



# THE FUND FOR SUSTAINABLE BIODIVERSITY

Investing today for a better future



## DEDICATION

In every forest we find trees on which hundreds of organisms live. Each tree is life and it gives us numerous services. This book is dedicated to these green friends that depend on human decisions to continue generating the valuable services on which everyone's future depends.

This document will reach the hands of those who are willing to take on the challenge of continuing to transform Costa Rica, for the benefit of its citizens and the planet. It is a gift to the people who have become aware of the importance of biodiversity to human, economic and social development. To the government and business friends that have opened their eyes and understand the complexity of living systems, that we human beings are part of a network of relationships and the disappearance of one species affects each and every one of us.

This book is for you.

*Jorge Mario Rodríguez*

FONAFIFO General Director

**Authors:** Vilma Obando A., Jesús Ugalde G., Álvaro Herrera V.(INBio)

**Layout:** Esteban Ocampo (INBio)

**Editing:** Diana Ávila

**Copyediting:** Ojalá Comunicación

**Traduction:** Lucinda Taft

**Photographs:** Fabio Hidalgo and Esteban Ocampo (INBio)

**Maps:** Oscar Chacón (INBio), Gilmar Navarrete (FONAFIFO)

**Technical review:**

Alexandra Sáenz, FONAFIFO

Carmen Roldán, FONAFIFO

Rebeca Brenes, FONAFIFO

Oscar Sánchez, FONAFIFO

Alonso Matamoros, INBio

All rights reserved in the name of FONAFIFO

No complete or partial reproduction of this documented is permitted.

Editorial INBio. First Edition 2013

## CONTENTS

<b>INTRODUCTION</b> .....	10
<b>CHAPTER I: PAYMENTS FOR ENVIRONMENTAL SERVICES, THE SEED THAT GAVE RISE TO THE FUND FOR SUSTAINABLE BIODIVERSITY</b> .....	18
Origin and development of forestry incentives .....	20
From incentive to payments for environmental services: recognition of the socio-environmental value of forests .....	29
<b>CHAPTER II: THE FUND FOR SUSTAINABLE BIODIVERSITY: AN INNOVATIVE TOOL FOR CONSERVATION</b> .....	72
Conserving biodiversity: an FBS imperative .....	74
Nature and scope of the FBS .....	80
FBS in a nutshell .....	83

**CHAPTER III:**  
**ABOUT COSTA RICA: THE COUNTRY THAT MADE PES A REALITY .... 90**  
Between social welfare and biodiversity conservation ..... 98  
Costa Rica: a natural treasure ..... 101  
A legal framework that  
favors the conservation and  
sustainable use of biodiversity ..... 105

**CHAPTER IV:**  
**PROTECTED WILDERNESS AREAS ARE STRENGTHENED BY PES .... 112**  
The regional context in protected wilderness areas ..... 113  
A closer look at Costa Rica's  
effort to create PWAs ..... 116  
Protected wilderness areas are not  
enough: enter biological corridors  
and private conservation ..... 123

**END NOTES ..... 135**

**REFERENCES ..... 137**



## INTRODUCTION

In the late 1990s, Costa Rica made a decision that it has stood by to this day: to invest in the conservation of its natural areas to ensure the current and future provision of ecosystem services. This wager wasn't made to generate large financial returns; it was done to care for what is most precious in the country: its nature and its people.

A decade before the Earth Summit in Rio de Janeiro in 1992, Costa Rica had taken steps to reverse the high rate of deforestation that had occurred between 1940 and 1970. The Rio Summit, however, contributed to strengthening the country's sustainable development approach as envisaged in its national plans.

This document aims to portray the country's efforts to protect its nature and it shows the actions, mechanisms and political and institutional achievements that have positioned Costa Rica at the forefront of conservation in the world.

It will also show that funding to protect the integrity of ecosystems with high social, economic and natural values is a constantly evolving process and the lessons learned have contributed to more robust strategic programs for achieving the environmental sustainability to which the country and the world aspire.





Since the creation in 1996 of the Payments for Environmental Services Program (PESP), Costa Rica has had marketing tools that have been crucial in supporting the legal recognition of environmental services provided by ecosystems. The positive impacts of the system for the Payments for Environmental Services (hereafter PES) are numerous, both in terms of the maintenance of ecosystems as well as the social benefits they generate for small and medium-size landowners.

The lessons learned so far have left ample experience for ensuring the effectiveness of this mechanism in consolidating conservation through financial support to forest owners who are committed to maintaining ecosystems that provide many important services to large segments of the population.

Nevertheless, it is clear that Costa Rica is not exempt from threats to its biodiversity. The effects of climate change and changes in land use, among other factors, impact the natural structure and function of ecosystems. But this, far from being a discouragement, is one reason more to double down on efforts to reverse the adverse indicators for environmental sustainability, in a struggle that must be steadily maintained over time.

On this path to confront the challenge of climate change and the need to provide long-term continuity to PES as a tool for forest conservation, Costa Rica has not stopped looking for ways to protect its natural wealth. The creation of the Fund for Sustainable Biodiversity (FBS<sup>1</sup>) in 2008 is another milestone in these long-term efforts. Its benefits go beyond PES and include all Costa Rican society, which enjoys and takes advantage of the services that ecosystems offer.

---

1. Original acronym in spanish.



The FBS emphasizes the socioeconomic and ecological importance of conserving biodiversity for the long term by strengthening PES. This is a novel tool for consolidating and improving forest protection coverage, which gives the government greater ability to monitor and identify positive impacts over time. The FBS is innovative, since it proposes agreements for forest conservation for periods up to 20 years

and its beneficiaries include the owners of very small sections of forest, as stipulated in the Forestry Law,<sup>2</sup> as well as indigenous communities whose territories are in collective ownership. The FBS is a joint investment structure for private forest smallholders to help maintain strategic natural areas that would otherwise run the risk of being lost.

Moreover, as an Endowment Fund that is structured as a trust, the FBS has more autonomy and decision-making capacity regarding the use of its resources. The creation and establishment of the Environmental Bank Foundation (FUNBAM), the administrator of the FBS, provides greater versatility and efficiency than traditional government support mechanisms or direct dependence on international donations for conservation.

With the FBS, the government of Costa Rica, with support from the National Fund for Forestry Financing (FONAFIFO), can certainly create the conditions needed to provide financial stability for biodiversity conservation programs and at the same time set a horizon that gives ongoing support to owners of forests with high biological value.

<sup>2</sup> **Forest:** Native or autochthonous ecosystem, with or without intervention, regenerated by natural succession or other forestry techniques, which occupies an area of two or more hectares, characterized by the presence of mature trees of different ages, species and heights, with one or more canopies that cover more than 70% of its area and where there are more than sixty trees per hectare of fifteen or more centimeters in diameter measured at breast height. Forestry Law No. 7575, 1996.

Nearly half of Costa Rica's forests are privately owned. The owners of private or communal lands –such as indigenous peoples and farmer organizations– have in their hands the decision to conserve and sustainably use the forest and the biodiversity it contains on their properties and in the surroundings. Mechanisms like the FBS constitute a joint contribution that supports them in this effort.

Supporting PES through the FBS means making a contribution to life in all its forms, from conserving species that are still unknown to science to ensuring the potable water supply in a capital city. It involves investing in ecosystems and in people, supporting the maintenance of forests in a country that uses them to sequester carbon for the entire world.



## CHAPTER I: PAYMENTS FOR ENVIRONMENTAL SERVICES, THE SEED THAT GAVE RISE TO THE FUND FOR SUSTAINABLE BIODIVERSITY

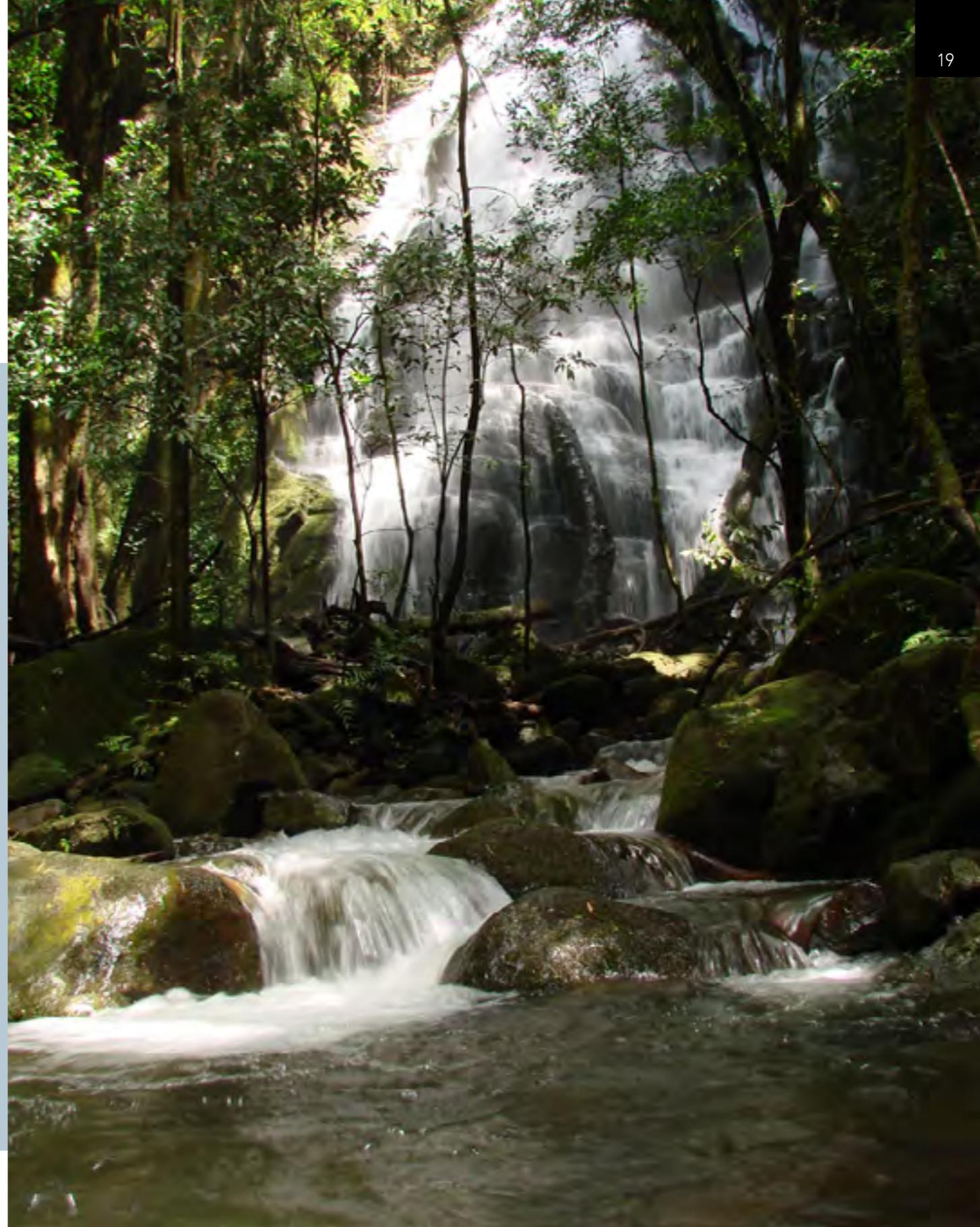
### Executive summary

The Fund for Sustainable Biodiversity (FBS) is the product of decades of experience in the development of economic incentives for conservation. To understand the evolutionary process that led to the creation of this mechanism, we must analyze the motivations, the path taken, and the lessons learned during the implementation of Payments for Environmental Services, which have guaranteed its effectiveness and stability over time.

Under the premise that biodiversity is a national asset that generates major benefits for quality of life of people, new protected areas were created and several laws were adopted. One of these regulations is Forestry Law No. 7575 of 1996, a legal instrument that changed the concept of forestry incentives to the Payments for Environmental Services (PES), establishing the National Fund for Forestry Financing (FONAFIFO) as the entity responsible for putting this new conservation mechanism into practice.

With PES, the value of forests as sources of ecosystem services for human welfare began to be recognized. Hence, this tool has evolved from a forest incentive scheme into cash remuneration one for services provided by a well-conserved forest.

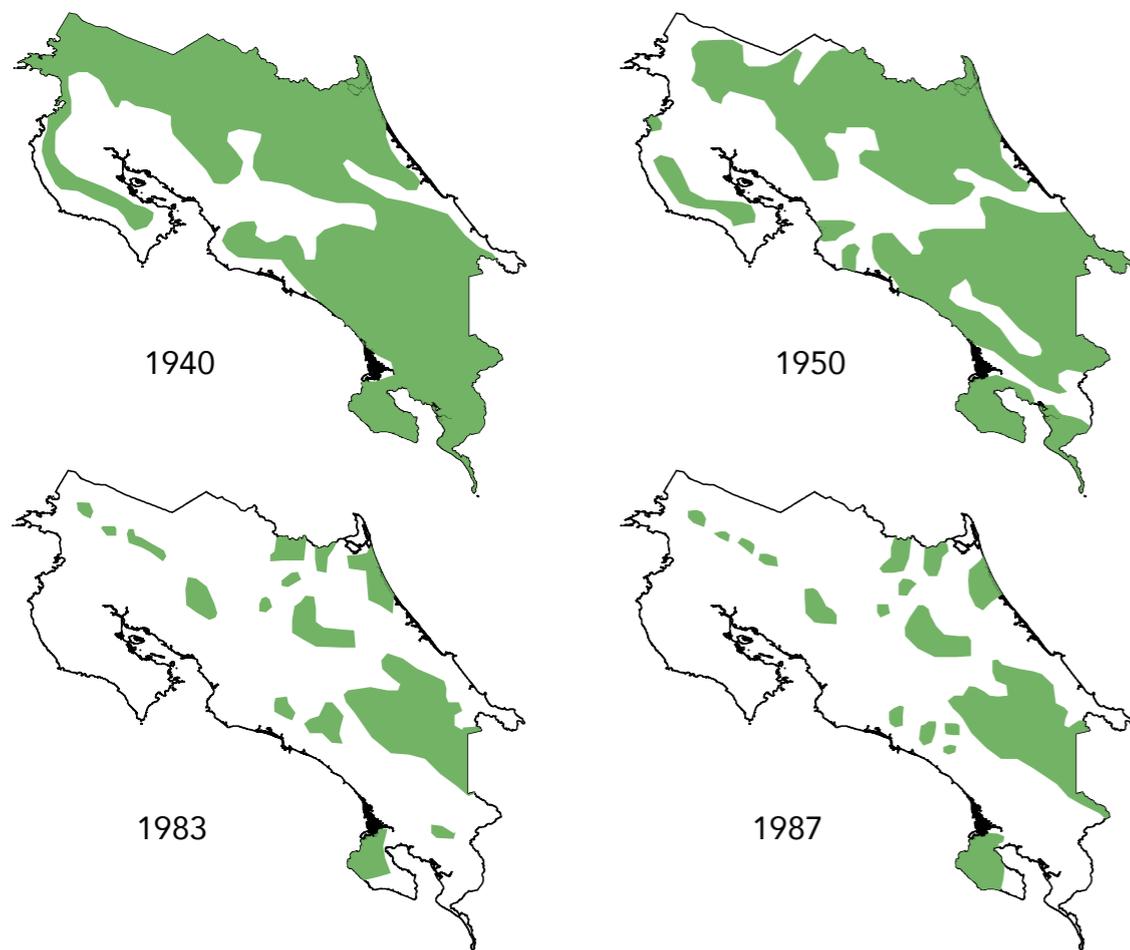
As a result, Costa Rica's forest cover today is 52.38% of its mainland territory and efforts continue to maintain and expand it through new financial mechanisms like the FBS, to ensure the services provided by nature in the future.



## ORIGIN AND DEVELOPMENT OF FORESTRY INCENTIVES

Just as a forest can regenerate and reach maturity, the seed sown by the incentives offered by the State to conserve forests evolved until it became the PES program.

However, the story that is told below is not the history of the mature forest but rather the origin and the track record that enabled the implementation of



PES and the transformation of Costa Rica into one of the first countries to be recognized internationally for implementing an explicit mechanism for valuing ecosystem services since the late 1990s.

In the late seventies, the country had only 30% of its natural forests, after three decades of suffering a deforestation rate of 55,000 hectares (ha) per year, a trend that continued into the 1980s (Figure 1).

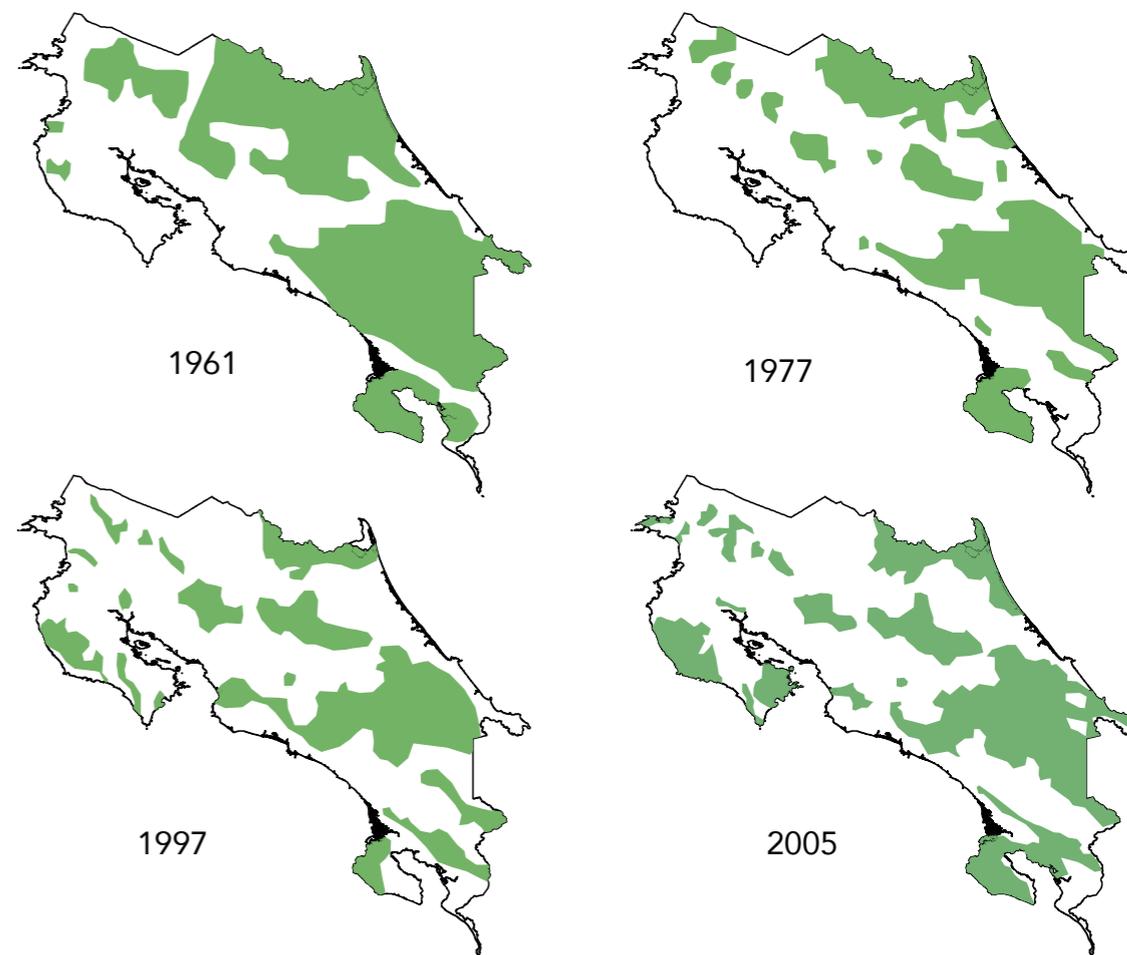


Figure 1. Forest cover from 1940 to 1987. Source: FONAFIFO, 2012.

