Emissions Reductions Program
to the FCPF Carbon Fund

Costa Rica

July 171thth October 12th, 20178

Government of Costa Rica
Ministry of Environment and Energy

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Note on the English translation

The official version of Costa Rica's Emission Reduction Program Document is in Spanish, this version is available at www.reddcr.go.cr. The current translation to English may have errors. However, this version is presented to the FMT due to time constraints. Nonetheless, Costa Rica is not responsible for any errors found in this document.

Measurement units

For all numbers, commas “,” represents the decimal point, for example 5,4. A point is used for thousands, as in 5.400,20. Emissions and removals (absorptions) are expressed in tons of carbon dioxide equivalent per year (t CO_2-e yr^{-1}). Removals are expressed as negative numbers. Gigagrams (Gg) are not used. For areas, hectares (ha) are used, unless otherwise specified (e.g. km^2 may be used in certain sections of the document).

1. Entities responsible for the management and implementation of the proposed ER Program

1.1. ER Program Entity that is expected to sign the Emission Reduction Payment Agreement (ERPA) with the FCPF Carbon Fund

Name of entity	Ministry of the Environment and Energy (MINAE)
Type and description of organization	MINAE is the government entity in charge of the Costa Rican environmental policy per the Organic Law of Environment, and amongst its responsibilities, it must ensure the comprehensive application of the existing forestry legislation, both in public and in private areas. MINAE has its own legal identity.
Main contact person	~~Dr. Edgar Gutiérrez Espeleta~~Sr. Carlos Manuel Rodríguez Echeverría
Title	Minister of the Environment and Energy
Address	Edificio Vista Palace, Calle 25. Avenida 8 y 10, San José, Costa Rica
Telephone	+(506) 2233-4533
Email	ministrominae@minaet.go.cr
Website	www.minae.go.cr

1.2. Organization(s) responsible for managing the proposed ER Program

Same entity as ER Program Entity identified in 1.1 above?	Yes; because MINAE is the governmental institution that concentrates the environmental competencies, but for the purposes of the program management, it will delegate it to the State Forestry Administration, which is part of the National System of Conservation Areas (SINAC), and to the National Fund for Forest Financing (FONAFIFO). A Secretariat for the coordination between both institutions as well as for the coordination and supervision of actions will be established by means of an Executive Decree. **National Fund for Forest Financing (FONAFIFO)**: was created by the Forestry Law, with the purpose of promoting forest management and reforestation, and to improve the use and industrialization of Costa Rica's forest resource. FONAFIFO is also in charge of obtain financing and manage the program of Payment for Environmental Services. It is governed by a Board of Directors that represent different stakeholders of the Forestry sector. Information of contact person Jorge Mario Rodríguez Executive Director (506) 2545-3501 jrodriguez@fonafifo.go.cr

	National System of Conservation Areas (SINAC): was created by the Law of Biodiversity, as a decentralized office of the Ministry of the Environment and Energy. It has the responsibility to issue forest policies for the sustainable management of natural resources. The System incorporates to the General Wildlife Office, the State Forestry Administration and the National Parks Service. Jointly, these execute their functions and competencies as a single instance, through the administrative structure of the System, without prejudice of the objectives for which they were established. Information of the contact person ~~Mario Coto~~Grethel Vega Arce Director (506) 2522-6500 ~~mario.coto~~grethel.vega@sinac.go.cr

1.3. Partner agencies and organizations involved in the ER Program

Name of partner	Contact name, telephone and email	Core capacity and role in the ER Program
National Center of Geo-environmental information (CENIGA)	~~Álvaro Aguilar~~Rafael Monge Director (506)2522-6500 rmonge~~Alvaro.aguilar~~@minae~~recope~~.go.cr	• Coordinating agency for the National System of Environmental Indicators (SINIA) • Responsible for the design of the National Land Monitoring System, according to Ministerial Guideline DM-417-2015. • Responsible for the REDD+ Safeguards Information System, in coordination with other institutions involved, such as FONAFIFO and SINAC.
High-level committee	~~Dr. Édgar Gutierrez-Espeleta~~Sr. Jorge Mario Rodriguez Zúñiga Fonaifo ~~Minister~~Director (506) ~~2233-4533~~2545-3502 jrodriguez@fonafifo.go.cr	• Composed by the directors of the FONAFIFO and the SINAC, plus two high-level representatives from each of both institutions. • Its main role is to guarantee the active and responsible participation of both institutions for the due implementation of the program measures and policy actions. • Responds to the political direction of the Minister of the Environment and Energy. • This committee will be created as part of the decree being drafted to regulate the implementation of the ~~Emissions Reduction~~Emission Reductions Program and the National REDD+ Strategy.

Office of the Minister of the Environment and Energy	~~Dr. Édgar Gutierrez-Espeleta~~Sr. Carlos Rodríguez Minister (506) 2233-4533 ministrominae@minaet.go.cr	• Highest political level of decision making in relation to the Program • Guarantees consistency with the national development goals • It is implemented through guidelines and regulations to define institutional arrangements, as required.
National Meteorological Institute, of the Ministry of the Environment and Energy (IMN)	Juan Carlos Fallas Director (506) 2222-5616 jcfallas@im.ac.cr	• Responsible for the Biennial Update Reports, National Communications and National GHG Inventories before the United Nations Framework Convention on Climate Change (UNFCCC). Serves as focal point before the Intergovernmental Panel on Climate Change (IPCC).

Colaborattors

a. REDD+ Secretariat Team (REDD+ ST)

Hector Arce Benavides. Head of REDD+ ST.
Alexandra Saenz Faerrón, Former Head of REDD+ ST.
María Elena Herrera Ugalde. Specialist ST.
Guisella Quirós Ramírez. Specialist REDD+ ST.
José Joaquín Calvo. Specialist REDD+ ST.

b. Consultants REDD+ Secretariat

Anna MacMurray (Carbon accounting and MRV).
Blanca Bernal (Carbon accounting and MRV).
Edwin Vega Araya (REDD Strategy)
Felipe Casarim (Carbon accounting and MRV).
Gabriel Sidman (Carbon accounting and MRV).
German Obando Vargas (Carbon accounting and MRV).
Javier Fernández (Editor),
Natalia Díaz (Safeguards)
Ricardo Ulate Chacón (Editor).
Rosa Bustillos (Legal)
AGRESTA (Activity Data)
CARBON DECISIONS INTERNATIONAL (Carbon accounting and MRV)

2. Strategic context and rationale for the ER-program

2.1. Current status of the Readiness Package and summary of additional achievements of readiness activities in the country

As part of the REDD+ Readiness Package (R-Package), Costa Rica performed its self-assessment considering all relevant stakeholders. The assessment was executed by an external partner to the REDD+ preparation process: the project "Widening Informed Stakeholder Engagement on REDD+" (WISE-REDD+) implemented by Conservation International in Costa Rica. This project organized, promoted and facilitated the country's self-assessment in July-September, 2015.

In 2015, the R-Package self-assessment was developed in collaboration with five key sectors identified as relevant stakeholders. This allowed for the identification of legal, institutional and capacity gaps, especially in relation to managing REDD+ priorities, improvement needs, achievements and recommendations during REDD+'s readiness phase. Some of the challenges and weaknesses identified were:

a) low effectiveness in sharing information with relevant stakeholders
b) limitations in institutional planning
c) lack of clarity in the roles of the relevant stakeholders in the REDD+
d) the formalization of processes by the REDD+ Secretariat to facilitate decision making at the sector level

However, this must be understood in light of the expectations that stakeholders may have, which also have changed with the progress made on international negotiations on REDD+.

During the self-assessment, there was clear evidence of the difference in opinions showed by the indigenous sector and the rest of the stakeholders. This may be attributed to the more intensive REDD+ readiness process conducted with the indigenous peoples. To ensure success in the next stage of the National REDD+ Strategy, the results of the self-assessment suggest that more information need to be provided to non-indigenous stakeholders and to increase, as feasible, the overall participation of all relevant stakeholders.

2.2. Ambition and strategic rationale for the ER Program

Strategic Role of the ~~Emissions Reduction~~Emission Reductions Program

Costa Rica has been a strong proponent of green, sustainable and resilient development, particularly in regards to the protection of natural resources, forests and their environmental services. In its Political Constitution, Costa Rica has provided for the fundamental right of a "healthy and ecologically balanced environment, and the responsibility of the State to guarantee it". In the Costa Rican mindset, environmental protection occupies a privileged position and enjoys popular support, although some areas are recognized to have more progress than others, where significant efforts are still needed.

It is with this spirit that Costa Rica presents its ~~Emissions Reduction~~Emission Reductions Program (ER-Program) to the ~~FCPC~~ FCPF Carbon Fund, as an additional opportunity to achieve a low carbon economy in a resilient environment. The ER-Program is part of the *Forests and Rural Development Program*[1] (**Figure 2.2.1.**). This is

[1] The *Forests and Rural Development Program* is an initiative of current government administration. Its objective is to assist the implementation of key elements of the National Forestry Development Plan. Besides the National REDD+ Strategy, the Forests and Rural Development Program includes the following initiatives: 1. Green and inclusive development program in rural productive territories, 2. Economic reactivation for the production, transformation and commercialization of sustainable forestry products and generation of income

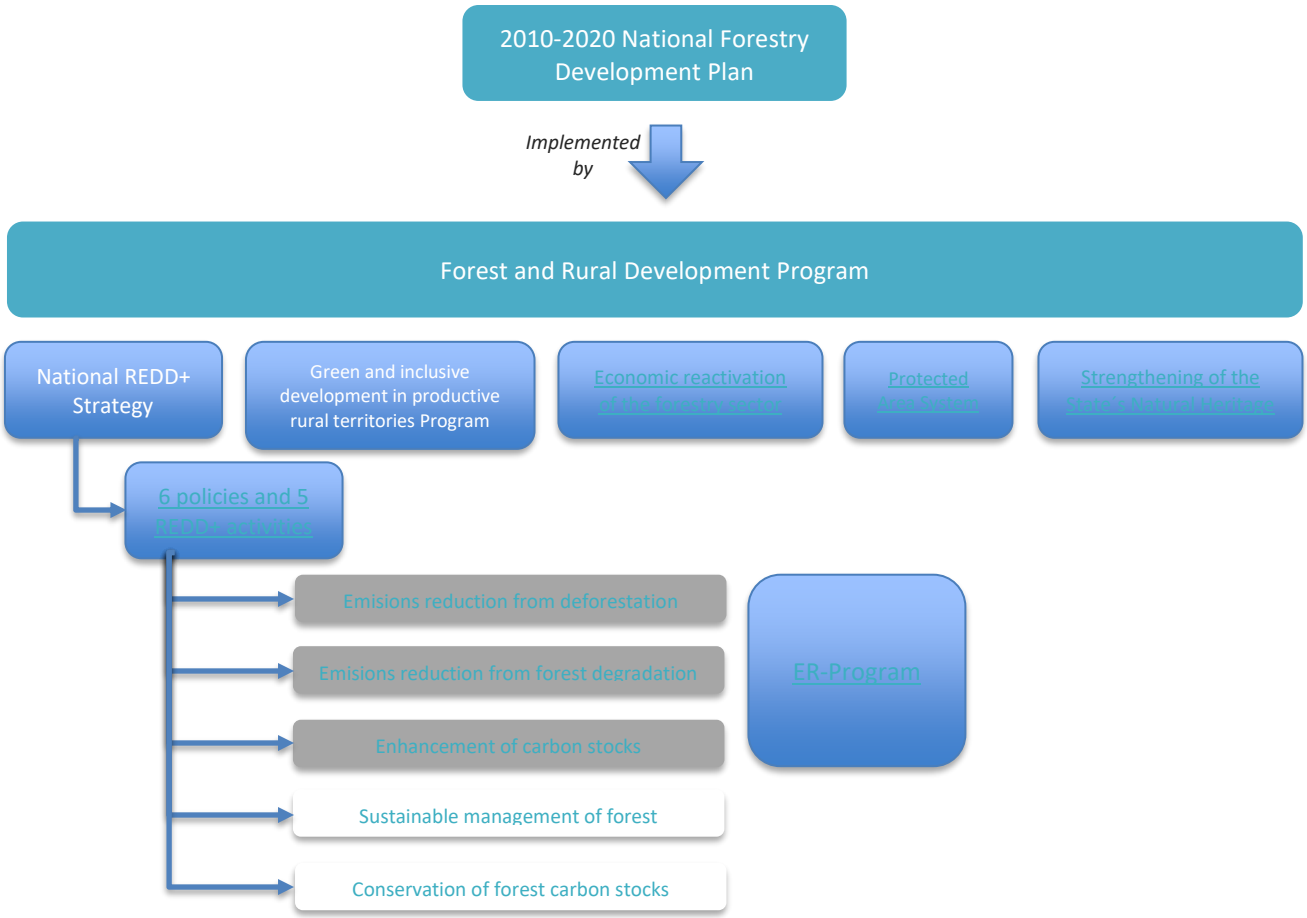
an ambitious platform promoted by Costa Rica to streamline the implementation of the National Forestry Development Plan. **Moreover, the ER-Program is key to make progress towards Carbon Neutrality and our Nationally Determined Contribution (NDC).**

The ER-Program is focused on increasing the impact of public policies that have proven successful in the last 20 years of implementation of the Forestry Law. The ER-P heavily relies on the prohibition to convert forests to other land uses, but also seeks to strengthen the Protected Areas System to guarantee the conservation of critical biodiversity and the Payment for Environmental Services (PES) program as a policy instrument to guarantee forest conservation and carbon (C) stock enhancement through reforestation, tree plantations, agroforestry and silvopastoral systems.

A goal of the ER-Program is to increase participation of all stakeholders, both public and private, including indigenous territories. Along this line, the ER-Program seeks to generate new alternatives to enable the participation of people with unclear land-tenure rights. Stakeholders may implement REDD+ activities across the country, with the purpose of achieving the highest possible emissions reductions offer at the national level.

There is clear political will to reduce emissions, conserve forest carbon stocks, and increase the ambition of mitigation actions, while actively seeking to eradicate poverty. A goal of the ER-Program is to contribute to both, as well as to promote entrepreneurship among micro, small and medium forestry-related producers and land-owners.

for the rural sector, 3. Policy for the Protected Wildlife Areas of the National System of Conservation Areas and 4.Strengthening of the State's Natural Heritage.


2010-2020 National Forestry Development Plan
Implemented by
Forest and Rural Development Program
National REDD+ Strategy
Green and inclusive development in productive rural territories Program
Economic reactivation of the forestry sector
Protected Area System
Strengthening of the State's Natural Heritage
6 policies and 5 REDD+ activities
Emisions reduction from deforestation
Emisions reduction from forest degradation
Enhancement of carbon stocks
Sustainable management of forest
Conservation of forest carbon stocks
ER-Program

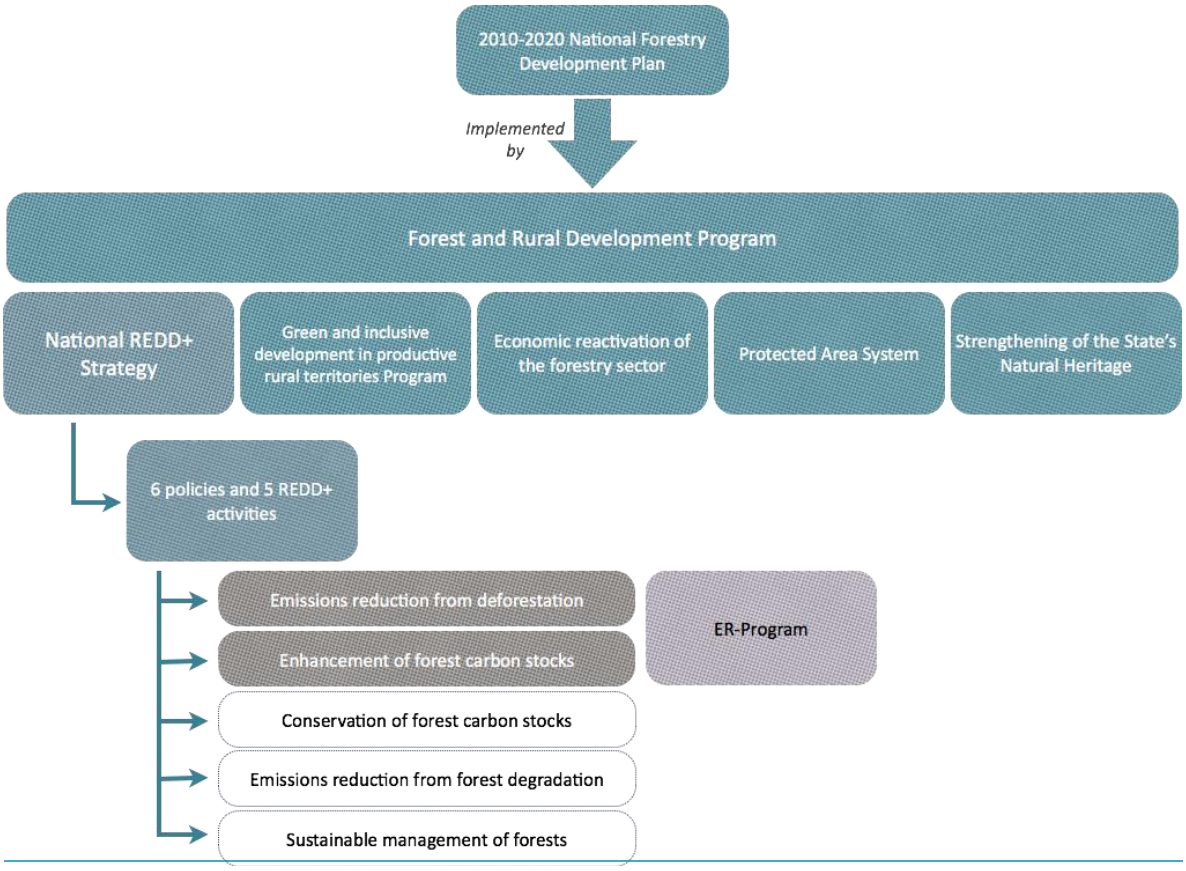


Figure 2.2.1. Relation of the *Forests and Rural Development Program* with National REDD+ Strategy and Costa Rica's ER-Program to the FCPC Carbon Fund. REDD+ activities in gray are included in ER-Program. Additional activities may be considered in the ER-Program in later stages of development.

Progress since the ER-PIN

Costa Rica initially presented a programmatic approach mainly focused on the expansion of the Program of Payments for Environmental Services (PES). The current ER-Program includes this goal, plus 73 additional policies and measures to support forest governance and address deforestation and forest degradation drivers (**Section 4**), *e.g.* strengthening the curreny policy framework for reducing illegal logging and the risk and impact of forest fires in SINAC (National System of Conservation Areas).

Additionally, the current ER-P addresses key governance issues, *e.g.* help in solving land-tenure conflicts and development of new financing options for areas under special land-tenure regimes. Other new features of the Program include new financing opportunities identified by stakeholders during SESA, as well as during the information and pre-consultation process of the National REDD+ Strategy, *e.g* more flexible PES modalities for indigenous territories and small forestry and agroforestry producers.

Costa Rica's ambition in the ER-PIN has been increased in the ER-Program. From a programmatic approach, the ER-Program evolved to a national-scale initiative, which seeks to make key forest policy operational and enable relevant stakeholders to participate across the country, considering almost every land-tenure regime.

