meet the demand for participation in the PES program. In particular, for 2015 only 42% of enrollment requests were accepted. In terms of hectares, contracts were signed for 44% of the total area that was submitted to be considered in the PES program for that particular year. Additionally, only 48% of the total number of trees requested under the agroforestry systems was accepted.

More than 12% of the total hectares under a PES contract have been located in indigenous territories, which has generated an income of over USD 46 million for this population since the program's inception. Contracts under the forest protection modality make

17 This calculation was made by applying the yearly (from 1998 to 2015) average exchange rate used by the Costa Rican Central Bank to FONAFIFO's yearly (from 1998 to 2015) budget in colons (Costa Rican currency) where 1 USD = 528.44 colons.

Table 8. Hectares under PES contracts by different modalities

Unit: Hectare

Year	Modality							Number of contracts *****
	Forest protection	Forest management	Reforestation	Established plantation	Natural regeneration	Total hectares	Agroforestry systems	
1997	88,830.0	9,325.0	4,629.0	-	-	102,784.0	-	1,200
1998	47,804.0	7,620.0	4,173.0	319.0	-	59,916.0	-	597
1999	55,776.0	5,125.0	3,156.0	724.0	-	64,781.0	-	622
2000	26,583.0	-	2,457.0	-	-	29,040.0	-	271
2001	20,629.0	3,997.0	3,281.0	-	-	27,907.0	-	287
2002	21,819.0	1,999.0	1,086.0	-	-	24,904.0	-	279
2003	65,405.0	-	3,155.0	205.0	-	68,765.0	97,381	672
2004	71,081.0	-	1,557.0	-	-	72,638.0	412,558	760
2005	53,493.0	-	3,602.0	-	-	57,095.0	513,684	755
2006*	19,972.0	-	4,586.7	-	279.3	24,838.0	380,398	619
2007*	60,567.5	-	5,070.9	-	755.1	66,393.5	541,531	1,180
2008	66,474.0	-	4,083.3	-	1,660.0	72,217.3	656,295	1,103
2009	52,017.7	-	4,017.5	-	1,500.2	57,535.4	370,187	796
2010	59,644.5	309.7	4,185.4	-	1,274.6	65,414.2	536,839	1,111
2011	65,967.3	478.6	4,116.4	-	2,309.8	72,872.1	598,683	1,130
2012	62,276.0	196.5	4,252.2	-	1,204.5	67,929.2	569,579	1,146
2013**	61,268.2	182.9	3,135.4	-	3,795.5	68,382.0	738,869	1,242
2014***	43,321.2	514.5	3,495.3	-	2,124.7	49,455.7	599,706	943
2015****	63,917.8	382.9	2,330.2		2,813.5	69,444.4	462,544	1,022
Total	**1,006,846.2**	**30,131.1**	**66,369.3**	**1,248.0**	**17,717.2**	**1,122,311.8**	**6,478,254**	**15,735**

*: Reforestation and natural regeneration were separated.

**: Additional to these data, there are 44.3 hectares of formalized contracts with ICAFE (Costa Rica´s Coffee Institute).

***: Additional to these data, there are 15.4 hectares of formalized contracts with ICAFE (Costa Rica´s Coffee Institute), for a total area under contract of 49,471.1 hectares.

****: This datum can vary according to subsequent updates.

*****: The number of contracts includes ongoing contracts as well as those that have expired and been renewed.

Source: FONAFIFO 2016

up 97% of these contracts—a proportion that is even larger than the national average. It should be noted that the amount of hectares allocated in indigenous territories was relatively small and unstable during the program's first decade. However, this situation shifted after 2008, when the number of contracts started to increase. These contracts incorporated the natural regeneration modality, implemented for the first time in 2007.

At the early stages of the program, there were a large number of small and medium landowners participating, but their share in the total area under contract was very low. For instance, in 1997, contracts below 50 hectares represented 60% of the total contracts approved but covered only 16% of the total hectares under contract. Furthermore, the budget was mostly allocated to large landowners with contracts covering 51 to 150 hectares representing 24% of the total program area and contracts covering over 150 hectares representing 60% of the total program area (though these contracts represented only 21% and 18%, respectively, of the total program contracts) (Gutiérrez 2002).

The enrollment numbers of smallholders, indigenous communities, and women in the program have improved over time. First, FONAFIFO introduced upper limits to the size of land that could be submitted for payment. In addition, the Ecomarkets Project established the goal of increasing participation of indigenous communities by 100% (indigenous areas incorporated into the program represented only 1.1% of the total program contracts in 1998). Nowadays, results show that most of these targets have not only been met, but they have been exceeded. The number of indigenous territory hectares under PES contracts grew from 1,118 in 1997 to 11,547 in 2015, which translates to an increase of 1,032% (FONAFIFO 2016). In addition, the number of women owning PES contracts went from 20 in 2000 to 157 in 2014, representing a 785% increase (Figure 9 shows the improved gender balance in the PES contracts). Although the proportion of women with PES contracts remains low, it has increased from 7% in 2000 to 16% in 2014 (FONAFIFO 2016).

Evaluation

Demonstrating (or, indirectly, getting) additionality was not a formal objective of the Costa Rican PES program. Nevertheless, some evaluation studies have attempted to assess, ex-post, the extent to which these programs have been successful in achieving additionality. Nearly a decade after the program's implementation, an impact evaluation was carried out (Pattanayak et al. 2010, Arriagada et al. 2009, Arriagada et al. 2008, Pfaff et al. 2008, Robalino et al. 2008, Sills et al. 2008, and Sierra and Russman 2006). Most of these assessments focused on land-use outcomes. Some impact evaluations were carried out in a specific region of the country, while others were conducted at the national level.

While many agree that the PES program has made a significant impact at the national level in level, some point out that the program can be further elevated by incorporating the issue of additionality. In fact, the initial criteria for enrollment in the PES program were general and were based on a broad identification of priority areas for conservation. These initial selection criteria did not differentiate plots based on the possibility of deforestation (additionality). Moreover, it must be noted that the Costa Rican PES program was launched when the country was already implementing other measures to reverse deforestation trends. This vital contextual information was not taken into account in these impact evaluations.

Although it is obvious that poverty reduction is not an end goal of the Costa Rican PES program, its socioeconomic effects have been explored by recent studies (Robalino et al. 2014, 37 Robalino et al. 2013). General conclusions show that the scheme has been successful in improving the gender balance among participants in the PES program (see Figure 9 for details). However, the program is yet to make a substantial impact on poverty rate. In the meantime, some interesting trends of geographical differences have been detected. For instance, poverty rate decreases in places where the deforestation threat is lower and, thus, land-use decisions are less affected by the PES program. On the contrary, the rate of poverty

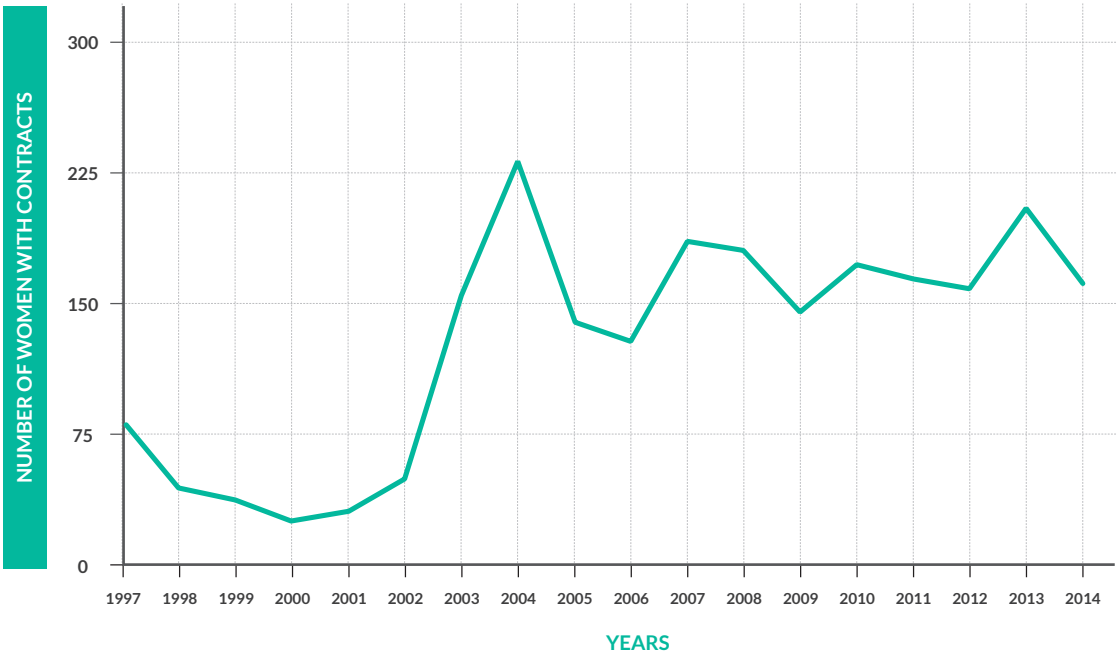


Figure 9. Improved gender balance in the PES contracts under FONAFIFO's program Source: FONAFIFO 2016

increases in places where the opportunity cost of the land is high (i.e. where forest would have been deforested in the absence of the PES program).

In a cumulative response to this, MINAE alongside FONAFIFO have aided in the development and execution of a new program launched by the Sustainable Biodiversity Fund (FBS) called Biodiversity Conservation Program (PCB) that address the issue of social inclusion aspect of the regular PES scheme (see Box 7).

Financing: Four Key Enablers

A stable and sufficient source of financing is usually the most striking barrier for PES survival. In fact, it is likely that the worst-case scenario for PES to prevail is a financial dependency on government budget and reduced donations from abroad. If no coherent efforts to diversify the portfolio of income sources are taken, the existence of such initiatives will assuredly fail in the middle to long-term. In the current context, in which private investors are more and more willing to invest in conservation projects, PES schemes should consider broadening their target audience to include more private entities benefiting directly from nature´s services.[18]

PES schemes should promote enabling conditions to secure sustainable financing, namely, a stable source of national revenue, as well as, diverse matching funds from individuals, international, and private actors. As presented in the previous section, the PES program administered by FONAFIFO has been able to consistently grow over the years, based primarily on governmental funds produced by a specific fuel tax. However, it is important to stress two possible sources of vulnerability to such an approach, which in turn justifies the quest for a budget diversification by incorporating the private sector more vigorously. First, the dependency on governmental funds makes the scheme potentially vulnerable to changing political and macroeconomic conditions. Second, as the evidence shows, the actual budget is not enough to meet the demand for participation in the program, and the chances of increasing governmental funding are scant. To move away from such undesirable conditions, a

18 Looking at private investments in conservation during 2004-2008 and 2009-2013, investments more than doubled in the latter period in comparison to the former (NatureVest and EKO 2014).

Figure 10. Key enablers for financing structure

comprehensive strategy can be carefully designed and implemented to generate the right incentives towards a more robust and diverse participation of the private sector and other key stakeholders into PES finance.

A set of complementary principles is necessary for building a robust finance structure, as indicated in Figure 10. These principles can be condensed into four guiding enablers: a strong ecosystem services marketing plan that clearly communicates benefits to investors; the minimization of transaction costs; the creation of transparent and credible trading mechanisms; and the diversification of financing sources to reduce excessive dependency on a single type of contributor. In this case, private companies and individuals might be interested in a greener production path offsetting their carbon emissions through a reliable scheme. This provides additional benefits to investors, such as avoiding cumbersome and lengthy negotiations.

Marketing of Ecosystem Services

Governmental and philanthropic funding sources are likely to either modestly increase or remain flat in conservation finance in general (see the next chapter for details on trends in conservation finance). There is no reason to believe that this tendency will not be the same for PES programs. Therefore, PES programs should consider moving from traditional sources of income (i.e. government, external donations) towards the private sector as a key financial source. However, given the absence of markets for trading the positive externalities generated by private lands and the invisibility of most ecosystem services as key inputs to production activities, investors rarely perceive the need to protect the environment and to pay for its conservation. It is necessary to formulate a comprehensive strategy for overcoming these problems. Such a strategy must include improved marketing strategies aimed at raising awareness among private investors, civil society, and international donors as to the value of the ecosystem services investments and the opportunity to channel resources through PES initiatives.