In this context, civil society organizations, visionaries, intellectuals and scientists, with government support, pushed for the creation of legislation and strategies focused on protecting the environment, under the premise that biodiversity was a national asset that generated major benefits for the citizenry. It was in this period that the Ministry of Natural Resources, Energy and Mines (MIRENEM) was created; today it is called the Ministry of the Environment and Energy (MINAE).

In Costa Rica, the 1996 Forestry Law defined environmental services as services provided by forests and forest plantations that directly affect the protection and improvement of the environment.

In the 1980s and 1990s, as we will see later, new protected areas were booming. Subsequently, the National System of Conservation Areas (SINAC) was created in 1995 as an agency of the Ministry of the Environment to manage these natural areas.

The legislation was also subjected to improvements. The 1996 Forestry Law helped create incentives to protect the forest that would later become the PES program and the foundations were laid for the establishment of FONAFIFO, the entity responsible for managing these funds.





Costa Rica approved the first forestry incentive for reforestation projects in 1979. The contribution at that time was 16,000 colones per hectare planted. The funds were income tax-deductible, as set forth in the 1969 Forestry Law (FONAFIFO, 2005).

However, this proved insufficient and forest cover continued to decline, to the point that deforestation in 1983 was around 59,000 ha per year (Fig. 1).

The impact of the first and second generation of forestry incentives was a reduction in the deforestation rate, from 59,000 ha to 4,000 ha per year over five years (1989-1994). Thanks to forestry incentives and PES, in combination with other conservation efforts, the government of Costa Rica was able to announce that the rate of forest cover loss in the country had reached zero in 1998.



It became necessary to increase efforts. Thus the forestry laws of 1986 and 1990 led to the participation of small and medium producers. This second generation of incentives consisted of four categories of compensation that were gradually implemented between 1986 and 1995 (SINAC-INBio, 1998; FONAFIFO, 2005 and 2012b):

1. The Forest Credit Certificate (CAF) (1986), focused on commercial forestry plantations;
2. The Advance Forest Credit Certificate (CAFA) (1988), aimed at small and medium-size landowners who wanted to reforest;
3. The Certificate of Forestry Credit for Forest Management (CAFMA) (1992), which encouraged forest management through silvicultural practices;
4. The Forest Protection Certificate (CPB) (1995), aimed at promoting the expansion and permanence of natural forest in areas of importance for the production of drinking water, protected areas or biological corridors.



Since the emergence of the first forestry incentives in 1979 and until 1995, approximately 140,000 ha were reforested (Table 1). By 1996, when contracts were no longer signed to grant incentives, the projects for reforestation, forest management and protection, among other modalities, totaled more than 200,000 ha.

In 1995 and 1996, in just 12 months CPBs covered more than half of the total number of hectares protected through CAFMAs for seven years or by CAFAs in 12 years (Table 2).

The reason for the success of the CPBs is that they recognized forest owners for the environmental services their lands offered, beyond the wood that was produced. This was a precursor of what would come to be the PES concept in 1996.

Table 1. Area (in hectares) reforested through forestry incentives, 1979-1995.

Year	Total
1979-1991	<b>67,235.5</b>
1992	<b>15,241.8</b>
1993	<b>16,080.9</b>
1994	<b>14,627.8</b>
1995	<b>25,981.0</b>
<b>TOTAL</b>	<b>139,166.5</b>

Source: Ministry of the Environment and Energy, SINAC and FONAFIFO, 1996, in: SINAC-INBio, 1998.

Table 2. Number of hectares under protection and management according to type of incentive or source of resources, 1979-1996.

Type of incentive	Hectares	Valid period
Income tax deduction	35,597	1979-1992
Soft credits	2,802	1985-1995
Forest Credit Certificate (CAF)	45,482	1986-2000
Advance Forest Credit Certificate (CAFA)	40,747	1988-2000
Fund for Forestry Development (FDF)	12,789	1989-1995
Certificate of Forestry Credit for Forest Management (CAFMA)	45,222	1992-1999
Forest Protection Certificate (CPB)	22,200	1995-1996
<b>Total</b>	<b>204,839</b>	<b>1979-1996</b>

Source: FONAFIFO, 2005.



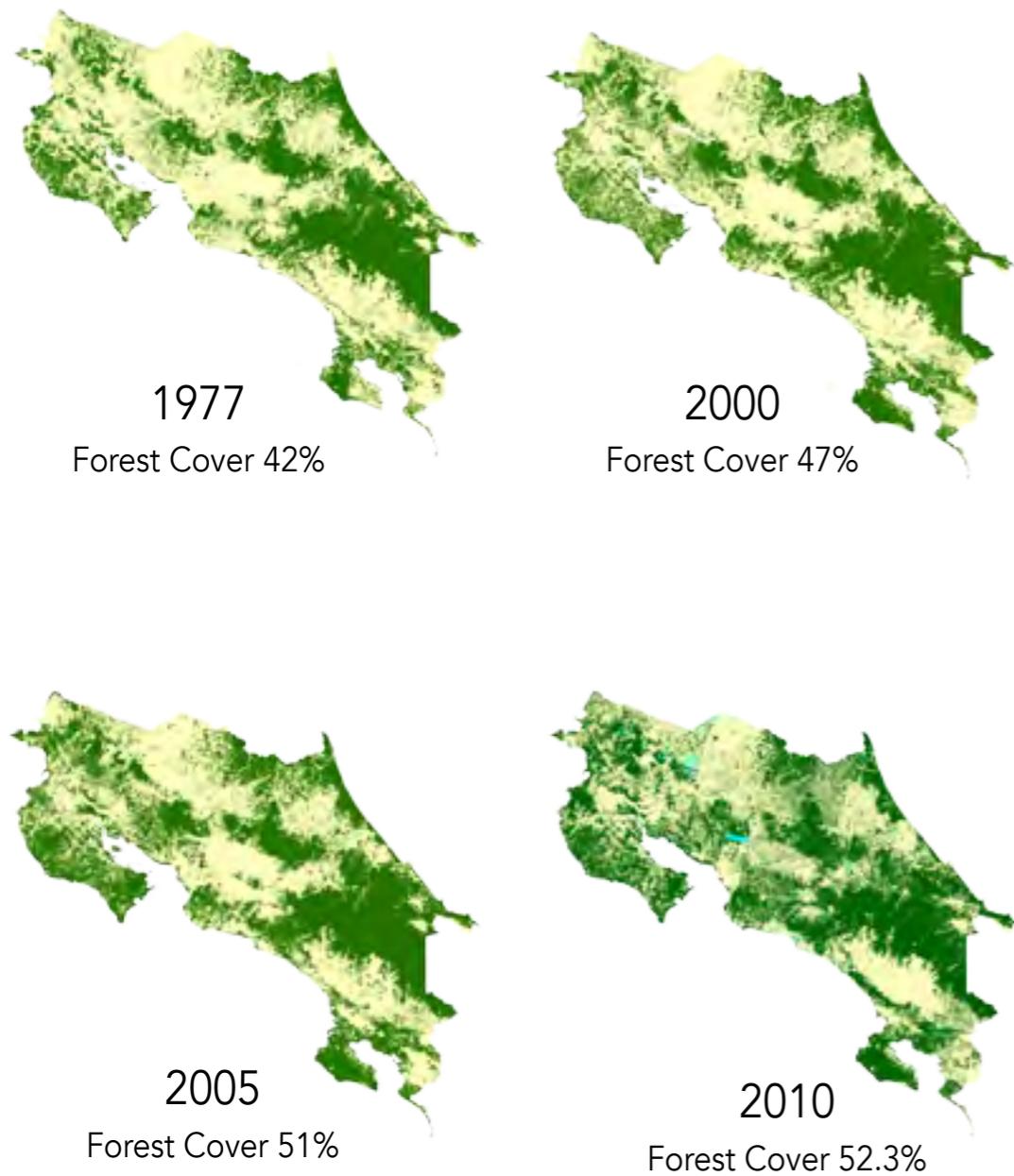
## FROM INCENTIVES TO PAYMENTS FOR ENVIRONMENTAL SERVICES: RECOGNITION OF THE SOCIO-ENVIRONMENTAL VALUE OF FORESTS

The establishment of PES in 1996 was a turning point, a conceptual shift that ended incentives as subsidies to forestry producers. This marked the beginning of the compensation scheme for services the forest provides and it was the first step in recognizing the efforts of those who protect the nation's water, scenic beauty and biodiversity.

This is how reforestation activity, which was promoted during the 1980s and early 1990s (Table 3), was complemented with actions that were meant to recover and conserve forests through PES.

Figure 2 shows, as will be explained in detail further on, that through this new PES concept, Costa Rica stopped deforestation and continued this trend to the point where forest cover accounted for 52.38% of its continental territory in 2010 (FONAFIFO, 2012), a percentage that could be close to its upper limit with respect to other land uses (Méndez, 2012<sup>3</sup>).

3 Eng. Arturo Méndez R., FONAFIFO, from a talk regarding the forest cover study for Costa Rica, 2010.



**Figure 2.** Recovery of forest cover in Costa Rica from 1997 to 2010. Source: FONAFIFO, 2012.

# 1970-2000

Development of numerous initiatives by the private sector and NGOs: ecotourism, biological corridors, private reserves, stronger efforts to learn about biodiversity, bioliteracy under the concept of Save-Learn and Use...

Creation of financial, institutional and technical structures for the development of an incentive system (1970-1996) and subsequently PES through the creation of FONAFIFO (1996).

Legal framework strengthened: 1996 Forestry Law.

Creation of SINAC (1995). 1998 Biodiversity Law...

Signature of international conventions on climate change and biodiversity (1994)...

Strengthening and creation of PA (strongly promoted since 1970).



Costa Rica announced to the world in 1998 that it had stopped deforestation.

Since then the major challenge moving forward has been to continue restoring forest cover and maintain recovered areas.



**Figure 3.** Important events in the country that had an effect on stopping deforestation, 1970-2000. Adapted from the Presidency of the Republic of Costa Rica, MINAET and FONAFIFO 2012 and FONAFIFO 2005.

### **FONAFIFO and its contribution to the development of PES**

The new generation of forestry incentives would require an institutional structure with sufficient capacity to implement forest recovery efforts. The answer was the creation of FONAFIFO in 1996, an institution that unified the five existing forestry funds that had been created using different sources.

Today, FONAFIFO is able to create trusts, issue securities and bonds, negotiate projects, and receive donations or loans; it also manages resources from the fuel tax that fund forestry activity, as well as 40% of the income received from the forestry tax (FONAFIFO, 2005).

Public sector intervention through PES is determinant for maintaining optimal areas of forest throughout the national territory, to ensure the provision of services such as hydroelectric energy, protection of springs, the water supply and scenic beauty for all society.

One of the objectives of FONAFIFO is to support small and medium producers through credit and other mechanisms to promote the management of forest, whether intervened or not, to stimulate processes for afforestation, reforestation, creation of tree nurseries and agroforestry systems, recovering deforested areas and implementing technological changes that increase the use and industrialization of forest resources.





The market is a crucial aspect when regulating the exploitation of forest resources. One of the main mechanisms used by FONAFIFO to reduce illegal logging is the creation of regulated sources of wood supply (e.g. plantations). Thus, the institution controls the reduction in price for the product and satisfies domestic demand. Furthermore, it encourages diversification of the sustainable use of forest resources, promotes a greater supply of wood from forest plantations and strengthens the credit system for commercial projects.

Essentially, the PES program allowed the recognition of forests as providers of goods and services, beyond the timber they produce and the agricultural uses they are given.

The State understood that these services should be valued even if there is no specific market for them (SINAC-INBio, 1998)<sup>4</sup> and PES became the way to compensate forest owners for their decision to conserve rather than cut.

This shift in vision has had a direct impact on ecological benefits (MINAE-FONAFIFO, 2012) for the population and society financially recognizes those who contribute to the welfare of the citizens through forest conservation.

4 Article 3 of the 1996 Forestry Law states that forest services are: mitigation of greenhouse gas emissions (reduction, absorption, fixation and storage of carbon), protection of water for urban, rural or hydroelectric use; protection of biodiversity for conservation and sustainable scientific and pharmaceutical use, research and genetic enhancement, and protection of ecosystems and lifestyles; and natural scenic beauty for tourism and scientific purposes.

PES achieves additional benefits by helping to mitigate impacts to the global environment. The key to this program lies in increasing its profitability for environmental service providers in conjunction with traditional management practices and impacts on particular resources, which in turn allow the temporary and permanent implementation of the model (MINAE-FONAFIFO, 2012). This is possible because the country, through its institutions and FONAFIFO in particular, has fostered the right conditions such as:

- Financing
- Regulatory framework
- Governance
- Active participation of different social sectors
- Monitoring the PESP

Forestry Law N° 7575 also involved SINAC in the management of PES. This institution is legally responsible for accompanying the control, monitoring and promotion of the PES program, as well as defining some criteria for prioritizing the areas under it. SINAC is in charge of the National Biological Corridors Program, as well as the oversight and implementation of conservation gaps in the country, under the Territorial Management Proposal for Biodiversity Conservation (GRUAS II)<sup>5</sup>.

SINAC is also responsible for drafting moratorium orders on the extraction of forest species and defining criteria so that PES can identify in which cases the forest protection modality applies. In this way, FONAFIFO prioritizes this category, for example, for farm applications that meet the criteria defined by SINAC.

5. Details are available at: <http://www.costaricaporsiempre.org>, <http://www.inbio.ac.cr/es/estudios/gruas-II.htm>.



## PES modalities and granting

PES implementation varies according to each project. Although participation in the program is voluntary, the beneficiary receives a payment that is subject to compliance with certain agreed protective actions (MINAE-FONAFIFO, 2012). An executive decree is used to establish PES modalities each year, as well as the areas prioritized for investment, the number of hectares and the amount payable per hectare. These parameters for selection are in alignment with what is defined by institutions such as SINAC or with national initiatives in conservation and natural resource protection.

By 2012 there were five general PES modalities that were divided into several sub-categories (see the details in Table 3):

1. Forest protection
2. Reforestation
3. Natural regeneration
4. Agroforestry systems
5. Forest management

The Agroforestry System (AFS) modality has been implemented since 2003 and it designates a value for each tree and for coppice management on a plantation for extraction. In 2006, payments for natural regeneration in

Supporting reforestation and forest management projects with PES addresses several needs; one of them is the provision of sustainably produced wood for domestic consumption without causing harm to ecosystems (Presidency of the Republic of Costa Rica et al., 2012).



spaces undergoing forest recovery were made possible in a way that would compensate landowners who allowed deforested land to regenerate naturally (FONAFIFO, 2012).

The amounts paid per hectare vary by type of PES and the distribution of payments during the term of the contract (Table 3). In 2010, for example, all contracts were for five year terms and the highest payment was for the reforestation modality followed by payments for protection and the natural regeneration modality in grasslands and pastures deforested as of December 31, 1989 (called Kyoto areas)<sup>6</sup> (FONAFIFO, 2012).

In 2012 the term became 10 years in most of the modalities and the amounts in all PES categories were increased compared to 2010 levels (Table 3). This still holds in 2013 (Decree 37660-MINAE March 2013, *La Gaceta* No. 77, April 23, 2013).

<sup>6</sup> Lands that did not have forest cover before December 31, 1989. In these priority Kyoto areas, the payments for forest regeneration could generate carbon credits sold by FONAFIFO. The Government guarantees carbon rights for the participants; the private sector can participate here, with commitments made through individual contracts to water users and in Environmental Services Certificates (ESC) (FONAFIFO et al., 2012).

Table 3. Total amount in dollars per hectare stipulated for the payment of environmental services for the term the contract is in force, according to the modality for 2012.

PES Modality	Total amount in US\$/ha for the term of the contract	Number of ha to cover	Period the contract is valid (years)
<b>Forest protection</b>	640	57,569	10
Protection in conservation gaps	750	1,000	
Protection of water resource	800	5,000	
<b>Reforestation</b>	980	7,500	5
<i>With native species</i>	1,470	600	
<b>Natural regeneration (1)</b>	410	1,500	10
<b>Natural regeneration (2)</b>	640	1,000	10
<b>Agroforestry systems</b>	1.3/tree	750,000 trees	3
<i>Strictly with native species</i>	US\$1.95		
<b>Forest management</b>	500	500	10

Source: Prepared based on Decree No. 36935-MINAET (Nov. 2011, for payment in 2012, <http://www.fonafifo.go.cr>).  
*Natural Regeneration 1*: In pastures and areas with productive potential in sites with at least one year of abandonment.  
*Regeneration 2*: In grasslands and pastures that had been deforested as of December 31, 1989 (Kyoto areas).



In general, the modalities and the amounts remain almost the same for 2013 (Decree No. 37660-MINAE); natural regeneration in Kyoto areas is not included and for some categories the hectares to cover vary with some going up and others going down. The largest change was in the number of trees under agroforestry system categories, passing from 750,000 trees to 1,315,000.

The increase in the compensation awarded under the agroforestry system modality responds to a decision of FONAFIFO to support these areas more strongly starting in 2013, in order to provide more wood to the domestic market and for which there are initiatives already approved and in implementation as part of the promotion of forestry (MINAE-FONAFIFO, 2012).

Each annual decree to establish PES details the criteria for their assignment and at times there is continuity between years as in the case of Decrees No. 36935-MINAET and No. 37660-MINAE of 2012 and 2013 respectively, which established the same conditions for eligibility. Some of the selection criteria are:

- Presence of species catalogued as threatened or under logging bans.
- Areas located in biological corridors.
- Level of contribution to fill conservation gaps.
- Presence of indigenous territories.
- Location in districts with Social Development Indices (SDI) below 40%.
- Areas without forest in zones with high productive potential for the development of forest plantations and those for protection as established in the Forestry Law (Art. 33).

### Characterization of PES beneficiaries

When FONAFIFO was created, farmers and owners of forested lands or lands suitable for planting and logging were the focus of interest, because at that time the expropriation of lands near national parks and biological reserves had become increasingly difficult (FONAFIFO, 2012b).

It was from 2003 on that it became possible for the owners of lands without formal property deeds to participate in the forest protection modality. Thanks to this, support was strengthened for indigenous territories, where land tenure is often informal or unclear.

Today these areas, considered communal lands administered by their own development associations, can access PES. Thus, according to the law, groups with social priority for PES are indigenous peoples and small and medium producers (MINAE-FONAFIFO, 2012).





Since its inception, FONAFIFO was accompanied by several organizations in the public and private forestry sector, which were strengthened with PES management and they established relationships that have enhanced the involvement of organized civil society in the FONAFIFO structure, including the National Forestry Chamber (CANAFOR), the National League of Rural Foresters (JUNAFORCA), and the Foundation for the Development of the Central Volcanic Range (FUNDECOR), plus numerous local forestry entities distributed in several regions of the country (Méndez & Salazar, 2010; FONAFIFO, 2012b).

PES beneficiaries are monitored to verify their compliance with the agreed conservation commitments. Monitoring is done by licenses forester regents who can visit the areas involved at anytime and whose work is paid for by the beneficiary. During their inspections, the regents accompany FONAFIFO personnel.

Personalized inspections are used because the natural areas under protection, which are not large in size, cannot be monitored by remote sensing, making visits essential. In addition, payments to beneficiaries are subject to the certification of the regent, who is responsible for producing reports that are regularly audited.

## Funding PES

Since its inception, FONAFIFO has shown great fundraising capacity. It currently has resources from taxes, donations, loans, agreements with private companies, bonds, certificates, temporary investments and forest loan recovery. However, it is clear that the largest source of resources continues to be state contributions from the fuel tax, fees for water use and international carbon sales. Despite having these resources, the amount of unmet demand for PES contracts underscores the need to expand and diversify these sources of funding, so as to provide long-term solutions such as the FBS (MINAE-FONAFIFO, 2012).