Ambition of current and future programs

The ER-Program is based on existing forestry policies and programs implemented in the last three decades as well as development of additional policies and measures to improve governance efficiency and to address key drivers of deforestation and forest degradation. The main instruments that form part of the ER-Program are SINAC's policy framework and FONAFIFO's PES program. However, additional new policy

instruments and mechanisms are also considered. Thanks to these policies and programs, Costa Rica has protected a significant portion of its territory (26%) as Protected Conservation Areas since 1970. Ecotourism, a national GDP driver, positively affects rural economies, especially, in coastal zones and highly depends on these Protected Conservation Areas.

FONAFIFO's PES program was also instrumental in achieving early REDD+ results. The PES was expanded thanks to two loans from World Bank known as Ecomercados I y II. Ecomercados' overarching goal was to secure the conservation of biodiversity and to guarantee its long-term sustainability by implementing market-based mechanisms for payment of environmental services. Through the Ecomercados projects, Costa Rica gained significant experience in complying with the World Bank's operational policies. This is an important step to define a management framework to follow-up REDD+ safeguards under the UNFCCC.

FONAFIFO's PES program is based on the principle that "whoever contaminates, pays". The PES is mainly financed by 3.5% of the national fuel tax and from a fee for water use. As of 2013, the PES compensated environmental services in >1,000,000 hectares of forest (120,000 hectares in indigenous territories), investing more than $400,000,000 in economically depressed rural areas. **The ER-Program intends to secure additional financial resources to strengthen this PES scheme.**

In addition to the policies and programs described above, **the ER-Program proposes six new forestry policies, especially directed at addressing some of the stakeholders' special interests**. Similarly, many of the policies and measures included in the ER-Program are proposed to solve deficiencies of current programs, *e.g.* through new PES modalities for indigenous territories, traditional forest management may be fostered. Another example is the design of more flexible financing mechanisms that may operate in areas under special land-tenure regimes or where land-tenure remains unclear. An important feature of the ER-Program is its goal to improve managerial capacities in the private forestry sector, to increase timber and non-timber production.

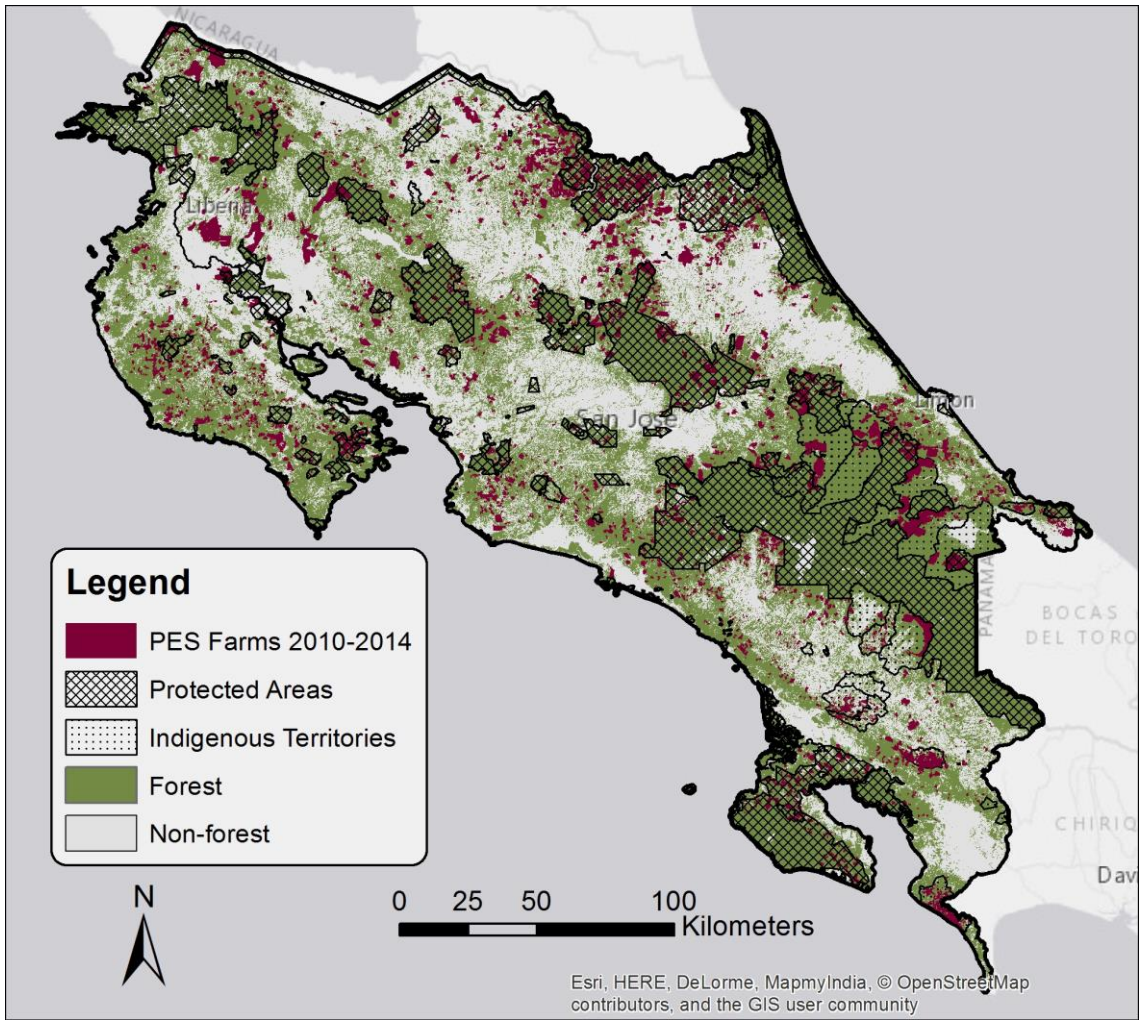


Figure 2.2.2. Forest programs cover for the conservation of forests in Costa Rica.

Early REDD+ actions and forest conservation

In 2013 Costa Rica had 2,215,543 hectares (ha) of primary forests[2] (44% of the national territory). Including secondary forests and other *Forest land*, Costa Rica had a total 3,134,026 ha of forests in 2013 (61% of the territory[3]). Maintaining more than half of the county's forest cover has been a significant achievement, which has required significant investments. Besides these financial implications, **Costa Rica has defined clear measures against deforestation, *e.g.* by passing legislation against forest conversion**. Today, these forests fulfill an invaluable environmental function, by providing numerous social and environmental benefits and by protecting a significant portion of the planet's biodiversity.

Considering the period 1986-2013, annual gross anthropogenic deforestation[4] has decreased in time. In the 1980s deforestation was close to 50,000 ha/yr, in 1990s it was 38,000 ha/yr, and after 2000 deforestation diminished to 27,000 ha/yr. At the same time, forest regeneration has substantially increased. In 1986, secondary forest and tree plantations ~~growing forests~~ covered 417,000 ha, while in 2013, their area increased to 918,000 ha. (**Figure 2.2.2.**).

[2] *Primary forests* are defined as those forests that have been present since 1986.
[3] Includes tree plantations, mangroves, "yolillales" and palm forests, as well as primary and secondary forests.
[4] Includes harvesting of tree plantations, defined as forest or forest lands.

In this context, **Costa Rica has been able to maintain a large proportion of its primary forests while reducing deforestation and promoting the ~~regeneration~~ reforestation of** secondary forest and tree plantations~~new forests~~. Much of this happened prior to the Conference of the Parties (COP) in Bali and Cancun, which reflect an early performance of the country in implementing REDD+. According to Costa Rica's Forest Reference Emission Level (FREL) submission to the UNFCCC, approximately 133,494,565 t CO_2e have been reduced due to the implementation of the current Forest Law in the 1997-2009 period.

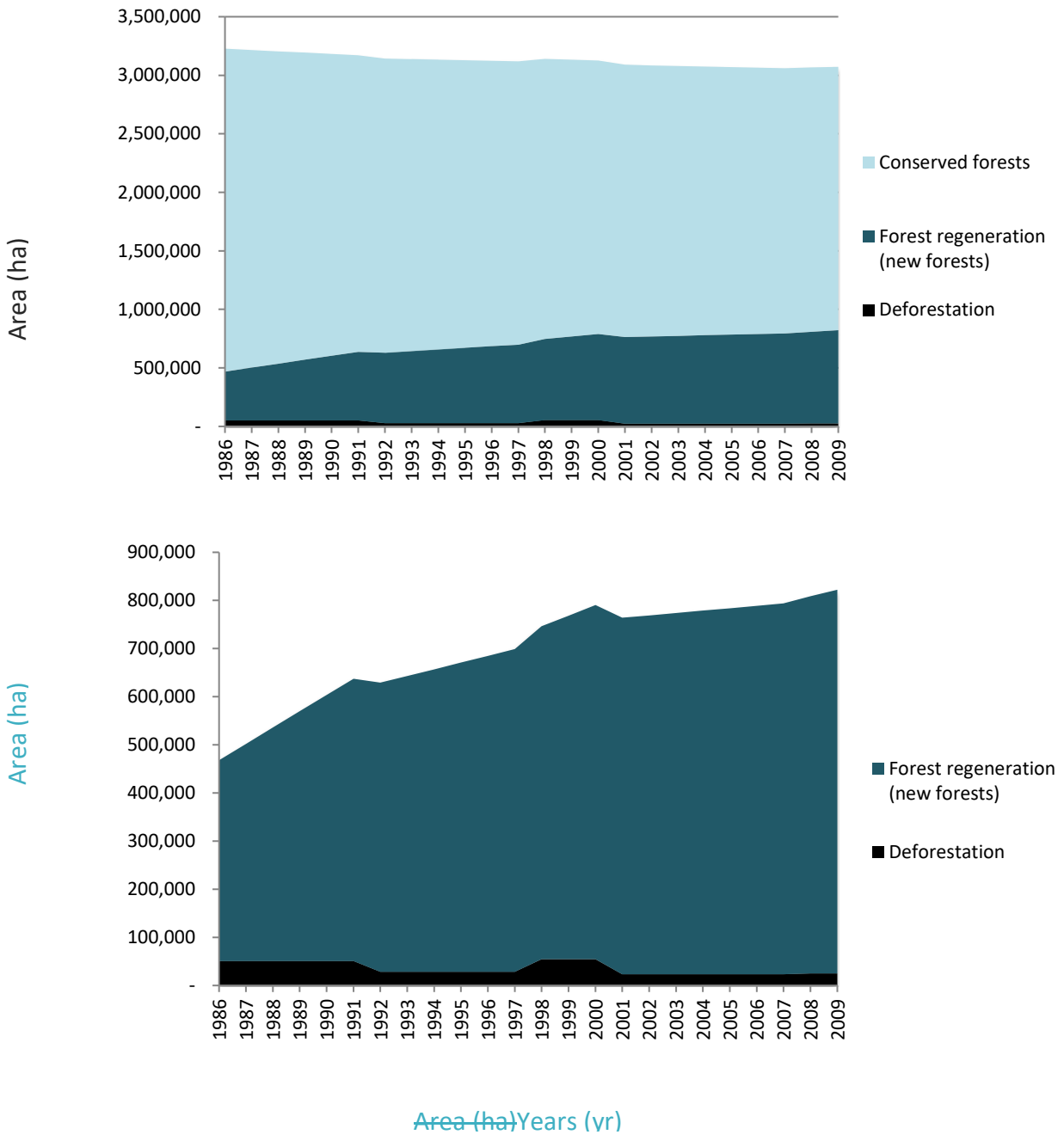


Figure 2.2.2. Area (in hectareas) of forest conservation, deforestation and forest regeneration for 1986-2009. The graphic below does not include forest conservation to provide more detail on forest regeneration and deforestation for the same period.

Consistency with national policies and development priorities

The ER-Program is meant to support the implementation of the National Forestry Development Plan (**Figure 2.2.1**), and is part of the *Forests and Rural Development Plan*. The six forest policies included in the ER-Program work consistently with the strategic actions included in the Plan.

In terms of national strategic planning, the ER-Program was defined as a specific goal[5] of the National Development Plan. The ER-Program will also support other strategic goals included in the National Strategy on Climate Change, both in mitigation and in adaptation, especially in relation to Carbon Neutrality and in increasing ecosystem and human population resilience to climate change. Further, the ER-Program has a strong social component and seeks to increase the participation of stakeholders in order to reduce poverty, especially in rural areas.

Payment expectation for emissions reductions

According to Costa Rica's R-PP and ER-PIN[6], the National REDD+ Strategy started implementation in 2010. For the FCPF Carbon Fund, Costa Rica agreed to shift the start date of the ER-Program to 2012, to accommodate the 1998-2011 historical reference period. Thus, Costa Rica has the expectation that the FCPF Carbon Fund will recognize emissions reductions starting from 2012.

Measured emission reductions in 2012-2013

Following the same methods described in **Section 8**, Costa Rica conducted a first monitoring of emission reductions for the period 2012-2013. These results are included in **Table 2.2.1**. These results show that, when compared to the historical reference period, Costa Rica has demonstrably reduced a total of -3,601,692 3,013,712 t CO_2e. It currently includes an estimate of emissions from forest degradation and carbon stock enhancement in forests remaining forests based on proxy measurements, as a preliminary step to include them in the reference level. Nevertheless, these estaimated emissions will be refined and improved in the near future, as explained in the Roadmap detailed in **Sections 8.8 and 8.9**.

Following the same methods described in Section 8, Costa Rica conducted a first monitoring of emission reductions for the period 2012-2013. These results are included in **Table 2.2.1**. These results show that, when compared to the historical reference period, Costa Rica has demonstrably reduced a total of -4,159,891.843.505.241 t CO_2e.

Table 2.2.1. Emission reductions for 2012-2013 (in tons of CO_2 equivalent per year).

Year	Total emissions from deforestation	Total absorptions from reforestation	Total emissions from degradationTotal net emissions in Forest land remaining forest land (C stock	Total absorptions from forest remaining forest	Total *net* emissions	Reference Level	Emission reductions against the Reference Level

[5] Program 2.4.of the National Development Plan 2015-2018.

[6] Technical basis for the *letter of intent* signed by the Government of Costa Rica with the World Bank for the payment of $63.000.000 or 12.000.000 t CO_2e, per resolution Nº CFM/5/2012/1 of the Carbon Fund during its fifth meeting in Paris (16-17 October, 2012).

			enhancement)[7]				
2012	5,264,436 6,028,654	-4,584,400- 4,478,048	2,773,693 1,146,180	- 965,422	2,488,307 2,696,786	**4,133,087** 4,854,712	-1,644,780- 2,157,926
2013	5,470,334 6,247,194	-5,102,430- 4,540,629	2,773,693 1,146,180	- 965,422	2,176,176 2,852,746	**4,133,087** 4,854,712	-1,956,912- 2,001,966
					Total		**-3,601,692 -4,159,892**

Year	Total net emissions from anthropogenic deforestation	Total absorptions net emissions in *land converted to Forest land* (new forests)in Forest land remaining forest land (C stock enhancement)	Total *net* emissions	Reference Level	Emission reductions against the Reference Level
2012	6,028,6546,360,543	-4,478,048 -4,568,633	1,550,606 1,791,910	3,708,5313,385,759	-2,157,925- 1.593.850
2013	6,247,194 6,559,345	-4,540,629 -5,084,977	1,706,566 1,474,368	3,708,5313,385,759	2,001,966- 1.911.391
				Total	- 4,159,891**3.505.241**

2.3. Political commitment

Costa Rica's political commitment to reducing emissions and conserve forests has been clear in its environmental legislation, sectoral and cross-sectoral goals. For example, the current Forest Law prohibits forest conversion. Political commitement is also clear in the country's strategic planning. The ER-Program is part of the National Development Plan for 2015-2018, *i.e.* program 2.4 of the Plan specifically refers to the implementation of the ER-Program.

Additionally, through the Biodiversity Law, SINAC was created to reduce illegal logging and the impact of forest fires. Costa Rica also established an extensive system of Protected Conservation Areas with several management categories. Most national parks and biological reserves are strategically located to create biological corridors, protect high-conservation value forests and avoid the loss of key species.

Other examples of political commitment are:

- The ER-Program was validated by the Minister of MINAE

[7] These figures come from the degradation tool (cell N74) "Balance of net emissions from changes in canopy density in primary forests during the period 2005-2015".

- The President of the Republic confirmed the intention of achieving Carbon Neutrality during the New York Climate Summit in 2014, and included forests as an important part of this strategy

- The Minister of MINAE spoke of the country's intention to develop a *Forests and Rural Development Program* at COP 20. This program aims to move towards an integrated approach to manage rural landscapes, while reducing poverty

- In an official mandate, the Minister of MINAE issued guidelines to facilitate the implementation of the National Forestry Development Plan for 2014-2018, mainly focused on the economic reactivation of timber production, as well as the transformation and marketing of forest products to increase revenue in rural areas

- Costa Rica initiated dialogues with multiple sectors to prepare the INDC submitted to the UNFCCC in October 2015; the INDC includes the forestry sector and the National REDD+ Strategy

- Currently, an Executive Decree is being prepared to define the responsibilities and roles of the public sector (and public institutions) in the implementation of the ER-Program. This decree will also help clarify the organizational structure and implementation framework of the ER-Program

3. ER-Program Location

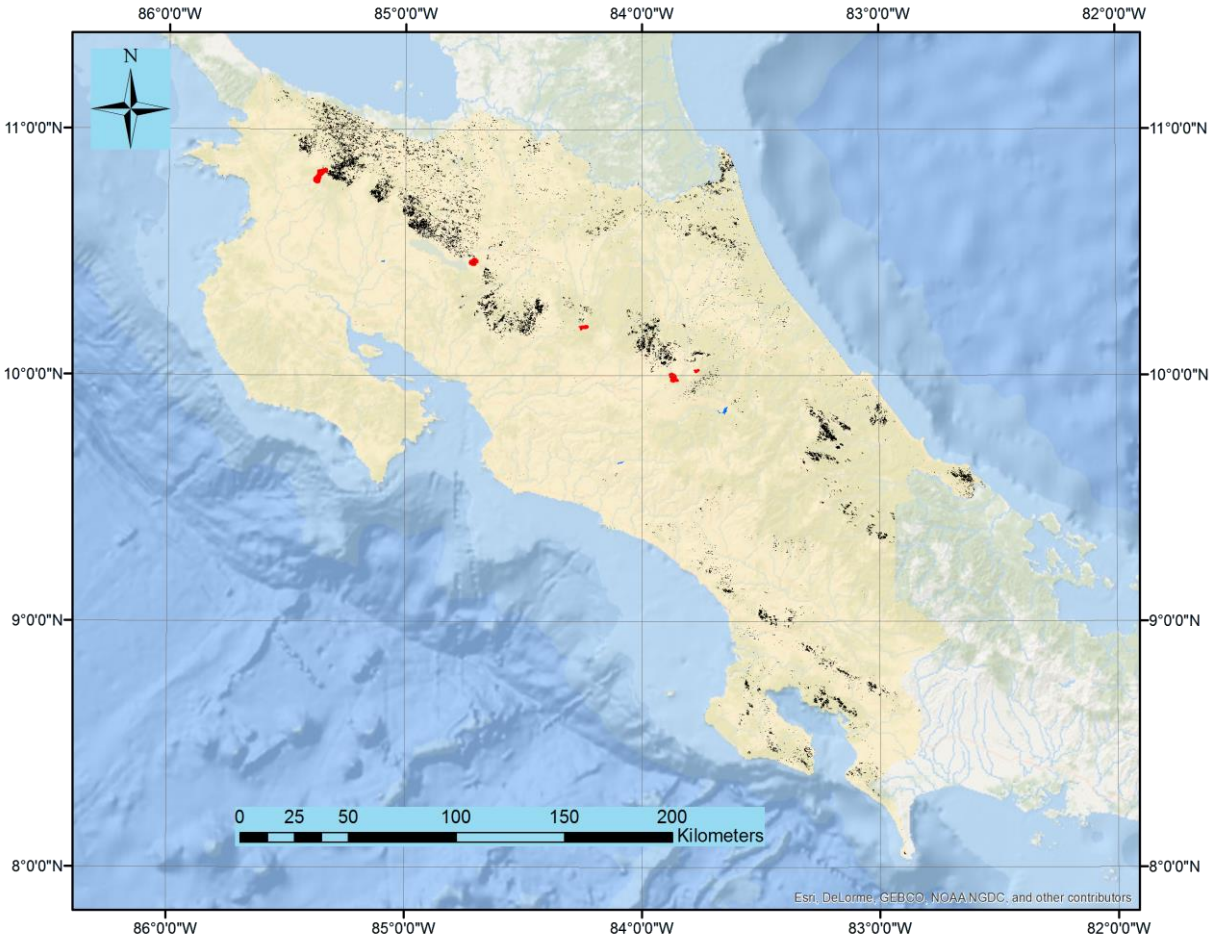
3.1. Accounting Area of the Emission Reduction Program

Location

Figure 3.1.1. shows the accounting area of the ER-Program, which includes the country's continental territory (5,133,939.50 ha), but excludes the Coco Island (238,500 ha)[8], a World Heritage site 532 km from Costa Rica's Pacific coast. The Coco Island is inhabited solely by park rangers and is not subject to anthropogenic intervention. The island is also too distant from Costa Rica's continental territory and is therefore not prone to displacements that may be caused by Costa Rica´s REDD+ activities.