Improved marketing campaigns will require a better definition and quantification of the ecosystem services being traded, as well as the development of new,

competitively priced, investment products which investors prefer.

Stronger Basis for Direct Benefits Provided

It is a reasonable premise that a consumer's willingness to buy a product depends on his/her perception of that product's attributes and, ultimately, of how these attributes will affect his/her well-being. However, as discussed in previous sections, the analogy behind buyers does not necessarily hold with this premise because there are, generally, great uncertainties regarding the relationships of land uses, ecosystem services, and human welfare to one another (causal relationship). It is, therefore, not surprising that it is difficult to convince companies and consumers to increase voluntary contributions beyond social corporate responsibility towards the financing of PES programs. Even after a causal relationship has been established, there will be a need to generate standardized metrics and evaluation methods for monitoring ecosystem service delivery. Without standardized metrics and evaluation methods, it will be difficult to further assure contributors that PES investments will render any benefits.

In summary, in order to diversify PES financing and attract private contributors, PES programs need to increase the knowledge base regarding the relationship between land uses and ecosystem services. It is necessary that individuals and companies better understand exactly what they are buying. Mechanisms to ensure measurable and verifiable impacts from PES interventions need to be strengthened. Scientific methods should be used to this end. However, in order to arm decision makers with better tools and information, these scientific methods should be accessible at reasonable costs (e.g. through user-friendly technological platforms) to governmental entities, non-profit organizations, international lending institutions, corporations, and citizens.

An interesting example of developing a strategy based on sound scientific evidence for decision making (in addition to other strategic components) to attract private investors, is the development of Costa Rica's Agua Tica initiative (see Box 6). Although this program is not framed as a PES scheme, implementers of PES initiatives can learn from it because it illustrates the opportunities and challenges in attracting private investment for conservation activities.

Improvement in Spatial Targeting Criteria

More investment in PES programs could also be obtained through a more detailed definition of criteria for targeting lands with the highest attributes for ecosystem services generation. Enrollment rules for program can, therefore, be strengthened to reflect these spatial prioritizations, as well as a potential for conglomeration of adjacent properties. These tasks are requisites for increasing the likelihood of delivering the desired ecosystem services and, potentially, additional social outcomes. In this regard, spatial targeting can be a stepping-stone towards a more cost-effective integrated ecosystem management approach, particularly in cases where these services are generated only in certain locations. For example, precise hydrogeological information is a critical input in evaluating where to allocate money from contributors interested in water. Similar to what is currently being implemented in biodiversity, the specific location of a biological corridor is integral to deciding where to invest funds for biodiversity conservation.

Therefore, this type of spatial targeting must be a necessary condition for the buyers of local-level ES. Similarly, focusing on areas in which the risk of losing ecosystem services is the highest can also increase the investment value. This might, in turn, increase the desire of private individuals and companies to contribute to PES. To reiterate: sound technical criteria for targeting should be developed and implemented at reasonable costs. A more accurate definition of critical areas for targeting with payments increases the likelihood that investments will render the expected benefits. Therefore, it will be easier to attract private investment in PES programs.

Development of New Specific Investment Products Addressing Different Types of Investors

Box 6

Agua Tica Fund

Agua Tica is a public-private financing mechanism created as a trust fund. It aims to protect water resources located in the Great Metropolitan Area (GAM) of Costa Rica, which contains about 50% of the nation's population and 75% of its industries. This initiative emerged in 2012 with USD 200,000 of seed capital from private enterprises and non-profit organizations (CRUSA Foundation, FEMSA Foundation, Florida Bebidas, The Nature Conservancy, FEMSA Costa Rica and The Coca-Cola Company). Additionally, other partners provided technical know-how regarding legal aspects and financial management, among other critical issues. A board of directors and a management secretariat manages the fund. They ask for voluntary contributions from private investors to finance activities and projects that ensure water quality and quantity for GAM businesses and residents. Eight types of strategic investments achieve these goals: reforestation, soil regeneration, mitigation of landslides, forest protection, restoring degraded areas, improved agricultural practices, agroforestry systems, and environmental education.

One of the distinctive elements of this initiative is that it generates and uses scientific criteria to ensure that the investments made can be measurable, traceable, and cost-effective. This feature, in turn, can be a planning tool to develop solid investment portfolios attracting private investment for conservation actions in particular watersheds. In this regard, the technical criteria are based on a tool named RIOS (Resource Investment Optimization System). RIOS is a software program that is part of InVEST (see Box 3). It provides a standardized, science-based approach to support the design of cost-effective investments in watershed services in different contexts. It combines biophysical, social, and economic data, allowing the identification of the best locations for protection and restoration activities to maximize the ecological return on investment on a given social and political setting (for more information see the Natural Capital Project, http://www.naturalcapitalproject.org).

This promising initiative still has some challenges to overcome in order to guarantee its long-term financial sustainability. Coordination, dissemination, and implementation efforts should entail low transaction costs for participants, particularly for the private sector. While investors are expecting a reliable, accountable, and science-based mechanism protecting critical water resources, they want it to come at a reasonable cost. Agile and accessible technological tools defining the relationship between land use and ecosystems may play a key role in facilitating the engagement of investors with this mechanism. Agua Tica must also overcome the usual skepticism around the private return obtained from conservation investments. Gaining investor confidence is usually a long-term process that can be catalyzed with good communication channels and the capacity to transmit the right information at the right time. On the other hand, the potential for scaling-up this initiative is another challenge. Not all watersheds have the necessary enabling conditions for these types of water funds, such as a large number of water users with potential ability and willingness to pay for protecting water sources. Information availability, legal viability, and a clear demand for restoring and protecting jeopardized water resources are some of the key ingredients for water fund success.

FUNDECOR (Fundación para el Desarrollo de la Cordillera Volcánica Central, http://www.fundecor.org/en) is a non-governmental organization established in Costa Rica, working on a sustainable development model that demostrates how conservation and economic growth can coexist in harmony. FUNDECOR has been the ad-hoc secretariat of Agua Tica, leading its negotiation and formalization processes. It has also received support from government agencies, private enterprises, and industry experts.

Assuming that all beneficiaries of ecosystem services have the same motivations for contributing is rather simplistic. This could also potentially limit possibilities for unlocking private PES investment. A more realistic assumption would be that beneficiaries differ in their interests (e.g. water, carbon sequestration, etc.) and in their capacities and preferences to contribute voluntarily to PES programs. The recent experience of FONAFIFO is a good example of the creation of a diverse portfolio of options to contribute, tailored to such differences.

FONAFIFO has been acknowledging the differences in the interests of some of its clients, as it has moved from selling a bundle of ecosystem services (four ecosystem services, as stated in Forestry Law 9696) to a single ecosystem service (e.g. water protection). This action has attracted the interest of some specific buyers at the local level (e.g. hydro-electrical companies), while also facilitating the development of innovative financial products. The logic here is that it is more likely that some local companies (e.g. a hydro-electrical company) would be willing to contribute voluntarily to PES if they perceive their production benefiting directly (e.g. conservation of water availability), rather than contributing to a global public good (e.g. mitigation of climate change).

Other mechanisms created to offset carbon emissions, such as Clean Flight Program and FONAFIFO's Offsetting Units, are examples of financial mechanisms focused on a single ecosystem service where contributions are deductible from income tax. Similarly, an interesting initiative in parallel of the existing PES program is the Sustainable Biodiversity Fund (FBS) (see Box 7). FBS aims to create a long-term funding source for the protection of biodiversity in the country.

A further acceptability of these products among potential investors depends on improvements in marketing and low transaction costs for its acquisition. Clearly, the development of innovative products for PES financing must be accompanied by standardized metrics of the services being sold by mechanisms guaranteeing secure and efficient transactions, and by easy to access mechanisms to verify the achievement of expected outcomes.

Transparency, Accountability and Trust

It is basic that investors trust the intermediary or fiduciary in which they are assigning their money. Hence, the credibility of the PES intermediary and its partnerships is critical to attracting potential contributors. Similar to well developed financial organizations, a PES governance structure is characterized by the principles of transparency, accountability, and trust in all relevant procedures (e.g. financial management, monitoring, and sanctioning of contracts). This is necessary in order to generate a positive environment for private investment.

The governance structure's credibility also depends on the critical mass of strategic personnel working for the organization. Through the years, FONAFIFO has been able to build a professional and stable staff (i.e. low rotation and highly qualified) for its key positions. This has contributed to the development of long-lasting relationships with critical stakeholders, leading to negotiation processes at the national and international level. Reliable and periodical external auditing processes and other monitoring mechanisms make the intermediary accountable to governmental organizations, civil society, and other relevant participants. As a result, credibility and legitimacy of the scheme is increased. Efforts to maintain and strengthen these monitoring elements will ensure greater participation from the private sector and investors in general.

Minimization of Transaction Costs

The experience from FONAFIFO has shown that private investors in PES desire agile mechanisms in order to make contributions, including efficient technological platforms and simplified legal paper work. Cumbersome and lengthy negotiations increase the transaction costs for both parties, demanding extra expenditures from intermediaries while reducing incentives for private investor participation. FONAFIFO's efforts to sell sequestration services in international carbon markets have demonstrated the difficulties in overcoming transaction costs in terms of extensive requirements

Box 7

Sustainable Biodiversity Fund (FBS)

The Sustainable Biodiversity Fund (FBS) is a trust fund of the Environmental Bank Foundation (FUNBAM), created by Law 8640 in 2008. It is a public-private partnership that seeks sustainable and long-term conservation of biodiversity on private lands. FBS uses revenues generated from investing the donations received in the financial markets, to fund conservation activities through its Biodiversity Conservation Program (or PCB by its Spanish acronym).

The Biodiversity Conservation Program is based on two main components: a financial incentive and an accompanying contract period, which fosters the generation of productive activities amongst beneficiaries, that propels environmentally conscious development.

To date, the fund has received donations from government and non-government organizations, such as the Global Environment Facility (GEF), Conservation International (CI), KfW Bank and Osa Conservation, comprising a net worth of more than USD 21.5 million.

Alongside Costa Rica´s National Bank (BNCR), FBS developed, additional financing mechanisms called Green Products. These include:

i. The Ecosticker (EcoMarchamo in Spanish) is a mechanism of compensation for GHG emissions for automobile users. It is directed at organizations that care about their carbon footprint, where the tool is equivalent to two carbon units. Nowadays, more than twenty companies, institutions, and local governments are using it as a Corporate Social Responsibility mechanism. This voluntary instrument allows people and companies to offset 100% of the emissions generated by fuel consumption of vehicles in a year. The Ecostickers have generated a revenue of more than USD 72,000 since their creation.

ii. Green Debit and Credit Cards: These cards were created to include the Costa Rican population in this initiative. Anytime they are used in a business as a payment mechanism, the bank donates 10% of its commission to FBS. Currently, more than 121,000 Green Cards (debit and credit) have been allocated between individuals and companies, accounting for an average yearly revenue of USD 200,000.

for additionality, monitoring, and reporting of results. Therefore, an evident strategy towards greater private sector investment would be to generate an enabling scenario through accessible, rapid, and low-cost investment mechanisms.

Similarly, the verification of the results (e.g. improved water quality) obtained from the investments in land-use change and protection should be easily understood and accessible to contributors and society in general. However, this is a great challenge because it implies that the metrics should be developed as part of ecosystem services marketing. Also, the metrics have to be both easily understood and considered during the decision-making processes of the contributing entities. As was mentioned above, mechanisms for the verification of PES program investment returns should be designed with efficient and low-cost technological platforms that minimize the transaction costs for investors.

Diversification

At this stage of the discussion, it is clear that a balanced composition of private, public, philanthropic, and international sources of income is the most recommended blend for the finance structure of a PES scheme. Furthermore, no matter the origin of the income flow (e.g. private or public), it is desirable to include a diverse set of sources that are as permanent and predictable as possible. In addition, the recent international agreements set in COP21 might help for creating new financial mitigation products for the worldwide community. These innovations could fortify PES initiatives financially or contribute to achieving shared objectives on carbon sequestration.[19]

Moreover, much of the preceding ideas on how to incorporate the private sector into PES financing were based on the assumption that mechanisms for contributing were entirely voluntary. However, the inclusion of compulsory mechanisms (e.g. water fees) should also be considered as a more stable and solid option for financing PES. This latter option requires legal legitimacy to force private entities to contribute, as well as the necessary political support to approve legislation of this sort. Despite having these elements be quite difficult to implement, the water fee used by FONAFIFO is a good example of a founding source that could help to inspire other schemes to start a negotiation process towards the implementation of mandatory payments for contributing to PES programs.