Between 1998 and July 2012, FONAFIFO received ¢70,224,974,852 from the fuel tax. From 2007 until July 2012, the water use tariff generated ¢2.009.840.597 for PES (MINAE-FONAFIFO, 2012).

The national budget for PES covers about 50% of the demand, so additional funds, like the FBS, are needed to cover the requests.

The institution has developed numerous experiences to generate financial resources to support its programs. These efforts have led to the involvement of the private and public sectors in green investments focusing on PES in determined areas. Through the Environmental Services Certificates (ESC), FONAFIFO raised funds from the businesses and institutions that benefit from environmental services; these funds compensate forest landowners to ensure forest conservation. By 2012, more than 42 companies had ESC and this number continues to rise (Sánchez, 2012).



The rate of water use is a legally decreed financial tool for regulating and administrating water resources. This tax mechanism helps create resources for the long term funding of sustainable water source management. PES contracts with resources from this fee reached US\$4.8 million in the period 2006-2010, to protect 13,483 ha of forest (Sánchez, 2012).



Strategic alliances with private hydroelectric companies for the compensation of landowners with forest in the area of influence of power generation projects are another funding mechanism. By 2004 there were seven agreements with private companies that were paying for this water resource environmental protection service. The greatest importance attached to this effort has been the institutional recognition of the essential nature of water environmental services (Sánchez, 2012), which are described more accurately in the next section.

In addition, Costa Rica has received external funding through international agreements with countries like Norway and Germany and loans from multilateral institutions such as the World Bank and the Global Environment Facility (GEF) through Ecomarkets I (2001-2006) and II<sup>7</sup> (2009 to July 2012), for more than US\$140 million (Sánchez, 2012; MINAE-FONAFIFO, 2012).

In 2003, FONAFIFO's finances were strengthened through a donation made by the German Development Bank (KfW 2003-2011) over seven years of about 10 million euros. In addition, another \$3.4 million were added through the REDD+ project (2010-2014), among other agreements reached (Sánchez, 2012; MINAE-FONAFIFO, 2012).

<sup>7</sup> The FBS was created by FONAFIFO in the context of Ecomarkets II, whose objective is to increase forest conservation in Costa Rica, support the development of markets and providers of environmental services offered by the private forests, include the protection of biological diversity, mitigate greenhouse effect gases and foster hydrological services. ([http://www.fonafifo.com/paginas\\_espanol/proyectos/e\\_pr\\_ecomercados.htm](http://www.fonafifo.com/paginas_espanol/proyectos/e_pr_ecomercados.htm)).

The REDD+ mechanism has become an opportunity for developing countries to mitigate the volume of greenhouse gas (GHG) emissions derived from industrialized countries and be financially remunerated for this service in the carbon market.

### **PES and the reduction of emissions derived from deforestation and forest degradation**

Costa Rica has used its work on PES as the basis for incorporating reforestation and forest management into its policies, such as the National Strategy for Reducing Emissions from Deforestation and Forest Degradation (REDD).

Later this strategy added elements such as conservation, sustainable forest management and enhancement of forest carbon reservoirs, adding a plus sign to its original acronym, namely "REDD+" ([http://www.fonafifo.go.cr/text\\_files/noticias/Estrategia%20REDD.pdf](http://www.fonafifo.go.cr/text_files/noticias/Estrategia%20REDD.pdf)).

REDD+ is a voluntary mechanism adopted by the United Nations Convention on Climate Change during the XVI Conference of the Parties in Cancún (2010), to which Costa Rica is a party to prevent deforestation and improve its carbon stocks.

This strategy is evolving globally based on ideas that have arisen in the country (MINAE-FONAFIFO, 2012). REDD+ will address a source of greenhouse gas emissions that is greater than the entire global transportation sector; without this strategy the global climate stabilization goal of 2°C will not be reached (Angelsen et al., 2009).

Given its experience and achievements in this field, Costa Rica received a contribution of US\$3.6 million in recognition of the services for which it had not received fair compensation in previous years. This amount has been used to carry out the Preparedness Plan for Reducing Emissions from Deforestation and Forest Degradation. Moreover, the country also received cooperation from the REDD-CCAD-GIZ Program that will support the development of some activities of the plan in the amount of US\$1.7 million over a period of two years (MINAE-FONAFIFO, 2012).

The implementation of REDD+ is essential for driving changes toward achieving a low carbon consumption economy in the short, medium and long term. In turn, it is expected that this mechanism will generate additional resources for expanding PES program coverage in support of the consolidation of protected areas.



Complementary to PES, REDD+ has become one of the most innovative of policy and incentive schemes that is helping to increase forest cover throughout the country, strengthening protected areas and fostering the participation of the forestry sector in global efforts for climate change mitigation. Its implementation is relevant for a low-carbon economy (Presidency of the Republic of Costa Rica et al., 2012).

In 2012, in the context of the REDD+ strategy, Costa Rica became the first country to access performance-based funding through the Forest Carbon Partnership Facility (FCPF), a global initiative that includes 54 countries and organizations. This is the first time that a national program has been strengthened with carbon funds, which is a positive precedent that supports the country's goal to be carbon neutral by 2021, and it is a source of resources for meeting the current demand for PES.

These funds will be invested in conserving 341,000 hectares of forests that are mainly in private hands and that will be restored through reforestation and agroforestry systems. In addition, forests will be protected of which 10% is in the hands of indigenous peoples. The resulting reduction in carbon emissions is estimated at 29.5 million tons of CO<sub>2</sub>; about half will be offered to the FCPF and it will require estimated funding of US\$63 million (assuming a price of US\$5 per ton of CO<sub>2</sub>) (Bosquet, 2012).

REDD+ has several strategic areas, most of which aim to support, strengthen and increase PES in specific areas, in addition to implementing concrete actions for compliance.

The REDD+ strategy enables us to propose a new concept that integrates carbon sequestration, the displacement of products with high carbon footprints, increased wood consumption, sustainable forest management, increased carbon stocks and more provision of raw material for the forest industry. All this means that the initiative takes on greater importance for the national challenges of developing a low carbon economy (MINAE-FONAFIFO, 2012).

Of the seven strategic areas for REDD+, the first three that contribute to PES are illustrated by way of example (for more information see <http://www.fonafifo.go.cr>) (MINAE-FONAFIFO, 2012):

1. **Reduction of deforestation rates:** To achieve this goal, PES coverage must be at least maintained order to evit the 2005 deforestation rate, of more than 200,000 ha.
2. **Expand PES coverage:** FONAFIFO must include 113,000 ha of old-growth forest in PES coverage. This increase should be adjusted every five years to maintain a level of coverage capable of reducing deforestation. In this regard, by 2030 there should be assurance that PES will cover at least 256,000 ha per year.
3. **Implement positive incentives to support regeneration and sustainably manage secondary forests:** FONAFIFO should make 20,000 ha available to the owners of regenerated areas, annually conserving them with positive incentives added to the current effort implemented through the PES program, in order to maintain a total 40,000 ha for regeneration between 2011 and 2030.



### The PES footprint

The PES program provides a transparent, effective and versatile approach that rests on a solid, innovative legal and financial framework with clear rules and high adaptability (Porrás et al., 2012b), a decidedly replicable experience. The positive results of this combination of factors have been numerous. The experience is described below.

Costa Rica's PES experience was a precursor to other PES in the region. PES now exists in all the countries of Central America, with different levels of progress and constraints. Similar initiatives also exist in Mexico and Ecuador.

### Support to conservation in strategic areas

The impact on biodiversity conservation is evident in the decline of the deforestation rate as well as the increase in forest cover. Most of the hectares that were given this benefit were in areas that had extensive deforestation problems.

The North Huetar region, where at least 50% of all natural forest wood and 72% of the total volume of wood consumed in Costa Rica is extracted, has been one of the areas to benefit most from PES. In 2000, the German government, through the German Development Bank (KfW), decided to launch a new counterpart system in the region. For every US\$3 contributed by the country, KfW would give counterpart support in the amount of US\$7. The fund rose to 10.2 million euros, of which 95% was used for PES over a seven-year period (FONAFIFO, 2012b).



### Creating synergies with organized civil society

The forestry NGO sector in Costa Rica has benefited from PES through FONAFIFO. Organizations such as the Foundation for the Development of the Central Volcanic Range (FUNDECOR) and the Forest Development Corporation (CODEFORSA) have used these incentives to develop new technologies for the production of seedlings, nursery establishment, implementation of reforestation techniques, development of forest management and promotion of agroforestry systems (Méndez & Salazar, 2010).

Furthermore, the PES program has motivated the development of complementary conservation actions; for example, in October 2010, FUNDECOR created a trust to fund the protection of 2,258 ha in 28 farms in Sarapiquí. Through this initiative, the producer would receive US\$58 per ha/year (MINAE-FONAFIFO, 2012).



### **Support to improving quality of life for rural areas and indigenous communities**

In general, PES-supported reforestation projects are smaller than 30 ha. This means that most participants are small and medium landowners; some possess only one hectare of forest but they are beneficiaries nonetheless, indicating a fair and equitable distribution of the program's resources (FONAFIFO, 2005 Méndez & Salazar, 2010).

Although PES were not designed to resolve poverty or wealth distribution problems, the incentive mechanism does supply social benefits in rural areas that have low Socioeconomic Development Indices (SDI), one of the criteria for assigning benefits.

One example of this is the participation of indigenous communities throughout the country (Fig. 6). Indigenous territories are relevant in the PES program because they represent 7% of the country's area, equivalent to more than 350,000 ha, of which almost 70% has forest cover (MINAE-FONAFIFO, 2012).

Between 1997 and 2011, more than 86,000 ha of indigenous territories were covered by the PES program under the concept of protection, reforestation and natural regeneration, with a clear emphasis on protection (97%). The amount awarded was over US\$19 million in 14 years, with an average of US\$1.3 million per year (<http://www.fonafifo.go.cr>). The use that the beneficiaries give to these resources is varied and highly significant, since in some cases this is the only income received by owners of the forests under protection.

PES benefits are both social and ecological in nature, since 97% are allocated for forest protection and most of the area in indigenous territories is adjacent to or near protected areas where the last remnants of large size forests within and outside of protected areas. The forests in these we find the indigenous territories area contiguous with some of the country's most extensive Protected Wilderness Areas (PWA).

### PES as a development tool for indigenous territories

The indigenous people of Costa Rica are concentrated in 24 territories covering 334,447 hectares. One noteworthy ethnic group is the Bribri-Cabécar people in the Talamanca Cordillera, in the southern part of the country, who possess 264,889 hectares covering almost 80% of the total indigenous land area of Costa Rica. According to the MIDEPLAN (2007) System of Indicators for Sustainable Development (SIDES), Talamanca was ranked the poorest district in the country with a social development index (IDS) of zero.

The Cabécar ethnic group's territory in the Talamanca region is part of the buffer zone of the Hitoy-Cerere Biological Reserve and La Amistad International Park, which is the largest protected wilderness area in Costa Rica. The economic impact of PES on this indigenous group was analyzed for 2007 to 2011. The study estimated that over a period of five years, the group was paid nearly US\$1 million per year, funds that were administered by the Integral Development Association of the Cabécar Indigenous Territory (ADITICA), an autochthonous governance structure that received PES funds for 3,600 hectares of forest.

These resources, which accounted for 80% of ADITICA funds during this period, contributed to the welfare of 10 communities. The funds were used to develop management skills among community leaders. PES resources were also used for negotiations with public and private entities, the creation of medical centers, improvement of access to bilingual education (Cabécar-Spanish), training, scholarships and legal advice for safeguarding rights, and more. The funds also enabled improvements to water supply infrastructure, schools, roads and houses. And some of the funds were reinvested to pay for forest monitoring and the identification of potential threats such as illegal logging and hunting.

Like the Cabécar Indigenous Territory, the indigenous territories of Telire and Taynín receive PES. These territories are also part of the area neighboring the Hitoy-Cerere Biological Reserve and La Amistad International Park (LAIP) in Talamanca. Telire is in a nearly inaccessible area and it is the least developed of all the indigenous territories of the country.

Not only are PES contributions significant economic inputs for the community of Telire, they are the only ones. In general, the Indigenous Development Associations (IDA) have invested these resources in development projects such as community halls, school infrastructure, aqueducts for schools, roads, wages for resource guards, forest monitoring and prevention of threats to conservation, in addition to the payment of allowances and per diems for managers, administrative staff salaries, and investments in small production projects (Borge & Amador, 2012).

A study by Perez and Herrera (2012) provides a socioeconomic and environmental indicator tool that shows when an Association receiving PES resources is organized and has a sense of community, it tends to invest income in its own socioeconomic development; thus the decision of the indigenous territories to protect their forests for environmental services has become a tool for improving their living conditions, with an impact that directly benefits Costa Rican society and the planet.

Source: Herrera & Pérez, 2012. Taken from: Presidency of the Republic of Costa Rica et al., 2012 and MINAE-FONAFIFO, 2012.



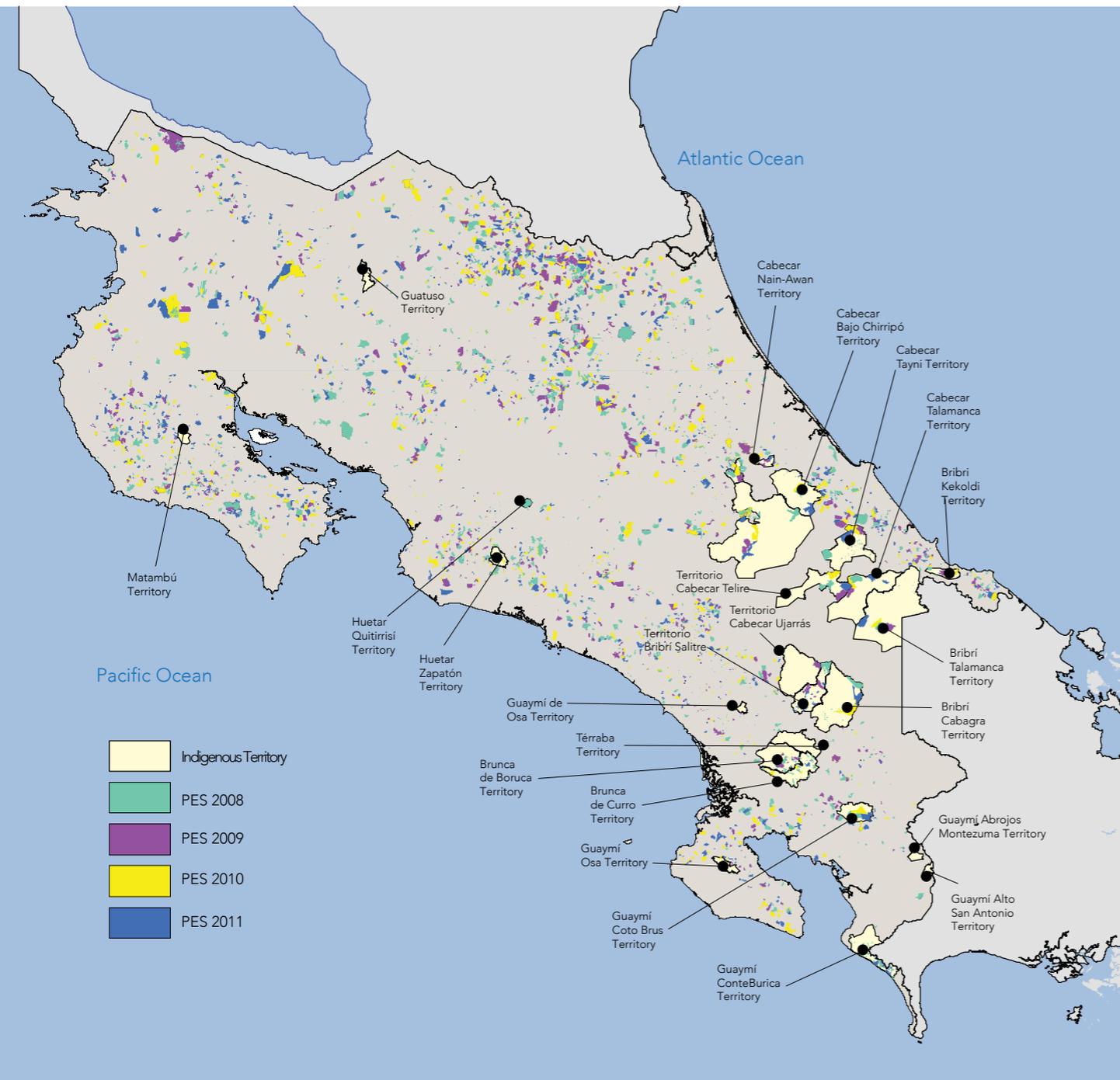


Figure 4. The PES program in the indigenous territories, 2008-2011.  
Source: Prepared using data provided by FONAFIFO, 2012.

From 2007 to 2011, around US\$3 million were awarded annually to indigenous territories by the PES program, equivalent to nearly 12% of FONAFIFO's annual budget. In return, the indigenous people protected more than 41,000 ha of forest, corresponding to 21% of the total hectares in the program for the given period (MINAE-FONAFIFO, 2012).

PES processes have also strengthened the advocacy capacity of the organized indigenous groups and they have managed to create a national organizational structure that will enable them to participate actively in REDD+ decision making, taking information back to their grassroots groups. These groups have gained a seat at the negotiating table for the REDD+ strategy (MINAE-FONAFIFO, 2012).

#### Agreements with NGOs and promotion of eco-competitive businesses to finance PES

In order to implement Corporate Social Responsibility (CSR) initiatives, many organizations use PES as a compensatory mechanism for greenhouse gas emissions or intensive water use. As a result, FONAFIFO received US\$10 million in 2011 from agreements signed with the public and private sectors. Some of these resources came from productive initiatives such as electricity generation and agriculture, which made use of the ESC modality (Table 4) (MINAE-FONAFIFO, 2012, Presidency of the Republic of Costa Rica et al., 2012).

Other income came from donations and the sale of services for the mitigation of carbon footprints due to emissions generated by the mobilization of land and air transport (MINAE-FONAFIFO, 2012; Presidency of the Republic of Costa Rica et al., 2012).

Table 4. Income for FONAFIFO received from agreements, exchanges or sales of PES, 2007-2011.

Year	Number of businesses	Amount in thousands of dollars	Annual average in thousands of dollars per agreement
2007	12	468	39
2008	8	104	13
2009	14	262	18.7
2010	13	368	28.3
2011	9	132	14.6

Source: Presidency of the Republic of Costa Rica et al., 2012.

Table 5. Hectares benefited by PES in biological corridors, conservation gaps, PWAs and indigenous territories, 2008-2011.

Year of assignment	Total hectares assigned	Hectares in biological corridors	%	Hectares in conservation gaps	%	Hectares in indigenous territories	%	Hectares in PWA	%
2008	69,880.3	45,121.2	64.57	41,097.5	58.81	18,581.7	26.59	33,505.8	47.95
2009	62,031.2	40,245.6	64.88	39,558.6	63.77	635,265	1.02	32,817.2	52.9
2010	66,650.3	46,198.3	69.31	39,284.5	58.94	11,272.2	16.91	40,502.0	60.77
2011	67,430.7	41,261.6	61.19	33,828.4	50.17	14,204.7	21.07	30,760.9	45.62

Source: Prepared using data provided by FONAFIFO, 2012. Note: There is overlap because PES zones found in a biological corridor might also be within a conservation gap or indigenous territory.

### Support for the strengthening of biological corridors and protected wilderness areas

The PES approach is an effective tool for meeting the conservation objectives of natural areas that have no protection regimen, such as biological corridors, private reserves and water protection zones.

Biological corridors are designed according to their potential to connect natural areas. Once a biological corridor is made official, private landowners within or near the corridor have met one of the criteria for becoming PES beneficiaries (Table 5).

This way, PES take on special relevance as a unifying element for the development of biological corridors to establish connectivity between PWAs (MINAE-FONAFIFO, 2012).