Figure 3.1.1. Geographical boundary of the ER-Program**. Source** of original map**:** https://wiki.hattrick.org/w/images/0/09/Location_of_Costa_Rica.PNG

[8] https://es.wikipedia.org/wiki/Isla_del_Coco



Color	Type of area	FREL	ha	%
	Areas associated to volcanic activity	excluded	1,580.67	0.03%
	Areas associated to river-meandering	excluded	16,693.29	0.33%
	Areas covered by clouds and shadows	excluded	115,364.16	2.26%
	Area with land-cover information	included	4,980,301.38	97.39%
	Total area considered		**5,113,939.50**	**100.00%**

Figure 3.1.2. Areas with special considerations within the accounting area of the proposed FREL/FRL.

Within the accounting area, special considerations were made for two types of areas: those without land use information due to clouds and shadows, and those where forest losses are associated to natural disturbances (**Figure 3.1.2.**).

Areas without land use information. This is due to the tropical moist to rainy climate in Costa Rica and the presence of three major mountain ranges, causing high cover by clouds and cloud shadows. Because of this, it is almost impossible to create cloud-free mosaics of satellite images without combining images acquired at different points in time

- Several maps[9] were generated for the accounting area on December 31st/January 1st of the years 1985/86, 1991/92, 1997/98, 2000/01, 2007/08, 2011/12 and 2013/14[10]. These maps were created using Landsat images acquired within a 14-months' time window. This resulted in 0.49%-1.83% of the total accounting area covered by clouds and shadows for each map (Agresta *et al*., 2015.a, p. 8). For 1986-2013, a total of 2.26% of the accounting area lacked land use information.
- The low percentage of area without land use information was obtained by filling cloud and shadow areas with global data published by Hansen *et al.* (2013)[11]. This method will also be used in future measurement and reporting. Due to increasing availability of global forest cover data, it is unlikely that additional areas will have to be excluded due to gaps in land use information in future periods.

Areas impacted by natural disturbances. Losses of forest cover associated to natural disturbances, such as volcanic activities and river-meandering, are not anthropogenic and cannot be avoided through REDD+ activities. Costa Rica deems more appropriate to exclude such losses in the context of results-based payments.

- Costa Rica has a mountain range composed exclusively by volcanoes (*Cordillera Volcánica Central*), six of which are active (*Arenal, Miravalle, Rincón de la Vieja, Poás, Irazú* and *Turrialba*). During 1986-2013, volcanic activity impacted 6,105.42 hectares of land (0.12% of the total accounting area), destroying 1,580.67 hectares of forests (63.6% of which were old-growth forests). Considering that areas impacted by volcanic activity can easily be identified in satellite images and that volcanoes can inflict significant non-anthropogenic damage to forests, Costa Rica decided to exclude forest losses associated to volcanic activity from its accounting area (**Figure 3.1.3.**).
- Similarly, flooding and river meandering may cause non-anthropogenic forest loss that could increase in the future as a consequence of increasing extreme weather events related to climate change. During 1986-2013, 16,693.29 hectares of forests (55.4% of which were old-growth forests) were lost to river meandering. As in the case of volcanic activity, forest-related emissions caused by flooding and river meandering are measured and reported, but excluded from the accounting area (**Figure 3.1.3.**).
- For the forest remaining forest activities (both forest degradation and forest enrichment), some areas were excluded from accounting given that forests can undergo natural, non-anthropogenic carbon fluxes. Areas that were both within protected areas and over 500 meters from a road were excluded, with the assumption that human activity is extremely unlikely to occur in these areas and any fluxes there are therefore considered natural. Natural fluxes were estimated (see **Table 8.4.5**) but excluded from the reference level).

[9] These maps are presented in Annex 1.

[10] A notation with two years is used to indicate that the land use maps represent simultaneously the ground situation on December 31st of the first year of the notation and on January 1st of the second year of the notation.

[11] Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, J. R. G. Townshend, 2013. High-resolution global maps of 21st-Century forest cover change. Science: 342 (6160):850-853. Available at: https://earthenginepartners.appspot.com/science-2013-global-forest

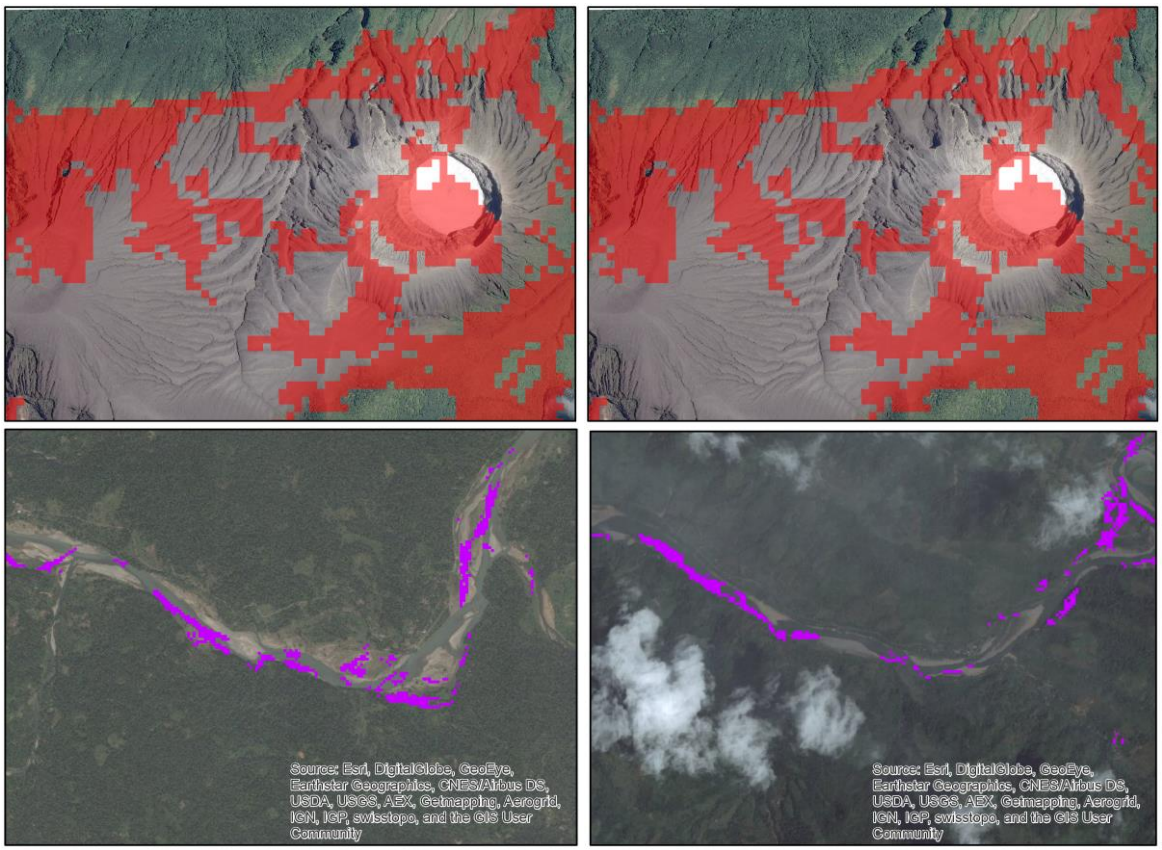


Figure 3.1.3. Examples of non-anthropogenic losses of forest cover associated to volcanic eruptions (red colored areas, top images) and river-meandering (purple-colored areas, bottom images).

3.2. Environmental and social conditions in the Accounting Area of the ER Program

Geography, vegetation and climate

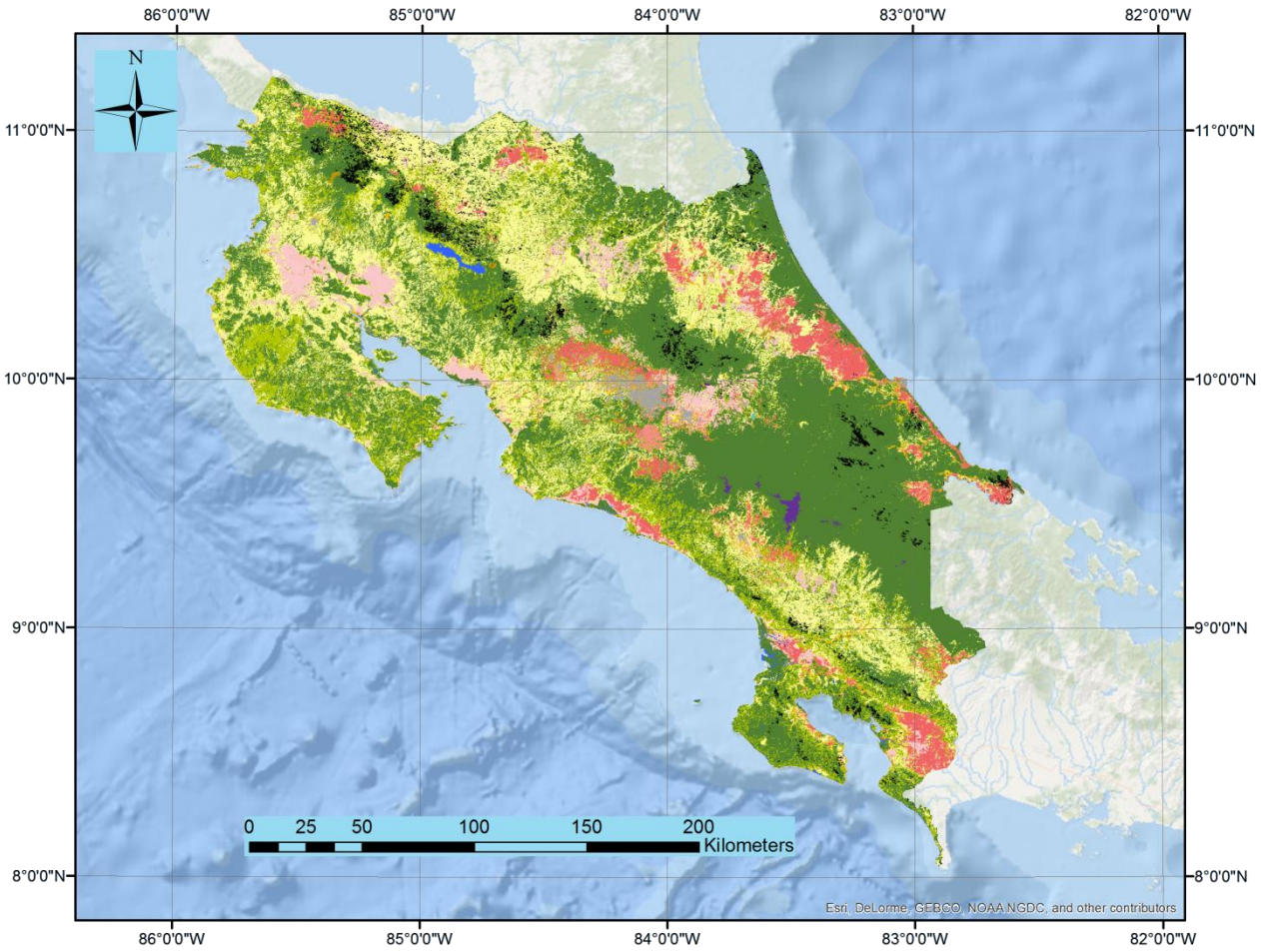
Costa Rica, a Central American country with a population of 4.592.149[12], is located in the tropical region and is characterized for having a wide variety of climates that have resulted in 12 different ecological and forest zones (**Figure 3.2.1.**). Due to geographical, atmospheric and oceanic factors, the country has been divided in seven climate regions: North Pacific, Central Pacific, South Pacific, Central Zone, North Zone, North Caribbean Region, and South Caribbean Region. With 51.139 km^2 of continental area, the country has 34 hydrological basins, amongst which Tárcoles and Reventazón are two of the main ones. It has a heterogeneous relief, subject to the action of important variable climate and biological conditions; it is a mainly mountainous country, whose Northwest-Southeast axis shows mountain ranges and chains whose higher peaks are Chirripó with 3.879 m a.s.l.[13] and Kamuk with 3.564 m a.s.l.

In general terms, two climate regimes exist: Pacific and Caribbean, both with dry and rainy seasons. The most frequent meteorological events and that can cause extreme events in the country are: tropical depressions, tropical storms, hurricanes, low-pressure systems, droughts and cold fronts. Any of these phenomena, if intense, may cause flooding.

Moreover, the variability of climate in Costa Rica is more related to the phenomenon "El Niño" South Oscillation. During El Niño, there is a higher probability for the Pacific area and the Central region to

[12] Data for 2011 of the National Statistics and Census Institute
[13] Meters above sea level

experience dry to extreme dry conditions, while in the Caribbean there is a higher probability of extremely rainy scenarios.



Land-cover		Area
Color	Description	ha
	Forest lands (FL)- Primary forests	2,233,118.88
	~~Lands converted to FL – New forests~~Forest lands	824,096.61
	Cropland - permanent	311,794.20
	Cropland – annual	244,122.84
	Grassland	1,247,688.99
	Settlements	45,039.24
	Wetlands - natural	22,350.60
	Wetlands - artificial	336.69
	Other land - moor	10,420.38
	Other land–natural bare lands	1,973.43
	Other land–artificial bare lands	57,633.48
	No information – clouds and shadows	115,364.16
	Total area	**5,113,939.50**

Figure 3.2.1. Types of forests and non-forest areas for 2011/2012 using classified LANDSAT images, considering the land use categorization of IPCC in its 2006 guides.

According to Holdridge's life zone's classification system and based on environmental factors such as wetness, precipitation and temperature, there are 12 life zones in Costa Rica. The most prominent zones are the very tropical rain forest (29,8% of the country), very wet premontane (15,5%), tropical wet (13,5%), and pluvial lowland montane (13,2%). These ecosystems take place in a high variability of parental material and lands, distributed in a heterogeneous relief and subject to the action of very variable climatic and biological conditions. The most common type of land is inceptisol, covering 38,8% of the territory; however, there is also presence of ultisols (21%), andisols (14,4%), and entisols (12, 4%) and alfisols (9, 6%). Vertisols do not exceed the 2%.

Likewise, the interaction of a diverse climate and altitudinal variables, a geological history very active in emersions, subsidence and volcanism, ~~have caused that since its origins as part of an isthmus,~~made Costa Rica a biological bridge where multiple species of flora and fauna coexist since its origins as part of an isthmus. It is estimated that 4% of the planet's terrestrial species are found in Costa Rica, even though it only has 0.01% of the global extension, which constitutes a heritage and a natural resource of big proportions. Of the 500,000 species calculated for the country, only an approximate of 87,000 (17,4%) have been described. More than 79% of these species described are arthropods. Plants compose the other majority group, of which an approximate 10,979 species have been described. Of the total diversity described for the world, approximately 6% corresponds to Costa Rica.

There is a high degree of endemism in the country. It is estimated that 12% of the Costa Rica plants are endemic (some 1,200 species) and are distributed in different locations. For the group of fresh water fish, it is estimated that there is 14% endemism. This way, factors such as the disappearance of the forest mass, the destruction and alteration of ecosystems, illegal hunting, overexploitation, the introduction of exotic species, the indiscriminate use of pesticides, the illegal trade of species and pollution pose a strong effect and many species are suffering a reduction in their populations, in a way that they can be considered threatened or vulnerable in the country. The World Union's red list of threatened species mentions Costa Rica with 242 endangered species out of which 111 are plants, 62 amphibians, 20 fish and 17 birds.

Economic and political conditions

Costa Rica has an old democratic and pacifist tradition, respectful of human rights. For instance, education was declared free and mandatory in 1869, the army was abolished in 1949, social guaranties of access for all Costa Ricans were enacted back in 1943 and the existence of a rule of law regime and democratic governments have produced a recognized political stability.

During the last 20 years, most households improved their life conditions, thanks to the combination of economic growth and a higher social public investment. Revenues were increased in general, within a framework of liberty and rights, and a better protection of them. It is still, as it was twenty years ago, a "middle income" country, and according to UNDP's classification, of "high human development"; however, the country's challenge is to improve the inequality in income, the reduction of poverty, the inequity of labor markets and environmental unsustainability, within the context of a new development model.

Between 2013 and 2014, the economy grew at a moderate pace, with acceleration and slowdown mini cycles, in a low inflation context. This growth was accompanied by a relatively high unemployment level (8,5%), a higher dynamism in the creation of informal jobs. Health, education and access to public services indexes continued to improve, as well as the average income of families. However, poverty remained stagnant in close to 20%. And in the political arena, the country held free and clear democratic elections for its sixteenth time, the longest sequence of this nature in Latin America. The country evolved towards a multiparty system.

Costa Rica has environmental strengths which are part of its image and historic evolution, and that have positioned it in the world as a responsible and innovative country in ecological issues. Conservation continues to be the country's biggest strength, even though the protected continental surface has not suffered

significant changes, in four years, the marine area almost tripled. Progress in knowledge has allowed the detection of threats to the integrity of ecosystems. Nevertheless, important fragmentations, few forests with high integrity, and strong pressures on land use have also been identified.

Linguistic and socio-cultural diversity

Costa Rica has 24 indigenous territories covering 334.447 hectares, who are the result of two cultural horizons: the Mesoamerican and the Chibchoide. Both are characterized for the cultivation of lands, for basing their diet in corn, cocoa, roots, tubers, wild animals hunting and fishery; but most of all, they maintain a cultural, philosophic and socioeconomic relation with forest resources. 60% of the indigenous population in the country speak their ancestral language, specifically Bribris 55%, Bruncas 6&, Cabécares 88%, Chorotegas 0,4%, Huetares 0,4%, Malekus 68%, Ngöbes 78% andTeribes 10%.