PES initiatives must consider the new trends in conservation finance, particularly through the creation of conservation impact investments, defined as investments that guarantee vital ecosystem protection or social outcomes and financial returns at the same time. In fact, these new trends are based on the premise that investors should understand more easily what are they buying and the returns it offers. Mechanisms to ensure measurable and verifiable financial and conservation impacts should then be implemented. Often, conservation impact investments take on a "pay for performance" approach, which means that investors make contracted payments based on pre-determined outcomes and only after benefits are measured, monetized, and proven. Exploring the potential of financing PES under these new trends (for instance, through joint ventures) could provide a new avenue for funding. Further ideas on these new finance trends are discussed in the next section.

19 The Paris Agreement established a new mechanism to facilitate trading by requiring all parties to undertake Nationally Determined Contributions (NDCs). In this regard, "Internationally Transferred Mitigation Outcomes" (ITMOs) have been created with the purpose of helping countries to meet carbon reduction targets set out in their NDCs (Szabo 2015). Any signatory of the agreement can be a buyer or seller of these emissions units. The Agreement focuses on the delivery of an overall mitigation in global emissions by enabling international transfers of emission reductions. The system shifts from a project-based approach towards wider "policies and measures" for carbon trading. Currently, accounting for ITMOs and other forms of voluntary cooperation still requires elaboration and guidance. If negotiations inside the United Nations do not bloom, interested countries may pursue bottom-up approaches (Mansell 2016).

Fact Sheet

01

Results to date indicate that 1,122,312 hectares have been submitted to the program, mostly (approximately 90%) under the forest protection modality, followed by reforestation, forest management, and regeneration. In addition, 6,478,254 trees have been planted in agroforestry systems, almost 16,000 families have been involved in the program, and over 136,000 hectares of indigenous territories have been placed under PES. The scope of the Costa Rican PES program has evolved over time, starting with forest conservation and reforestation and, later, expanding its coverage to agroforestry, natural regeneration, biodiversity conservation, and the protection of water resources.

02

The success of Costa Rican PES program has been attributed largely to the central government's support in the form of continual policy interventions. This national-level program has adopted various economic tools in addition to traditional land-use regulations (e.g. prohibitions, protected areas, etc.), together with complementary regulatory set-ups and strong enabling policies promoting land ownership security and social and political stability (e.g. legal prohibition on land-use change, a National Protected Areas System, removal of perverse incentives such as subsidies for cattle-ranching extension).

03

The program's financing structure depends heavily on governmental funding sources (e.g. fuel tax represents 79% of the total budget over the last five years). However, as of 2015, the budget has accommodated only around 44% of program applicants. Program administrators are looking to diversify its funding sources in order to ensure the long-term success of the program.

The Way Forward: Unlocking Private Financing Potentials

The private sector is a key potential funding source for filling the conservation financing gap. There are new, emerging, and innovative sources of ecosystem financing that, if tapped properly, could result in benefits for the environment along with profits for businesses.

New Trends in Conservation Finance

Conservation finance refers to financial investments in an ecosystem aimed at conserving the values of that ecosystem in the long run. However, the financing of conservation activities has been difficult for several reasons. Two major obstacles are the difficulty in determining and measuring the benefits generated by ecosystems, and, in some places, the high opportunity costs associated with their protection. Historically, the bulk of investment in conservation activities has come from public and philanthropic funds. However, governmental budget and philanthropic funds for conservation finance are expected to increase modestly in the near future. The good news is that there are untapped financing resources from the private sector and growing innovative financial products that can invest in integrated ecosystem management.

The involvement of the private sector (referring to, among others, development finance institutions, fund managers, corporations, private foundations, non-profit organizations, HNWIs: High-Net-Worth-Individuals; and UHNWIs: Ultra-High-Net-Worth-Individuals) has increased in the last decades through new financial mechanisms. They include carbon finance, biodiversity offsets (i.e. compensations for adverse biodiversity impacts arising from project development), watershed management and nutrient trading (i.e. the exchange of pollution allocations between sources). Private investments in integrated ecosystem management—

which includes the conservation of water quantity and quality, habitat conservation, and sustainable food and fiber production—more than doubled between the periods 2004-2008 (USD 893 million) and 2009-2013 (USD 1,923 million). (NatureVest and EKO, 2014).

Even though the private sector is financing more and more land-use related projects, 80% of the current funding for conservation efforts comes from non-market sources, mostly in the form of domestic governmental budget allocations (Credit Suisse, WWF, and McKinsey, 2014). Figure 11 represents a 2012 Global Canopy Programme (GCP) study, which estimated the global scale of conservation funds to be are around USD 51.5-53.4 billion. Non-market sources make up 80% of this number at USD 41.4 billion per year, while the remaining USD 10.4 billion is generated by market-based activities (excluding ecotourism). Of the market-based activities, USD 6.6 billion is provided by "green commodities" (i.e. natural products produced in an environmentally sustainable way and often certified by groups such as Forest Stewardship Council: FSC), with a small fraction (USD 3.8 billion reaching up to 7%) being generated from direct markets (biodiversity and ecosystem service payments).

To scale up private sector conservation finance, it is first important to look at where sufficient financial capital available to meet conservation investment needs exists. Given that annual global conservation needs are around USD 300-400 billion, based on the most-cited research results [20], and assuming current governmental and philanthropic conservation funds were to roughly double to about USD 100 billion per year, a gap of USD 200-300 billion would remain. According to a 2014 Credit Suisse, WWF, and McKinsey report, the bankable assets of the main investor segments (i.e. HNW/UHNW individuals, retail investors, and institutional investors) are estimated to be USD 175 trillion. On a global scale, this asset base is projected to grow at 2~8% over the next years (differentiated by each investor groups). If 1% of the assets of these investor segments were

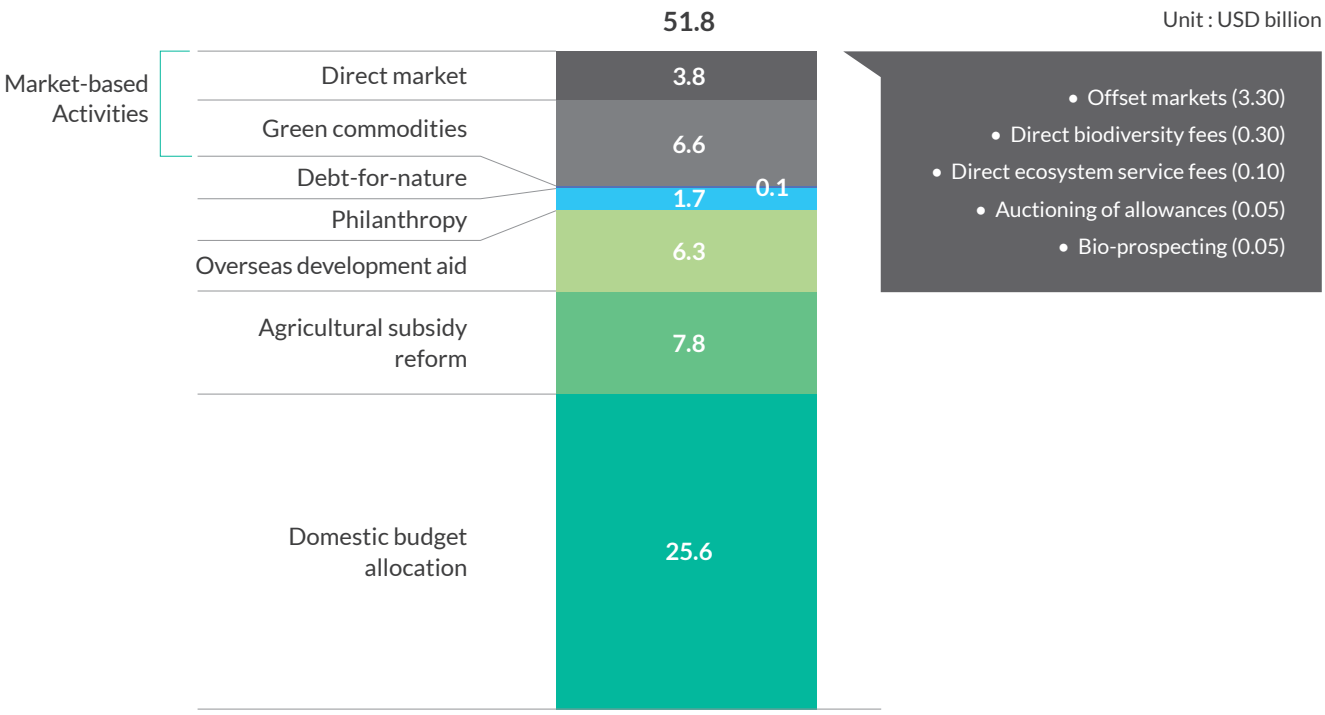


Figure 11. Composition of conservation finance (2012)

Source: GCP 2012

20 The global conservation finance gap was estimated at USD 300 billion in 2010 (Gutman 2010) and USD 350-385 billion in 2007 (Berry 2007).

allocated to conservation finance, around USD 200-300 billion per year would become available.[21] This estimation is only directional, but it is positive that these sources of groups could conservatively provide this amount of capital for conservation investments, and substantially more if conservation investments were to develop into a more mature asset class like their traditional alternatives. In the current context, an investor-driven approach to conservation finance seems like an adequate alternative to the traditional donor-based method.

Within this setting, "impact investments" have emerged as a powerful tool for for-profit investors seeking environmental and social impacts, moving the environmental and social subjects from the periphery of activist investors to the core of mainstream financial institutions. The Global Impact Investing Network (GIIN) reported in its sixth annual impact investor survey that investors committed USD 15.2 billion to 7,551 impact investment deals in 2015, and 16% more – USD 17.7 billion – in 2016.

Conservation Impact Investments

Landscape

Although there are many different terms used to describe various types of impact investments (e.g. sustainable investing, ethical investing and mission investing, among others indicated in Figure 12), in essence they all refer to investment activities designed to make a positive measurable impact on social or environmental issues. As explained in Figure 12, impact investors provide funds to the projects that can generate financial returns from below market to market/high return as long as the projects are aligned with generating social returns. From that point, conservation impact investments are defined as investments intended to return principal or generate profit while also driving positive impact on environmental (and/or social) outcomes.