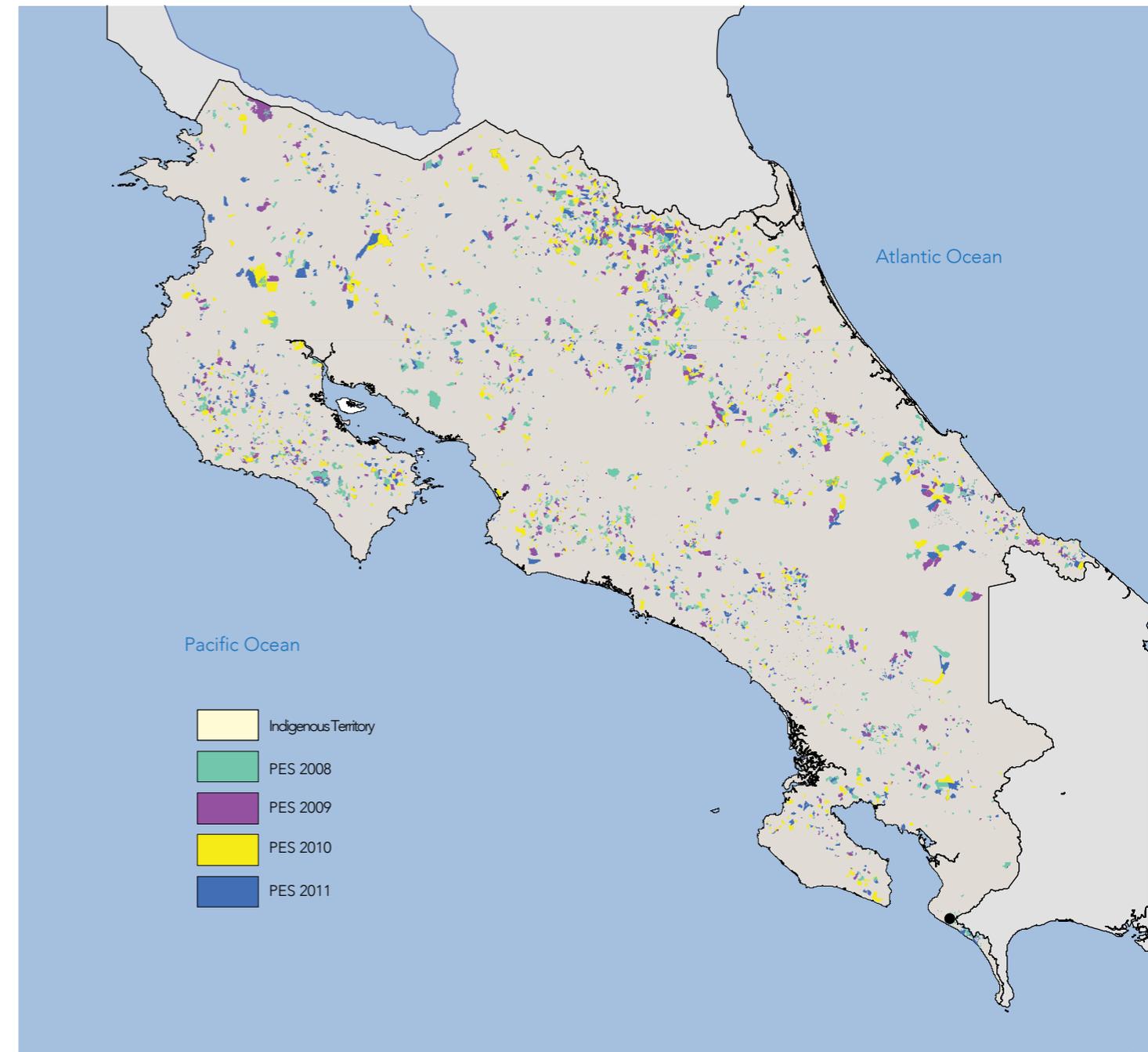
By 2005, about 270,000 ha were under some modality for protection included in PES and approximately 1.3 million ha were in PWAs (647,000 in national parks and biological reserves). An average of around 34,000 ha in PWAs per year were subject to PES between 2008 and 2011 (Table 5). This is evidence of the contribution that the program has provided to the strengthening of PWAs, mainly in cases where farms of importance due to their location within PWAs or adjacent areas could not be expropriated, and they maintain their private status; this makes incentives for the recognition of conservation and the protection of their resources necessary in order to maintain connectivity and/or environmental resources (MINAE-FONAFIFO, 2012).

Due to the importance of complementarity between the PES program and the strengthening of biological corridors, private reserves and PWAs, Chapter IV addresses this issue in more detail.

### PES in figures

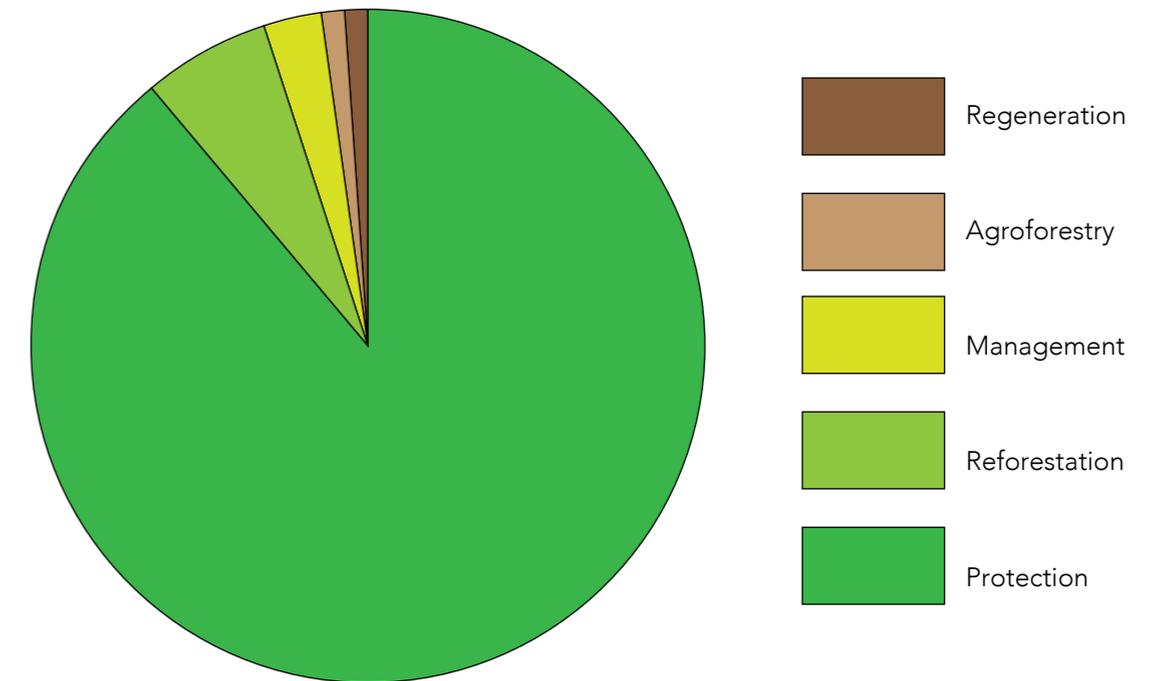
PES have been distributed throughout the country (Fig. 5), however, demand for them is still greater than the available supply given current resource levels (Barrantes, 2000, Porras et al., 2012a, b). The figures are given below.

- Between 1997 and 2008, FONAFIFO distributed more than US\$200 million in PES to corporations (40%), individuals (31%), global contracts (14% valid until 2002), indigenous groups (11%) and associations (4%) (MINAE-FONAFIFO, 2012).
- By 2012, PES covered almost 900,000 ha or 16% of the country's surface area (Table 6). Of this area, 89% is dedicated to forest protection (Table 6, Fig. 6).
- More than four million trees have been planted in agroforestry systems (Table 6) (MINAE-FONAFIFO, 2012).



**Figure 5.** Distribution of PES in Costa Rica, 2008-2011.  
Source: Prepared using data provided by FONAFIFO, 2012.

- By 2012, more than 11,000 forest owners, mainly small and medium-size producers, farmers, indigenous people, projects, companies and cooperatives have benefited from PES and forestry credits countrywide (Méndez & Salazar, 2010; MINAE-FONAFIFO 2012) (Table 6). In the case of the indigenous territories, a contract benefitted several communities and thus several families because the land is communally owned.
- Between 2007 and 2011, indigenous territories were awarded nearly US\$3 million annually in PES; this is 12% of FONAFIFO's annual budget (Presidency of the Republic of Costa Rica et al., 2012).
- According to Costa Rica's National Weather Institute, between 1999 and 2005, PES prevented the deforestation of 108,000 ha, of which 72,000 (67%) are of high value for biodiversity conservation and 37,000 (34%) are of high value for the protection and supply of potable water (MINAE-FONAFIFO, 2012).



**Figure 6.** Percent distribution of the number of hectares by PES modality, 1997-2010. Source: FONAFIFO, 2012b, MINAE-FONAFIFO, 2012.

Table 6. Distribution of hectares contracted in PES. Total for the period 1997-2011.

Forest protection	Forest management	Reforestation	Established plantations	Natural regeneration	Total hectares	Agroforestry systems (# of trees)	Number of contracts
776,063.00	28,854.30	53,156.20	1,248.00	7,779.00	867,100.50	4,107,556.00	11,378.00

Source: Department of Environmental Services Management, WEB-SIAP Reports. <http://www.fonafifo.go.cr> (2011.pdf). Cutoff date August 16, 2012.

### **PES: Lessons and challenges from an experience to share**

The PES program, as a globally pioneering effort, has been the object of study both within and outside the country. The approach has proven its ability to adapt and generate new sources of revenue.

This financial success could be explained several ways. These will be described below, based on FONAFIFO et al., 2012; FONAFIFO, 2012b; Barrantes, 2000; Porras et al., 2012b; MINAE-FONAFIFO, 2012 and Presidency of the Republic of Costa Rica et al., 2012:

- It provides a transparent and highly effective approach based on a solid and creative legal and financial framework with clear rules and high adaptability (Porras et al., 2012b).
- It has successfully integrated sources of income at several levels to grow the fund.
- It has consolidated the commitment of the participants and beneficiaries, businesses as well as communities and individuals, to conserve forests and natural areas.
- The management approach developed is clearly defined.
- Administrative processes for expenditures are transparent and there is effective monitoring and control of areas under protection.





However, PES has had to face several challenges during implementation. The identification of such challenges has helped to clarify areas for improvement, which eventually may be strengthened in order to enhance the experience. Some of these challenges are:

- Several authors indicate the need to conduct impact assessments to eliminate biases, particularly those related to factors affecting indicators of forest coverage and quality, in a way that would make the identification of the real and direct benefits of PES clearer (Arriagada 2008; Pfaff et al., 2008; Robalino et al., 2008a; and Sills et al., 2008; among others; MINAE-FONAFIFO, 2012). This is a significant challenge due to the cost involved in collecting biophysical, economic and social data from the intervention group and the control group, which would have to be covered by PES contracting parties as well as by FONAFIFO. For this reason, it has been understood that a tool for the periodic assessment of impact should be an integral part of the institution's normal monitoring system, in order to avoid duplication in data collection and redundancy in monitoring (MINAE-FONAFIFO, 2012).
- Financial sustainability. The asymmetry between rising demand and insufficient funds to cover PES puts the government of Costa Rica at a crossroads for providing lasting support to participants. This reveals the need for a long-term model to ensure the sustainability of the system, which can be achieved largely by promoting the Fund for Sustainable Biodiversity (FBS).
- Diversification of funding sources. Fund injection mechanisms must be established to ensure the long-term adoption of conservation activities. Once the PES contract expires, the conservation of natural areas is heavily dependent on contract renewal. This limitation is one that could be resolved through the time horizon of the FBS.

- The PES program is under strong pressure and social responsibility because it must demonstrate that the remuneration afforded to forest owners is comparable to the social and environmental wellbeing received for the conserved areas. For example, in the case of water resources, the criteria for the prioritization of the areas to receive PES must be better defined. Currently, according to Decree No. 36935-MINAET, the placement of contracts for the protection of hydrologically important areas represents only 7% of the total demand in hectares (MINAE-FONAFIFO, 2012).
- The financial sustainability of the program does not depend solely on the existence of economic resources; it also relies on society's legitimate interest in conservation. It is therefore very important that decision-makers trust in the positive social impact of supporting the provision of environmental services. For this reason, the program's trend has been to strengthen scientific and technical knowledge and to establish and strengthen partnerships with diverse social, public and private sectors.

The FONAFIFO Strategic Plan 2013-2021 includes the objective of having a Payment for Environmental Services Program that would increasingly contribute to the generation of services from ecosystems. One challenge for the coming years is the development of schemes that continue to contribute to the achievement of a green economy. Toward this end, efforts will be made to implement PES schemes that facilitate the creation of integrated farms and the development of a holistic vision in production (MINAE-FONAFIFO, 2012).



## CHAPTER II: THE FUND FOR SUSTAINABLE BIODIVERSITY: AN INNOVATIVE TOOL FOR CONSERVATION

### Executive summary

The Fund for Sustainable Biodiversity (FBS) is an evolutionary leap from traditional PES, which takes the conceptual basis and the experience gained over years of work and identifies strengths and areas for improvement, in order to formulate a robust proposal for a more stable conservation tool that focuses on benefits for ecosystems that provide environmental goods and services.

The FBS more accurately focuses on the conservation of areas that are significant for their biodiversity potential as well as their ability to enhance the connectivity of forests and PWA segments.

Moreover, the FBS also has the ability to provide greater stability and conditions for monitoring impacts due to its long-term vision, posing contracts for the conservation of forest areas for up to 20 years. This way the FBS aims to become an alternative for social welfare and development for smallholders and indigenous communities, which receive far more stable remuneration for their commitment to conserve highly relevant ecosystems. It is for this reason that the Fund's priority falls on private areas within biological corridors and

indigenous territories with high levels of biodiversity, whose priority status was established by taking into account criteria set by technical institutions such as SINAC.

The slogan "Biodiversity and Society allied forever" summarizes how FONAFIFO, through the FBS, seeks funding to mobilize the conservation of key or priority areas for the long term. To achieve this goal, an endowment fund mechanism has been developed, with institutional autonomy and capacity to inject funds into forest conservation.

In this effort, the FBS has been accompanied by a number of allies and strategic partners from international cooperation, non-governmental organizations (NGOs), state institutions and financial entities, which have not only recognized the importance of contributing to this conservation objective, they also support the fund to ensure transparent management of the funds raised, thanks to a mixed oversight structure that characterizes the operational mechanism of the trust that grows the FBS.

## CONSERVING BIODIVERSITY: AN FBS IMPERATIVE

Biodiversity is much more than all the forms of life on Earth; it is the foundation that supports the continuity of existence. Its endless interactions form a single network upon which human beings depend; not only is protecting it an ethical imperative, it is a rational act.

When ecosystems are healthy, they are able to adapt to change and continue to provide services that contribute to human welfare. Under the slogan "Biodiversity and Society allied forever," the FBS seeks to fulfill the mission of contributing to the protection of ecosystems in a comprehensive manner.

### **Reasons to support the Fund for Sustainable Biodiversity**

With the slogan "Biodiversity and Society allied forever," the FBS is a novel and advanced idea in a field where the country has distinguished itself as a pioneer and leader: the creation of innovative measures and mechanisms associated with the conservation and sustainable use of biodiversity. Investing in the FBS means investing in Payments for Environmental Services, an effort by a nation that has more than 15 years of experience in conservation action and that has evolved at the pace of the conservation needs of Costa Rica and the world.





In a broad sense, ecosystems provide services to human societies: security, physical and mental health, social relationships and access to basic material goods (WRI, 2003). Each time some element of biodiversity is removed, the capacity of ecosystems to recover and continue providing their services is reduced. In Costa Rica, the 1996 Forestry Law (No. 7575) defines these services as those provided by forests and forest plantations that directly affect the protection and improvement of the environment and for the purposes of the PES program the law recognizes the following benefits: mitigation of greenhouse gas emissions (carbon fixation, reduction, sequestration, storage and absorption), protection of water for urban, rural or hydroelectric use, protection of biodiversity to conserve and make sustainable use of it through science and pharmaceuticals, research and genetic enhancement, protection of ecosystems and life forms, and natural scenic beauty for tourism and research.

The agents or drivers of change that cause the loss of biodiversity may be indirect, such as demographic, economic, scientific and cultural factors; or direct as in changes in land use and plant cover, the introduction and elimination of species, the use of technologies and external inputs that are harmful to the environment, as well as the overexploitation of natural resources.

Today, climate change is the most powerful driver of changes that affect the loss of biodiversity.

One of the most important drivers of change is climate change, originating from the consumption of fossil fuels that give off greenhouse gases. Confronting climate change is an unprecedented challenge due to the speed at which alterations are occurring and reducing displacement options for plants and animals.

However, in this context of environmental degradation, biodiversity is offered as a response for human intervention in order to mitigate<sup>8</sup> or reduce pressure on the climate system, and while this pressure decreases, to adapt or adjust natural systems or societies to climate change,<sup>9</sup> so long as the right strategies are used to encourage their conservation and the equilibrium of the environmental setting.

<sup>8</sup> Mitigation: An anthropogenic intervention to reduce anthropogenic forcing of the climate system. It encompasses various strategies to reduce greenhouse gas sources and emissions and to enhance their carbon sinks (IPCC, 2007).

<sup>9</sup> Adaptation: Adjustment of natural or human systems in response to actual or expected climatic stimuli or their effects that moderate harm or exploit beneficial opportunities (IPCC, 2007).



Conservation and the increase in forest cover is an effort that fosters resilience, defined as the ability of an ecosystem to return to its pre-disturbance status while maintaining its essential characteristics of taxonomic composition, structures, functions and processes (Thompson et al., 2009). Thus, through the protection and restoration of forest sections the treasure trove of biodiversity is safeguarded. This is why the FBS seeks to fulfill its ethical imperative to conserve, protect and restore the delicate web that sustains present and future life.

In its constant search for new ways to fund the cost involved in conserving forests and their associated biodiversity, FONAFIFO, through the PES program, achieved the approval of the Ecomarkets II Law, which gave life to the FBS.

What the FBS seeks is long-term funding for conservation in areas that are crucial or prioritized due to their rich biodiversity and privileged position for connecting portions of forest in biological corridors that increase ecosystem resilience.

The FBS implies an evolutionary step within the context of the PES program, since it offers dynamism, opportunities for technical and scientific improvement, and a more focused approach to positively impact areas of particular interest to conservation, as well as better identified social groups.

The FBS also expands the potential for PES projects to reach a greater number of landowners due to its long-term vision, since it provides better contractual terms for forest owners, which makes the PES model even more stable and much more suitable for estimating the actual impacts of its implementation.

## NATURE AND SCOPE OF THE FBS

The parameters for selecting natural areas that can be submitted to the FBS coincide with the criteria defined for the assignment of PES. Some are related to capacity to protect aquifer recharge areas, the potential for connecting patches of forest or PWAs, or satisfying the conservation needs of species of relevant importance, conservation in areas belonging to indigenous territories, and even values associated with financial support to landowners with areas smaller than 50 ha in districts with low development indices.

However, the innovative aspect of the FBS is in its temporal approach and scope. The FBS will use yields from capital assets to finance, for a term of 20 years or more, the transfer of economic incentives for conservation in sites that show attributes of high socioeconomic vulnerability and a high level of biodiversity (Fig. 7).

The long-term concept is crucial to the FBS, not just for ensuring the availability of funds to make payments but, above all, so that these payments can go on for more than 20 years.

Thus the FBS goes well beyond the horizon of 5 or 10 years traditionally applied to other PES approaches. To achieve this, the FBS has more flexible financial instruments that give small forest owners and indigenous communities access to financial transfers that previously they had no possibility of requesting due to formal reasons related to the assignment of conventional PES.