~~With regards to~~100% of small and mid- sized agro forestry producers~~, the 100%~~ speak Spanish. The country has 12 life zones at heights that go from 0 to 3,800 m above sea level, which produced a variety of ecosystems, types of land, microclimates, geography, etc.; it caused that the peasant culture adapted to so diverse conditions producing a particular rural landscape depending on each region (diverse crops, farm sizes, economy and technology adapted to each climate and land conditions).Regarding the socioeconomic indicators, in this sector, the average population has grown old and the youngest abandon the farms in search of better opportunities, the average age of peasants is now 50-54 years, and most of them are males.

Lifestyles and the dependency of local populations on forest resources

According to the National Population Census of 2011, there are 104,143 indigenous people in Costa Rica, of which 48,500 live in their territories. The indigenous homes located in territories add up to 11.853. Of that total, 62,8% performs some sort of productive agricultural activity.13% worked on crops during the last year; 11% own cattle, pigs, poultry, others for self-consumption; therefore 63% have performed at least one agricultural activity. Of the 7.204 indigenous agricultural employees, 88% are male and 12% female, and the position they occupy in this activity corresponds to 2% employers, 69% self-employed workers and 20% employees of private companies. In terms of environmental protection, it is evidenced that the locations where the indigenous peoples exist, match the big remnants of protected areas in the country; their close relationship with nature is also recognized to indigenous peoples, its resources are the fundamental basis of their identity and because of its cosmogonic component, vital for community life.

For the sector of small and medium forestry and agroforestry producers, 30% of the farms in the country are covered by forest, indicating a change of vocation and conscience of many farmers. On the other hand, livestock farming has remained an important activity at the national level. However, the main economic activity is agriculture, which varies according to the country zone. The Central Region represents 92% of the lands planted reported in the agricultural census and is characterized by the production of vegetables with a high technological degree. The Chorotega Region is the one with the biggest production of meat cattle in the country; besides, in the agricultural field, it can be affirmed that Guanacaste is the main producer of grains because of its diversification (rice, beans, sorghum, as well as non-traditional products such as coffee). In the Brunca Region; its economy is based in the agriculture of basic grains, especially corn and beans, as well as Oil palm and pineapple.80% of the country banana is planted in the Caribbean region, and along with the pineapple farms, offers employment to many growers; in the North Huetar Region there are more farming lands; their economy is based in the agriculture of basic grains, sugar cane, coffee, plantains, banana and non-traditional export products such as citric, cardamom, pineapple, passion fruit, papaya, yucca, ornamental plants and some others.

4. Description of actions and interventions to be implemented under the proposed ER Program

4.1. Analysis of drivers and underlying causes of deforestation and forest degradation, and existing activities that can lead to conservation or enhancement of forest carbon stocks

Deforestation and ~~forest regeneration~~reforestation were assessed for 1987-2013 at the national and sub-national scale[14]. This assessment was based on the land use maps used for the construction of the reference level (**Section 8**). At the ***national*** level, the patterns of gross deforestation and gross ~~regeneration~~ reforestation were analyzed. Deforestation reflects current conditions and decision-making by land-owners, while ~~forest regeneration~~reforestation results from longer-term land use planning considerations.

At the ***regional*** level, zones of homogeneous deforestation processes were identified. The zones share distinctive land-cover trajectories. The regional analysis was based on *cantons*. For clustering cantons in zones, the first stage was to conduct a *Two-Step Cluster* analysis according to 3 indicators: the intensity of deforestation during 2001-2011, the cantonal deforestation trend in 1987-2001 and 2001-2011, and the final land use (i.e. 2013). In a second stage, the clusters were manually refined according to expert judgement. Local experts in five consultation workshops validated the results.

Once the zones were finalized, national statistics on land use and agricultural productive systems were derived for them, based on the maps mentioned above. The statistics on population dynamics, employment and migration were also estimated for each zone based on agricultural censuses.

In addition to deforestation and reforestation, emissions and removals in forests remaining forests from forest degradation and forest carbon stock enhancements ~~respectively,~~ were also ~~considered~~included. ~~These emissions and removals are based on proxy measurements of canopy cover and the establishment of a linear relationship between canopy cover and carbon stocks (see **Section 8** for more details). The canopy cover maps were generated for 2005 and 2015, and the estimated emissions and removals were then interpolated to align with the end date of reference period of land use change activities (deforestation and reforestation), thus allowing the establishment of a reference level for forest degradation and forest carbon stock enhancements based on a reference period of 2005-2011. These preliminary proxy estimates will continuously be refined and improved as explained in the Roadmap detailed in **Section 8.8.**~~

Forest cover change in 1987-2013

Forest cover in Costa Rica shows a clear recovery trend. Between 1997 and 2008, Costa Rica started gaining more forests than it lost. During this period, net deforestation gradually fell and net regenerateds increased consistently towards 2013 (**Figure 4.1.1.**).

[14] CDI, 2015.d. Patterns and factors of change in the natural forest cover of Costa Rica, 1987-2013. Report prepared for the Government of Costa Rica under the Carbon Fund of the Forest Carbon Facility (FCPF). 57 p.

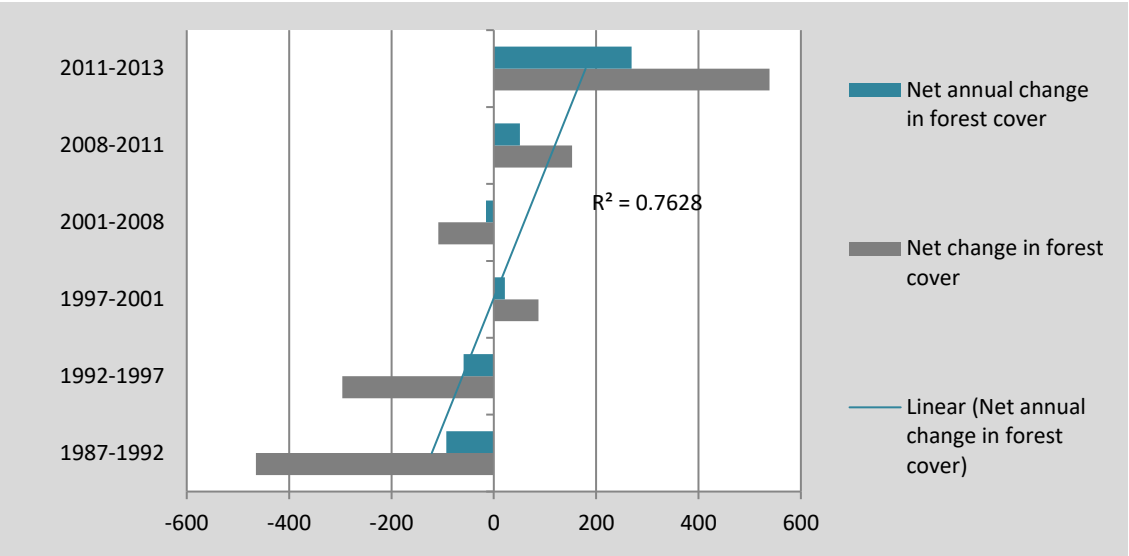


Figure 4.1.1. Forest cover change in 1987-2013, in km^2.

Annual gross deforestation fell from 550 km^{2}yr^{-1} in 1986 to 300 km^{2}yr^{-1} in 2013, *i.e.* a 40% reduction in annual forest loss (**Figure 4.1.2.**). Conversely, forest regeneration presents a recovery trend, especially after the year 2000. 70% of deforested areas were used as grasslands (**Figure 4.1.3.**). Crop production was established on 20% of deforested areas. These crops were sold in the domestic market (*i.e.* rice, beans, oil palm) and exported (*i.e.* pineapple, banana, oil palm) (**Figure 4.1.4.**). 10% of the converted areas were regenerated (**Figure 4.1.4.**).

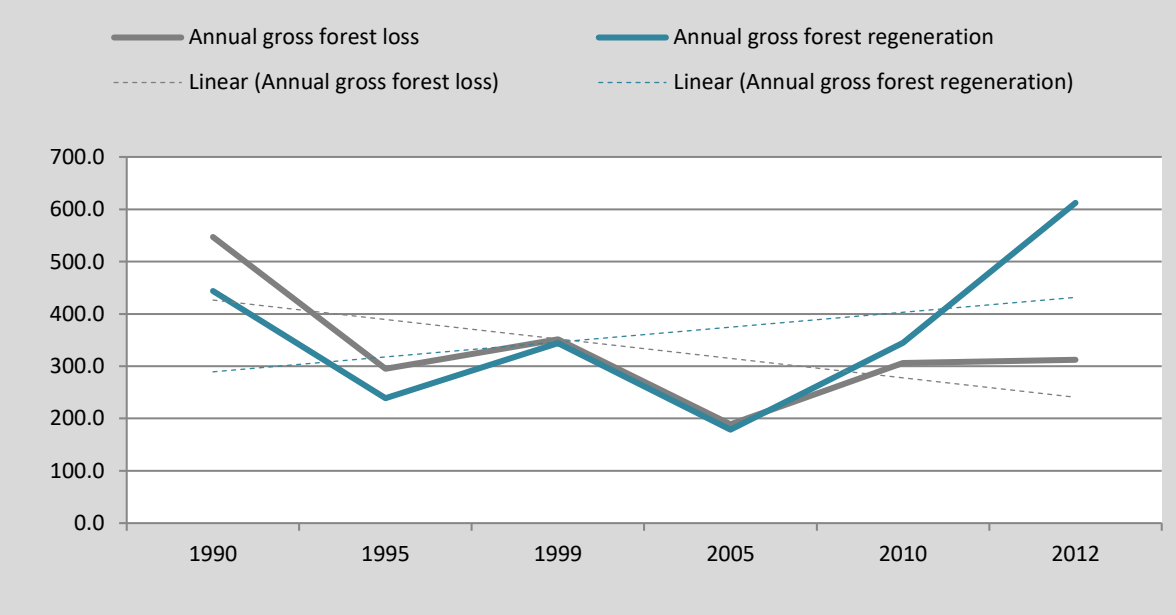


Figure 4.1.2. Forest loss and regeneration in 1987-2013. The year assigned is the average of each period.

In the 1990s, a combination of institutional and economic factors modified existing forest cover change trends. In particular, the institutional regulatory framework implemented on the basis of the current Forest Law reverted the former regeneration trend. From then on, and in contrast with previous periods, an important part of the forests being regenerated had to be preserved according to the new law; this could explain its accelerated expansion during this decade. Conversely, the law apparently did not have the same effect on gross deforestation. Some research (Arias 2005, Campos *et al.* 2001, Campos *et al.* 2007, FUNDECOR 2005,

SINAC 2002) noted that as a result of the Forest Law, forest owners developed strategies to continue expanding croplands in response to market incentives.

The Forest Law posed stricter regulations on forest management, but less restrictions to timber harvesting in non-forest areas, *e.g.* treed grassland. This created certain negative incentives, such as increased removal of trees from grasslands and forest understory clearings (*socolas*). With the new Forest Law, many land-owners converted managed forests into grasslands and croplands (SINAC, 2002). Notably, land-owners would take advantage of these gaps in the ~~law~~ legislation and practice *socolas* to then request a permit to harvest tress in non-forest areas. Therefore, some forests were first degraded and then deforestated in a longer-term process. Once timber was harvested, the owners decide if the area would be maintained for cattle grazing or to leave it for forest regeneration. This process is most commonly observed in the Tortuguero, Huetar Norte and Cordillera Volcanica Central Conservation Areas (FUNDECOR 2005). On the other hand, the law could not be retroactively enforced, and to the extent that harvesting permits were issued on the basis of the previous law, those permits were executed and implied an additional source of deforestation or degradation during the years immediate after the enactment of the new law.

~~On the basis~~Because of this new Forest Law, a political dialogue was launched in 1998 to develop the country's first National Forestry Development Plan for 2001-2010. This plan contained policies to facilitate the implementation of the Forest Law. Among others, the following key elements were addressed (MINAE 2001):

- Creation of a national system for forestry planning
- Strengthening existing information systems for monitoring and control of forest resources and forest use
- Creation of new funding mechanisms
- Improvement in forestry and the forest industry competitiveness
- Strenghening of institutional capacities
- Linking national to global efforts in forest conservation

Building upon the new Forest Law, and as a response to the alarming situation of deforestation, in 2002 MINAE developed the "Illegal Logging Control Strategy 2002-2007" (SINAC 2002) as well as other related measures. This strategy aimed to stop the *socola*-deforestation cycle and promoted the sustainable use of the forestry resources by simplifying requirements and facilitating the legal access to merchantable timber, particularly for small owners. This strategy also proposed a modification of the Forest Law to reduce the high-levels of impunity and to re-structure SINAC to strengthen information and monitoring systems for the management of Costa Rican Conservation Areas.

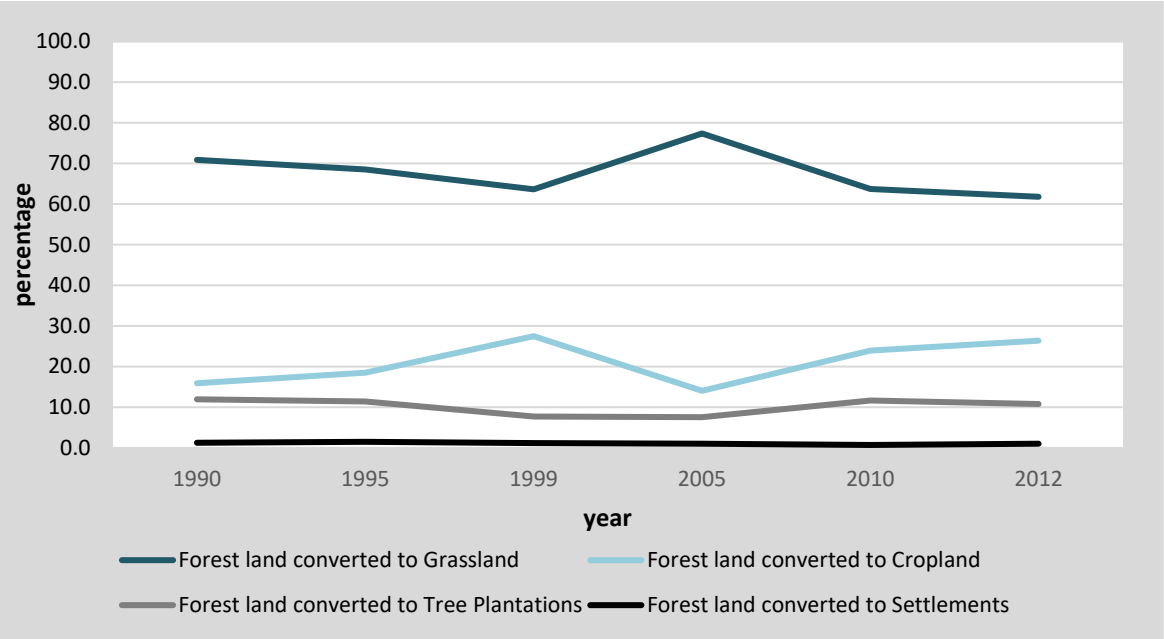


Figure 4.1.3. *Forest land* conversion in 1986-2013 (in %).

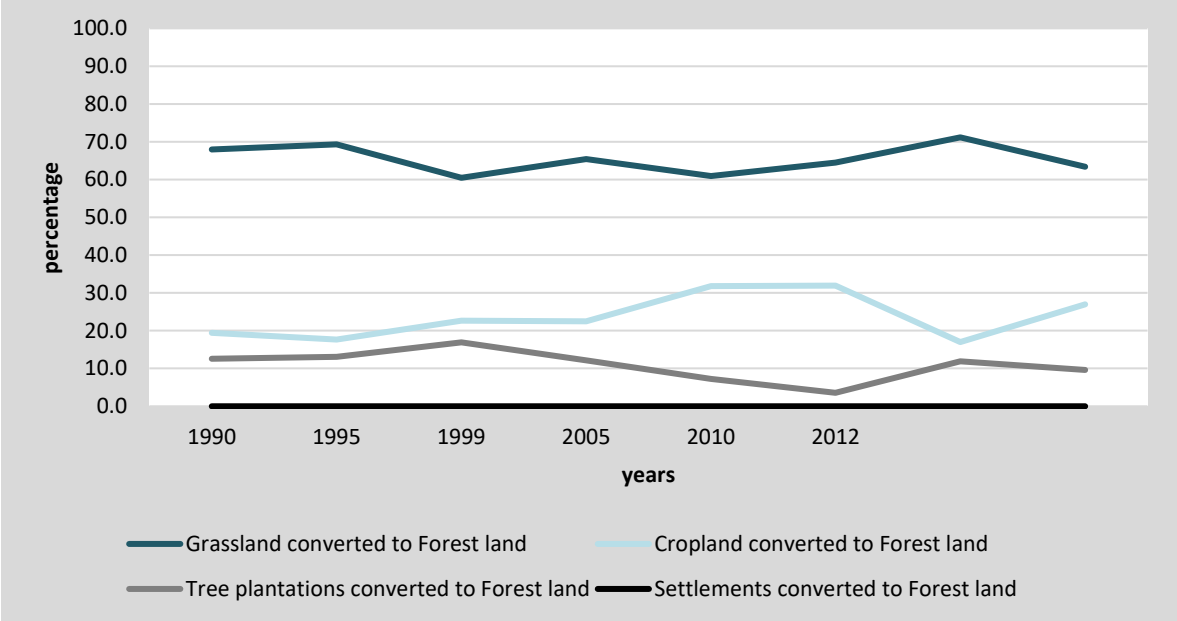


Figure 4.1.4. *Land* converted to Forest land in 1986-2013 (in %).

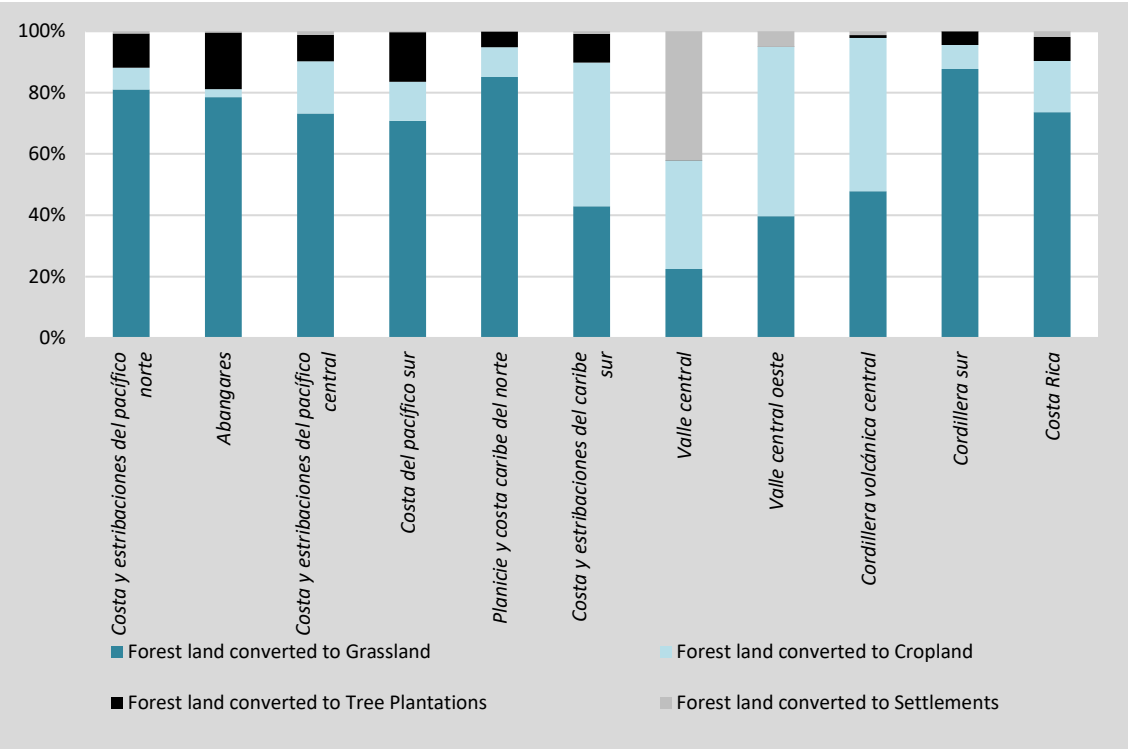


Figure 4.1.5. *Forest land* conversion in 1986-2013, by *zone* (in %).