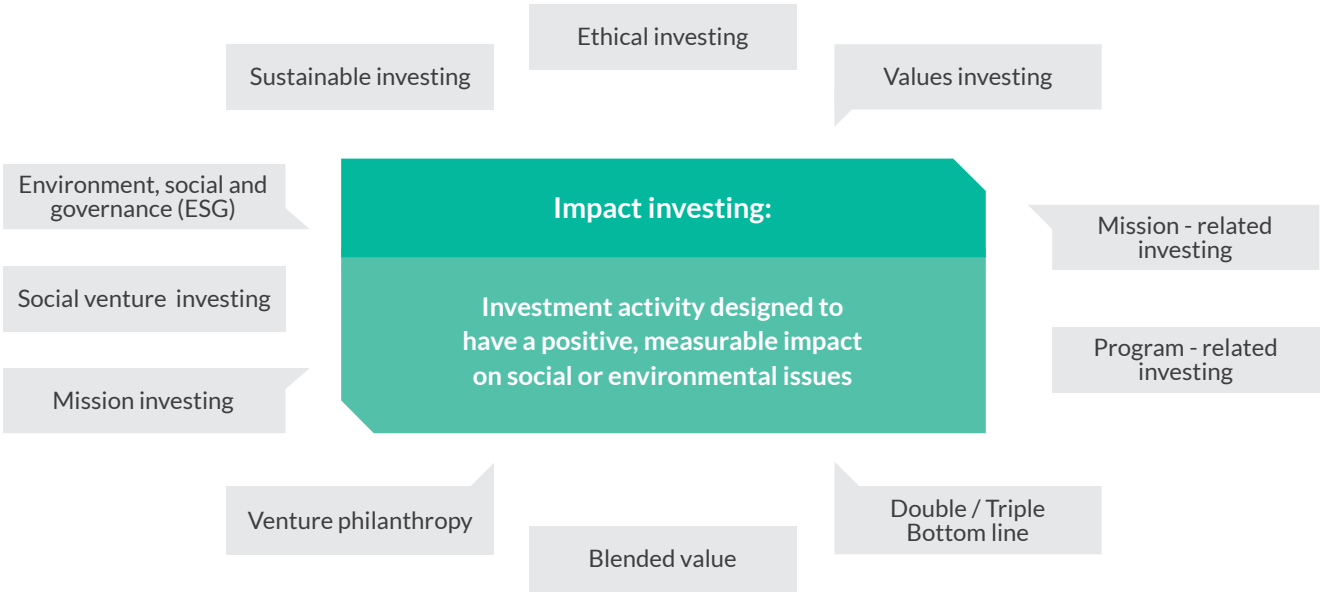
Investable cash flows from conservation projects would need to be at least 20-30 times greater than they are today in order to fill the funding gap.[22] Since it appears that private investors are gaining an appetite for investing in the environment, [23] impact investments may be capable of delivering this result. These types of investments are especially worth looking into for developing countries, where donors are experiencing fatigue. First of all, some developing countries have already achieved middle-income levels, excluding them from the giving criteria of certain donors. Many remaining donors are reluctant to increase traditional, grant-type funding in these countries because they have not been satisfied with project outcomes. For this reason, the 'payment for performance (P4P)' concept was particularly emphasized during the REDD+ discussion at COP 21 in Paris. Due to their performance-driven nature, impact investments may be a solution both for attracting private funds and for improving project outcomes.

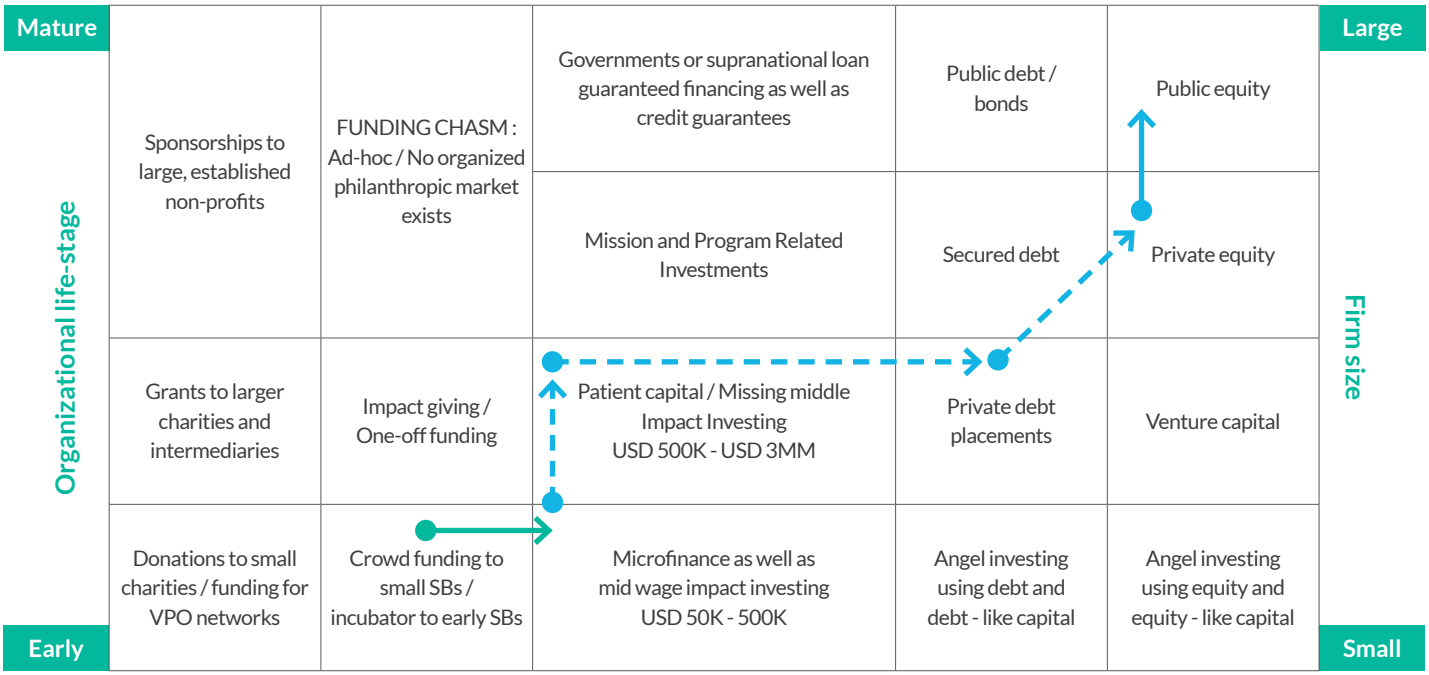
Impact investments also foster the emergence of a larger capital pool, which might improve financial

21 This estimation directly sources from the report produced by Credit Suisse, WWF, and McKinsey (2014). According to the authors of the report, this estimate is based on three different groups of investors, which are HNW/UHNW individuals, retail investors, and institutional investors. Firstly, the bankable assets of the HNW/UHHNW individuals are estimated to be USD 46 trillion. On a global scale, this asset base is projected to grow at 8% over the next years. If 1% of these new assets and of reinvested existing assets were allocated to conservation finance, approximately USD 85 billion per year would become available. Secondly, existing financial assets in the retail segment (excluding life insurance and pension assets) are approximately USD 53 trillion and growing at rate of 2% per year. If 1% of these new and reinvested assets were allocated to conservation finance, USD 65 billion per year would become available from this segment. Thirdly, with roughly USD 62 trillion of existing institutional assets growing at 5% per year, 1% of new and reinvested capital allocated into conservation finance would amount to USD 90 billion per year.

22 As discussed in Credit Suisse, WWF, and McKinsey (2014).

23 A 2014 report issued by Imperial College London University found that corporate buyers are willing to pay 33% more per ton for carbon credits with verified social, economic and environment "co-benefits."(ICROA 2014) In 2015, Huffington Post reported that "banks already are readying their own conservation-oriented financial products for their wealth-management clients." (Bank 2015)





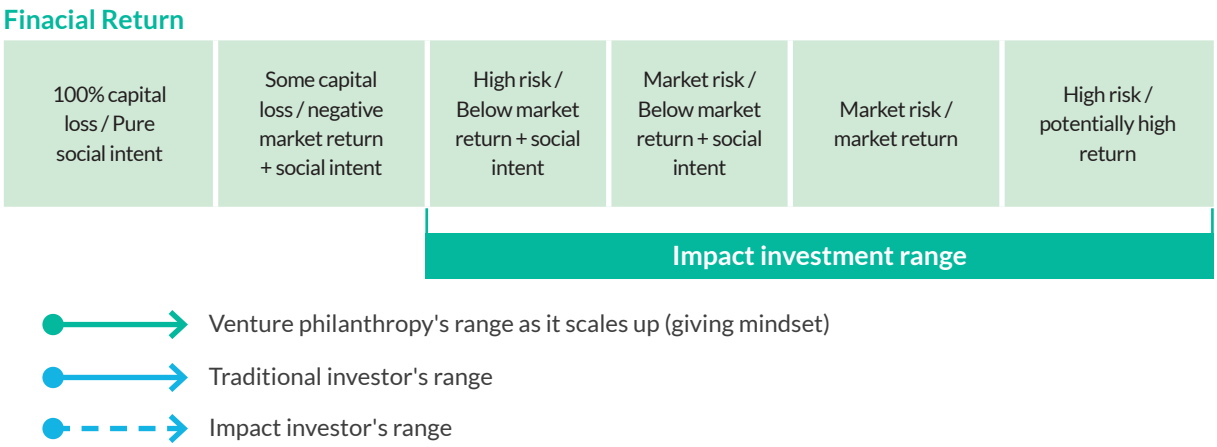


Figure 12. Definition of 'impact investing' and related concepts Source: The Gordon and Betty Moore Foundation 2013, IBR 2013

scalability. In addition, by depending less on public and philanthropic funding, these investment mechanisms are no longer controlled by funding criteria. This independence gives them flexibility to focus on new areas and sectors, such as improvements across the supply chain. Government investors and development finance institutions can help guarantee financial returns (at least partially) for the private sector. In addition, in the current context of climate change, ecosystem services conservation actions represent an urgent need. Therefore, besides generating wealth, impact investments compliment climate change mitigation and adaptation strategies by promoting the adoption of sustainable practices.

To scale up impact investments, intermediaries will need to increase their capacity on investor groups. Each of these groups has its own motivations, risk-return expectations, investment horizons, and investment product preferences. The spectrum of impact investment preferences is large, going from the creation of environmental value on one end (e.g. traditional and recovery grants), to the generation of financial value on the other (e.g. socially responsible and mission-related investing). Returns can range from below market to risk-adjusted market rates, depending on the relevant asset and investor return expectations, as Figure 12 and Figure 13 shows.

Figure 14 presents how the level of risk, as well as, the type and size of the investment, varies according to the stage of the conservation investment life cycle in which the investor puts her/his money. This life cycle goes from project commencement to the commercialization of conservation finance activities. For instance, pilot and experimental projects are conservation impact investments made at early stages. This phase is associated with higher risks rates. Accordingly, intermediaries tend to seek financing for this phase from philanthropists and foundations. Conversely, investments in the fourth phase are generally financed by High-Net-Worth-Individuals (HNWIs), as well as institutional and retail investors. This is because replication and scale-up steps have already proven the

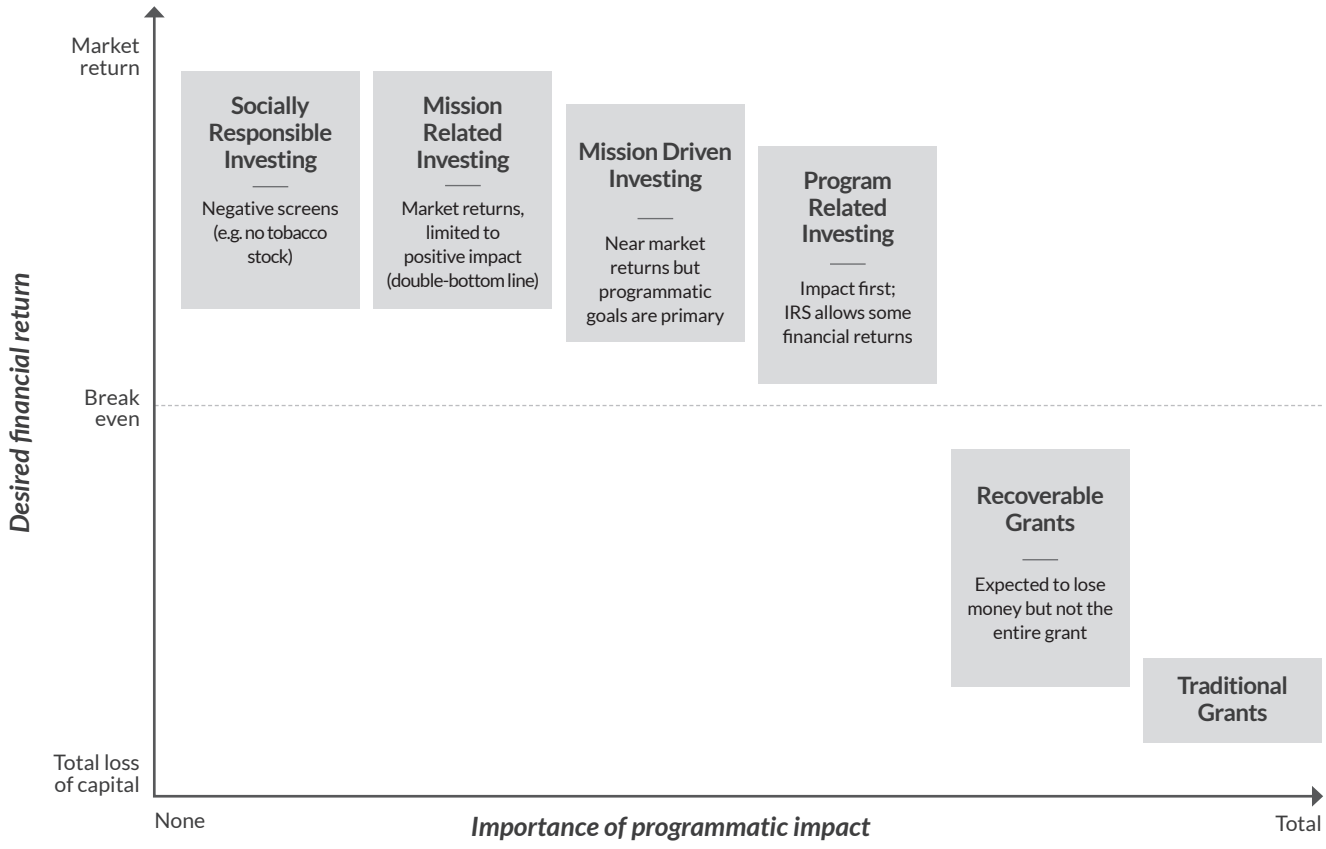


Figure 13. Range of impact investment categories

Source: The Gordon and Betty Moore Foundation 2013

financial viability of the investment by this point. In this phase, investments have become fully competitive in terms of risk-adjusted returns. However, the middle phases (second and third) pose the biggest challenges as benefits are not sufficiently locked in these phases and the risk-return relationship is more uncertain.