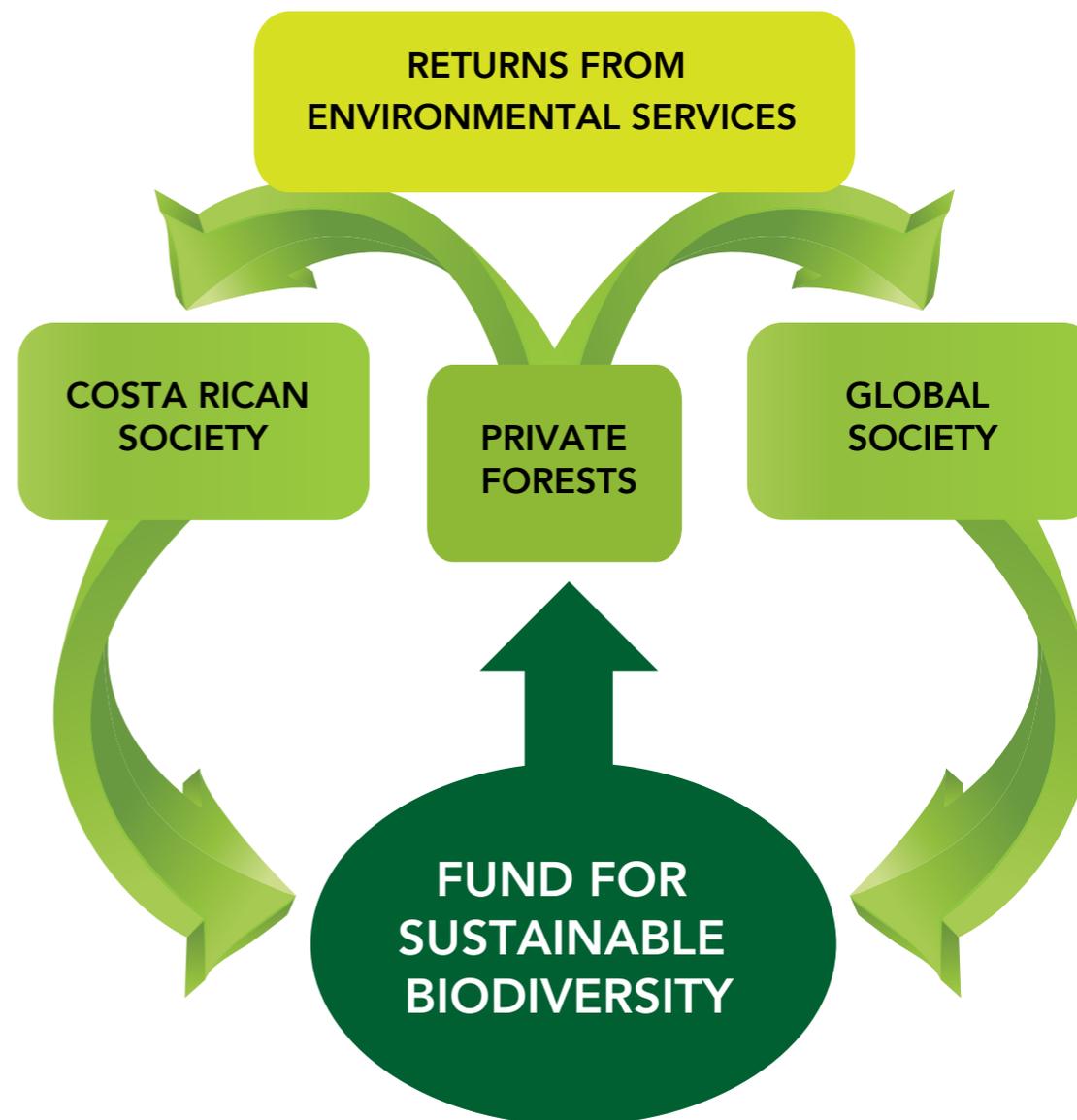


Figure 7. General scheme of FBS operation. Prepared using information from FONAFIFO, 2013.



## FBS IN A NUTSHELL

### Operating mechanism

The FBS is an endowment mechanism with institutional autonomy, which injects funds to sustain the PES program for the long term in areas with high biodiversity. Under a trust structure, it adheres to the state banking system through the *Banco Nacional de Costa Rica*.

### FBS objectives

Generally, the FBS aims to preserve environmental services from forest ecosystems of national and global relevance. To achieve this goal, new economic incentive schemes will be developed in order to fund the recognition of those services for the long term.

### FBS partners and administrative structure

The FBS has a number of strategic partners, namely: The Germany Government through the Credit Bank for Reconstruction (KfW), the Global Environmental Facility (GEF), and the NGOs Conservation International (CI), The Nature Conservancy (TNC), Conservación Osa and the FONAFIFO's Employees Association.

The operational structure for the development,

implementation and oversight of the FBS consists of:

- The Environmental Bank Foundation (FUNBAM), created by law to support the FBS exclusively as a trustee.
- The *Banco Nacional de Costa Rica*, which is involved as a trustee.
- FONAFIFO and its beneficiaries are trustees.
- The operational bodies, consisting of a Special Committee, a Cooperating Council and the Executive Secretariat.

FUNBAM's function is to manage US\$7.5 million donated by the GEF to the country as counterpart to the FBS. To this amount is added a contract that KfW made with FUNBAM in 2010 for the donation of 6 million euros, a donation from Conservation International for US\$0.5 million and another for the NGO *Conservación Osa* of \$0.5 million.

Strategic allies and other committees of the FBS form a joint oversight structure that ensures transparency and effective resource management.

FUNBAM therefore has the power to support conservation activities for national and international ecosystems, for which it can conduct any kind of transaction or financial management and disposition process, capitalization and fundraising in the context of the FBS mechanism.

The group of partners and stakeholders participating in the trust has enabled the development of a mixed oversight structure with public and civil society representatives to facilitate transparency and accountability.



Moreover, the FBS is associated with the Conservation Finance Alliance (CFA) and in the near future it will join the Network of Environmental Funds for Latin America and the Caribbean (RedLAC), which provides technical and financial support to environmental funds through tools, training and technical support.

The returns obtained through the management of the FBS are only used to finance PES economic transfers to small forest owner beneficiaries of the Fund.

Some parameters for estimating the progress of the FBS are: the increase in the number of hectares with PES contracts, the increase in carbon dioxide sequestered, financial returns equal to or greater than 5% per year, the proper implementation of existing financial mechanisms, and the development of other innovative fundraising approaches.

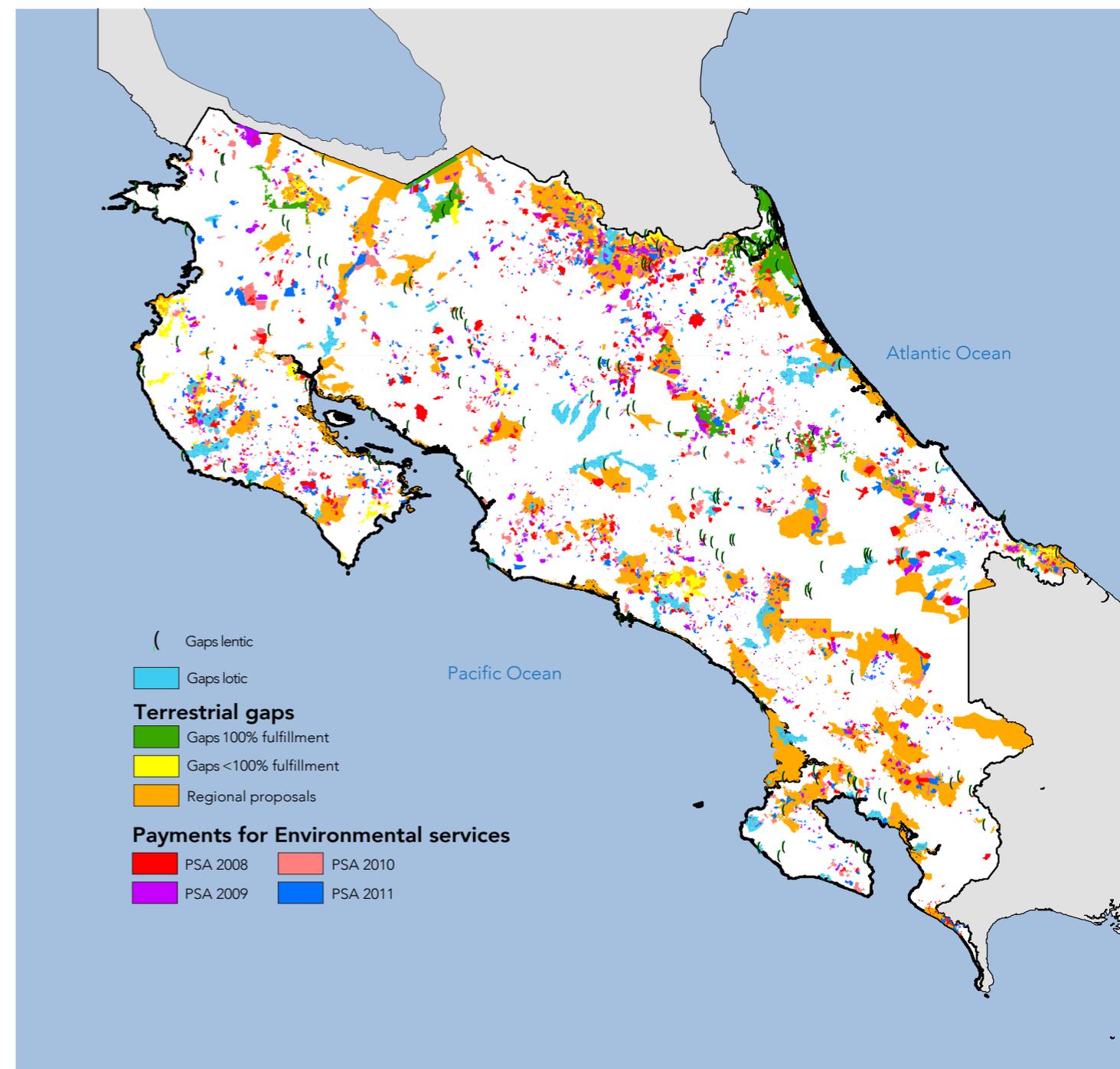
### Investment priorities

FBS's priority lies in the private areas within biological corridors and indigenous territories with high levels of biodiversity, as defined by the Fund's Special Committee. This prioritization is based on sites with conservation gaps defined by SINAC<sup>10</sup> (Fig. 8). The protection of small tracts of forests is key because they can provide connectivity between large, established protected areas.

### FBS beneficiaries

Private forest owners and the indigenous communities living in areas with low indices of development are the main beneficiaries of the FBS. These groups, which for formal reasons could not access traditional PES benefits, are now able to access mechanisms that are more inclusive and flexible and, above all, more focused on meeting the conservation needs of socially deprived areas with high ecological value.

10. Ecosystems that are not represented in the established protected wilderness areas. These were defined through the project for The Territorial Management System for Biodiversity Conservation, known as GRUAS II.



**Figure 8.** The PES program and the conservation gaps identified for the country. Source: Prepared using data provided by FONAFIFO, 2012.



### The goal of FBS

To protect the biodiversity found in prioritized sites for the long term, the goal of the FBS is to create an endowment of US\$100 million by 2021. This is expected to have a major impact on the biological corridors where payments are awarded, in places that will interconnect existing forested areas.

### Additional financial mechanisms

The funds for the FBS come from donations and the purchase of specific products by public and private sectors, NGOs and society in general. For its part, FONAFIFO made a commitment to help raise additional funds for the FBS. In addition to the many negotiations to obtain funds from international cooperation sources, they have also developed specific deposit products that include:

1. **The Servibanca Green debit card:** This is a tool whereby the Banco Nacional de Costa Rica donates 10% of transaction commissions from using the card to the FBS. This mechanism has been operating since 2010 with great success.
2. **Ecological Vehicle Registration:** This is a financial mechanism aimed at owners of private vehicles, which offers the option of fully offsetting 100% of greenhouse gas emissions. A percentage of the emissions is already offset by the payment that each citizen makes through the fuel tax.

Funds derived from the application and marketing of the two products are automatically and immediately credited to the FBS.

## CHAPTER III: ABOUT COSTA RICA: THE COUNTRY THAT MADE PES A REALITY

### Executive summary

Rated a middle income country for international cooperation purposes, Costa Rica is a nation whose wellbeing is the product of a consolidated social welfare state and in recent years, it has tended to not be reliant on additional funds in order to conserve its natural resources. Thanks to a series of social and economic policies, the country has achieved a level of development that, while not exempt from challenges, aims for a prosperity framed in a peaceful setting that aspires to continue enjoying the services provided by its ecosystems.

Costa Rica's exceptional biodiversity makes it one of the nations with perhaps the largest number of species per square meter in the world. For this reason, the country endeavors to create the institutional and regulatory conditions needed to ensure the conservation of its natural resources. This is evident in the creation of a protected areas system and the PES program.

However, these advances do not make the country immune to global trends in species decline and ecosystem loss. Providing PES over the long term through the FBS is one way to diminish the impact of the drivers of environmental degradation that are leading to the loss of its biodiversity.

### The path toward an investment in life and social welfare





The Costa Rican population in general feels satisfied with the social, economic and environmental achievements attained by the country since the mid-twentieth century.

It is no coincidence that Costa Rica is considered a middle income country, as reflected in the reduction of non-reimbursable funding from international cooperation during the last decade.

This is why seeking new ways to fund conservation and the sustainable use of biodiversity, as well as efforts to establish mechanisms like PES to safeguard natural capital, are a priority for the country.

Socioeconomic and environmental indicators give the country a privileged position with respect to its neighbors in the Latin America region and in some cases beyond.

However, in order to understand Costa Rica, the country has to be analyzed from diverse points of view, ranging from the geographic to the social.

Costa Rica is a Central American country with a land area of 51,000 km<sup>2</sup>. Several mountain ranges cross its territory, fostering an enormous variety of climates and microclimates in a relatively small space.

These variations make the country a location with extremely high biodiversity. In just a few hours of travel one can see the many ecosystems and landscapes

Costa Rica is a country with democratic and pacifist traditions, which abolished its army in 1948. Since then it has invested its resources in education and health.

that today make Costa Rica a popular tourism destination, a feature that has been exploited to offer a wide range of alternatives for ecological and community-based tourism.

Despite the wide variety of ecosystems and landscapes that Costa Ricans can access, the population has historically been concentrated within the limits of the Greater Metropolitan Area (GMA). In numerical terms, 60% of its 4.6 million inhabitants live in barely 3.8% of the national land area.

The influence of a series of social policies established in the last 60 years, including the abolition of the army, means that Costa Rica today has one of the strongest democratic regimes in the Americas and it has managed to maintain political stability throughout its recent history. This aspect has generally placed Costa Rica in a competitive position in terms of its socioeconomic indicators, which in some cases are similar to those of developed nations.

### Health, education and poverty

Costa Rica is a country committed to peace, which decided to eliminate its army in 1948 to invest in education and health instead.

These two sectors continue to show growth, despite the contraction of the State due to the global crisis (CONARE, 2011).

Education is free, mandatory and universal for children and adolescents. Literacy rates are high among youth and adult populations (above 92%)

Most of Costa Rica's population has access to social security and drinking water.



(MIDEPLAN, 2009). The country has maintained a net enrollment rate in primary education (children 7 to 12 years of age) of nearly 100% from 1990 to 2008.

Costa Rica is one of the few countries in the region that continues to invest in the creation of primary and secondary schools. Also outstanding is the high level of social security coverage, since 70% of the economically active population contributes to the social security system (CCSS) (CONARE, 2011).

Regarding access to drinking water, the percentage of the population that enjoys this service has risen significantly since 1991, from 50% to 81.2% in 2006, 82.0% in 2007 and 83.4% in 2008 (MIDEPLAN,2009). By 2010, 89.5% of the population had access to this resource, representing the highest percentage in Latin America under this heading in that year (CONARE, 2011).

## Economy and production

In recent decades, the country has diversified its productive base with the expansion of high technology industries and the deepening of its openness to international trade.

Costa Rica is one of the countries in Latin American with the least inequality in income distribution.

The orientation of trade policy has helped make the Costa Rican economy one of the most open in Latin America and it has turned the country into one of the main destinations for direct foreign investment per capita in the region.

At present, the Costa Rican economy grows at around 4% per year. The Gross Domestic Product (GDP) per capita shows a rising trend and for 2011 it reached US\$8,884 (<http://indicadoreseconomicos.bccr.fi.cr>).

In 2010 inflation stood between 4% and 9%, historically low levels since the average for the last decade was around 10% (CONARE, 2011).

Low inflation, high diversification of the productive base and increasing openness to international trade are traits that characterize of Costa Rica.

In 2010, the work force was 2,057,902 people, approximately 45% of the population. By 2012, it was reported that nearly 150,000 people more had joined the work force. Of this group, the private sector employs 1,621,000 people, corresponding to 78% of the country's workers (CONARE, 2011).

Table 7, using a series of socioeconomic and environmental indicators, shows the positions that Costa Rica holds in comparison with the Latin American region and the rest of the world.

Table 7. Summary of some socioeconomic and environmental indicators for Costa Rica in comparison with Latin America and the Caribbean (LAC) and the world.

Indicator (to 2010)	Costa Rica	Position in relation to other countries
Human Development Index (HDI)	0.725	8 in LAC, 62 in the world, for 169 countries
HPI (Human Poverty Index) <sup>1</sup>	3.7	4 in LAC, 11 in the world, for 135 countries
Index of Economic Freedom	65.9	9 in LAC, 54 in the world, for 179 countries
Environmental Performance Index (EPI)	86.4	1 in LAC and 3 in the world, for 163 countries
Ecological Footprint Index	2.69	14 in LAC and 62 in the world, for 152 countries
Support for democracy	72	3 in LAC, for 18 countries
Satisfaction with democracy	61	2 in LAC, for 18 countries

Source: CONARE, 2011. XVII State of the Nation Report. State of the Nation Program. Statistics. <http://www.estadonacion.or.cr/>

During the presidential administrations of 2006-2010 and 2010-2014, the government took on the challenge of making the country carbon neutral<sup>11</sup> by 2021. This has involved an enormous national effort to fix and sequester more carbon through the implementation of best practices in the private and public sectors, as well as the maintenance and planting of millions of trees, strengthening protected areas, private reserves and biological corridors, and raising environmental awareness.

## BETWEEN SOCIAL WELFARE AND BIODIVERSITY CONSERVATION

The social and economic achievements of Costa Rica would be incomplete without the possibility of conserving the ecosystems that provide environmental goods and services.

This is how the protection of biodiversity as a support for social welfare has become a strategic task for the country, since natural area conservation is the most effective way to achieve this objective.

Throughout years of work Costa Rica has created protected wilderness areas while simultaneously developing environmental legislation, strengthening its institutional framework and creating inter-sectoral efforts to support conservation action.

<sup>11</sup> Carbon neutral: This is a status whereby unavoidable carbon emissions to the atmosphere are minimized and offset (IPCC, 2007).



In this context, PES constitute a major effort that integrates achievements in environmental matters and engages the owners of forested areas in creating conditions for connecting protected natural areas and creating biological corridors that increase ecosystem resilience.



## COSTA RICA: A NATURAL TREASURE

Costa Rica is one of the world's twenty most biodiverse countries (Table 8). It is estimated to have nearly half a million species, representing 3.6% of the planet's biodiversity with close to 14 million species. However, the distinctiveness of the country does not lie in the total number of described species recorded but in their density (Fig. 9), meaning the number of species per unit area. In this category, Costa Rica surpasses all the megadiverse nations<sup>12</sup> (Table 8).

Costa Rica is also the country that houses the highest freshwater diversity in the mountain sub-systems of Central America.