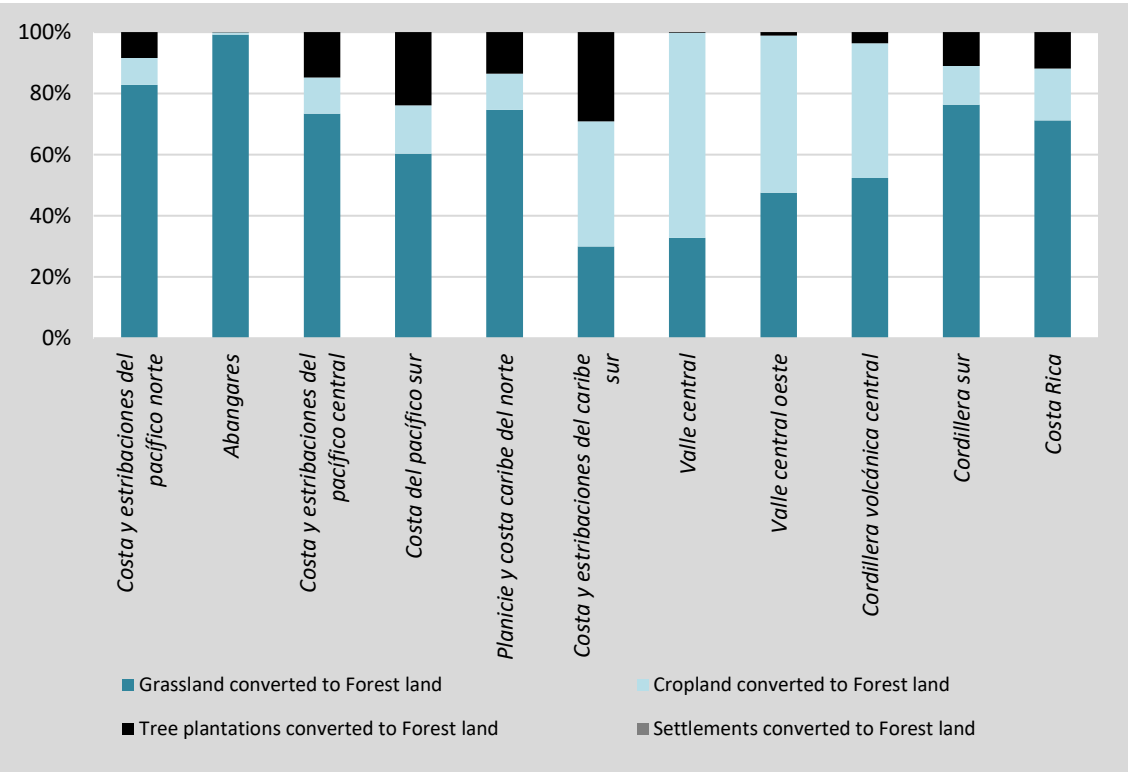


Figure 4.1.4. *Land* converted to *Forest land* in 1986-2013, by *zone* (in %).

Deforestation ~~and forest degradation~~ by land-tenure regime

Land tenure regime is an important factor driving land use change, as identified in Costa Rica's R-PP. Namely, deforestation is higher in private forests ("tierras privadas") and much lesser in protected areas ("Parques Nacionales y Reservas Biológicas"). It could be argued that lands with fewer restrictions by law are more prone to land use change (**Figure 4.1.5**).

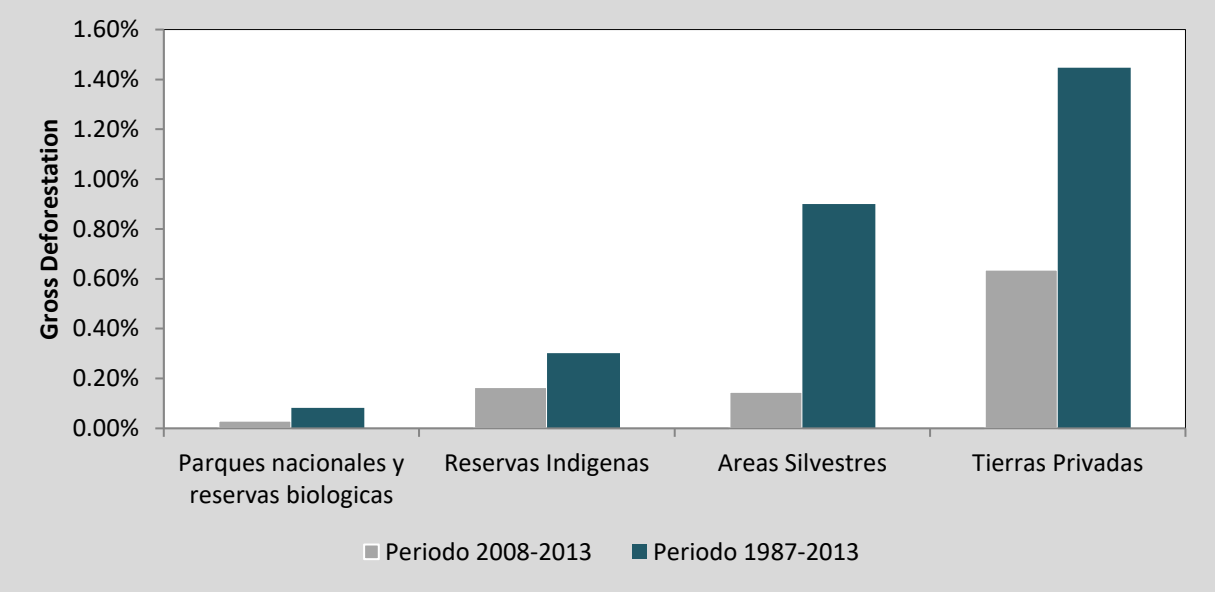


Figure 4.1.5. Gross deforestation (%) by land tenure regime for 1987-2013 y 2008-2013.

Protected wildlife areas including National Parks and Biological Reserves

Forest protection has a significant impact on gross deforestation rates (**Table 4.1.1.**). Deforestation outside protected areas could be up 40% higher. Forest regeneration is also more likely within protected areas.

Table 4.1.1. Probability of land use change *outside* and *inside* protected areas in Costa Rica, 1987-2013.

Period	Location	Forest lands	Deforestation	Agriculture	~~Forest regeneration~~Reforestation
1987-2001	*Outside Protected Areas*	62.9	88.7	93.2	88.6
	Inside Protected Areas	37.1	11.3	6.8	11.4
	Costa Rica	100.0	100.0	100.0	100.0
2001-2013	*Outside Protected Areas*	61.8	91.4	92.9	87.9
	Inside Protected Areas	38.2	8.6	7.1	12.1
	Costa Rica	100.0	100.0	100.0	100.0

Protected Areas in Costa Rica are classified according to its protection category. The most restrictive category in terms of use is *National Parks and Biological Reserves*; here, deforestation present but to a lesser extent (MINAE, 2011). Remaining deforestation may be due to the fact that certain properties have yet to be formally expropropiated from private owners. If properties are registered as state property and if there were institutional presence in these areas, deforestation would likely be less frequent. In other cases, illegal

tenants, illegal loggers, hunters and miners may cause deforestation. In many cases, the State has little capacity to prevent these events.
Regarding other categories, 14% of the country is located in forestry reserves and wildlife refuges. Most of these areas are located in private or mixed tenure regimes (not all lands are State-owned and some belong to private owners). Lack of clear land title is a problem here due to costly and lengthy administrative or judicial processes. In forestry reserves, current legislation requires owners to demonstrate possession 10 years before the creation of the reserve. Very often this is difficult to demonstrate.

Private lands outside National Parks and Biological Reserves

In most cases, landowners generate higher incomes with agriculture prodcution or cattle grazing than with forests. Forest management is restricted by several factors such as road access, policies, legal regulation, as well as market conditions. It is likely that in a growing economy, more pressure will be put on forests (Joyce, 2006 and Joyce, 2013). Other likely causes of deforestation in private lands could be access to timber resources. This means that failure in enforcing the law, combined with existing timber harvesting regulations, may result in barriers to obtain fair income from *Forest lands*.

The findings regarding the behavior of deforestation by regeneration stage that indicates the increase in deforestation at early regenerations stages instead of at the stage of mature forests, it is clear that the cause of deforestation is the ban on use change resulting from the current legislation since owners do not allow that the recovered cover becomes a fully mature forest. It is argued that legislation and related institutions (Forestry Law 7575 in its article banning land use change and the lack of efficient control) promote more deforestation in early stages of regeneration to avoid a conversion into "forests".

Finally, small peasants and forestry producers (Zuñiga, 2014) argue over-regulation and administrative banning of sustainable management of natural primary and secondary forests; restrictions on access to PES or in the recognition of the values of standing trees to land owners or possessors of natural forests; the lack of competitiveness of the forest use vis a vis alternate use; the weakness of the government in the implementation of control mechanisms as elements that drive deforestation and forest degradation. As barriers to maintain forest carbon reservoirs it is mentioned the difficulties to engage the incentives scheme, to have access to financing and that the government do not promote forestry activities. Regarding activities to increase forestry reserves it is mentioned that there is lack of financing and that the government do not promote the activities as well as the uncertainties deriving from the ban on land use change imposed by the forestry law. Regarding sustainable forests management, it is argued as main causes the complexity of procedures to access forestry management as per current schemes.

Areas under special regime, especially indigenous territories

The consolidation of indigenous territories has reached varying degrees of success. Some are still in the early stages of consolidation, *i.e.* the demarcation of their territories on the basis of executive decrees or laws. Others are starting the cadastral, registry and land tenure studies and others are already operating on clarified land-tenure rights or recovering lands occupied by non-indigenous in these territories.

Deforestation in these areas are related to the lack of control by indigenous peoples of their entire territories, as well as lack of ability by the State to avoid irregular land-titling by invaders in indigenous territories. This is done by irregular purchase of land and is enhanced by the lack of a mechanism to recognize land titles which is managed by indigenous peoples.

State lands outside Protected Areas

There is not enough knowledge on the location, magnitude and deforestation trends in these lands. The country has already enacted a legal framework for its planning and control, however the irregular cadastral situation and the lack of concrete measures to incorporate these lands as part of the *Natural State Heritage* prevent a clearer understanding of the situation. According to article 13 of the current Forest Law, the *Natural*

State Heritage shall include forests of the national reserves, of those areas declared under full state control (inalienable), of farms registered as state property including those of Municipalities, autonomous institutions and other agencies of the Public Sector.

~~*Land tenure of degraded forest areas*~~

Deforestation by forest age & land tenure regime

Forest age is also an important factor driving deforestation in all land tenure regimes (**Figure 4.1.6**). The highest deforestation rates are found in younger forests (<10 years). Conversely, lower deforestation rates are found in older forests. This suggests that people prefer to conserve older forests and that deforestation agents are influenced by legal and economic incentives to clear younger forests.

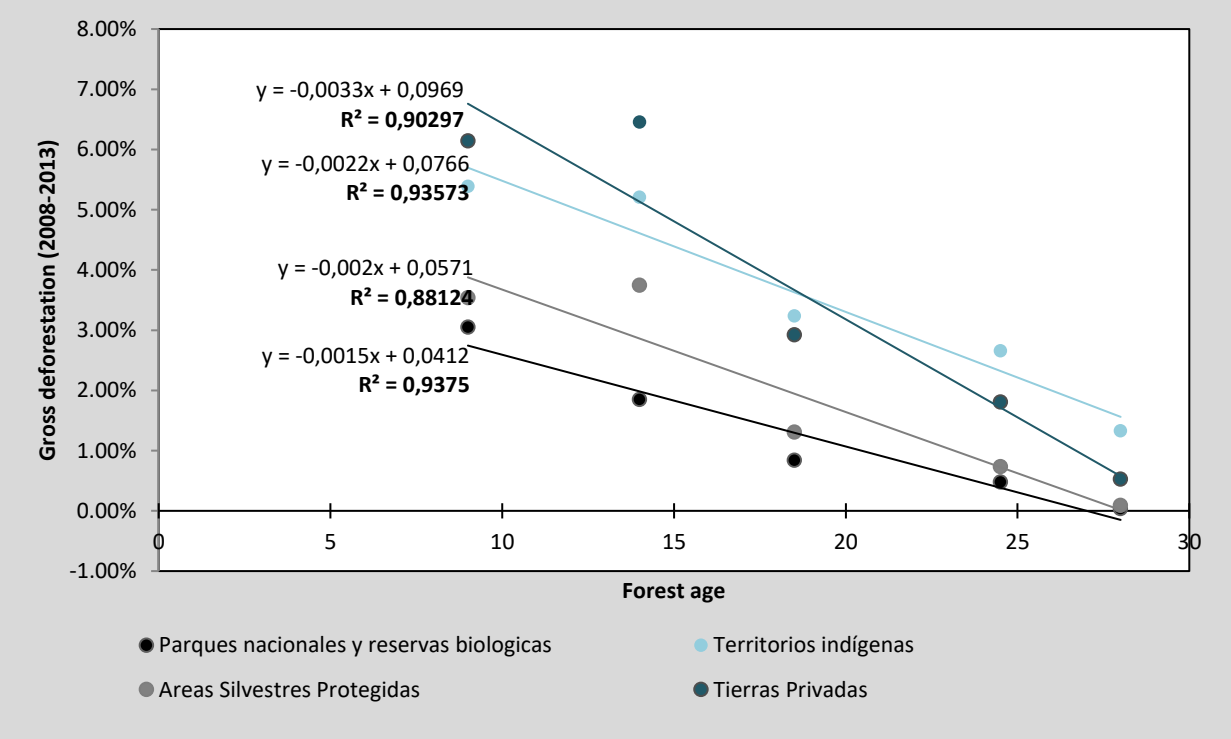


Figure 4.1.6. Gross deforestation by forest age.

Indirect factors for each deforestation homogeneous zone

Table 4.1.2 below shows summary information of key factors for each deforestation homogeneous zone. These results are aggregated for all zones and were validated by local communities. The most important factors driving deforestation are related to the competitiveness of agricultural activities. These factors show that deforestation is mainly an economic phenomenon, in which the decisions of changing the land use from forest to other uses are driven by the desire of 1) exploiting timber, or 2) to make an alternate land use. The decisions of conserving forests are made because 3) given the conditions, a higher profitability is NOT obtained by conserving forests (that includes values for ecotourism use, or for research, of future options, personal values, etc.), or 4) the impossibility of doing so, for instance, because of a legal mandate. According to this, any agricultural policy promoting the alternate use of forests will favor deforestation.

On the other hand, programs such as PES, act by increasing the forest's relative profitability. These must deal with other market situations, such as the behavior of the local price of timber, or the long term price of any product that may foster competition for land use (*e.g.* melon or pineapple), that increase the general profitability of all the competitive uses of forests. These variations in price may be caused by international situations or even by the improvement of accessibility through infrastructure development.

Different authors have also argued in favor of other factors governing deforestation, such as existing legislation or institutions (*e.g.* Forestry Law). Other factors such as spiritual values towards the forest, household income, labor availability in the zone, educational level, etc., are considered marginal[15].

Table 4.1.2. Key indirect factors driving deforestation and forest regeneration.

Indirect factors	Score	Relative contribution
Prices of key agricultural crops	39	24%
Tourism (employment, land value)	15	9%
Urban markets growth and increase of urban demand for derived products	14	8%
Proximity and access to the central valley (control, land price)	13	8%
Changes in employment structure (to urban and tourism)	12	7%
Productive transformation towards agribusiness systems (productive intensification)	12	7%
Demand increase of cattle products	10	6%
Rural-urban migration	9	5%
Foreign labor force, rural labor force availability	7	4%
Appropriate ecological context for cattle	6	4%
Fall of livestock density capacity	5	3%
Fall of livestock density capacity in regions neighboring traditional livestock areas	5	3%
Indigenous productive systems	5	3%
Foreign labor force availability in services sector	4	2%
Land cost increase in neighboring regions	4	2%
Forest moratorium	3	2%
Land cost increase (in other economic activities)	2	1%
Total	165	100%

Drivers and underlying causes of forest degradation

Privately owned forests in Costa Rica went through an intervention process during the 1970s and 1980s, followed by a reform of the forestry sector in the 1990s. The current Forest Law 7575, which allows for payments to forest owners for environmental services (Art. 22-27) and establishes the National Fund for Forest Financing (FONAFIFO) to provide financial support for small and medium-sized forestry companies (Art. 46-51) (Brockett & Gottfried, 2002)[16] triggered the initial identification of forest degradation drivers in Costa Rica.

[15] Studies referred to previously show that spiritual values of forests have not a significant relevance, however the issue should be assessed in indigenous territories that includes more than 10% of the country forest cover and where this issue could be relevant (MINAE, 2011; Vallejo,2013).

[16] Brockett, C. D., & Gottfried, R. R. (2002). State Policies and the Preservation of Forest Cover: Lessons from Contrasting Public-Policy Regimes in Costa Rica. *Latin American Research Review*, *37*(1), 7–40. Retrieved from http://links.jstor.org/sici?sici=0023-8791(2002)37:1%3C7:SPATPO%3E2.0.CO;2-0

In the initial stages of implementation of the Payment for Environmental Services Program (1997-2003), forest degradation was identified associated with the harvesting of remnant trees in wooded pastures. This practice is attributed to the excessive regulation of the management of natural forests promoted by the Forest Law; by the implementation of an unwritten policy by the Ministry of Environment, Energy and Telecommunications (MINAET, formerly MINAE), which ordered an administrative ban on the management of natural forests; by the elimination of PES for forests subject to natural forest management (Contraloría General de la República, 2008)[17]; and by flaws in legislation defining the legality of forestry operations (Navarro et al, 2006)[18].

This restrictive legislation may have been excessive, leading to a decline in the commercial competitiveness of forest management when compared to other rural economic activities and increasing bureaucracy and associated costs to achieve legality of native forest management operations. To be ilustrative, the cost of achieving legality native forest management, considering an average four-month processing time, is 13.9 USD/m^3. If this process were to reach eight months, this cost would be 17.5 USD/m^3. Comparatively, the cost to achieve legality for forestry plantations is around 3.87 USD/m^3, which are still high considering that achieving legality for agricultural activities, with which forestry activities compete, comes at no cost for the landonwer. Therefore, the increase in the cost to achieve legality of sustainable forest management has reduced the competitiveness of forestry as land use, and leads to the logical consequence of forest owners opting to change land use to agriculture and/or grazinglands, or to illegally harvest trees (Navarro et al, 2006[19] and Navarro et al, 2008[20]) (Figure 4.1.7).