Asset Classes

Conservation impact investments can be carried out in a variety of areas and sectors, such as forestry, agriculture and sustainable land-use, carbon, fisheries and marine conservation, aquaculture, wetlands, and freshwater. In the continuing low-interest rate environment, amid volatile equity and debt market, the forestry and ecosystem services asset class are practical for investors pursuing a sustainability agenda. A major reason investors are interested in this asset class is due to its low correlation with debt and equity markets, thus having little relevance to macroeconomic conditions (Environment Finance 2016).

In a survey of 56 private investors (5 development finance institutions (DFIs) and 51 private investors), results showed two categories attracting more impact investments: water quantity and quality conservation

	Early-stage development	Establishment of business model	Replication / Scale-up	Commercialization
Regulatory policy, markets	Develoment of regulation and market structures			
Description	• Pilot project/proof of concept • Experimental approaches	• Single ecosystem project • Stable expectation of cash flows, risks and returns • Government establishes regulatory framework	• Multiple proven projects spanning a country, or replication of proven business model across multiple countries or ecosystems	• Tradable investments into conservation classes • Investments into associated markets
Investment instruments	• Venture Philanthropy • Ground-making equity / catalytic first-loss absorbing equity • Grants/donations • Seed funding	• Projects and early-stage finance • Venture capital	• Specialized investmnet vehicle (e.g. funds, feeder platforms) • Equity investment	• Market instruments (e.g. equity, bonds, options) • Securitized cash flows
Investors	• NGOs • Grand-making trusts • Venture philanthropists • Development banks	• Venture philanthropists • Development banks • NGOs • HNWIs	• large-scale NGO JVs • Development banks • HNWIs	• Institutional investors • Retail investors • HNWIs
Investment profile	• Very high risk compared to similar investments in other sectors • Very illiquid • Uncertain recovery of principal	• High risk • Medium investment horizon possible • Possibly high IRR upon exit	• Medium risk • Long-term, stable returns • Long investment horizon, rather illiquid	• Low risk compared to similar investments in other sectors • Liquid

Figure 14. Stages of the conservation investment life cycle

Source: Credit Suisse, WWF, and McKinsey 2014

Box 8

Example of Impact Investments for Forest Ecosystem Services

- Investor: the David & Lucile Packard FOUNDATION
- Investee: Ecotrust Forest Management, Inc.
- Deal size: USD 1 million
- Instrument: Debt
- argeted Impact: Demonstrate the economic viability of sustainable forest management.
- Location: North America
- Investor: The David and Lucile Packard Foundation (Packard Foundation) makes grants and program-related investments according to the Foundation's mission, which includes conserving and restoring the earth's natural systems.
- Investee: Ecotrust Forests LLC is an equity fund that manages forestlands for financial, ecological, and social returns.
- Summary: The Packard Foundation's investment of USD 1 million will be used to naturally manage nearly 13,000 acres of forestland, generating financial returns for investors from timber sales, ecological services, and tax credits.
- Impact metrics:

Number of acres under ecosystem-based forest management
Percent of total logs and pulp that are delivered to the Forest Stewardship Council (FSC)'s chain of custody mills (Packard views FSC-certified mills as having the highest standard of environmenta practice in the timber industry)
Percent of snags per acre and presence of coarse woody debris that provide habitat for a number of cavity nesting birds, mammals, amphibians, insects and fungi
Metric tons of carbon stored relative to prior periods and appropriate baseline (Climate Action Reserve standard)
Number and USD value of sales of ecosystem services (like water quality credits, wetland credits or mitigation banking credits, which ensure improved functioning of important ecosystems)
Number and USD value of sale of conservation easements-Number of direct jobs maintained or created
Proportion of jobs or contracts to highly economically distressed communities

Source: GIIN 2016

for DFIs and sustainable food and fiber production for private investors. [24] The water quantity and quality conservation category included investments in sectors such as watershed protection, water credits, and water rights trading. Development finance institutions (DFIs) had a preference for this category. As Figure 15 shows, these institutions spent USD 21.5 billion in conservation impact investments from 2009 to 2013, USD 15.4 billion of which corresponded to investments in projects related to water quantity and quality conservation. The DFIs plan to increase their total investment by 50% for the period between 2014 and 2018.

Sustainable food and fiber production-related projects include investments in sectors such as sustainable agriculture, timber production, aquaculture, and wild-caught fisheries. Private investors (including fund managers, corporations, and foundations) preferred this category. They committed a total of USD 1.9 billion in impact investments from 2009 through 2013, 66% of which was implemented in sustainable food and fiber production, as shown in Figure 16.

In addition, 65% of integrated ecosystem investments made by the public and private sectors (approximately 1.25 billion out of 1.9 billion [25]) between 2009 and 2013 targeted real assets (NatureVest and EKO 2014). In the case of water quality and quantity conservation, real asset investments included watershed and aquifer conservation easements and land purchases made with the intention of restoring the land and water bodies running through the property. In the case of the sustainable food and fiber production category, assets referred mainly to the purchase of forests and/or farmland. Lastly, in the habitat conservation category, real asset-based transactions were made mostly for developing mitigation banks and the purchase of ranches and forests for restoration purposes.

Conservation asset classes have been classified into three main groups, in which managers and project developers can invest. As Table 9 shows, one of these asset class groups includes investments in the underlying ecosystem, while the two other classifications refer to investments in the development of cash flow generation activities within the ecosystem.

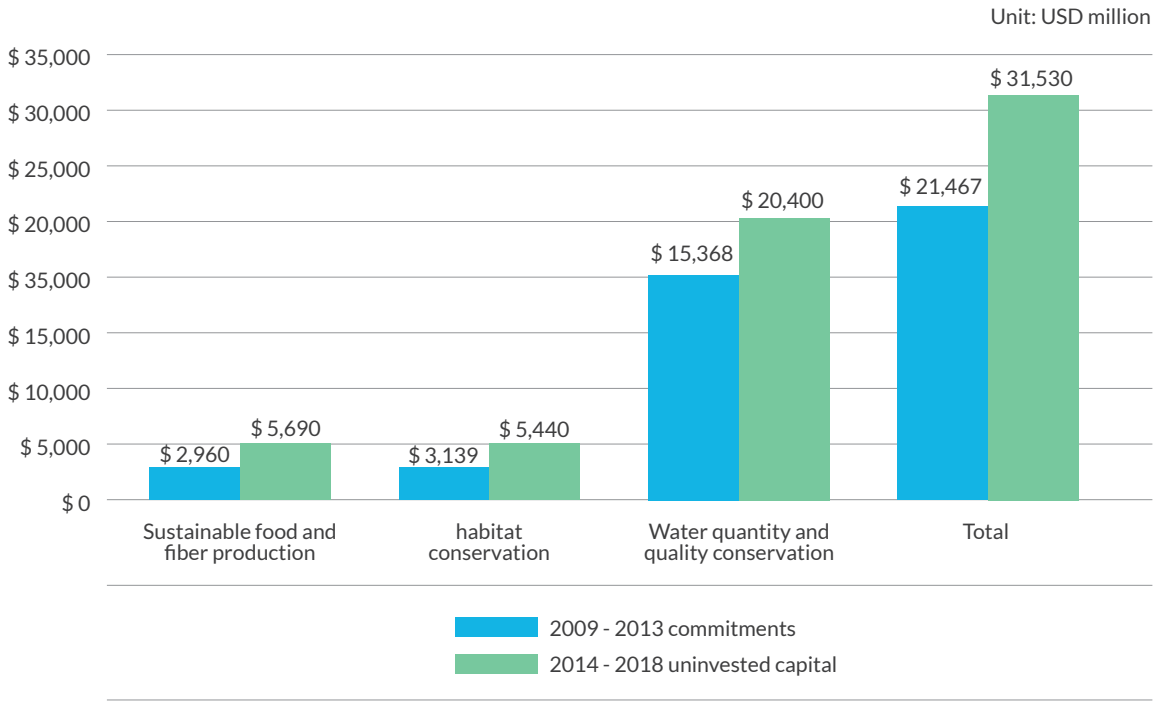


Figure 15. DFIs deployed capital (2009-2013), and projected capital to be invested (2014-2018)

80% of respondents provided data.
Source: NatureVest and EKO 2014

24 See more details at NatureVest and EKO 2014
25 See more details at NatureVest and EKO 2014

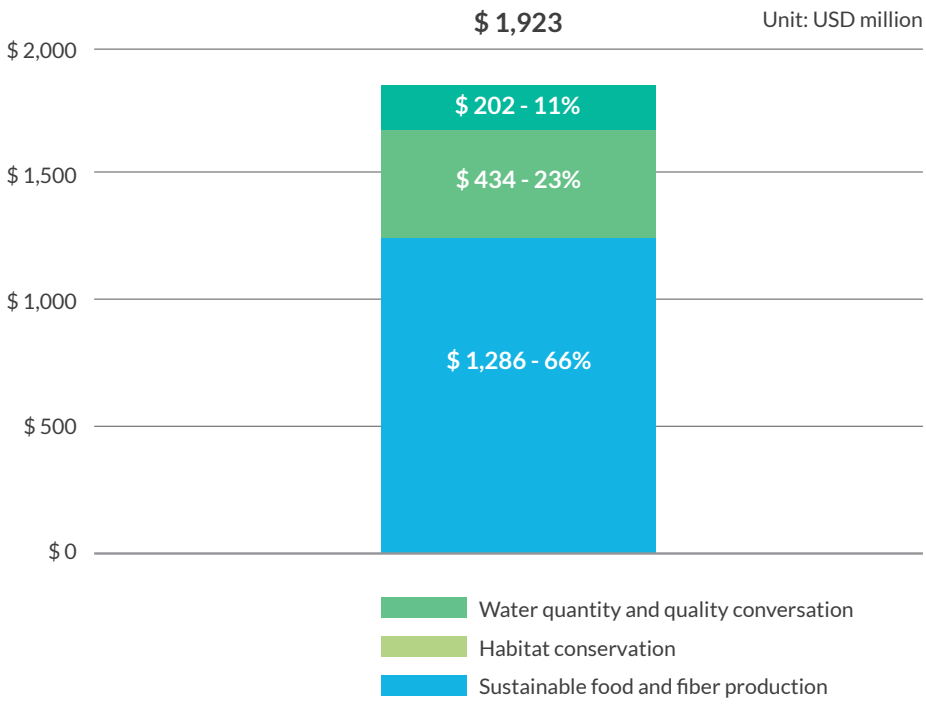


Figure 16. Private committed capital by category (2009-2013)

84% of respondents provided data.
Source: NatureVest and EKO 2014

Table 9. Classification of integrated ecosystem investment

	Underlying	*Cash flow generation*	
Investment into	Ecosystems	Sustainable ecosystem management or related infrastructure	Environmental markets and regulatory arbitrage
Examples	• Grassland • Temperate forest • Tropical forest • Freshwater • Deserts • Mountains • Coastal areas	• Sustainable agriculture • Sustainable forestry • Sustainable fishery/ aquaculture • Freshwater protection • Ecotourism • Renewable power generation	• Permit or rights issuance and trading • Offsetting- voluntary • Offsetting- mandatory • Tax arbitrage
Typical investor rationale	• Long-term • Capital protection	• Mid-term • Return generation • Prevention of capital erosion	• Short-term • Return enhancement

Source: Credit Suisse, WWF, and McKinsey 2014

Within the underlying ecosystem category falls investments aimed at capital protection. These can be made either by acquiring land or by obtaining long-term property usage rights within ecosystems. For example, a forest can be acquired with a long-term conservation commitment and a clear financial perspective. The financial return will come from converting the ecosystem, i.e. the forest, into a financial asset. The scaling up of these investments depends on landowners' willingness to cede ownership or usage rights to outside investors.