Its tropical location between two continental land masses, with its varied marine and terrestrial geography, diverse climate conditions, and extensive system of rivers and lakes, foster conditions for the development of major biodiversity despite its small size.

Advances in research have revealed more than 91% of the vertebrate species and plants that inhabit Costa Rica (Obando et al., 2012). The challenge is to learn about new species, primarily invertebrates, fungi and microorganisms, which have enormous diversity that is still undiscovered (Obando, 2007, SINAC, 2009).

<sup>12</sup> Megadiverse countries: This is a set of countries that house more than 70% of the planet's biodiversity and whose area covers 10% of the Earth's surface (WCMC, 2001). They are Australia, Brazil, Colombia, China, Ecuador, the United States, India, Indonesia, Madagascar, Mexico, Peru, and the Republic of Congo (Mittermeier and Goettsch, 1992, in Obando, 2002). The list was expanded in 2001 by UNDP's World Conservation Monitoring Center (WCMC) to 17 countries with Venezuela, Papua New Guinea, the Philippines, Malaysia and South Africa.

Table 8. Absolute amounts and densities of vascular plant, bird, reptile, mammal and amphibian species per 1,000 km<sup>2</sup> for Costa Rica and five megadiverse countries.

Country	Values (density/1,000 km <sup>2</sup> )	Vascular plants	Birds	Reptiles	Mammals	Amphibians	Area (km <sup>2</sup> )
Costa Rica <sup>1</sup>	Absolute number	11,535	903	239	236	200	51,100
	Density	204.5	17.5	4.5	4.6	3.8	
Mexico <sup>2</sup>	Absolute number	25,008	1,096	804	535	361	1,972,547
	Density	12.7	0.6	0.4	0.3	0.2	
Colombia <sup>3</sup>	Absolute number	26,000	1,885	524	479	763	1,141,748
	Density	22.8	1.7	0.5	0.4	0.7	
Brazil <sup>4</sup>	Absolute number	28,066	1,825	721	658	877	8,511,965
	Density	3.3	0.2	0.1	0.1	0.1	
Indonesia <sup>5</sup>	Absolute number	31,746	1,595	781	515	363	1,919,270
	Density	16.5	0.8	0.4	0.3	0.2	
Australia <sup>6</sup>	Absolute number	19,324	828	917	386	227	7,686,849
	Density	2.5	0.1	0.1	0.1	0.05	

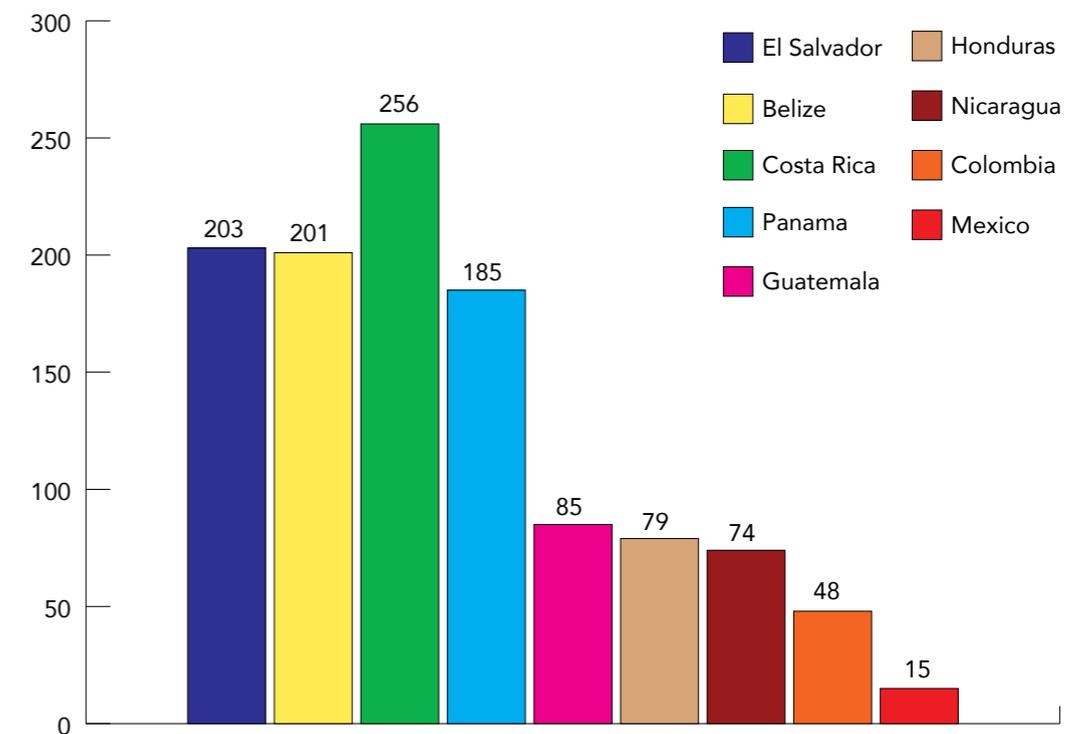
Sources: <sup>1</sup>INBio, unpublished data (Obando, Herrera and Ugalde, 2013); <sup>2</sup>Llorente-Bousquets and Ocegueda, 2008; <sup>3</sup>Ministry of the Environment, Housing and Territorial Development, Colombia, 2010; <sup>4</sup>Ministry of the Environment, Brazil, 2010; <sup>5</sup>Ministry of the Environment, Indonesia, 2009; <sup>6</sup>Chapman, 2009.

Of the half million species expected for the country, 365,000 (70%) are different types of insects, with only just over 69,000 known to date. Fungi are the second most important group in expected diversity with 65,000 species of which only 3,850 are known.

Even though there is still much to learn about ecosystem dynamics and the conservation status of the populations of most species, the PES program and the creation of PWAs have enabled the conservation of forest areas and diverse ecosystems, opening the door for more knowledge.

Mesoamerica also houses many subspecies of native domesticated plant species, which are important for the creation of new varieties that are resistant to changes in the environment and to new pests. In this regard, Costa Rica and the region in general form a natural germplasm bank for the production of food and timber resources. By conserving natural ecosystems such as forests, we also conserve the genetic diversity and the wild relatives of domesticated species.

This is how rich Costa Rican biodiversity not only contributes services to local and national communities, but also to the entire region of Central America and the planet. Biodiversity conservation through PES is a huge opportunity for current and future populations to enjoy the services provided by the country's natural wealth.



**Figure 9.** Density of vertebrate and plant species in Central America with respect to two megadiverse countries (highlighted in the oval). (Number of species/1,000 km<sup>2</sup>). Source: Herrera and Obando, 2009.

## A LEGAL FRAMEWORK THAT FAVORS THE CONSERVATION AND SUSTAINABLE USE OF BIODIVERSITY

Despite the heartwarming fact that Costa Rica today is steadily pursuing the conservation of biodiversity, it is also true that the loss of species worldwide is alarming. It is estimated that two-thirds of living organisms may disappear and this poses a challenge of enormous proportion for current generations. However, reversing this panorama is not an impossible task if we combat the forces that are driving environmental degradation and promote the participation

Threats to biodiversity and its loss over the years have led to different strategies for conservation in Costa Rica, placing the country on the world stage as innovator and pioneer. PES is a clear example of these efforts.

of stakeholders, especially ones from the private sector, which are the largest generators of environmental alteration.

PES and the FBS offer alternatives for the private sector to contribute to conservation, sustainable development and the reduction of carbon emissions.

Conservation efforts, including PES, are included in international conventions signed by the country. It is through these channels for action that Costa Rica has responded and generated discussion regarding the guidelines to follow for environmental protection, often in pioneering and innovative ways.

In addition to PES, a series of legal milestones have defined the way for Costa Rica's environmental policy. These include modifications to Article 50 of the Constitution, the prohibition of land use changes on private lands with forest cover, declaring wildlife management in the public interest, and integrating institutions involved with biodiversity into a single entity (SINAC).





An important milestone in Costa Rican constitutional law is the 1994 reform to Article 50 of the Constitution. This article establishes the right to “a healthy and ecologically balanced environment” for all its inhabitants. It also states that any person can report acts in violation of that right and make claims for damages resulting from those acts (Rodríguez and Ulate, 2010).

Another important advancement is the creation of the Biodiversity Law in 1998, which led to the creation of a legal framework for wildlife protection.

These policy and environmental legislation achievements have been complemented by the participation of civil society, with the backing of regulatory frameworks such as the Biodiversity Law and the Environmental Law, as well as structures such as the Conservation Area Councils and local councils.

#### Some of the international agreements signed and ratified by Costa Rica since 1966:

- Convention to combat desertification and drought. Law No. 7699 (1997).
- Regional Convention for the management and conservation of natural forest ecosystems and forest plantation development. Law No. 7572 (1996).
- Central American Regional Convention on Climate Change. Law No. 7513 (1995).
- Convention for the conservation of biodiversity and protection of priority wildlands in Central America. Law No. 7433 (1994).
- Convention on Biological Diversity (CBD). Law No. 7416 (1994).
- United Nations Framework Convention on Climate Change. Law No. 7414 (1994).
- Convention for Cultural and Natural Heritage. Law No. 5980 (1976).
- Convention for International Cooperation Concerning the Protection of World Cultural and Natural Heritage. Adopted by UNESCO in 1972.
- Convention on Wetlands of International Importance especially as Waterfowl Habitat. Ramsar Convention. Law No. 7224 (1971).
- Convention for the protection of flora, fauna and natural scenic beauty of the countries of America. Law No. 3763 (1966).

Intersectoral organization is a key element in conservation. One clear example of this is the Rural Community Tourism Development Law of 2009. The purpose of this law is to promote rural tourism through family and community-based businesses. This helps the inhabitants of rural communities develop enterprises focused on making sustainable use of their local natural resources. Some tourism activities involve indigenous territories and numerous owners of forest that have lands in the buffer zones of PWAs, comprising biological corridors. Through PES, these people receive income in addition to their main productive activity, which is tourism.

**Some laws in force regarding biodiversity, its conservation and sustainable use:**

- Rural Community Tourism Development Law. No. 8724 (July 2009).
- Wildlife Conservation Law, No. 7317 (October 1992). New regulations in 2005.
- Fisheries and Aquaculture Law, No. 8436 (March 2005). Manages fisheries outside of protected areas.
- Biodiversity Law No. 7788 (April 1998)<sup>13</sup>.
- Soil Use, Management and Conservation Law. No. 7779 (1998).
- Forestry Law No. 7575 (February 1996).
- Organic Environmental Law, No. 7554 (October 1995).
- Reforms to Articles 18 and 50 of the Constitution: The right to a healthy environment (1994).

---

13. This law was awarded in 2010 with Future Policy Award 2010 by the World Future Council.

- Law of the National Park Service Law, No. 6084 (August 1977).
- Law for the Creation of the Ministry of Natural Resources, Energy and Mines (MIRENEM), No. 7152 (began operations in 1986 and became official in 1990).
- Costa Rican Tourism Institute Law, which established the area contained within a 2 km radius around volcanic craters as a national park (1955).

## CHAPTER IV: PROTECTED WILDERNESS AREAS ARE STRENGTHENED BY PES

### Executive summary

Globally, nations with high levels of biodiversity usually have low percentages of protected areas. In Central America, however, the trend has been very different and the region is at the conservation forefront, given that around 20% of its territory has some type of protection.

However, it seems paradoxical that the relatively high number of protected areas in Central America does not necessarily lead to better forest conservation and biodiversity protection. In a period of ten years, the region, with the exception of Costa Rica, experienced a negative forest loss rate.

What is it that Costa Rica has done differently from the rest of the Central American countries? A large part of the answer may lie in the synergy that has been created between the PES program and the establishment of protected wilderness areas in combination with encouraging intersectoral action for conservation, where the private landowner becomes the main figure for forest protection.

PES has played a fundamental role in motivating owners of private lands adjacent to protected areas to conserve segments of forest that are capable of becoming biological corridors. These in turn improve connectivity with blocks of forest that connect wildlands, reserves and national parks. All this will be strengthened by the FBS.

This lesson has marked the way for several countries to follow this Costa Rican approach, creating mechanisms that remunerate owners of private lands with potential to strategically connect protected wilderness areas.

## THE REGIONAL CONTEXT IN PROTECTED WILDERNESS AREAS

Globally, only 20 countries have at least 20% of their territory protected under some conservation or management category. Costa Rica is a member of this small group, accompanied by three of its Central American neighbors: Belize, Guatemala and Panama, followed closely by Honduras.

Other Latin American countries, even though they concentrate the greatest natural wealth on the planet and are considered megadiverse, have lower percentages of areas designated for protection. Mexico and South America, for example, have 16% of protected natural space.

Latin America has enormous biological wealth that is concentrated in countries considered megadiverse, but the relationship between this wealth and the percentage of territory under protection appears out of balance.

Brazil possesses 15-20% of the planet's biodiversity, but only 8% is under some category of protection. Central America on average, has nearly 7% of global biodiversity and 20% of its territory is protected (Table 9).

This asymmetry is explained by the significant increase in protected areas that Central America experienced in the 1980s and 1990s (CONARE, 2008). Of the total area protected in Central America, Costa Rica contributes around 20% of this territory.

It should be emphasized that of the conservation modalities that prevail in several Central American countries, such as Guatemala, Belize and Nicaragua, 44% of these areas do not have absolute protection and they allow the sustainable use of natural resources. In Panama, Costa Rica and El Salvador, a large part of the protected areas are subject to complete protection (CONARE, 2011b).

In this context, Central America has nine PWAs that have been declared World Heritage Sites, of which three are found in Costa Rica and three in Panama.

These notable achievements in the establishment of PWAs in Central America are important because they have reduced human impact on natural areas; however, increasing their surface area and strengthening their management and stewardship is a huge challenge.

Table 9. Percentage of territory protected and representation of global biodiversity in Costa Rica, Central America and other Latin American countries.

Country	% of global biodiversity	% of territory under some category of PWA management
Brazil*	15-20	8
Colombia*	14	10
Mexico*	10-12	11.8
Ecuador	NF	16
Bolivia	NF	16
Argentina	NF	6.3
Uruguay	NF	1.7
<b>Costa Rica</b>	<b>3.6</b>	<b>26.5</b>
<b>Central America*</b>	<b>7</b>	<b>20 (average)</b>

Source: <http://www.cbd.int> (The Convention on Biological Diversity webpage and revision of the Fourth National Reports regarding CBD implementation available on that page). NF: Not found. \*Considered megadiverse. Note: With the exception of Costa Rica, the documents for the countries included do not specify whether their respective percentages are for the planet's expected biodiversity (13 to 14 million species) or for the biodiversity known or described (nearly 2 million species); therefore, expected biodiversity was used.

Despite the existence of large tracts of PWAs, the numbers do not favor Central America. With the exception of Costa Rica, nearly all the countries of the region experienced negative forest loss rates in a ten year period and although this has been decreasing, forest loss continues.

In contrast, the forest recovery rate was positive in Costa Rica, largely due to the combination of efforts made to establish PES and PWAs.

The Costa Rican forest conservation strategy, besides consolidating or expanding the area in PWAs, has closely focused on PES, the creation of clean development mechanisms, and the reduction of emissions resulting from deforestation and forest degradation (REDD Strategy). Central American countries are following suit and by 2011 they were already implementing some kind of PES (CONARE, 2011b).

### **A CLOSER LOOK AT COSTA RICA'S EFFORT TO CREATE PWAS**

The establishment of protected wilderness areas has been one of Costa Rica's greatest conservation achievements in the last 50 years and PES has played an important role in obtaining monetary remuneration for owners of private lands within and outside of these areas for the services their forests provide.

State protected areas in Costa Rica, such as national parks and biological reserves that are in the most restrictive use categories due to their high conservation value, do not allow human settlements within their boundaries. Neighboring communities are situated in what are known as "buffer zones."





Management categories such as private and mixed wildlife refuges, forest reserves and protection zones, which allow private and state property within their boundaries, are the ones in which PES has become an enormously valuable tool for ensuring the conservation and sustainable use of biodiversity.

This fact is of vital importance because these kinds of management categories represent 45% of the total protected area on the mainland, a percentage that also includes sections of private forest found in national parks and biological reserves that have not yet been fully expropriated.

Some of the protected areas, individual ones or those in groups, are in categories assigned by international conventions such as Biosphere Reserve, Ramsar Site or World Heritage Site. In Costa Rica there are 11 Ramsar sites, three Biosphere Reserves and three World Heritage Sites (SINAC, 2009).

By 2011, the country had 165 PWAs in nine management categories according to the objectives for their creation (Table 10). Together they represent 26.5% of the continental territory of the country (Fig. 10).

Table 10: Protected wilderness areas according to management category.

Number of PWA	Management category	Continental area protected (ha)	(Percentage of national continental territory (51,100 km <sup>2</sup> ))
28	National Park	629,394.00	12.32
8	Biological Reserve	21,634.00	0.42
31	Protected Zone	157,213.00	3.08
9	Forestry Reserve	216,277.00	4.23
71	National Wildlife Refuge for Wildlife (mixed, private and state)	237,553.00	4.65
13	Wetland (including mangroves)	69,251.00	1.36
5	Other categories (2 Absolute Natural Reserves, 1 National Monument, 1 Natural Monument, 1 Experimental Station, 1 other area annexed to a PWA for conservation purposes)	23,166.00	0.45
165	<b>TOTAL</b>	1,354,488.00	26.51

Source: SINAC-MINAET; prepared by G. Jiménez, August 2011. Note: Only the terrestrial area was updated to 2011. The marine area was obtained from SINAC, 2009.

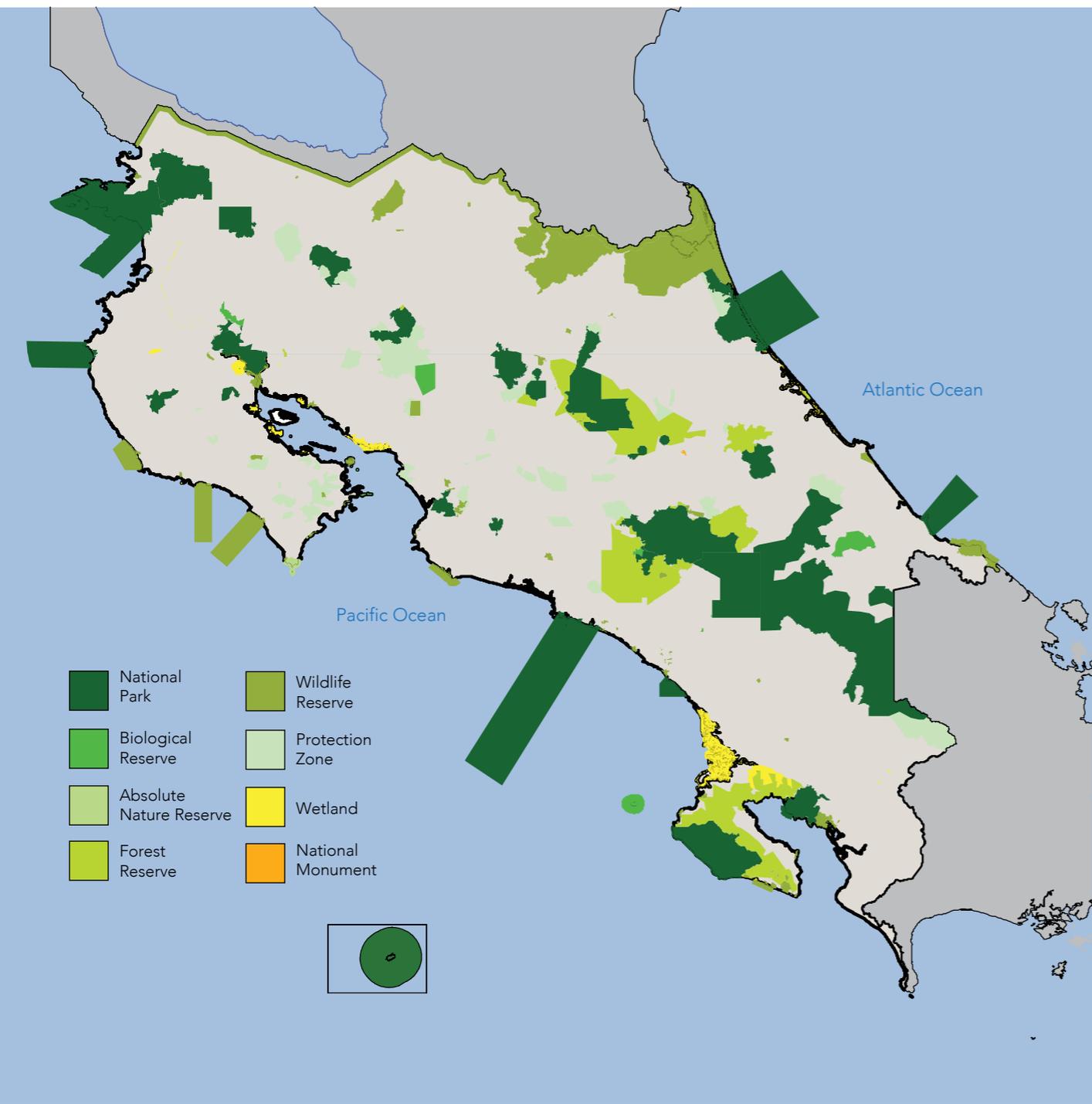


Figure 10. Protected wilderness areas in Costa Rica, 2010. Source: SINAC, 2006.