[17] Contraloría General de la República. (2008). *INFORME No . DFOE-PGAA-7-2008 DIVISIÓN DE FISCALIZACIÓN OPERATIVA Y EVALUATIVA ÁREA DE SERVICIOS PÚBLICOS GENERALES , AMBIENTALES Y NORMATIVA EN MATERIA DE RECURSOS FORESTALES POR EL MINISTERIO DEL AMBIENTE Y ENERGÍA (MINAE)*. San José, Costa Rica. Retrieved from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwiLzarz2c3YAhWDnlMKHdKcBvQQFggqMAA&url=https%3A%2F%2Fcgrfiles.cgr.go.cr%2Fpublico%2Fdocs_cgr%2F2008%2FSIGYD_D_2008008479.doc&usg=AOvVaw27b3cnnwpxntnKkvzdHOPQ

[18] Navarro, G., Vieto, R., & Bermúdez, G. (2006). *Costos de Acceso a la Legalidad, Cadenas y Actores de Mercado de la Madera legal e ilegal en Costa Rica.* San José, Costa Rica. Retrieved from http://www.fao.org/forestry/12925-0876f8fe8d9a597707a654029b82a818a.pdf

[19] Ibid

[20] Navarro, G., Obando, G., & Corella, O. (2008). Ambientalismo light y la resaca forestal en Costa Rica. In Organización de Estudios Tropicales (Ed.), *El abastecimiento sostenible de madera en Costa Rica* (p. 120). San J: Organización de Estudios Tropicales. Retrieved from http://onfcr.org/media/uploads/cyclope_old/adjuntos/AbastecimientoSostenible_Madera_CRnu34231.pdf

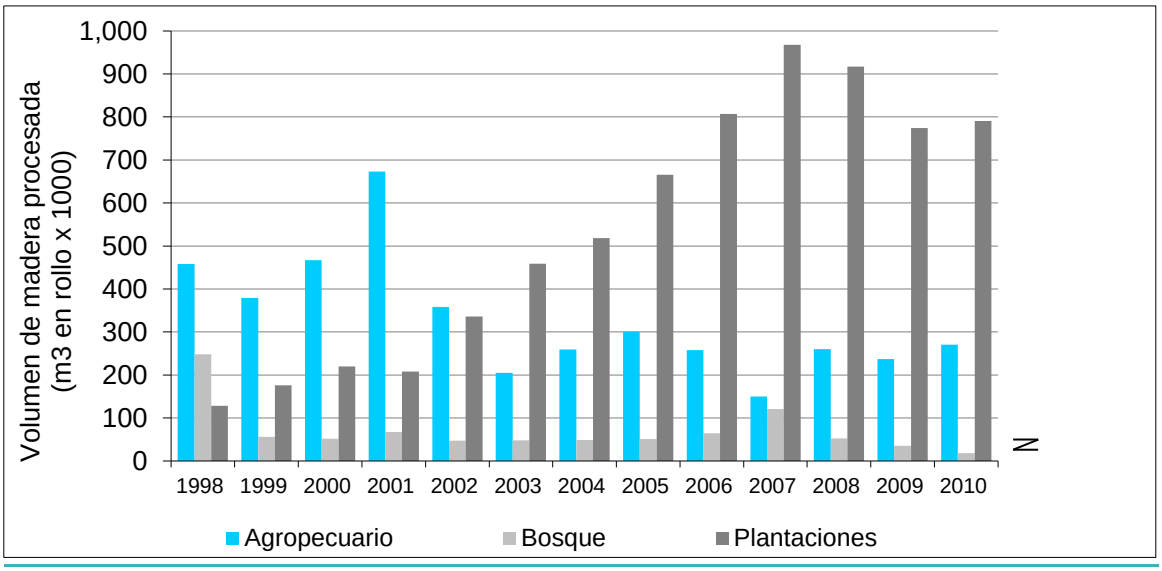


Figura 4.1.7: Wood supply chain by source in Costa Rica from 1998-2010. Source: Oficina Nacional Forestal, 2010[21].

Such increased costs led to a significant change in the dynamics of wood supply in Costa Rica. Until the mid-1990s, natural forests were the main source of wood supply; however, the restrictive policy applied to the management of natural forests (primary and secondary forests) resulted in a rapid increase in the use of trees in agricultural lands, along with forest degradation and deforestation. Beginning in 2002, MINAE formalized the strategy to control illegal logging and toughened the requirements to obtain cutting permits in agricultural lands (SINAC, 2007)[22]; consequently, sources of wood supply changed radically. Now, approximately 49% of processed wood comes from forest plantations, 5% from natural forests, 12% from agricultural lands, and 34% is imported.

Gaps in forestry legality requirements

The legitimation of forestry operations is guaranteed in Costa Rica through the request and issuance of permits, a process that, as mentioned perviously, has become more costly and bureaucratic with the current Forest Law. The stricter regulations of native forest management are believed to have led to a forest degradation process know as “illegal woodwashing” with illegal permits (Navarro et al., 2006)[23]. The authors point out that public management has gaps that allow "legitimization" of irregular use of native forest resoruces.

The Forest Law posed stricter regulations on forest management, but less restrictions on timber harvesting in non-forest lands, such as treed grassland or agroforestry lands. This created certain negative incentives, such as increased removal of trees from grasslands and forest understory clearings (socolas). With the new Forest Law, many land-owners converted managed forests into grasslands and croplands (SINAC, 2002). Notably, land-owners would take advantage of these gaps in the legislation and practice *socolas* to then request a permit to harvest tress in non-forest areas.

[21] Oficina Nacional Forestal. (2010). *Usos y aportes de madera en Costa Rica. Estadísticas 2010*. San José, Costa Rica. Retrieved from http://onfcr.org/media/uploads/documents/usos_y_aportes_de_la_madera_2010.pdf

[22] SINAC. (2007). *ESTRATEGIA PARA EL CONTROL DE LA TALA ILEGAL 2002 - 2007*. San José, Costa Rica. Retrieved from http://www.fao.org/forestry/12914-065eef297f49b39d41d2fc1b6dfcf3cd8.pdf

[23] Ibid

By cutting the understory and sowing grass seeds, the original forest structure gradually changes to treed patureland, which is more convenient for landowners for achieving legality for harvesting trees, since it does not require a bureaucratic process as native forest management. Thus, issuance of a permits to cut trees in non-forest land is more rapid and less costly to landowners. In order to ensure legitimacy to the tree cutting permits issued, the use of georeferencing technology (GPS devices) in pre-felling inventories along with the use of the Forest Cover Map for the year 2000 was implemented to avoid misleading the officials of the State Forestry Administration.

However, despite the use of GPS and the Forest Cover Map, the increase in the number of permits processed has been continued. So, it is presumed that landowners have found a strategy to evade these requirements by questioning the interpretation of satellite imagery, and arguing that trees would be cut in agroforestry/silvopastoral systems instead of a natural forestland.

Summary information on ~~land use change & its~~ drivers and their underlying causes

- *Generalities*: for 1986-2013, changes in primary forests were small. Due to a fall in gross deforestation and an increase in forest regeneration, a net gain in forest cover was observed.
- *Direct factors driving deforestation and forest regeneration*: 70% of *Forest lands* are converted to grasslands, a little over 20% are converted to Croplands and almost 10% to tree plantations. Land converted to *Forest land* was previously grassland (65%), cropland (20%) and tree plantations (20%).
- *Land tenure regimes*: higher deforestation was observed in private lands. Higher forest regeneration rates were found in State-owned National Parks. There seems to be a gradient of deforestation by land tenure regime (deforestation of 1.4% was observed in Private Lands, 0.9% in mixed-tenure Wilderness Areas, 0.3% in indigenous territories and 0.1% in Protected Areas.
- *Forest age*: forest age is an important factor driving deforestation in all land tenure regimes; the deforestation rate in forests <15 years was 4.5%, 2.0% in 15-25-year forests and <1.0% in forests >25 years.
- *Deforestation concentration*: higher concentration of deforestation was found in the North Pacific coast and foothills (34% of total deforestation in 1987-2001 and 19% in 2001-2013), the North Caribbean plateau and coast (28% and 31% of total deforestation for 1987-2001 and 2001-2013, respectively), and the South Range (with 6% and 14%, respectively). For forest regeneration, these are the most important regions too. For the same periods, North Pacific coast and foothills 35% and 29%, the North Caribbean plateau and coast 20% and 20%, and South Range 8% and 5%.
- *Forest degradation*: forest degradation is caused mainly by stricter regulations imposed by the Forest Law to native forest management, which have increased the operation costs of forest management and led to pervasive practice of gradually converting the native forestland into silvopastoral or agrosilvicultural systems to reduce costs related to securing timber harvesting permits.

4.2. Assessment of the major barriers to REDD+

Main barriers to ~~attend~~ address deforestation ~~barriers~~drivers

From the R-PP and ER-PIN analysis, the main barrier to address deforestation drivers is the opportunity cost of land in private forests, and at the same time, the lack of an efficient and successful forestry sector in the production, industrialization and marketing of wood and other products originating in sustainable management of forest. This implies that the profitability of forestry management is lower to the profitability of agricultural production. In this case, it is assumed that the forestry management, not as REDD+ activity but as an emission reduction measure by deforestation and forest conservation, since it is the only productive alternative explicitly made by the current Forestry Law to forest owners.

Currently, another element is the existence of rights on non-registered lands and consequently over the forest resources, which produces a disadvantage for land holders because this condition prevents them from

participating in the Payment for Environmental Services program, since they do not comply with the requirements previously set, or because they are located in areas excluded by the program. For these owners, the lack of requirements is a barrier for forest conservation. The problem of land tenure in different areas under the administration of different State institutions is also a condition that acts a barrier, since those holders have no legal security to remain and develop their lives in such lands.

It is also important to recognize that the private owned areas within Protected Wildlife Areas that have not been expropriated or paid produce a feeling of dissatisfaction in the owners and a general mistrust on the State compliance. Although not formally confirmed, it is possible that the owners incur in criminal actions in adjacent areas as well as in the boundaries of Protected Wildlife Areas. In this case, the barrier is the non-expropriation and the payment of the lands owed by the State and considered part of the State Natural Heritage.

In the case of accidental fires in the forest, the forest fire does not change the land use, unless deliberately used as part of the tools for such purpose[24]. In Costa Rica, from 1998-2014, an average 3,300 ha/year of Forest, 9,700 ha/year of Secondary Forest and 16,400 ha/year of grasslands caught fire[25], being theses covers an approximate 90% of the total burnt area. The National Committee on Forest Fires has an ordinary State budget; however, it does not include all fires reported in zones outside of protected wildlife areas (ASP), since its priority is to prevent fires to penetrate the ASP in the first instance, and only then to provide support to private owners outside the ASP. This is a significant barrier and is reflected in the 100% of the burnt area for the 1998-2014 period, the 87% is outside the ASP and only the 13% within the ASP. The records on fire causes are kept since 2007 and of the fires between 2007 and 2014, 24% of the fires were caused by grassland burnings, 21% vandalism, 19% agricultural burnings, and 11% hunting activities. Most of the forest fires are caused for accidents outside the forests.

Regarding illegal logging, it is estimated that in Costa Rica it is equal to 36%, understood as the percentage of the wood coming from illegal logging[26], some 200.000 m^3 per year. In the consultation to experts made in the aforementioned study, the main causes of illegal logging were identified as procedures with 17%, poor control management 17%, demand of forest products 14% and human needs 11%. Additionally, 50% blamed the State for illegal logging, more than the responsibility attributed to the private sector (22% to consumers and market and 22% to owners). As of this moment, the main barriers for the prevention of illegal logging have been the inefficacy of the existing mechanism and of the monitoring systems to detect forest loss. The functioning of the current control model obeys to the need of covering control and protection actions of immediate response, in a way that their response level in this role is usually reactive before society claims and is not enough to become preventive. There is not an integrated model either, because due to SINAC's organizational structure each conservation area makes an effort to respond to claims and they are all organized independently. This situation hinders management and follow-up of the control policy at the national level, besides the planning and budgeting and the control per strategic results. Currently, SINAC is reviewing the

[24] Only in case that fires regularly affect a forest ecosystem, let say year by year, with each affectation there is a disruption of the succession process due to severe affectation of regeneration because of exposition to high temperatures during a fire, on one hand. On the other hand, big trees could suffer important damage in its cambium or in its main structures and became weak or eventually die. This could lead to open spaces in the forest leaving space for colonization by herbal species.

[25] Data provided by the National Committee on Forest Fires, 1998-2014 period. There are no records on the type of cover changed both in the forest burnt area or in the secondary forest, but the expert criteria is that the percentage is very low. The affectation of forest fires in Costa Rica is for degradation.

[26] The estimate of Illegal Forest Logging mentioned in this document comes from the Consultancy Report "Strengthening of the Strategy for prevention and control of illegal logging" developed in the framework of the Preparation for REDD+ along with SINAC, through the offer-demand method. There, consultant Muñoz mentions an estimate made by CATIE (35%) for yr 2001 and the currently performed (37%) for 2011, which are close to the ones perceived by several players consulted by the end of 2014 by the consultant, 36%, understood as the percentage of wood volume coming from illegal logging.

control institutional model on Illegal Logging, in order to improve key features for its functioning, such as scope, structure (organization and components), processes, methodologies, instruments, resources, etc.

In indigenous territories, the main barrier is the poor flexibility of current financial mechanisms to allow the cultural exploitation of forests in indigenous territories. For instance, the Payment for Environmental Services does not permit hunting or the extraction of non-wooden products from areas registered under the modality of conservation, including indigenous territories. This is against the worldview and management ancestral practices. This could cause that they become forest areas outside the Payment for Environmental Services areas to compensate for the need of forest products. Additionally, the presence of non-indigenous population in possession of indigenous territories has been pointed out as an eventual driver of deforestation, given the precarious situation of land tenure rights in those areas, which implies the need to continue moving towards the clarification of rights, particularly in indigenous territories and other areas under special management schemes.

Main barriers to address forest degradation drivers

The main barrier to addres forest degration drivers and its underlying causes is the rooted culture that forest management leads to a depletion of the forest resources. This led to strict regulations written in the Forest Law for conducting native forest management in Costa Rica, and in turn resulted in a perverse incentive for forest landowners to clear the forest understory for converting the land use to silvopastoral or agrosilvicultural systems, so that timber harvesting permits can be acquired more rapidly at a much lower cost.

A revision in the Forest Law legislation regulating native forest management decreasing the bureaucracy and its associated costs to native forest management would be required to discourage the current practices that are causing forest degradation in Costa Rica. This effort has begun with the studies developed in Costa Rica (by Navarro for example) showing evidence of the unintended negative impacts of such restrictive regulation on matainance of functional forest ecosystem.

Main barriers for REDD+ and forest conservation

REDD+ in Costa Rica is implemented through forestry and environmental policies that created the National System of Conservation Areas, its illegal logging control programs and forest fires management as well as the Payment for Environmental Services. The private sector has contributed to the reduction of emissions from deforestation through the conservation of forests.

At the governance level, REDD+ faces significant challenges. Its complexity and inter-disciplinary and inter-sectoral scope[27] require of capacities which are new in the country. Attaching the existing governance structures might be limited by the legal competence of ministries and institutions. This applies to the implementation framework as well, since REDD+ must be coherent with the other mitigation actions, consistent with the GHG inventory and must provide environmentally sound emission reductions within a Carbon-Neutrality framework. Achieving consistency in the accounting scheme has been an important challenge to the country. It has also been a challenge for the country to properly adapt to the emerging methodological frameworks. Regarding the transfer of title to emission reductions, being a requirement of the Carbon Fund, there are land tenure problems in the country, particularly in Protected Wildlife Areas, border areas and indigenous territories in which a transfer may not be legally possible. In terms of financing, the country cannot commit to a highest ambition in emission reduction, without knowing and being sure of the availability of international financing resources.

~~The main barriers to decrease forest degradation in Costa Rica have not been assessed yet. It is the intention of the country to include such evaluation along with the recalculation of the net degradation emissions, as explained in the Roadmap detailed in **Section 8.8**.~~

[27]Seeking the attention of the deforestation drivers.

Consistency with the barriers' analysis of ER-PIN and R-Package

The ER-PIN poses barriers to the implementation of REDD+ through the Payment for Environmental Services program. The scope of this ~~Emissions Reduction~~Emission Reductions Program is nation-wide for the reduction of emissions caused by deforestation, and therefore the magnitude is higher and the scope broader than the barriers considered; however, some of the barriers explained in the ER-PIN are applicable. With regards to deforestation, the barriers explained in the ER-PIN match.

Consistency between the proposed policies and the strategic options of R-PP

The policies, actions and activities included in the ~~Emissions Reduction~~Emission Reductions Program were designed building on the risks identified during the consultation process. These risks derive from the analysis of the strategic options originally incorporated into the R-PP. In the R-PP, the strategic options did not entail sufficient details as to construct a program with specific actions and tasks as contemplated in the policies hereby considered. It is because this common base that the consistency between the strategic options and the Program policies and actions can be assured. For instance, concrete actions to strengthen the National System of Conservation Areas were identified (Strategic option 1), in particular regarding its capacities to guaranty its integrity, by strengthening fire control and illegal logging strategies. Moreover, actions to integrate national parks and biological reserves were also incorporated (Strategic option 2) in addition to the Protected Wildlife Areas and other State Natural Heritage lands to carbon capture. Likewise, actions to support the regularization measure of rights on areas under special arrangements (Strategic option 3) including indigenous territories were included, so that the land offer for the Payment for Environmental Services can be expanded. The Program also includes actions to maintain the coverage of Payment for Environmental Services in the long term and to broaden its scope (Strategic options 4 and 5). Finally, actions to promote the sustainable production and consumption of Wood are included (Strategic option 6), the strengthening of the control actions by the Agronomists Association (Strategic option 7), and the development of a financing strategy (Strategic option 8) for National REDD+ Strategy as identified in **Section 4.3.**

4.3. Description and justification of the planned actions and interventions under the ER Program that will lead to emission reductions and/or absorptions

Costa Rica's forestry policy is formally defined in National Forestry Development plans. The first Plan was created for 2001-2010 and included a strong participation process with stakeholders. The second Plan currently covers 2011-2020, and this provides continuity to forestry state policies. The Government defined priority areas for implementing the *Forest and Rural Development Program*, in order to support the implementation of the forest policies defined in the second plan. However, public financial resources have been insufficient to cover the costs of the second plan, even though the country has requested loans from the World Bank to fill some of the existing finance gaps.

Fundamentally, Costa Rica has adopted measures to:

1) Expand and consolidate a national system of protected areas with different management categories
2) Improve operational capabilities to stop illegal logging and ensure the prohibition of *Forest land*-use change
3) Strengthen actions to prevent and reduce forest fires
4) Strengthen the PES program, both for the conservation of forests and for reforestation with plantations and agroforestry systems
5) Improve capacities to incorporate public lands to the *State Natural Heritage*
6) Adquire land to improve the integrity of protected areas and forest reserves for production of hydroelectricity

The ER-Program considers the first two National Forest Development Plans, especially the second plan, and is based on its forest policy framework, defining six new policies to reduce emissions, increase absorptions and develop the capacity to improve environmental sustainability and the integrity of these emission reductions.

Costa Rica policies and measures are not aimed at addressing the drivers of deforestation only. Although this is recognized as a critical issue, it may not be the most important challenge the country faces to enhancing forest carbon stocks. The main challenge is to maintain and increase *Forest lands* in an increasingly competitive economic environment with other land uses. That is why the country has made significant efforts to develop a ***public policy approach*** that enhances synergies between the forestry and agriculture sectors and promotes the integrated management of the landscape, instead of focusing their efforts simply to strengthen the traditional forest policy. Currently we are working on several joint initiatives between the environmental and agriculture sectors, which will be of great importance in the country's future and its potential contribution to reducing global emissions in the land use sector. This is the approach presented in the 6 policies of the ER-Program and has been welcome by the public and private sectors.