The first of the two cash flow generation categories includes investments directed towards infrastructure and sustainable management of ecosystem services (e.g. the implementation of lodges and trails for ecotourism activities that simultaneously provide cash flows). These investments usually have a mid-term horizon and aim to provide a financial return beyond capital protection.

The second cash flow generation category covers investments in ecosystem markets and regulatory mechanisms made with the purpose of enhancing financial returns (e.g. securities and derivatives, such as voluntary and mandatory carbon or biodiversity offsets). Often, the success of these mechanisms depends largely on external conditions, such as market inefficiencies and taxation, as in the case of subsidized renewable power production. Therefore, when structuring financial products in this space, care should be taken in measuring the true conservation benefit directly attributable to these instruments.

Case Study (Sample Deals by Front Runners)

A "bankable" sustainable land-use project [26] attracts investors by generating cash flow, typically from the sale of various forestry/agricultural commodities, and, in the case of REDD+ implementation and sustainable agricultural production, through carbon credits and premium price for commodities (e.g. cacao, coffee, etc.). Since this kind of project is very nascent in its development, identifying existing and potential business models that are profitable and can be drawn upon to catalyze private sector investment is an important first step. In particular, it is important that issues relating to financing are addressed through the inclusion of appropriate access arrangements, competitive markets, and appropriate risk mitigation measures. To encourage investments from the private sector, there is a growing case that the fund is backed by the government or public sector entity. Regarding the carbon offsets market, there is still an uncertainty over the pricing and transactions. The following Table 10 indicates the current transacted volume of carbon credits in the voluntary market and most recent update in carbon standards, including the one dealt with forest carbon. Although the market is still vulnerable, the carbon credits can be bundled with other forestry/agricultural commodities in a business model portfolio. The followings are sample deals in the sector reflecting these trends.

Althelia Climate Fund

The Althelia Climate Fund is a European environmental impact investment fund created in 2011, aiming to finance global sustainable land use and ecosystem service projects in developing countries in Latin America, Africa, and Southeast Asia. Together with Credit Suisse, the Fund created the Nature Conservation Notes, directed at HNWIs and quasi-public institutions that want to invest in conservation projects while receiving target market-rate returns. These investors come mainly from European and Asian countries and were selected by Credit Suisse, being qualified by the bank as wealthy investors. The Fund's projects seek to generate conservation impact, as well as, environmental assets, such as carbon credits and certified commodities, which can be sold at premium prices and, thus, produce financial returns for the investors. However, the Fund does not administer

26 Generally, a project is bankable if it can attract third-party financing – that is, someone other than the project developer.

these projects, itself. Instead, this task is left to local organizations and NGOs.

Althelia is also leveraging public funds. The US Agency for International Development (USAID) agreed to back up 50% of Althelia's projects as a risk mitigation measure by providing a USD130 million loan. In addition, the Fund operates under a "payment for performance" approach. This means that no more than 30% of the total investment is allocated to the upfront costs (to cover capital expenditure and initial operating costs). The balance is disbursed year-by-year, according to the project performance.

Currently, the Althelia Climate Fund has raised over USD105 million and is targeting a total fund size of USD 204 million. Its first project started in 2014 in the Taita Hills, in southeastern Kenya. Its purpose is to protect standing forest and grasslands through improved agriculture and agroforestry and better grasslands

Table 10. Factsheet of carbon standards in 2015

	Verified Carbon Standards (VCS)	*Climate Action Reserve (CAR)*	*Gold Standard*	*American Carbon Registry (ACR)*	*Plan Vivo*	*Clean Development Mechanism (CDM), as sold to voluntary buyers*	*Total*
Transacted Volume in 2015	23.3 Mt	9.3 Mt	8.8 Mt	2.5 Mt	865,000 t	839,000t	48.8 Mt
Average Price	USD 3.2/ tonne	USD 2.6/ tonne	USD 4.3/tonne	USD 4.3/ tonne	USD 7.6/ tonne	USD 2.3/tonne	
Value	USD 74.5 M	USD 24.2 M	USD 38 M	USD 10.8 M	USD 6.6 M	USD 1.9 M	
Market Share	49%	20%	19%	5%	2%	2%	Nearly 98%
Transactions by Top Offset Categories	Forestry: 46% Renewable Energy: 39% Methane: 11%	Methane: 74% Gases: 24% Forestry: 1%	Renewables: 44% Household devices: 41% Efficiency and Fuel Switching: 9%	Forestry: 33% Other: 28% Methane: 19%	Forestry: 100%	Efficiency and Fuel Switching: 54% Renewables: 24% Methane: 15	
Transacted by Project Developers	32%	32%	57%	66%	53%	47%	
Transacted by Secondary Market Actors	68%	68%	43%	34%	47%	53%	

Source: Ecosystem Marketplace 2016

management. It covers more than 200,000 hectares. The Taita Hills Project was the first REDD Project to achieve credit validation and issuance under the Verified Carbon Standard (VCS). It will prevent almost 48 million tons of CO2 emissions over a 30-year period. Income is expected to be generated from the sale of these REDD credits as well as certified products, such as sustainable charcoal.

Another relevant project funded by Althelia is in Peru, where the Nature Conservation Notes have committed USD 7 million to protect 570,000 hectares of natural forest and 4,000 hectares of degraded land around parks. Buffer zones will be restored in agroforestry systems, producing "deforestation-free" cocoa. This project is expected to improve the livelihoods of the 1,100 farmers who live there. Eventually, the investment should yield at least 3,200 tons of certified deforestation-free organic and Fairtrade cocoa each year, and four 4,000 million tons of prevented carbon dioxide emissions over the next seven years.

Three features make this fund particularly distinctive:

1. The presence of mechanisms to mitigate financial risk: Although the Notes' expected returns have not been openly specified yet, 50% of the Fund is backed by a USAID guarantee. This action not only encourages private investors to acquire the Notes, but also fosters private lenders operating in local markets to extend financing to businesses associated with underlying Althelia projects. In addition, by leaving project development to local organizations with a positive record of accomplishment, the Fund reduces the risks associated with the project implementation phase, while empowering local partners.

2. Assuring high conservation impact: Althelia developed a set of standards to systematically assess investment impact across its portfolio. Some of these indicators are applied across Althelia's entire portfolio, while others are region and/or project-specific. Local partners and investors agree upon these indicators before an investment is made. Although Althelia monitors its projects and disburses a yearly balance, the environmental assets generated by the projects are also audited and certified by third parties.

3. Financial stability: The structure of the investments provides financial stability to the projects, as they count on a long time horizon, which, in turn, allows them to achieve their conservation and financial goals.

The Nature Conservancy's Conservation Note

The Nature Conservancy
Protecting nature. Preserving life.™
nature.org

The Nature Conservancy, in collaboration with the Calvert Foundation, created the Conservation Note in 2012. They are the first retail investment vehicles for conservation targeting a small group within the retail investor segment, namely HNWIs. Due to the positive reputation of The Nature Conservancy and the previous experience of the Calvert Foundation in the field, the Notes' offering was fully subscribed in less than a year, issuing USD 25 million. The Notes were sold directly with no custodian and limited sales staff. Most of the investors are foundations, although individual investors also participate.

The funds generated through the Notes are used to leverage (typical) public finance for high-priority large-scale conservation transactions, mainly those supporting the protection of critical landscapes. Although the resources are not pointed at a specific geographic area, most of the funds have been directed to the United States for land acquisitions or other conservation easement purposes. To date, the Note has supported 105 projects and facilitated the conservation of over 200,000 hectares of land. These projects have pre-defined disposition strategies to repay the Notes, such as sales to public agencies and conservation buyers.

The Nature Conservancy's Conservation Note carries an Aa2 credit rating from Moody's ratings service

and are structured as general debt obligation of the Conservancy. Investors are able to choose the Notes' rate and term, and whether to redeem or reinvest them at maturity. The minimum investment is USD 25,000, and terms of one-, three-, or five-years can be chosen. The interest rate varies from 0% to 2%, depending on the term, offering the option to investors of receiving zero interest and donating the amount to The Nature Conservancy. Recently, individual investors have tended to choose the maximum available rate of return for a given term, while foundations have chosen lower return options. In addition, all investors have chosen to reinvest their Notes at maturity, instead of redeeming them.

Three significant features of the Notes are:

1. The presence of mechanisms to mitigate risk: The Aa2 credit rating of the Notes and the possibility of short-duration terms serve as mechanisms to mitigate risk.

2. Assuring high conservation impact: The Nature Conservancy sends an annual impact report to the investors that explains how the funds were used.

3. Credibility of the developing institutions: The Nature Conservancy and the Calvert Foundation are well-known and have good reputations, the former on conservation matters and the latter by developing the Community Investment Notes. This fact adds credibility and trust to the Notes.

The Freshwater Trust

The Freshwater Trust
Changing the course of conservation.

The Freshwater Trust (TFT) was created in 1983 to facilitate the restoration of rivers and streams in the state of Oregon (US Pacific Northwest). The implemented projects have sought to offset the impact of warm-water discharge from factories, power plants, and wastewater treatment facilities on watersheds. Actions taken include planting trees and shrubs upstream to provide shade and water-cooling, which is cheaper than building large chilling towers. These restoration projects generate water temperature credits, which are purchased as offsets by regulated entities. For instance, TFT has secured agreements with the US Forest Service and the Oregon Watershed Enhancement Board to purchase temperature reduction credits that will be retired for conservation purposes.

In addition, several private foundations made a joint USD 5 million impact investment in TFT, with the aim of providing growth capital to the fund. These resources will allow the Fund to focus on creating conservation impact, while reducing the pressure of looking for profit-generating investments that accompany the conservation goal.

Throughout the years, TFT has gained renown mostly because of the generation of metrics that ensure measurable and verifiable ecological impacts. For instance, the Fund has worked with several organizations and agencies to scientifically demonstrate the amount by which a tree's shade reduces the sun's impact on a river or stream. In addition, projects are monitored and maintained for 20 years or more. These actions have provided credibility and trust to the buyers of the credits.

Challenges and Recommendations

Conservation impact investments face several criticisms. They are seen by some sectors as a sort of subsidy to for-profit investors since, for instance, some impact investments funds are tax-free. Complaints cite the fact that this type of investor does not actually need any additional financial push. Impact investments are also considered to be a "greenwashing" of traditional business investments. Additionally, if conservation impacts are not correctly addressed and measured, impacts will be loose, diluted and meaningless. This outcome will turn this type of investment into a “feel good” rather than a “do good” mechanism. Lastly, this instrument is said to be based on an adverse selection of investors, as conservation impact investors are

considered less capable and visionary than traditional business investors. This situation might end up damaging the conservation and financial outcomes of the projects.

The field of conservation finance is said to be 10 years or more behind the field of social impact investing. Therefore, for it to be able to reach that level and to answer the complaints of its critics, it must recognize some remaining challenges:

Investment vehicles and investable products need to be scaled up at the global level.