The number of PWAs increased by 144% between 1989 and 2006 (Fig.11), when the creation of restrictive categories (such as national parks and biological reserves) was emphasized due to the high rate of deforestation occurring in the country in the 1970s and 1980s, and because of the need to promote more forest cover, as explained in previous chapters.

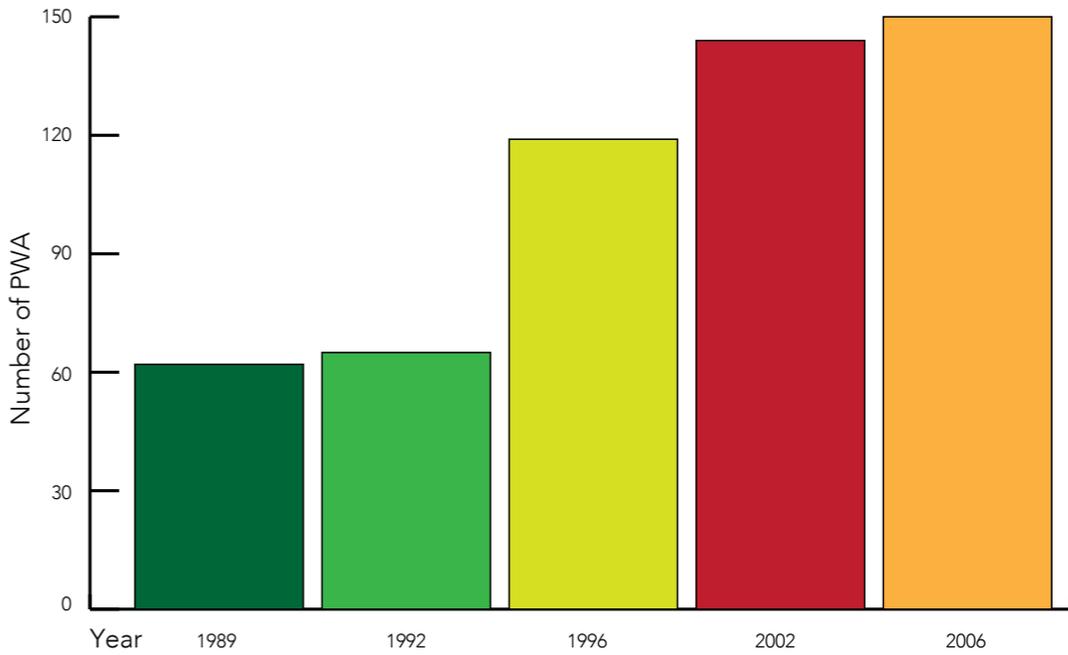
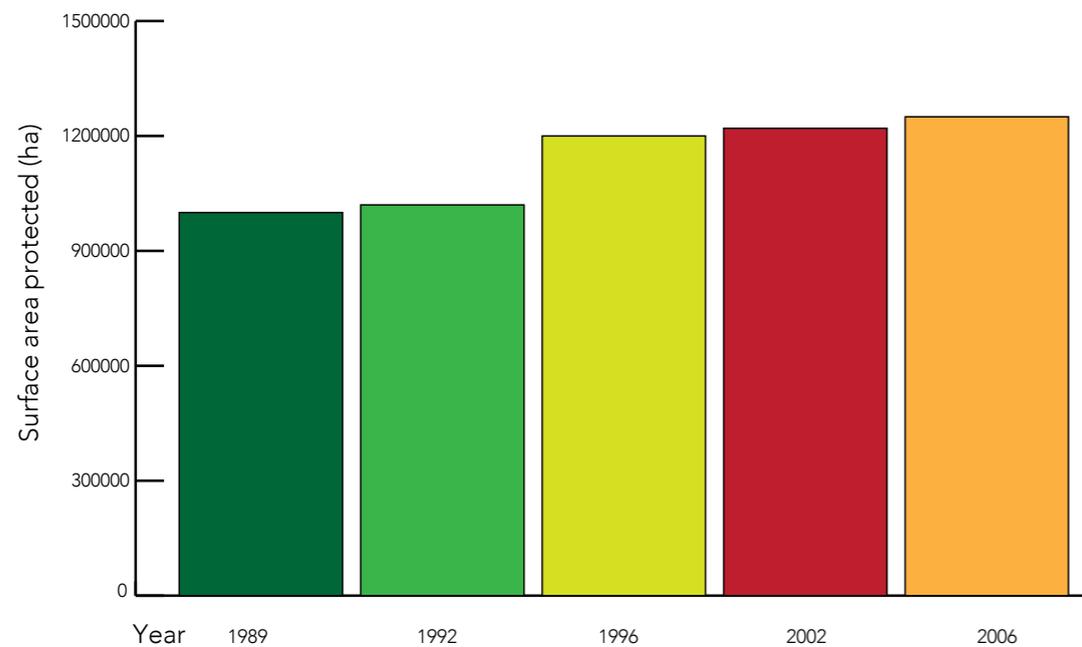


Figure 11. Number of PWAs in Costa Rica, 1989-2006. Source: MINAET-SINAC, 2007.

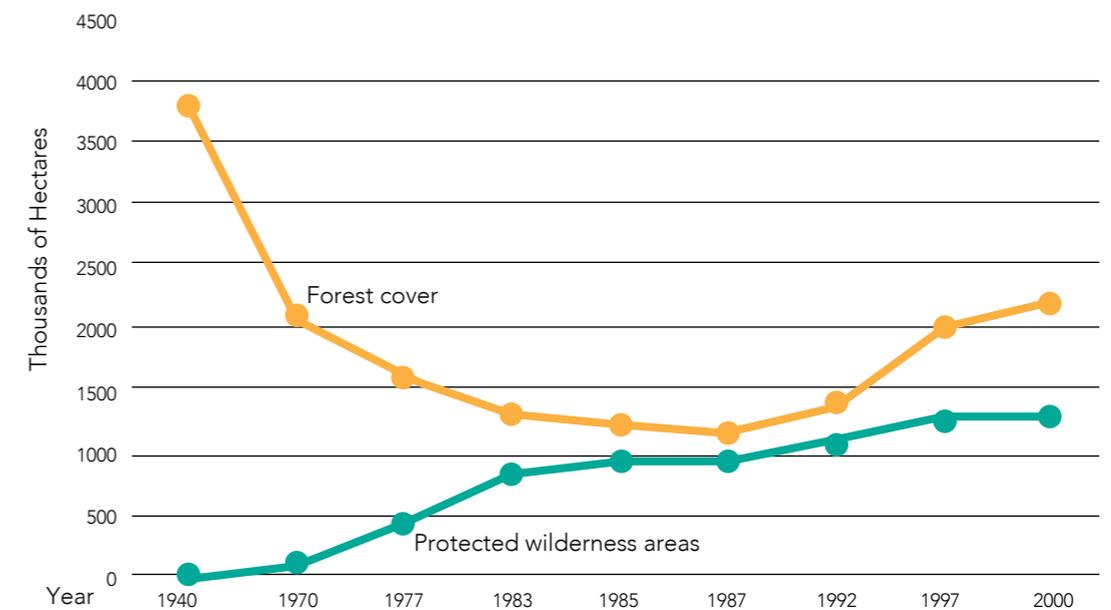
The rate of creation of new PWAs during the period 1989-2006 is higher than the rate of increase for total protected surface area before this period (Fig. 12). This fact reflects a trend in the creation of increasingly smaller protected wilderness areas associated mainly with remnant fragments of natural plant cover (MINAET-SINAC, 2007). By having many areas that are small in size, conservation strategies like PES, within or outside their boundaries, help strengthen blocks of forest and establish biological corridors that are vital for ensuring the viability of these natural areas in the medium and long term.



**Figure 12.** Total surface area covered by protected wilderness areas, 1989-2006.  
Source: MINAET-SINAC, 2007.

## PROTECTED WILDERNESS AREAS ARE NOT ENOUGH: ENTER BIOLOGICAL CORRIDORS AND PRIVATE CONSERVATION

PWAs cover a significant part of the enormous biological wealth that exists in the country for both land and sea, and their establishment promoted more extensive forest cover during critical eras for the country (Fig. 13). However, studies indicate that this is not sufficient to ensure the conservation of biodiversity and the services that nature provides for the benefit of present and future generations.



**Figure 13.** Relationship between the territory with forest cover and territory under some PWA management category (in hectares), 1940-2000. Adapted from Gámez and Obando (2003), in INBio (2007).



### **Biological corridors: unity is strength**

In order to restore and maintain connectivity across the landscape, biological corridors are seen as an efficient strategy that has been gaining strength in international, regional and national contexts in recent years. Although this is a conservation biology concept that has been in use since the mid-1980s to allow the movement of wild populations between fragments or blocks of forest or natural or modified habitat, social, economic and political aspects are being incorporated into the natural space concept with increasingly more emphasis.

For Costa Rica, the creation of biological corridors has been of great importance, not only because they take biological aspects into account but also because of the active participation of communities in their management. A biological corridor complements, integrates and focuses many national and local management efforts.

FONAFIFO uses biological corridor maps that are periodically updated in order to adjust boundaries and set strategic priorities for PES, as discussed in Chapter I.

The biological corridor concept and its promotion have been included in the national legislation since the 1990s. The Organic Environmental Law highlights the value of biological corridors and private reserves as modalities for protection; even if they are not PWAs exactly, they fill an interconnectivity function and allow the migration and dispersal of species to ensure their conservation.

The creation of biological corridors gained momentum in 1999 with the Mesoamerican Biological Corridor (MBC) regional project. By 2006, the National Biological Corridor Program<sup>14</sup> was officially created as a strategy for the conservation of biodiversity; therefore, this is one of the criteria for granting PES today.

<sup>14</sup> PNCB webpage: <http://www.sinac.go.cr/corredoresbiologicos/home.html>

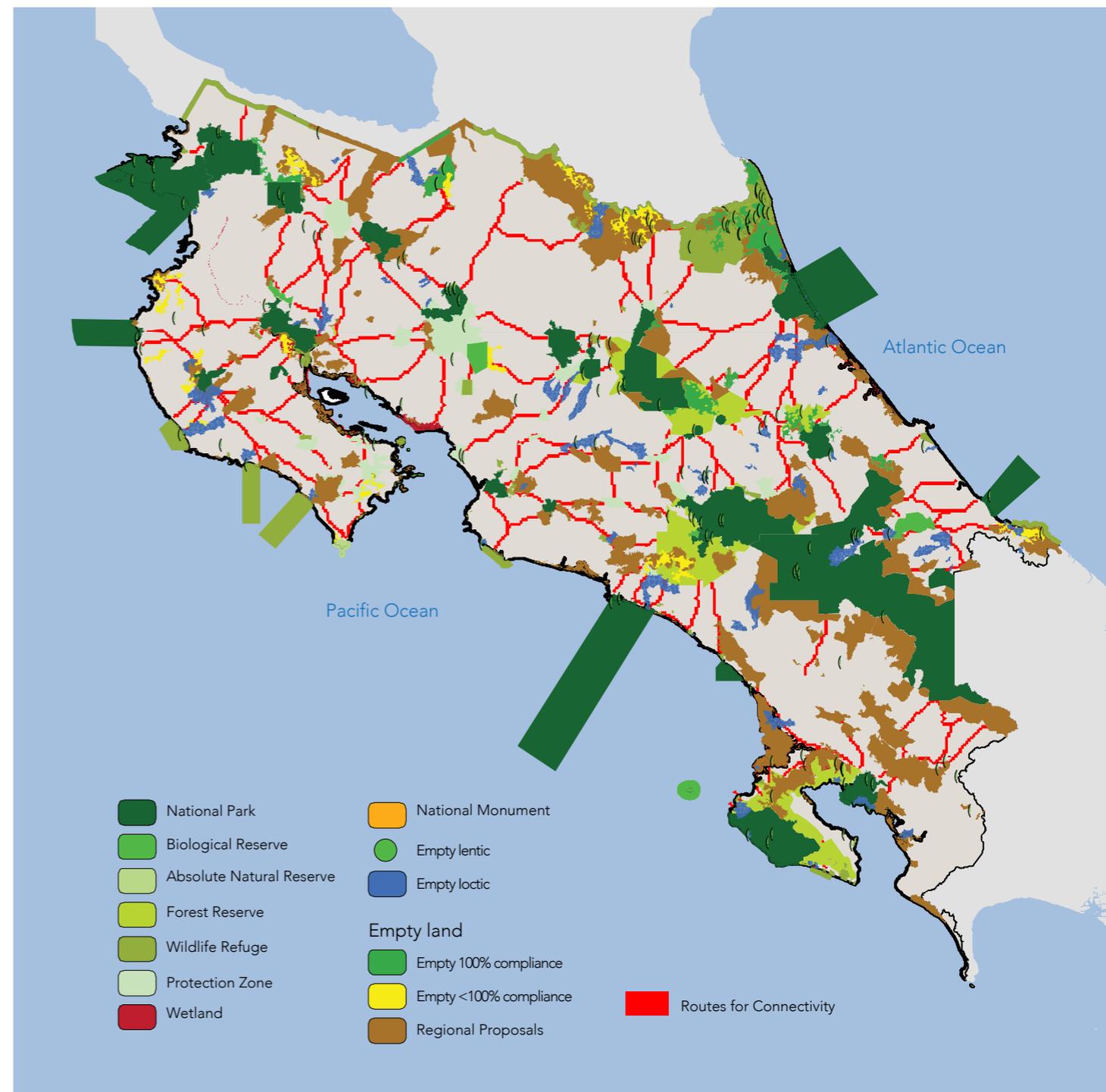
The technical basis for establishing biological corridors is GRUAS II. This project determined the connectivity routes for the countrywide linking of PWAs and isolated blocks of forest (Fig. 14).

The technical basis for establishing biological corridors is the study for the identification of gaps in the representation of ecosystems in terrestrial, marine and freshwater settings. The determination of their location was done through the project called Territorial Management Proposal for the Conservation of Biodiversity (GRUAS II) (Fig. 14). The conservation gaps identified are not covered by existing PWAs, hence the importance of their conservation and the use of this reference by FONAFIFO as a criterion for assigning PES.

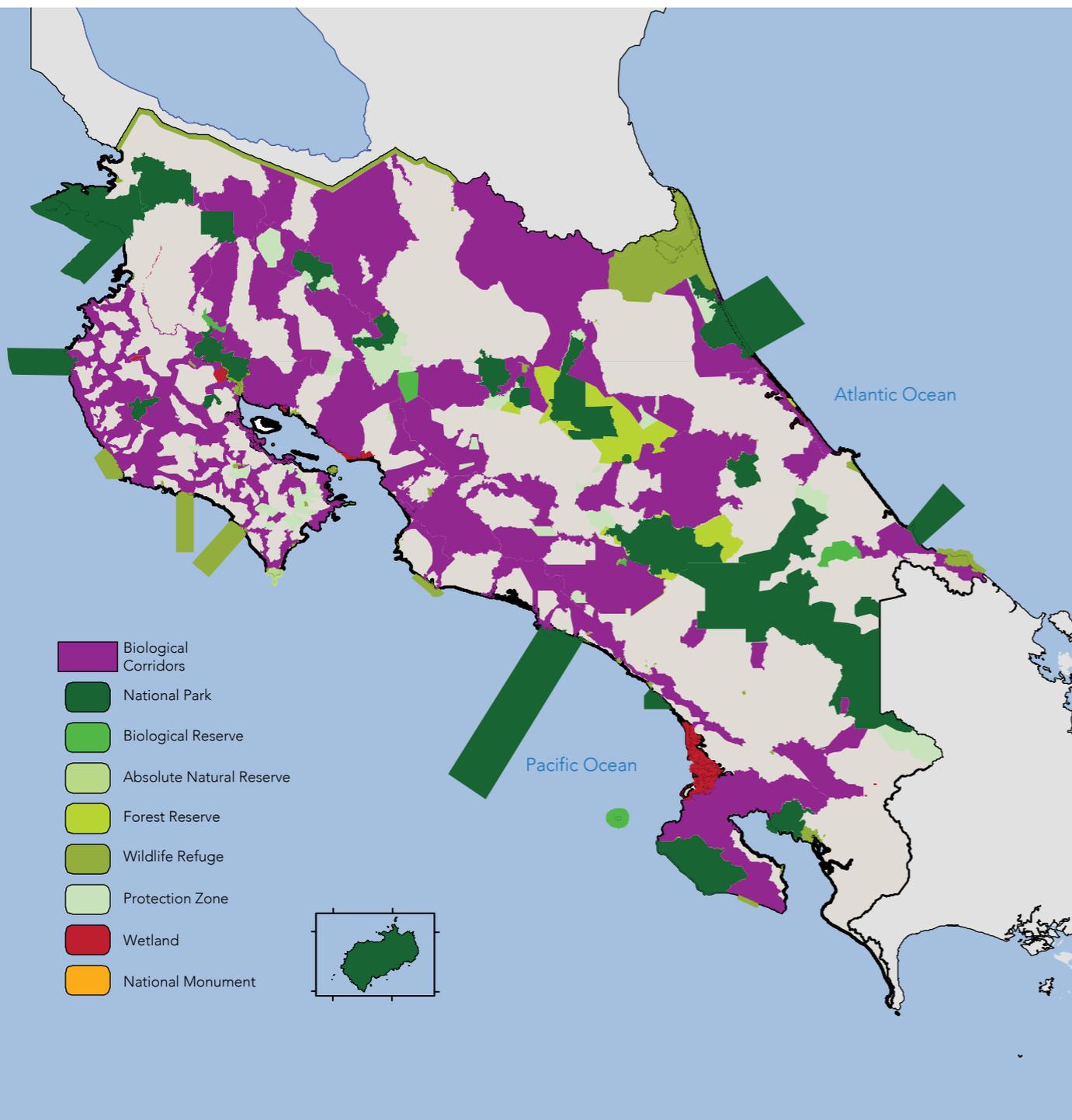
GRUAS II helped identify the country's conservation gaps for the determination of routes for connectivity, which are then used to design biological corridors. In turn, each conservation area has defined local initiatives for biological corridors according to their experience and needs (Fig. 14).

It is clear that research and monitoring of ecological and socioeconomic aspects are critical in determining the biological functionality of biological

Of the 37 initiatives to form biological corridors in Costa Rica, 21 have active local councils (Coto, M., SINAC, pers. comm.). Many stakeholders and community actors from both public and private sectors participate on these councils.