Context of the proposed measures

Each REDD+ activity is supported by policies and measures that are additional and/or build upon existing relevant laws (**Section 4.5.**), which have not been fully implemented due to insufficient human, technical and financial resources[28]. The proposed policies and measures include all five REDD+ activities, although the reference level (**Section 8**) includes two activities only. This means that the investment of results-based payments may be done for any of the REDD+ activities, even if these results were a product of the performance of only 2 REDD+ activities. Costa Rica may consider additional REDD+ activities in the reference level in future re-submissions to the UNFCCC and the FCPF Carbon Fund.

Methodology for defining the proposed measures

Costa Rica's strongest proposal to the FCPF Carbon Fund is a set of policy actions that were derived from multi-stakeholder participatory processes. The six policies presented here are a product of ample discussion with government institutions, indigenous peoples, the small- and medium landowner forestry sector, as well as large -scale, industrial forestry sector. These measures are in the form of policies, actions and specific tasks or activities derived from the SESA and during the information and pre-consultation phases of National REDD+ Strategy.

The participatory processes were designed to identify risks and opportunities related to the proposed Strategic Options[29] included in Costa Rica's R-PP. Over 100 recurring risks and opportunities were identified and grouped in 27 groups, to address reflect ideas. This systematization was done by the REDD+ Secretariat and is publicly available here. Subsequently, five strategic axes and six forestry policies were identified for addressing these risks and to foster opportunities. In addition to this, the REDD+ Secretariat included other specific actions, within the framework of the six policies, according to specific political interests by the Minister of MINAE. This set of policies will be subject to formal national consultation. All policies are part of the ER-Program to the FCPF Carbon Fund.

[28]For instance, Article 2 of the Forestry Law defines the authority of the State to execute expropriations of private forest lands in Protected Conservation Areas. However, many expropriations have not been appropriately compensated, an actually have been identified as a driver of deforestation (**Section 4.1.**). Often, proper compensation has not been carried out because the State is unable to assign public financial resources for payment. Currently, the State Forest Administration annually assigns funds for payment of these lands, but it is not sufficient to pay for all the pending expropriations.

[29] It must be noted that the REDD+ Secretariat performed a consistency analysis of the original strategic options with the six policies, actions and tasks eventually defined, and found full compatibility.

Furthermore, opportunities to enhance the current set of REDD+ policies have already been identified. For example, Costa Rica is currently finalizing a proposal to the World Bank for developing a "Green and Inclusive Development Plan in Productive Rural Lands". The purpose of this Plan is to capitalize value chains and the provision of ecosystem services in forests and agricultural lands. This is intended to go beyond current restrictive measures and seeks to rehabilitate productive lands. Particularly for the forestry sector, overly restrictive forest management policies are in place, and these have caused a significant reduction of investment in forestry businesses, as well as the development of value chains for forest products.

In summary, the objective of this initiative is to promote green and inclusive development, favoring the application of sustainable productive systems in rural territories with lower development and potentially vulnerable to climate change. Mainly, the Plan seeks to:

- Rehabilitate rural lands, and reduce degradation processes to generate ecosystem services and improve wealth of small- and medium- scale producers,

- Increase productivity and competitiveness of agricultural production and strengthen value chains to increase monetary value of the territories, based on their environmental goods and services,

- Foster enhanced resilience of rural lands by increasing mitigation and adaptation.

There is some redundancy with the ER-Program, which will be solved as the proposal to the World Bank is further advanced.

Proposed measures included in the ER-P

Table 4.3.1. Policies, actions and activities included in the ER-P and the National REDD+ Strategy. (It is important to remember that the ER-P is the operational framework proposed by Costa Rica to implement the National REDD+ Strategy).

Policies	Actions
POLICY 1. Guarantee the integrity of the State Natural Heritage and private forests, as well as the Measurement, Report And Verification capacities, according to REDD+'s requirements	ACTION 1.1: Strengthen the operation and financing of SINAC's Forest Fires Management Strategy inside and outside Protected Conservation Areas ACTION 1.2: Strengthen the operation and financing of SINAC's Illegal Logging Control Strategy ACTION 1.3: Strengthen Costa Rica's system for monitoring land use/cover dynamics ACTION 1.4: Develop a strategy to integrate public lands to the State Natural Heritage ACTION 1.5: Contribute to the consolidation of SINAC's Protected Areas System ACTION 1.6: Device synergies between conservation and resilience of the State's Natural Heritage ACTION 1.7: Execute action plans to address direct and underlying causes of deforestation and forest degradation
POLICY 2: Promote the comprehensive and harmonious participation of stakeholders in REDD+, including lands under special land-tenure regimes	ACTION 2.1: Prepare a Forestry Development Plan with Indigenous Territories ACTION 2.2: Implement mechanisms for solving conflicts in regards to REDD+ ACTION 2.3: Develop mechanisms to promote the participation of agroforestry producers and farmers in REDD+

Policies	Actions
POLICY 3: Improve capacities in the public and private sectors to manage and promote silvicultural practices in forests and tree plantations, in order to increase competitiveness	ACTION 3.1: Contribute to the implementation of forest policies in the National Forestry Development Plan related to improving management capacities in support of REDD+ implementation ACTION 3.2: Strengthen policies to promote and recognize sustainable agricultural and agroforestry practices
POLICY 4: Promote legal security by supporting clarification and regularization procedures of land tenure and emission reduction rights, with an emphasis on indigenous territories, public lands and areas under special land-tenure regimes	ACTION 4.1: Address land-tenure and emission reductions rights in indigenous territories ACTION 4.2: Address land-tenure and emission reductions rights in areas under special land-tenure regimes ACTION 4.3: Address land-tenure and emission reductions rights in public lands ACTION 4.4: Promote consistency in the delimitations rules for areas under special land-tenure regimes
POLICY 5: Increase opportunities for all stakeholders to receive benefits from REDD+ activities, as well as those addressing deforestation and forest degradation	ACTION 5.1: Plan land use as a function of the potential contribution of areas to REDD+ objectives ACTION 5.2: Improve competitiveness of forestry and agroforestry financing mechanisms, also in relation to other land uses ACTION 5.3: Broaden financing sources and consolidate a benefit sharing mechanism, which is consistent with the goals of the National REDD+ Strategy. ACTION 5.4: Promote tree planting in urban public zones

Policies	Actions
POLICY 6: Guarantee the operation of participation, follow-up and accountability mechanisms, consistent with technical, methodological and political provisions applicable to REDD+	ACTION 6.1: Design, test and implement a Safeguards Information System (SIS) ACTION 6.2: Implementation and follow-up of the Social and Environmental Management Framework (ESMF) ACTION 6.3: Achieve a sound Measurement, Reporting and Verification (MRV); consider other methodological issues ACTION 6.4: Consider gender, youth and the participation of other relevant groups

Implementation, Monitoring and Evaluation of policies, actions and activities

The ER-Program is implemented at the national level. Costa Rica's goal is to reduce emissions in different ways and to enable the implementation of multiple activities with different stakeholders. As a whole, these activities are expected to have a global impact on total net emissions at the national level, reflected in terms a decrease in t CO_2-*e* yr^{-1}, according to the national GHG inventory and measured against a reference level. Determining the individualized impact of each policy, action and activity proposed here is not a goal of the ER-Program or of the monitoring system described later in the document (**Section 9**). Hence, emission reductions may be a product of multiple types of interventions. Interventions may not have the same impact across the country, so different combinations of activities may be required to effectively reduce emissions.

In order to assess performance of specific policies, actions and activities, the implementing entities will define the required indicators in their monitoring and evaluation (M&E) frameworks, without implying that these indicators should be measured in terms of t CO_2-*e* yr^{-1}. Those policies, actions and activities implemented by public institutions are required to have M&E provisions, based on MIDEPLAN's guidelines, which are not sector-based (*i.e.* indigenous territories, farmers and forestry producers). Thereby, and with support from CENIGA, these indicators will be compiled to produce reports on the effectiveness of the policies, actions and activities. These reports will be defined in collaboration with CENIGA in 2016.

Despite the fact that specific policies, activities and actions are not monitored in terms of t CO_2-*e* yr^{-1}, some of the measures will have a stronger impact on the reduction of emissions. For example, expanding the PES program, as well as enhancing the Illegal Logging Control and Forest Fires Management strategies by SINAC. How these measures are financed will be discussed in the context of the benefit sharing mechanism (**Section 15**). Since MRV will be biennial (**Section 9**), Costa Rica will produce regular information to understand the collective impact of these policies, actions and activities.

Consistency of policies with the attention of drivers of deforestation

The ~~Emissions Reduction~~Emission Reductions Program plans to address the deforestation and degradation drivers, as identified in the country and during REDD+ implementation. Specifically, on deforestation drivers, there is a description below on how political actions support the attention of identified drivers (**Table 4.3.2**.).

Table 4.3.2. Indirect factors and attention of deforestation drivers by political actions proposed in the ~~Emissions Reduction~~Emission Reductions Program.

Indirect factors	Political attention
Tenure regime	National REDD+ Strategy strengthens and consolidates the situation in tenure arrangements with proven lower deforestation: Policy 1 contains actions to develop and consolidate public lands and integrate them to the State Natural Heritage, guaranteeing that they belong to arrangements of proven lower deforestation. It also intends to contribute to the consolidation of the Protected Areas National System, by increasing the financing for land purchases, financing the tenure inventory within Protected Wildlife Areas, etc. Policy 2 is aimed at finding mechanisms to encourage and strengthen the participation of populations of farmers and agro producers in the so-called "areas under special management" (indigenous territories, wildlife refuges and other types of protected areas, refuges and bordering reserves, maritime zone) in which there are conflicting conditions particularly regarding the rights of land tenure. Policy 4 also seeks solutions to the problems of land tenure and therefore carbon rights in areas under special management, as well as improving the delimitation of these zones.
Forest age	Actions to increase control over the change of use in all ages of the forest and on the other hand to make monetary recognition and incentives for forest regeneration are being promoted, since that has been the driving force in recent years anyway in improving forest cover in the country. Policy 1 has actions that strengthen the supervision and control within PAs, and in some cases outside of PAs (strengthening the National System of Conservation Areas, Agronomists Association and the Regional and Local Committees for Conservation Areas, volunteering, etc.) Policy 5 improves the competitiveness of the financing mechanisms for forest and agro forestry ecosystems in relation to other land uses, motivating forest maintenance from an early age. One of them is the strengthening of the existing modalities of FONAFIFO's Environmental Services, amongst which reforestation is found.
Deforestation concentration	In the context of REDD + the level of carbon has already been identified; the places with the most problems and policy actions both for protection categories of Protected Wildlife Areas and of land in special arrangements and private lands, can be properly oriented.

	Policy 1 promotes the constant updating of deforestation causes and the review and alignment of policies to address the findings. So existing instruments such as the Payment for Environmental Services or the control of the State Forestry Administration can emphasize problem areas. Policy 6 guarantees that through the mechanisms established for the participation of multiple stakeholders, as well as robust monitoring system that covers the entire national territory, allow follow up actions and the results thereof at the local level.
Low competitiveness with regards to the alternatives	The National Forestry Development Plan is reinforced by strengthening the forestry sector at all stages of the production chain of wood and "profitability" of conservation increases. Policy 5 is fully aimed at strengthening investment opportunities in both traditional (Payment for Environmental Services and the like) and new (Payment for Environmental Services to indigenous peoples/peasants) methods to enable the participation of the widest variety of actors and activity modalities and therefore improve the alternative profitability of forest and tree systems in non-forest lands. Policy 2 provides mechanisms to encourage the participation of agro forestry and peasant producers in REDD+. Policy 3 provides for the promotion and recognition of sustainable agricultural and agro forestry practices, and the generation of business models and participation of the academy in strengthening the sector.
Labor force, migrations, social support	Overall, although the migrations issue is not treated, the strategy as such represents a transfer of resources from other sectors, mostly urban and international, to the Costa Rican rural sector. Policies 2, 3 and 5 related to increasing the competitiveness of forestry activities will implicitly improve salaries and the socio-economic conditions of families dedicated to agro forestry. Policy 6, by promoting the implementation of the Environmental and Social Management Framework (including compliance with safeguards) and expanding the participation of other population segments, contributes that rural areas are represented and enjoy MDB benefits through REDD +.

4.4. Assessment of land and resource tenure in the accounting area

Assessment methodology of land and resource tenure

Costa Rica's REDD+ Secretariat made an analysis on land and resource tenure, in order to inform the potential transfer of titles to emission reductions and the challenges and opportunities of REDD+ implementation. A summary of the main results follows.

Land tenure modalities

In Costa Rica, lands can be classified as: a) Public domain lands, b) Private domain lands held by private parties, and c) Private domain lands owned by Public institutions.

Some other land tenure classifications condition its use, such as:

- Private rights over land, referred to property right or possession right and other use rights derived; here we have private owners of registered lands and holders of non-registered lands
- Rights on state lands, of which public sector institutions are owners and
- Collective rights on lands in indigenous territories whose title holders are Indigenous Integral Development Associations

Legal situation of different tenure forms

Property rights can be registered or not at the National Registry, in which case it is known as possession. Property rights in Costa Rica are covered at the constitutional level (Art. 45), and are developed in the Civil Code including possession, use and enjoyment, transformation and alienation, defense and exclusion and restitution and indemnification rights.

As part of the Costa Rican reality, there is an important part of the national territory under public or private property without titling problems, as well as a wide territory under different management categories that are part of the State Natural Heritage. These properties also have the guaranty of registrar publicity provided by the National Registry, as a protection tool in front of third parties. There is also legislation that covers other type of land tenure such as the possession, which constitutes a minor part of the national territory, allowing the registration of such rights.

There can be some limitations referred to annotations and liens in the registration at the Real Estate Registry related to the property rights that could eventually jeopardize participation in the REDD program, but it cannot be affirmed at this time, because it will depend on the flexibility of the negotiation related to the legal requirements for the transfer of titles on emission reductions.

Indigenous collective rights on lands

The regulations on indigenous territories go back to 1939; Indigenous Law No. 6172 set forth that the indigenous reserves remain the property of indigenous communities and are inalienable and imprescriptible and must be registered at the National Registrar under their name; their size cannot be modified but by Law. These changes have been reinforced with the adhesion to relevant international agreements. The Indigenous law sets that non-indigenous people who are good faith owners or holders within the indigenous reserves shall be relocated in similar lands, if they wish so; if it is not possible to relocate them or if they do not accept the relocation, it will be necessary to expropriate and indemnify them in accordance with the procedures set forth in the Expropriations Law by the Lands and Colonization Institute, currently the Rural Development Institute. The expropriation and indemnification studies and procedures will be performed by that institution in coordination with the National Commission on Indigenous Affairs. Bad faith owners shall be evicted in the case of simple holders and in case of owners, it would be necessary to file a judicial proceeding for the invalidity of the respective title.

In the case of indigenous territories, the legislation is very clear; the problem is that it has not been followed by all the competent State institutions and no resources have been allocated as set forth in the National Commission on Indigenous Affairs for the execution of actions tending to recover the lands and make them available to the indigenous population as it legally corresponds. In concrete, the Rural Development Institute has not demarcated the indigenous territories and for this reason, the National Commission on Indigenous Affairs has not been able of performing the population census of indigenous peoples and therefore there is lack of formal identification of non-indigenous occupants that exercise occupation.

There are also overlaps of lands belonging to indigenous territories that are also part of declared protected wildlife areas. If these lands are registered as part of the indigenous territories, then the rights of indigenous peoples represented by the Associations of Indigenous Integral Development prevail.

Regarding land-tenure conflicts in indigenous territories, there exists a detailed identification on such conflicts, generated as part of the REDD+ readiness, particularly those related to lands occupied by non-indigenous people.

Rights on state lands

The State, autonomous institutions and Municipalities own rights on lands, some of public dominion, and other private property of those institutions, which for the purposes of interest are analyzed as follows:

State Natural Heritage

Was created in 1969 and is comprised by the forests and forest lands of national reserves, inalienable areas, properties registered under its name and those that belong to municipalities, autonomous institutions and other Public Administration organizations. They are non-seizable and inalienable. This Heritage constitutes a restrictive regime regarding land uses; research activities, training and ecotourism are the only activities accepted, prior permit. National reserves per Art. 11 of the Lands and Colonization Law No. 2825, and Art. 261 of the Civil Code are lands that are not registered as private property and are not covered by the ten-year possession rule.

Rural Development Institute

The Rural Development Institute, as part of its duties, has developed the titling of lands on behalf of private parties for a long time; however, from the judicial rulings and Declarations of the General Comptroller's Office of the Republic ordering the recovery of lands that were granted titles, it has been necessary to start administrative adverse effects and judicial proceedings requesting their invalidation.

Border zone 2000 meters

Border zones in an extension of 2,000 meters wide along the border were also declared inalienable and non-susceptible of acquisition through denounce or possession per Law No. 2825 of 10/14/1961 and its amendments. However, there are people in these zones with possession rights from many years ago.

In the case of possession rights that could exist in the areas that were national reserves or within the border zone, the holders cannot legalize their possession rights because the legislation is too old, and therefore it is impossible for them to show their rights existed prior to those laws. The Rural Development Institute is processing the invalidation of titles in this area in order to recover the assigned lands, before the Contentious-Administrative Treasure and Civil Courts.

Port Management and Economic Development Board of the Atlantic Coast

The Port Management and Economic Development Board of the Atlantic Coast is the owner of the State lands located in the area crossed by navigable canals that comprehend a ten kilometers area from the sea and inland, parallel to the coast and a strip of three kilometers width, parallel to both sides of the rivers and the canals managed by the Board, in the province of Limón. Likewise, those

lands were occupied under institutional tolerance by local population that accumulated possession rights for many years. In order to contribute in solving the land tenure problem in this region, special law No. 9205 published in La Gaceta No. 40 on 2/26/14 was issued, authorizing the institution to issue titles within the aforementioned strip, based on the Possession Law, prior determination of the Ministry of the Environment and Energy of the areas that constitute State Natural Heritage.

Regarding land-tenure conflicts in non-indigenous populations, it is important to note that even if there is clarity in terms of the current conflicts, there is not an explicit information available on each of the conflicts, since it will require a broad study that is not available, however the country has been implementing important efforts to update the cadastral information at the national scale. These efforts, led by the National Cadaster and the Public Property Registry have generated important information than can help in further efforts to clarify land-tenure rights in the country.

Taking the foregoing into account, for the implementation of the REDD program, there is current disposition on titles on State private property lands part of the State Natural Heritage, the lands that are private property of individual persons and the lands property of Indigenous Development Associations that are under the Payment for Environmental Services program.

Likewise, at a later stage, the lands registered as private property will be disposed of and will be entered in some sort of agreement in which they will transfer their titles to the State to be negotiated. With regards to rights of possession on non-registered lands, Law No. 8640, article 9 will be applied, that enables the Payment for Environmental Services to non-registered land holders for the case of forest protection, under certain requirements[30]; holders within or outside areas belonging or assigned to the State that comply with the requirements of admissibility into the system according to the aforementioned law are included in this provision.

The experience in the Payment for Environmental Services shows that most of the requests processed correspond to properties registered and a small number of non-registered properties that can be included in the program as mentioned, based on the application of Law No. 8640.