There is a large unrealized potential in conservation finance, especially since private investing exceeds philanthropy in terms of capital volume.

To date conservation finance has been small-scale and segregated, focusing on the development of niche projects. For instance, even when conservation projects are successfully designed for cash flow generation, they are not running with the kinds of commercially viable business models that attract investors looking for large-scale investment opportunities.

In order to appeal to a broader range of investors, conservation finance mechanisms need to be simple and modular, ideally structured as combinations of investments in underlying assets and revenue-generating mechanisms. As a result, these investments must make the following clear to investors: 1) the asset being invested in, 2) the parties receiving the benefits, and 3) the amount of payment required to obtain those benefits.

NGO, foundation, governmental, and philanthropic funding can be focused on financing early-stage investments. This action would address the lack of investment in the high-risk experimental stages of a conservation finance mechanism. Funding from these sources can act as a lever and allow investments to overcome the capital-intensive activation period of cash flows.

Generation of standardized metrics that ensure measurable and verifiable (monetized) conservation impacts and financial returns.

Investors want to know what they are paying for and confirm that programs are achieving their environmental objectives. Competitive returns have to be demonstrated in many cases.

Since the environmental benefits of ecosystem services are usually gained for free (positive externalities), people are not aware of their conservation impact. By measuring, and monetizing when possible, conservation impacts, investors will understand the circumstances in which maintaining ecosystems and their services may generate greater economic benefit than promoting economic processes that degrade and deplete these ecosystems.

The generation of standardized metrics would also increase the transparency and credibility of the investment product and its institution.

Integration of the involved institutions and taking over other roles.

To scale up conservation projects into investable programs, connectivity, coordination, and collaboration are needed among the involved institutions.

The involved institutions should also take over other roles. In this regard:

- IOs/NGOs could serve as advisors to the investors for the selection of projects and, once a project is underway, they can act as verifiers of its conservation impacts. They could also work in the elaboration of standardized metrics and act as facilitators between governments, financial institutions and providers of early-stage finance.

- Financial institutions could tailor conservation-related investment products according to the needs of their private and institutional clients.

- Private banks and asset managers could make

conservation finance a part of their standard advisory services.

- Governments and local policy makers can give incentives to non-marketable conservation benefits through regulation and, thus, make these benefits accessible to investors.

The involved institutions need a collective, legitimate voice to advocate for this type of investing and to recruit other investors. They will have to demonstrate the viability of this approach.

Impact investments should also be directed towards developing countries, as these geographic areas possess large natural capital assets.

Currently, impact investments have a clear focus on developed countries. Around 80% of conservation finance is based in developed countries, 59% of which is spent there. [27]

An issue of scale might inhibit conservation impact investments in developing countries, as HNWIs, and institutional and retail investors might be looking for larger investments. Therefore, instead of looking for international investors, developing countries could think of a more national / local scale. This action would require an educational component for local bank familiarizing them with the concept and informing them on how to proceed when they are approached.

Although the number of private investors seeking environmental and social returns is growing, it is important to note that investors require a financial instrument that guarantees market returns in most cases. As previously explained, recent innovative financial instruments are opening up a new methodology that attracts private investors and also supports development and conservation objectives in the land use sector. On the other hand, it is also important for conservation investment developers to be careful to deal with pressures from private investors on financial returns, which can potentially shift the focus away from the environmental objectives. Therefore, before starting project development there must be a dialogue with potential investors to discern their needs in terms of performance indicators, risk management, time frames, and their expectations regarding financial return. Mechanisms have to be developed in order to guarantee that the environmental goals will not be conditional on the interests of the private sector. All in all, it is crucial to develop a proper business model of conservation impact investments that can be shared and replicated in developing countries.

27 More details in Credit Suisse, WWF, and McKinsey 2014, NatureVest and EKO 2014

Conclusion

Although many strategies around the climate change discussion boil down to reducing GHG emissions, efforts to preserve ecosystem services allow us to take a much broader approach. This can be achieved through several measures, including intelligently managing forests, encouraging reforestation, and developing sustainable agricultural practices. Payment for ecosystem services (PES) is a powerful vehicle for accelerating these changes.

The Costa Rican case regarding PES and international trends on conservation finance can provide important lessons for developing countries aiming to develop market-based policies and for mainstreaming ecosystem conservation into decision-making processes. Despite the reputation of the Costa Rican National PES, however, countries and stakeholders in general should be careful in extrapolating this experience without carefully understanding its context and the different conditions that have facilitated its development. The step-by-step analysis in this report helps to design and implement PES, paying attention to the contextual particularities and the dynamic nature of PES.

As PES may not work the same way over time, and as a "one-size-fits-all" design does not exist for PES, this type of program should be capable of learning, innovating, and adapting to change. The development of a successful PES program depends on the capacities and flexibility of its governance structure to learn from evaluation and accountability procedures. It's important to remember that PES is not an end goal in itself, but rather a tool that enables better ecosystem conservation while enhancing social inclusion.

The implementation of a PES program is generally progressive, depending on the goals and funds available. The fact that this process is gradual is not necessarily negative. Rather, it might be an opportunity for learning-by-doing and, at the same time, for generating credibility and management capacity. Similar to well-developed financial organizations, a PES governance structure characterized by principles of transparency and accountability in all relevant procedures (e.g. financial management, monitoring and sanctioning of ES contracts) is a necessary condition for attracting private investment. Further, PES programs require improved marketing strategies with better means of defining and quantifying the ES being trading (using standardized metrics and verification methods). New investment products must also be developed, which are competitively priced and consistent with investor preferences. Both activities should be accompanied by low-cost and accessible mechanisms for dissemination and participation. A balanced composition of private, public, philanthropic, and international income sources is the most recommended blend for a PES scheme. Furthermore, no matter the origin of the income flow (e.g. private, public), it is desirable to include a diverse set of sources that are as permanent and predictable as possible, as well as, a combination of voluntary and non-voluntary (e.g. water fees, taxes) mechanisms for private contributions.

From a broader perspective, beyond PES, the conservation finance has shifted from the traditional donor-based approach to an investor-driven one. Conservation impact investments seem promising as sources of income for conservation. These investments guarantee competitive returns, while demonstrating the achievement of conservation and/or social goals. Although they are in an early stage of development, once a solid business model is developed, tested out, and proved, conservation impact investments have a potential to be scaled up in a way that will strengthen sustainable land-use management.

References

AGF-CPF (Advisory Group on Finance of the Collaborative Partnership on Forests). 2012. 2012 *Study on Forest Financing*. New York: UNFF (United Nations Forum on Forests).

Agriinfo. 2016. "Website of Agriinfo." Accessed July 5, 2016. http://www.agriinfo.in/.

Alpízar, Francisco, and Róger Madrigal. 2008. "Constructing Payment Schemes for Ecosystem Services at the Local Level: Methodological Approach and Some Lessons Learned." *Paper presented at the Conference Economics and Conservation in the Tropics: a Strategic Dialogue.* San Francisco, United States of America: Moore Foundation, CSF and RFF, 2008.

Arriagada, Rodrigo, Erin Sills, Subhrendu Pattanayak, and Paul Ferraro. 2009. "Combining Qualitative and Quantitative Methods to Evaluate Participation in Costa Rica's Program for Environmental Services." *Journal of Sustainable Forestry* 28 : 343-367.

Bank, David. 2015. "'Nature Conservation Notes' Bring Individual Investors into Climate Fund." *Huffington Post.* January 22, 2015. Accessed July 15, 2016. http://www.huffingtonpost.com/david-bank/nature-conservation-notes_b_6516576.html.

Barbier, Edward B. 2007. "Valuing Ecosystem Services as Productive Inputs." *Economic Policy* 22 : 179-229.

Bellassen, Valentin, and Sebastiaan Luyssaert. 2014. "Carbon Sequestration: Managing Forests in Uncertain Times." *Nature* 506 : 153-155.

Berry, Pam. 2007. *Adaptation Options on Natural Ecosystems.* A Report to the UNFCCC Secretariat Financial and Technical Support Division. Accessed July 5, 2016. ipcc-wg2.gov/njlite_download.php?id=5755.

Blackman, Allen, and Richard T. Woodward. 2010. "User Financing in a National Payments for Environmental Services Program: Costa Rican Hydropower." *Ecological Economics* 69 : 1626-1638.

Boyd, James, and Spencer Banzhaf. 2007. "What Are Ecosystem Services? The Need for Standardized Environmental Accounting Units." *Ecological Economics* 63 : 616-626.

Campos, José Joaquín, Francisco Alpízar, Róger Madrigal, and Bastiaan Louman. 2007. "Enfoque Integral para Esquemas de Pago por Servicios Ecosistémicos Forestales." *Revista Ecosistemas* 16 : 91-96.

CGIAR (Consultative Group on International Agricultural Research). 2015. "Wetlands Play Critical Role in Economic Growth of the Mekong." February 3, 2015. Accessed July 5, 2016. https://wle.cgiar.org/thrive/2015/02/02/wetlands-play-critical-role-economic-growth-mekong.

Credit Suisse, WWF (World Wildlife Fund), and McKinsey & Company. 2014. *Conservation Finance: Moving beyond Donor Funding toward an Investor-Driven Approach.* Zurich: Credit Suisse, WWF (World Wildlife Fund), and McKinsey & Company.

Daily, Gretchen C. 1999. "Developing a Scientific Basis for Managing." *Conservation* 3 : 14.

Daniels, Amy E., Kenneth Bagstad, Valerie Esposito, Azur Moulaert, and Carlos Manuel Rodríguez. 2010. "Understanding the Impacts of Costa Rica's PES: Are We Asking the Right Questions?" *Ecological Economics* 69 : 2116-2126.

Ecosystem Marketplace. 2016. "Raising Ambition: State of the Voluntary Carbon Markets 2016." Accessed July 5, 2016. http://www.forest-trends.org/documents/files/doc_5242.pdf.

Environment Finance. 2016. "Sustainable Forestry - A Budding Market." *Environment Finance*. March 10, 2016. Accessed August 15, 2016. https://www.environmental-finance.com/content/analysis/sustainable-forestry-a-budding-market.html.

Executive Decree on Transportation. 2002. Republic of Costa Rica Executive Decree No. 30748-J-MOPT.

Executive Decree Nº 39083-MINAE, 2015. Republic of Costa Rica Executive Decree No. 39058-MAG.

FONAFIFO (National Forestry Financing Fund), CONAFOR (National Forest Commission), and MINAE (Ministry of Environment and Energy). 2012. *Lessons Learned for REDD+ from PES and Conservation Incentive Programs. Examples from Costa Rica, Mexico, and Ecuador.* Accessed July 5, 2016. https://www.forestcarbonpartnership.org/sites/forestcarbonpartnership.org/files/Documents/Full%20version%20of%20PES%20Lessons%20for%20REDD+%20March%202012.pdf.

FONAFIFO. 2016. "Website of Pago de Servicios Ambientales." Accessed June 21, 2016. http://www.fonafifo.go.cr/psa/index.html.

FAO (Food and Agriculture Organization of the United Nations). 2000. *Forest Resources Assessment 2000.* Rome: FAO.

FAO (Food and Agriculture Organization of the United Nations). 2010. *Forest Resources Assessment 2010.* Rome: FAO.

FAO (Food and Agriculture Organization of the United Nations). 2014. *State of the World's Forests: Enhancing the Socioeconomic Benefits from Forests.* Rome: FAO.

FAO (Food and Agriculture Organization of the United Nations). 2015. *Forest Resources Assessment 2015: Terms and Definitions.* Rome: FAO.

Forestry Law. 1996. Republic of Costa Rica Law No. 7575.

Freeman, A. Myrick. 1993. *The Measurement of Environmental and Resource Values: Theory and Methods.* Washington, D.C.: Resources for the Future.

GIIN (Global Impact Investing Network). 2016. *Annual Impact Investor Survey 2016: The Sixth Edition.* Accessed July 5, 2016. https://thegiin.org/knowledge/publication/annualsurvey2016.

GCP (Global Canopy Programme). 2012. *The Little Biodiversity Finance Book 3rd Edition.* Retrieved from http://www.globalcanopy.org/materials/little-biodiversity-finance-book.