**Figure 14.** PWAs, conservation gaps and routes for connectivity defined in GRUAS II.  
Sources: SINAC, 2006 • INBio, 2011.



**Figure 15.** Biological corridors and PWAs in Costa Rica. Sources: SINAC, 2006 • INBio, 2012.



A biological corridor in Costa Rica complements, integrates and focuses the many local and national management efforts in conservation and the sustainable use of biodiversity. In its prioritization criteria, PES relies on properties in these forested areas adjacent to protected areas.

corridors. The PES program contributes to their consolidation by supporting private owners who have properties that can potentially be part of a biological corridor, making this feature one of the selection criteria for choosing beneficiaries.

By 2012 there were 37 biological corridor initiatives identified and formalized; these, along with the protected areas they connect, cover an area of 1,753,822 ha, representing 34% of the country's land surface area (Fig. 15). Many landowners located in these corridors receive PES.

The biological corridor program in Costa Rica is strengthened by support from national donors and local and international NGOs. PES has also become an ideal mechanism for promoting connectivity between forested areas, since it is a clear incentive for forest owners to become involved and they are interested in the biological corridors that exist in their community.

Similarly, funding sources such as the GEF-UNDP Small Grants Program<sup>15</sup> and the First USA-CR Debt for Nature Swap<sup>16</sup> take into account the location of the biological corridors as a priority for funding sustainable development projects in rural communities. As such, the corridors become geographic areas where resources are allocated and efforts are made in integrated way and, therefore, they are more effective in terms of their impact on conservation.

### Private reserves: citizen engagement in conservation

Nearly 200 private reserves, most of them integrated into biological corridors and several protected area management categories, contribute substantially to the conservation of valuable services from ecosystems for collective benefit, and many of them are PES recipients.

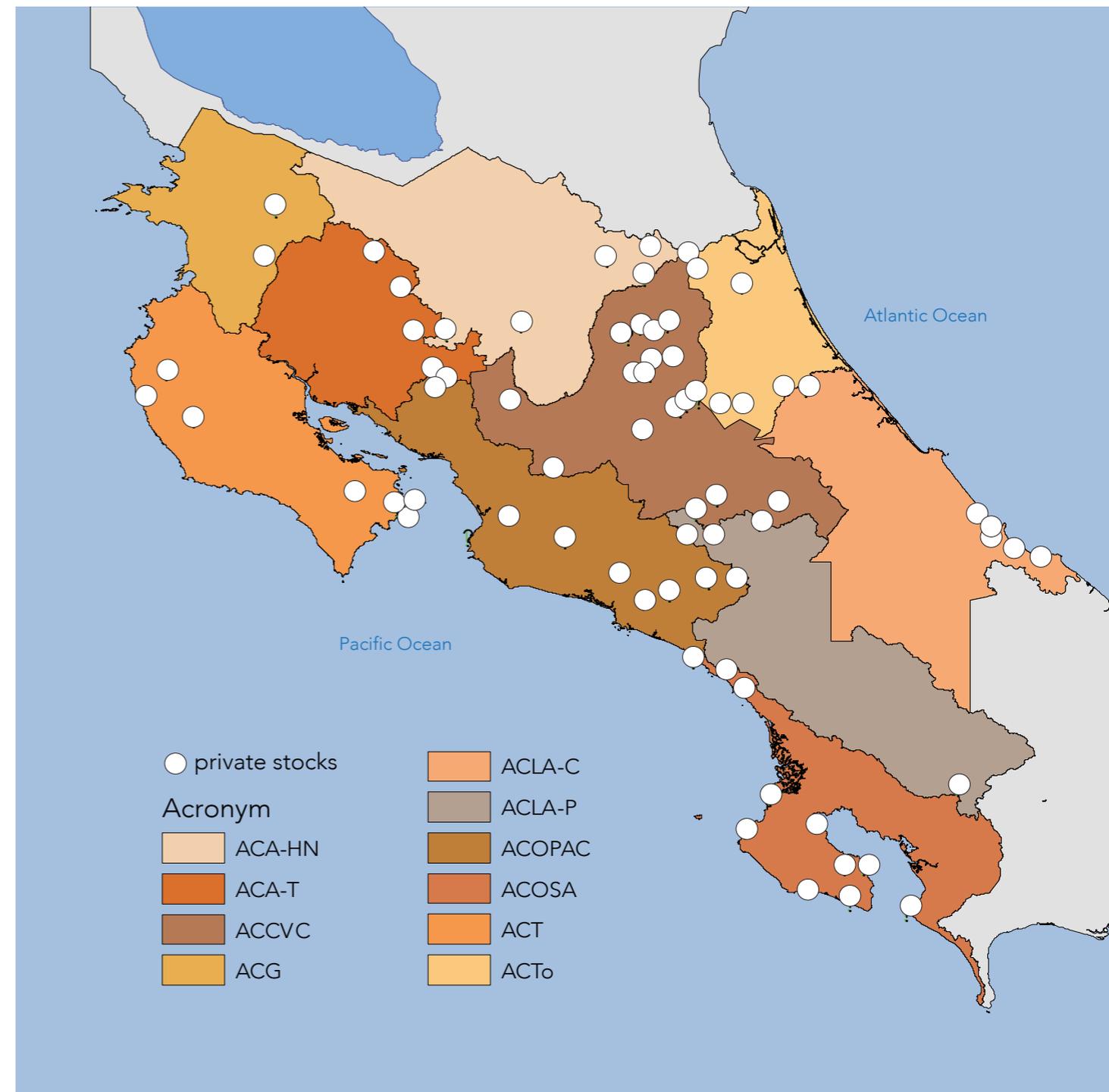
The creation of private reserves is one of the mechanisms that civil society has in Costa Rica to become involved in voluntary conservation. As it does for biological corridors, the Environmental Law emphasizes private reserves as a form of protection that complements PWAs (CONARE, 2011).

This law states that private nature reserves are natural areas that are not in the public domain whose owner has the responsibility of voluntarily preserving or sustainably using them and ensuring their conservation. About 10% of the area covered is included in the management categories for Forest Reserve, Wildlife Refuge (74%) or Protected Area (10%). Thus, the owner's commitment is vital for the conservation of these PWA.

Although 40% of them are small and only 10% reach 500 ha, private reserves collectively protect an area larger than 83,000 ha in Costa Rican territory. Much of this area is primary forest. Private reserves account for 2.07% of the country (Fig. 16).

<sup>15</sup> <http://www.pequenasdonacionescr.org/>

<sup>16</sup> <http://www.canjeusacr.org/>



**Figure 16.** Location of private reserves by conservation area. Source: SINAC, 2006.

Some 60% of the area in private reserves is dedicated to conservation, while 40% combines conservation management with ecotourism and research. Most are located within biological corridors.

Near half the forest of the country are located in private lands.

The contribution from private reserves is also an effort that transcends the country's borders, by belonging to an initiative with a macro approach for the region, the so-called Mesoamerican Network of Private Nature Reserves, which has included the Costa Rican Natural Reserve Network in order to promote the interconnectivity of shared ecosystems regionally.<sup>17</sup>

The PES program should continue to encourage the consolidation of the Network of Private Reserves and areas with high income levels, such as timber production forests. Toward this end, FONAFIFO is expanding PES coverage to natural forests under sustainable forest management, in order to avoid perpetuating an imbalance among systems with PES for protection, and to keep the wood deficit in the domestic market from worsening (MINAE-FONAFIFO, 2012).

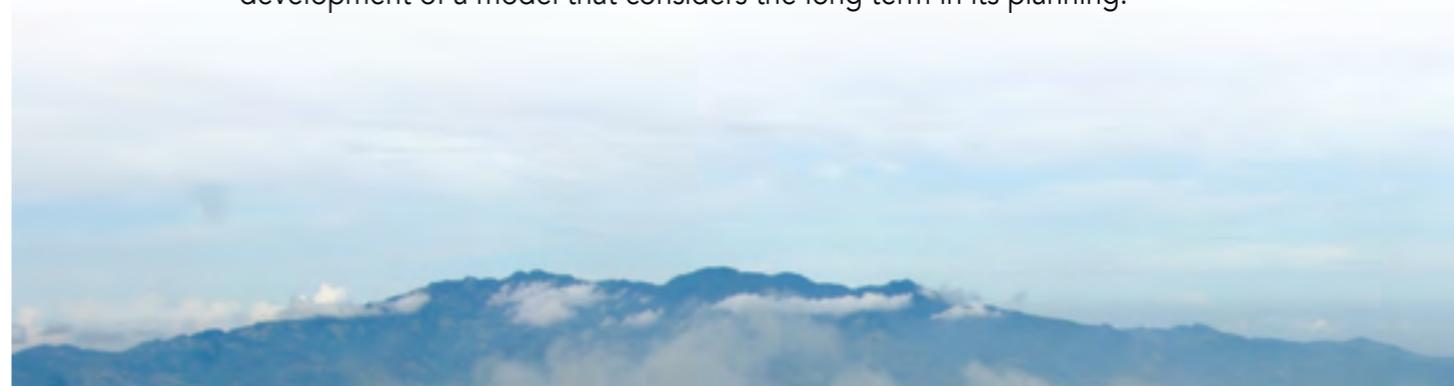


<sup>17</sup> [http://www.cedaf.org.do/Eventos/LandTrust/Voluntad\\_Consevar.pdf](http://www.cedaf.org.do/Eventos/LandTrust/Voluntad_Consevar.pdf)

## END NOTES

The consolidation of PWAs and the channeling of efforts toward new challenges, such as connectivity between ecosystems, are essential to ensure the effective stewardship of biodiversity. Every effort leading to harmonizing the social, ecological and environmental dimensions in decision making processes is heading in the right direction. Strategies such as PES and the FBS therefore strengthen the national effort to create and maintain protected wilderness areas and forests with high biodiversity that are not in any kind of management category.

Costa Rica aspires to a new model for development aimed at having a carbon neutral economy by 2021, a decision that represents an ambitious challenge that is congruent with internationally acquired obligations. Progress has been made toward this goal with the optimization of common public and private interests. Strengthening SINAC and the injection of funds for FONAFIFO are central to achieving this objective. The FBS is seen as the pathway to the development of a model that considers the long term in its planning.



The nation has developed consistent forest and biodiversity policies based on the responsibilities assumed with the ratification of international conventions such as the ones for Climate Change (UNFCCC) and the Biological Diversity (CBD). A series of measures were established for their implementation that in recent decades have promoted the gradual reversal of the loss and fragmentation of forests as well as the degradation of their associated biodiversity.

Investing in the FBS to strengthen the PES program involves contributing integrated approaches; in other words, strengthening part of a national bond that extends beyond the country itself, benefitting the Central American region and the planet. With investment in the FBS, people are given a chance to contribute to the task of achieving present and future environmental sustainability.

## REFERENCES

- Barrantes, G. 2000. Aplicación de incentivos a la conservación de la biodiversidad en Costa Rica. Document prepared for MINAE-SINAC for submission to the Secretariat of the Convention on Biological Diversity, CBD, as a case study. Nov. 2000. INBio, IPS. 29 p. Mimeographed. <http://www.cbd.int/>.
- Borge, C.; Amador, E. 2012. Diagnóstico social de las zonas de vecindad de la Reserva Biológica Hitoy Cerere. Informe final para el Diagnóstico local del Plan de Manejo de la RB Hitoy Cerere. INBio, Asociación Costa Rica por Siempre y ACLAC-SINAC. 40 p. Mimeographed.
- Bosquet, B. 2012. Costa Rica scripts a new chapter in forest carbon finance. Published on the Development in a changing climate blog. <http://blogs.worldbank.org/climatechange> . October 18, 2012.
- Chapman, A.D. 2009. Number of Living Species in Australia and the World. 2nd edition. Department of the Environment, Water, Heritage and the Arts, Australian Government. 80 p.
- Coates, A.G. 1997. The Forging of Central America. In: Coates, A.G. (ed.). Central America A Natural and Cultural History. Yale University Press. 277 p.

- CONARE. 2008. XIV Informe Estado de la Nación. Capítulo Armonía con la Naturaleza. Programa Estado de la Nación en Desarrollo Humano Sostenible. San José. <http://www.estadonacion.or.cr/>
- CONARE. 2011. XVII Informe del Estado de la Nación. Programa Estado de la Nación en Desarrollo Humano Sostenible. Ponencia Gestión del patrimonio, conservación y biodiversidad: resultados de la gestión ambiental. San José. <http://www.estadonacion.or.cr>.
- CONARE. 2011b. IV Informe Estado de la Región Centroamericana en Desarrollo Humano Sostenible: Capítulo 5. Panorama ambiental. Programa Estado de la Nación en Desarrollo Humano Sostenible. San José. <http://www.estadonacion.or.cr>.
- Convention on Biological Diversity (CBD). 1992. <http://www.biodiv.org/>.
- FONAFIFO. 2005. FONAFIFO. Más de una década de acción. MINAE-FONAFIFO. 70 p.
- FONAFIFO. 2012a. Estudio de cobertura forestal de Costa Rica 2009-2010. 26 p.
- FONAFIFO. 2012b. Programa Forestal Huetar Norte. Desde la raíz de la protección hasta el dosel del desarrollo. 30 p.
- FONAFIFO, CONAFOR y Ministerio de Medio Ambiente del Ecuador. 2012. Lecciones aprendidas para REDD+ desde los programas de pago por servicios ambientales e incentivos para la conservación. Ejemplos de Costa Rica, México y Ecuador. Auspiciado por PROFOR, BM. Forest Trends and Forest Carbon Partnership Foundation. 176 p.
- IMN. 2008. El clima, variabilidad y cambio climático en Costa Rica. Proyecto Segunda Comunicación sobre Cambio Climático en Costa Rica. Instituto Meteorológico Nacional, Ministerio de Ambiente, Energía y

- Telecomunicaciones, Programa de las Naciones Unidas para el Desarrollo y Comité Regional de Recursos Hidráulicos. 74 p.
- INBio. 2007. Evaluación de la situación actual de la biodiversidad y la sostenibilidad-representatividad ecológica del Sistema de Áreas Protegidas de Costa Rica. Informe final de consultoría elaborada para el SINAC. Proyecto GEF-Removiendo Barreras para la sostenibilidad. SINAC-MINAET.
- INEC. 2010. Panorama demográfico Año 2010. Boletín Vol. 1, Año 5. 37 p. <http://www.inec.go.cr>
- IPCC. 2007. Resumen para Responsables de Políticas. En: Parry, M.L.; Canziani, O.F.; Palutikof, J.P.; van der Linden, P.J.; Hanson, C.E. (eds.). Cambio Climático 2007: Impactos y Vulnerabilidad. Contribución del Grupo de Trabajo II al Cuarto Informe de Evaluación del IPCC. Cambridge, United Kingdom: Cambridge University Press.
- La Gaceta. 2005. Decreto Ejecutivo No. 32633-MINAE. 20 de septiembre de 2005.
- La Gaceta. 2006. Decreto Ejecutivo No. 33106-MINAE. 30 de mayo de 2006.
- La Gaceta. 2012. Decreto Ejecutivo No. 36935-MINAET. 20 de enero de 2012.
- Llorente-Bousquets, J.; Ocegueda, S. 2008. Estado del conocimiento de la biota. En: Capital natural de México, Vol. I: Conocimiento actual de la biodiversidad. México: Conabio, pp. 283-322.
- Méndez, J.; Salazar, G. 2010. Las organizaciones forestales y su aporte al Programa de Pago de Servicios Ambientales en Costa Rica. Costa Rica Forestal. CODEFORSA, ONF. 16 p.
- Ministerio de Ambiente, Vivienda y Desarrollo Territorial. 2010. Cuarto Informe Nacional ante el Convenio sobre la Diversidad Biológica. Bogotá, 239 p.

- MINAET-SINAC. 2007. Informe nacional sobre las Áreas Silvestres Protegidas en Costa Rica. II Congreso Latinoamericano de ASP. Bariloche, Argentina. 30 de septiembre a 6 de octubre.
- Ministry of the Environment. 2009. Fourth National Report to the Convention on Biological Diversity. Jakarta: Biodiversity Conservation Unit, Ministry of the Environment.
- Ministry of the Environment. 2010. Office of the National Program for Biodiversity Conservation DCBio. The Fourth National Report to the Convention on Biological Diversity. Brasilia (October).
- MINAE-FONAFIFO. 2012. FONAFIFO: 15 años comprometidos con un desarrollo forestalmente sostenible que beneficia a Costa Rica y al planeta. San José: FONAFIFO. 78 p.
- Obando, V. 2002. Biodiversidad en Costa Rica. Estado del conocimiento y gestión. Santo Domingo de Heredia, Costa Rica: Editorial INBio.
- Obando, V. 2007. Biodiversidad de Costa Rica en cifras. Santo Domingo de Heredia, Costa Rica: Editorial INBio. 26 p.
- Obando, V.; Herrera, A. 2009. Estado del conocimiento sobre biodiversidad en la región centroamericana. Gobierno de Noruega-INBio. Santo Domingo de Heredia: Editorial INBio. 50 p.
- Obando, V.; Ugalde, J.; Herrera, A. 2013. Biodiversidad en cifras, datos generales actualizados. Sistematización de registros de especies de Costa Rica al año 2012. Documento de trabajo. INBio.
- Porras, I.; Miranda, M.; Barton, D.; Chacón, A. 2012. De Río a Río+: Lecciones de 20 años de experiencia en servicios ambientales en Costa Rica. London: International Institute for Environment and Development. 96 p.

- Porras, I.; Miranda, M.; Barton, D.; Chacón, A. 2012b. Payment for environmental Services in Costa Rica: from Río to Río and beyond. IIED Briefing. May 2012. <http://pubs.iied.org/1712611ED>.
- Presidency of the Republic of Costa Rica, MINAET, FONAFIFO. 2012. Costa Rica. Tropical forests: a motor for green growth. Rio+20 The future we want. June 2012. 36 p.
- Sánchez, O. 2012. Talk in *PowerPoint* format about PESP (in Spanish). FONAFIFO. PDF document, facilitated by FONAFIFO.
- Secretaría del Convenio sobre la Diversidad Biológica. 2010. Perspectiva Mundial sobre la Diversidad Biológica 3. Montreal. 94 p.
- SINAC-INBio. 1998. Primer Informe de País sobre el cumplimiento del Convenio sobre la Diversidad Biológica (CDB). INBio. Mimeographed. <http://www.inbio.ac.cr>.
- SINAC. 2007a. GRUAS II: Propuesta de Ordenamiento Territorial para la Conservación de la Biodiversidad de Costa Rica. Vol. 1: Análisis de Vacíos en la Representatividad e Integridad de la Biodiversidad Terrestre. San José: SINAC, Ministerio de Ambiente y Energía. 100 p.
- SINAC. 2007b. GRUAS II: Propuesta de Ordenamiento Territorial para la Conservación de la Biodiversidad de Costa Rica. Vol. 2: Análisis de Vacíos en la Representatividad e Integridad de la Biodiversidad de los sistemas de aguas continentales. San José: SINAC, Ministerio de Ambiente y Energía. 102 p.
- SINAC. 2008. Guía práctica para el diseño, oficialización y consolidación de corredores biológicos en Costa Rica. Comité de apoyo a los corredores biológicos. 1 ed. San José: SINAC. 56 p.

SINAC. 2009. IV Informe de País al Convenio sobre la Diversidad Biológica. GEF-PNUD. Mimeografiado. 220 p.

UNIMER-La Nación, AMANCO, P&G, ULACIT. 2002. Estudio nacional sobre valores ambientales de las y los costarricenses. August. Mimeographed. 76 p.

WCMC. 2001. List of the planet's megadiverse countries. Based on: Biodiversity Theme Report. Australia State of the Environment Report 2001 (Theme Report). Prepared by: Dr Jann Williams, RMIT University. Published by CSIRO on behalf of the Department of the Environment and Heritage.