Green Facts. 2015. "Valuing the Ecosystem of the Indonesian Rainforest." Accessed July 5, 2016. http://www.greenfacts.org/en/indonesian-forests/.

Gutiérrez, María. 2002. "Acceso al Pago de Servicios Ambientales en Costa Rica." In *Potencialidades de los Sistemas Silvopastoriles para la Generación de Servicios Ambientales. Memorias de una Conferencia Electrónica Realizada entre Septiembre y Diciembre del 2001*, edited by Muhammad Ibrahim, Jairo Mora Delgado and Mauricio Rosales, 162-168. Turrialba: CATIE (Tropical Agricultural Research and Higher Education Center).

Gutman, Pablo. 2010. *World Conservation Magazine.* The Magazine of the International Union for Conservation of Nature. July 2010 edition. Accessed July 5, 2016. http://cmsdata.iucn.org/downloads/101252_uicn_24pp.pdf.

Harvey, Cecilia, Francisco Alpízar, Mario Chacón, and Róger Madrigal. 2005. *Assessing Linkages between Agriculture and Biodiversity in Central America: Historical Overview and Future Perspectives.* San José, C.R.: TNC (The Nature Conservancy).

Hein, Lars. 2011. "Economic Benefits Generated by Protected Areas: the Case of the Hoge Veluwe Forest, the Netherlands." *Ecology and Society* 16 : 13.

Houghton, Richard. 2013. "The emissions of carbon from deforestation and degradation in the tropics: past trends and future potential." *Carbon Management*, 4(5). 539–546. DOI:10.4155/cmt.13.41.

Houghton, Richard, Brett Byers, and Alexander Nassikas. 2015. "A role for tropical forests in stabilizing atmospheric CO2" *Nature Climate Change* 5: 1022-1023.

ICROA (Interntional Carbon Reduction and Offset Alliance). 2014. "Unlocking the Hidden Value of Carbon Offsetting." Accessed July 21, 2016. http://www.carbonneutral.com/images/uploads/news/ICRO2895_ICROA_online_pdf_F.pdf.

IBR (Impact Business Review). 2013. "Opportunity and Potential of Impact Investment as Social Finance *(translated from Korean)*" *IBR*. November 7, 2013. Accessed August 22, 2016. http://ibr.kr/1/.

InVEST. 2016. "Website of InVEST." Accessed June 21, 2016. http://www.naturalcapitalproject.org/invest/.

IPCC (Intergovernmental Panel on Climate Change). 2014. "Chapter 11. Agriculture, Forestry and Other Land Use (AFOLU)." In *IPCC Fifth Assessment Report.* Accessed Jun 21, 2016. https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter11.pdf.

Limburg, Karin E., Robert V. O'Neill, Robert Costanza, and Stephen Farber. 2002. "The Dynamics and Value of Ecosystem Services: Integrating Economics and Ecological Perspectives." *Ecological Economics* 41 : 409-420.

Madrigal, Róger, and Francisco Alpízar. 2008. "Diseño y Gestión Adaptativa de un Esquema de Pago de Servicios Ecosistémicos en Copan Ruinas, Honduras." *Investigación Agraria: Sistemas de Recursos Forestales* 17 : 79-90.

Mansell, Anthony. 2016. "What's ahead for Carbon Markets after COP21?". *Biores.* February 22, 2016. Accessed August 16, 2016. http://www.ictsd.org/bridges-news/biores/news/what%E2%80%99s-ahead-for-carbon-markets-after-cop21.

McCartney, Matthew, and Lisa-Maria Rebelo. 2015. "Consortium of International Agricultural Research Centers (CGIAR)." February 2, 2015. Accessed June 20, 2016. https://wle.cgiar.org/thrive/2015/02/02/wetlands-play-critical-role-economic-growth-mekong.

Mercado, Leida, Francisco Alpízar, Maureen Arguedas, Jorge Sellare, Pablo Imbach, Christian Brenes, and Amilcar Aguilar. 2016. "Rapid Participatory Appraisal for the Design and Evaluation of Payment for Ecosystem Services: an Introduction to an Assessment Guide." In: *Pro-poor co-investment in environmental services in agricultural landscapes in the developing world: a theory of change.* Nairobi: ICRAF (World Agroforestry Centre). Manuscript submitted for publication.

MEA (Millenium Ecosystem Assessment). 2005. *Ecosystem and Human Well-Being*. Washington, D.C.: Island Press.

Mitchell, Robert Cameron, and Richard T. Carson. 1989. *Using Surveys to Value Public Goods: the Contingent Valuation Method.* Washington, D.C.: Resources for the Future.

Monitor Institute. 2009. *Investing for Social & Environmental Impact: a Design for Catalyzing an Emerging Industry.* San Francisco, CA: Monitor Institute.

Motta, Ronaldo Serôa da, Richard M. Huber, and H. Jack Ruitenbeek. 1999. "Market Based Instruments for Environmental Policymaking in Latin America and the Caribbean: Lessons from Eleven Countries." *Environment and Development Economics:* 177-201.

NAMA Facility. 2014. "Implementation of the NAMA Support Project – Low Carbon Coffee Costa Rica." Accessed July 21, 2016. http://www.nama-facility.org/fileadmin/user_upload/pdf/Factsheet_-_Implementation_of_the_NAMA_Support_Project_-_Low_Carbon_Coffee_Costa_Rica.pdf.

NatureVest and EKO. 2014. *Investing in Conservation: a Landscape Assessment of an Emerging Market.* Arlington, VA:

TNC (The Nature Conservancy).

NCE (New Climate Economy). 2014. "Chapter 3. Land Use Protecting Food, Forests, and People." In *Better Growth, Better Climate.* Washington D.C.: NCE.

OECD. 2011. T*owards Green Growth: Monitoring Progress.* Paris: OECD Publishing. doi: 10.1787/9789264111318-en.

Pagiola, Stefano. 2008. "Payments for Environmental Services in Costa Rica." *Ecological Economics* 65 : 712-724.

Pattanayak, Subhrendu K., Sven Wunder, and Paul J. Ferraro. 2010. "Show me the Money: Do Payments Supply Environmental Services in Developing Countries?" *Review of Environmental Economics and Policy* 4 : 254-274.

Persson, U. Martin, and Francisco Alpízar. 2013. "Conditional Cash Transfers and Payments for Environmental Services- a Conceptual Framework for Explaining and Judging Differences in Outcomes." *World Develoment* 43 : 124-137.

Pfaff, Alexander, Juan Andrés Robalino, and G. Arturo Sánchez-Azofeifa. 2008. *Payments for Environmental Services: Empirical Analysis for Costa Rica.* Working Paper Series SAN08-05, Durham, NC: Terry Sanford Institute of Public Policy, Duke University.

Porras, Ina, David N. Barton, Adriana Chacón-Cascante, and Miriam Miranda. 2013. *Learning from 20 Years of Payments for Ecosystem Services in Costa Rica.* London: IIED (International Institute for Environment and Development).

Porras, Ina, Adriana Chacón-Cascante, David N. Barton, and Diego Tobar. 2014. *Ecosystems for Sale: Land Prices and Payments for Ecosystem Services in Costa Rica.* Country report, London: IIED.

PROFOR (Program on Forests). 2014. *Private Financing for Sustainable Forest Management and Forest Products in Developing Countries: Trends and Drivers.* Washington, DC: PROFOR.

Ricketts, Taylor H. 2004. "Tropical Forest Fragments Enhance Pollinator Activity in Nearby Coffee Crops." *Conservation Biology* 18 : 1262-1271.

Robalino, Juan Andrés, Alexander Pfaff, G. Arturo Sánchez-Azofeifa, Francisco Alpízar, Carlos León, and Carlos Manuel Rodríguez. 2008. *Changing the Deforestation Impacts of Ecopayments: Evolution (2000-2005) in Costa Rica's PSA Program.* Working paper, Turrialba, Costa Rica: CATIE.

Robalino, Juan, Catalina Sandoval, Laura Villalobos, and Francisco Alpízar. 2014. "Local Effects of Payments for Environmental Services on Poverty." *Environment for Development- Discussion Paper* 12 : 1-20.

Robalino, Juan, Francisco Alpízar, Catalina Sandoval, and Laura Villalobos. 2013. "Análisis Socioeconómico del Programa de Pagos por Servicios Ambientales." Consultancy report, Turrialba, Costa Rica.

Rojas, Manrique, and Bruce Aylward. 2003. *¿Qué Estamos Aprendiendo de la Experiencia con los Mercados de Servicios Ambientales en Costa Rica? Revisión y Crítica de la Literatura.* London: IIED.

Rosa, Herman, Susan Kandel, and Leopoldo Dimas. 2003. *Compensación por Servicios Ambientales y Comunidades Rurales: Lecciones de las Américas y Temas Críticos para Fortalecer Estrategias Comunitarias.* Mexico: Instituto Nacional de Ecología.

Searchinger, T., Hanson, C., Ranganathan, J., Lipinski, B., Waite, R., Winterbottom, R., Dinshaw, A. and Heimlich, R., 2013. "Creating a Sustainable Food Future: A Menu of Solutions to Sustainably Feed More than 9 Billion People by 2050." *World Resources Report* 2013-14: Interim Findings. World Resources Institute, the World Bank, United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), Washington, DC. Available at: http://www.wri.org/publication/creating-sustainable-food-future-interim-findings.

Sáenz, Leonardo, and Mark Mulligan. 2013. "The Role of Cloud Affected Forests (CAFs) on Water Inputs to Dams." *Ecosystem Services* 5 : 69-77.

Sierra, Rodrigo, and Eric Russman. 2006. "On the Efficiency of Environmental Service Payments: a Forest Conservation Assessment in the Osa Peninsula, Costa Rica." *Ecological Economics* 59 : 131-141.

Sills, Erin, Rodrigo Arriagada, Paul Ferraro, Subhrendu Pattanayak, Luis Carrasco, Edgar Ortiz, Silivia Cordero, Katie Caldwell, and Kwaw Andam. 2008. *Impact of Costa Rica's Program of Payment for Environmental Services on Land Use.* Learning paper, Washington, D.C.: The World Bank.

Soussan, John, Bharat K. Shrestha, and Laya P. Uprety. 1995. *The Social Dynamics of Deforestation: a Case Study from Nepal.* Nashville: Parthenon Publishing Group.

Szabo, Mike. 2015. "Paris Agreement Rings in New Era of International Carbon Trading". *Carbon Pulse.* December 12, 2015. Accessed August 16, 2016. http://carbon-pulse.com/13339/.

TEEB (The Economics of Ecosystems and Biodiversity). 2010. *Mainstreaming the Economics of Nature: a Synthesis of the Approach, Conclusions and Recommendations of TEEB.* Malta: Progress Press.

The Gordon and Betty Moore Foundation. 2013. "Impact Investing." Presentation held at the meeting of the Red Latinoamerica de Fondos Ambientales (RedLac). San José, Costa Rica: RedLac, 2013.

The World Bank. 2007. *World Development Report 2008: Agriculture for Development.* Washington, D.C.: The World Bank.

UN (United Nations). 1993. "Convention on Biological Diversity." New York: UN. 1-28.

UNDP (United Nations Development Program)e. 2016. *Sustainable Development Goals.* 2016. Accessed June 21, 2016. http://www.undp.org/content/undp/en/home/sdgoverview/post-2015-development-agenda.html.

Vincent, Jeffrey R., Ismariah Ahmad, Norliyana Adnan, Jie-Sheng Tan-Soo, and Kyle Thomas. 2013. "Accounting for the Water Purification Service of Tropical Forests."

Whittington, Dale. 2002. "Improving the Performance of Contingent Valuation Studies in Developing Countries." E*nvironmental and Resource Economics* 22 : 323-367.

Wunder, Sven. 2006. "Are Direct Payments for Environmental Services Spelling Doom for Sustainable Forest Management in the Tropics?" *Ecology and Society* 11 : 23.

Wunder, Sven, Stefanie Engel, and Stefano Pagiola. 2008. "Taking Stock: a Comparative Analysis of Payments for Environmental Services Programs in Developed and Developing Countries." *Ecological Economics* 65 : 834-852.

Global
Green Growth
Institute

Follow our activities
on Facebook and Twitter

www.gggi.org