Options for addressing existing land tenure conflicts

1. The current legislation and its interpretation in some cases, supports the eviction of the holders, the invalidation of the titles and cadastral plans, to consolidate the State Natural Heritage. For this purpose, it is necessary for the judicial offices to intervene and apply the legislation, invalidating titles and cadastral plans if corresponding, or defining the indemnifications for good faith holders.
2. Legislation to clarify the possession rights situation, permitting a solution for land tenure. It is a legislative reform to take care of the problem in an integral manner, because so far the efforts to partially amend the law to solve the problems have not been successful. This reform requires a modification in the scope on the form of doing conservation different than the current one, considering the people within the conservation dynamics of natural resources.
3. Also for the case of situations showing some level of incertitude even in the case of ownership of registered lands, the figure of payment for results or of year due currently applied for the Payment for Environmental Services can result in an instrument to favor the payment in those lands, reducing the risk of reversals.

[30] Law No. 8640 has allowed the National Fund for Forest Financing to grant the Payment for Environmental Services to forest holders, and in this sense, it allows the legitimization of the acknowledgment of mitigation actions to those land holders who may receive the corresponding payment within the National REDD+ Strategy, as long as they can comply with the requirements there set.

4. In relation to other indigenous territories, what corresponds is the compliance of the legislation by the institutions involved, to restitute the indigenous population of the lands occupied by non-indigenous people.

In cases where overlaps are found with wildlife protected areas in territories registered as part of an indigenous territory, a way forward is to reach an agreement and the proper arrangements with the respective Association of Indigenous Integral Development, through which these Associations could transfer the rights to the Government, to be negotiated, to the extent that the Government is the legitimate entity to claim for the emission reductions on those lands. This situation that affects some indigenous territories, is also been addressed in the context of updating the national forest development plan, that will include a specific chapter on forestry policy in the indigenous territories.

The Program will positively impact on owners and possessors of land due to the valuation deriving from the emission reduction actions they will perform. Furthermore, it will also contribute to address problems related to land-tenure issues through the deployment of actions specifically designed to solve these problems and that are included in the program. On the other hand, it is clear that there is no intention in the program to significantly contribute to solve the current land-tenure related problems since this is far beyond the possibilities of the national REDD+ strategy and involves a broad range of governmental institutions.

4.5. Analysis of laws, statutes and other regulatory frameworks

Legal framework on climate change and the forestry sector in Costa Rica

Climate change and international regulations

Costa Rica has been proactive in promoting and participating in the international conventions and agreements for environmental protection (**Table 4.5.1.**). Additionally, it must be mentioned that the international agreements, per article 7 of the Costa Rican Political Constitution, have a higher rank than regular national laws. Said hierarchy is ratified in article of the Public Administration General Law N° 6227, 2/5/1978.

Table 4.5.1. Main international conventions and agreements related to climate change and environmental protection ratified by Costa Rica.

Law	Convention Name	Date
Law N° 7414	United Nations Framework Convention on Climate Change	La Gaceta N° 126 of 7/4/94
Law N° 7513	Central American Convention on climate changes Guatemala	La Gaceta N° 128 of 7/6/1995
Law N° 5605	Convention on International Trade in Endangered Species of Wild Flora and Fauna	1/28/1975
Law N° 7224	Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR Convention)	La Gaceta N° 86 de 8/5/1991
Law N° 7226	Central American Convention for Environmental Protection (Constitutes the Central American Committee for Environment and Development)	La Gaceta N° 88 of 5/10/1991
Law N° 7416	Convention on Biological Diversity	La Gaceta N° 143 of 7/28/1994

Law N° 7433	Convention for the conservation of biodiversity and the protection of priority wildlife areas in Central America	La Gaceta N° 193 of 10/11/1994
Law N° 7572	Regional convention for the management and conservation of forest ecosystems and the development of Tree plantations	La Gaceta N° 47 of 3/6/1996
Law N° 7699	United Nations Convention to Combat Desertification and Drought, in particular African countries	La Gaceta of 11/3/1997

National forestry sector

In relation to specific legislation issued at the country level that aims to protect the forest, it must be started by the Political Constitution which is the highest norm, which in Article 50 incorporated the right of all people to enjoy a healthy and ecologically balanced environment, consistent with that principle, several Laws, regulations and executive decrees exist, whose purpose is ensuring the conservation of the environment, which are detailed below (**Table 4.5.2.**).

Table 4.5.2. Legal framework applicable to the national forestry sector.

Forestry Law N° 7575 of 4/14/1996 and its Forestry Regulation, Decree Nº 25721-MINAE of 10/17/1996 as amended.
The Law states as a function of the State to "ensure the conservation, protection and management of natural forests and the production, exploitation, industrialization and promotion of the country's forest resources." Prohibits changing the land use in forest-covered land and regulates the conditions for its use; regulates the industrialization and export of round wood. Creates the figure of forest regents and involves civil society in the protection and conservation of forests and forest lands, defines environmental services and creates the National Forestry Financing Fund to finance sustainable management of forest activities, reforestation, agro forestry systems, recovery of denuded areas, improved utilization and industrialization and for the Payment for Environmental Services of forests and plantations. In relation to protected wildlife areas it grants the State the authority to expropriate private domain lands; it establishes the State Natural Heritage and regulates the activities that the State may authorize; creates the protection areas. It also includes a chapter on offenses and penalties for invasion of the State Natural Heritage, the use of forest resources without permission and environmental damage.

Executive Decree N° 38323-MINAE, La Gaceta N° 72 of 2/14/2014.
Regulates the Payment for Environmental Services, which is complemented with the Manual for Payment of Environmental Services, published in La Gaceta No. 46 of 3/6/2009, as amended, which provides for all the procedures for awarding payments for environmental services.

Decree N° 27998-MINAE, of 6/22/1999.
Sets the Principles, Criteria and Indicators for the Sustainable Management of Secondary Forests and the Forestry Certification in Costa Rica.

Executive Decree N° 27388-MINAE of 9/18/1998.
On Principles, Criteria and Indicators for the Exploitation and Management of Forests and Certification.

Executive Decree N° 34559- MINAE of 1/8/2008.
Sets the Sustainability Standards for Natural Forests Management: Principles, Criteria and Indicators, Code of Practices and Procedural Manual and the Regulations on Forestry Regencies.

Decree N° 38444-MINAE of 2/20/2014.

Regulates the requirements for the accreditation of forestry regents, develops the duties both of the regents, and of their Professional Association; it also includes all the formal procedures for the performance of regencies and sanctions in case of failure.

Executive Decree N° 25700-MINAE of 11/15/1996.
Sets a comprehensive and complete ban on the exploitation of endangered trees.

Organic Law of Environment N° 7554 de 10/4/1995.
Sets the Environmental Impact Assessment as a tool to protect the environment and creates the National Environmental Technical Secretariat as the office competent to perform them. Reiterates the authority of the Executive Branch to establish protected wildlife areas and to include as part of these private farms, establishing the expropriation as a means to achieve it, forbids the reduction of these areas unless technical studies justifying the change are issued. Creates the Environment Comptroller's office attached to the Minister of the Environment and Energy. Provides for administrative sanctions before the violation of rules that might be harmful to the environment and creates the Environmental Administrative Tribunal as a decentralized entity of MINAE, with exclusive competence and functional independence in the performance of its duties; its rulings will be mandatory. These instruments have been applied contributing in great extent with the conservation of the environment.

Biodiversity Law N° 7788 of 4/30/1998 and its Regulation, Executive Decree N° 34433-MINAE of 3/11/2008.
Article 22 creates the National System of Conservation Areas, a decentralized body of the Ministry of the Environment and Energy, which integrates the competences in forestry, wildlife and protected areas. It is in charge of the management and institutional coordination in order to plan and execute actions, as well as the issuance of policies to ensure the sustainable management of natural resources. The system incorporates the Directorate General of Wildlife, the State Forestry Administration and the National Parks Service that will fulfill their duties and responsibilities as a single instance, using the administrative structure of the System, without prejudice to the purposes for which they were established. Includes rules that promote the adoption of incentives and compensation for environmental services for the conservation and sustainable use of components of biodiversity, including criteria that respond to principles of environmental law of great importance for conservation, such as the precautionary principle or *indubio pro natura*, the environmental public interest and integration. It also refers to the payment for environmental services, as incentives for the conservation of biodiversity

National Parks Service Law, Nº 6084 of 8/24/1977.
Sets prohibited or permitted activities within the national parks.

Land Use, management and Conservation Law, N° 7779 of 4/30/1998 and its regulation, Executive Decree N° 29375-MAG of 8/8/2000.
It aims to protect, conserve and improve lands in integrated and sustainable management with the other natural resources; it states that the Ministry of Agriculture and Cattle Farming shall coordinate with the Ministry of the Environment and Energy the management actions for land conservation and the conservation of environmental resources and regulates matters related to use practices, management and soil remediation.

Law for the Development, promotion and enhancement of organic agricultural activities, N° 8591 of 6/28/2007.
Defines the agricultural environmental benefits, including the mitigation of GHG emissions by means of fixing, reducing, seizing, storing and absorbing; the protection of water; the protection of biodiversity in integral organic agricultural systems, for their conservation and sustainable use, as well as the protection of organic agro-ecosystems.

The Indigenous Law N° 6172 of 11/29/1977 and its Regulation, Executive Decree No. 8487 of April 26, 1978 and Executive Decree No. 13568 of April 30, 1982 (Legal representation of Indigenous Communities by Development Associations as Local Governments).
Sets the inalienable and imprescriptible character of indigenous territories, stating that they are the property of indigenous communities; it also includes the rule mentioned in article 7 according to which forest lands must keep said nature in order to maintain the hydrological balance of watersheds, conserve wildlife; as a principle, it states that natural resources must be exploited in a rational manner.

Legal framework specific for REDD+ in Costa Rica

REDD+ Preparation

Executive Decree N° 37352-MINAET of 8/27/2012, published in La Gaceta N° 220 of 11/14/2012 sets the legal framework for the coordination and preparation of REDD+. This executive decree implements the Executive Secretariat that works as the support to the National Fund for Forest Financing in the design of National REDD+ Strategy, per the terms and conditions set forth in the FCPF Readiness Donation agreement, donation TF012692. This Secretariat is assigned with duties such as the development of the consultation plan, the execution of the Social and Environmental Strategic Assessment, the development of a forest reference level and the preparation of National REDD+ Strategy. The National Fund for Forest Financing is defined as the headquarters for the Secretariat. The decree also created a REDD+ Executive Committee and assigns it specific roles. Currently, said decree is undergoing an amendment in such a way that it clarifies the specific duties and responsibilities of the different public organizations involved in the implementation of the ~~Emissions Reduction~~Emission Reductions Program, as well as other provisions related to the safeguards and participation mechanisms of the relevant stakeholders in the implementation of the ~~Emissions Reduction~~Emission Reductions Program, as well as other provisions related to the safeguards and participation mechanisms of the relevant stakeholders. Since the aforementioned decree is still under negotiation, more explicit institutional arrangements are not included.

With a view of improving the implementation framework of National REDD+ Strategy and the ~~Emissions Reduction~~Emission Reductions Programs, a decree is being prepared to clarify the roles and responsibilities of the different relevant stakeholders. At this moment, there is a bipartite committee between and the relevant stakeholders represented at the National Forestry Office.

REDD+ Implementation

The legislation addressed to protect natural resources in Costa Rica is abundant and even though some weaknesses can be identified related to the legal interpretation, confusion about some competences and lack of institutional and financial capacity for their compliance in some areas, it can be affirmed that overall, its contents provide sufficient support for the policies, actions and activities proposed by the National REDD+ Strategy and in the ~~Emissions Reduction~~Emission Reductions Program. The decree also includes regulations that clarify the issue related to the administrating entity of the Strategy which shall be the State Forestry Administration through the National System of Conservation Areas and the National Fund for Forest Financing for the competences of each institution according to the legislation in force.

Notwithstanding the foregoing, there are some features that the legislation might need to amend for it to be harmonic with other rules of higher rank, such as the handling of natural resources by indigenous peoples so that their right of self-determination and autonomy is included; however, taking into consideration the implications of a legal reform, it is possible to improve the regulations by means of executive decrees, that would not prevent the subsequent legislative amendment. The topics related to the participation and insertion in areas under special arrangements may be strengthened with the issuance or amendment of executive decrees to strengthen their participation according to the particular features of each group.

Regarding the legal security related to land tenure, the legislation provides legal tools to move forward in this process, such as the case of the indigenous territories. For other tenure rights included within the two thousand meters border zone, the State Natural Heritage, the lands under administration of the Port

Management and Economic Development Board of the Atlantic Coast, titling projects of the Rural Development Institute, the situation is complex and although there is legislation related to land tenure, it does not respond to the existing reality, and the interpretation of the rules is made both at the administrative and judicial levels, that do not favor land holders. In order to solve the land tenure problem, a legal reform is necessary to include innovative ways to conserve natural resources, allowing for the integration of local populations.

Finally, it would also be appropriate to amend the definition of the environmental services at the legal level, allowing the incorporation of other type of activities in addition to those appearing in the legislation in force.

4.6. Expected lifetime of the proposed ER Program

Implementation period of actions and interventions

The main political actions that the country implements in the forestry sector are based on current legislation have public resource sources in the framework of the National Planning System and budget. The Payment for Environmental Services program is the largest investment and it has resources granted by Law or regulations, either due to taxes on fuel or for water use fees. The foregoing implies that the main policies for forest conservation are guaranteed ad perpetuam, at least as long as the legal framework remains valid, and it is very unlikely that it will be amended in the short term because of the high level of social support that these initiatives have. On the other hand, the country is working on a long term financing strategy to produce appropriate conditions to guarantee the sustainability of the National REDD+ Strategy, including access options to financial resources from the private sector, the World Bank (Green and Inclusive Development Program in Productive Rural Areas), the Green Climate ~~Green~~ Fund and bilateral cooperation.

The ~~Emissions Reduction~~Emission Reductions Program will be implemented in the 2010-2025 period. This, considering the formal finalization of the Carbon Fund in 2025 and the country assessment on the Nationally Determined Intended Contributions to be submitted before the United Nations Framework Convention on Climate Change during the 2020-2025 period. In this sense, the Program will be part of a larger effort that the country will exercise in order to move sufficient financial funds for the full implementation of the National REDD+ Strategy.

5. Stakeholder Consultation and Participation

5.1. Description of stakeholder consultation process

Relationship between REDD+'s National Strategy and the Emission Reduction Program consultation process

The policies, actions and activities proposed in the ~~Emissions Reduction~~Emission Reductions Program Document are an integral part of Costa Rica's REDD+ National Strategy. Both documents were developed and discussed with a wide participation of relevant stakeholders. This process will continue until March 2016, to obtain their final feedback. The above-mentioned is developed in the consultation process framework, which was defined since the beginning of REDD+ readiness phase. The consultation process is composed by three stages: information, pre-consultation and consultation. The Policies and actions proposed in the Program and in the Strategy are a result of the information and pre-consultation stages, which included the systematization of risks and opportunities identified by the relevant stakeholders during the Social and Environmental Strategic Assessment (SESA).

The SESA workshop was held in 2011. It was an activity in which the stakeholders validated the different actors that encompass the forestry sector. The relevant stakeholders were defined as indigenous people, small and medium forestry producers, wood industries, academy and government. The stakeholders mentioned above, are now parties of REDD+ Executive Committee. During the workshop they also developed their feedback for Costa Rica's Readiness Preparation Proposal (R-PP). As a result of this workshop, the stakeholders provided the main risks and opportunities of the strategic options proposed in the R-PP. This risks and opportunities are approached in the Environmental and Social Management Framework. The process developed to define the policies, actions and activities is explained in **Section 4.3.**, sub-section Methodology for the definition of the measures proposed. During this SESA workshop, the stakeholders identified benefits aswell, categoriced as non- carbon benefits, which were concised and prioraticed. This non- carbon benfits are decribed in sections 16.1 and 16.2. In the policies benefit-cost assessment - which is currently developing- the non-carbon benefits will be spacially modeled, in order to identifiy potential areas that will enable more benfits.

As part of the feedback process, in August 2015, the National REDD+ Strategy and the ~~Emissions Reduction~~Emission Reductions Program were presented to the Executive Committee, as the representative entity of Relevant Stakeholders. It was also presented to a larger audience, constituted by members from the social and private forestry sector. During both meetings, participants' comments were compiled and then incorporated in both document's relevant sections. Even though the consultation process is going to be extended until March 2016, no substantive modifications regarding proposals on policies and actions are expected; however, if that was the case, all contributions will be incorporated in updated versions of both documents. As part of the given participatory approach, both documents must be dynamic and properly adjust, as information or political decisions arise in order to attend political goals or the relevant stakeholders' needs. These might arise as part of the consultation process itself, or from the Information, Feedback and Disconformities Mechanism, described in **Section 14** of this document.

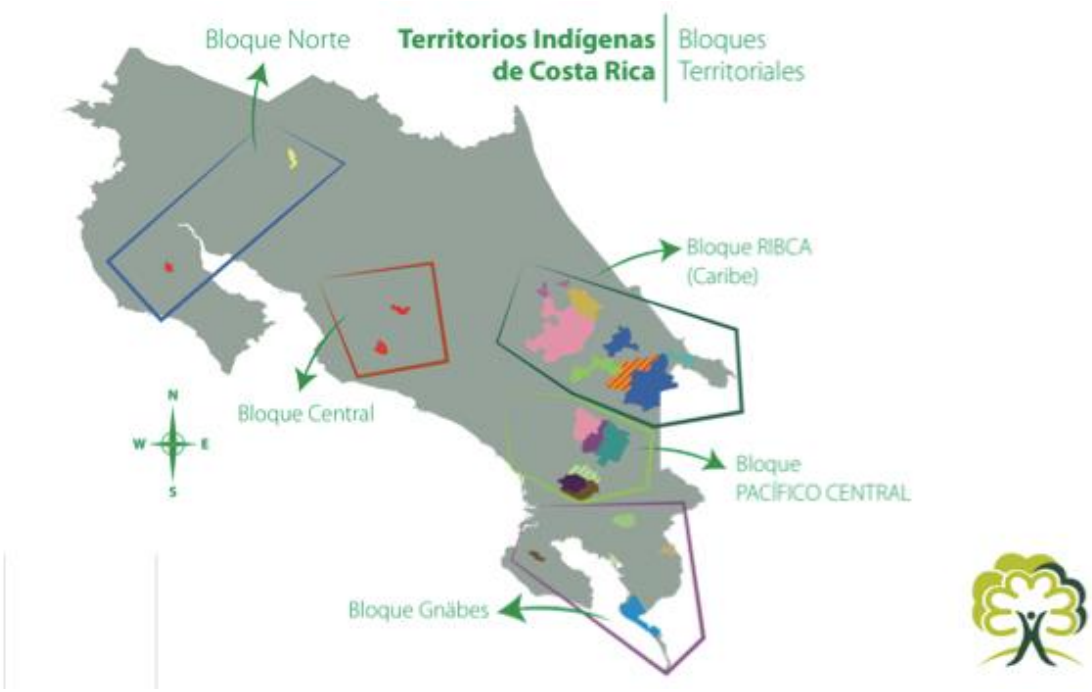


Figure 5.1.1. Structure of indigenous groups and territories in Costa Rica.

Consultation and exchange information mechanisms during the design of policies, actions and activities

As shown in the figure above, Costa Rica's twenty four indigenous communities, decided to organize themselves into four territorial groups, gathered according to their resemblances regarding geographic location, culture and worldview. They also established their participation process during REDD+'s readiness phase, taking into account their culture and national and international legislation.

Indigenous people, defined that their participation would be based into a three-stage process: First, *information:* corresponding to a culturally appropriate explanation about REDD+ and the progress made during readiness phase, including a continuous communication process, informing about the main achievements and following steps. For this purpose, the cultural mediators program was implemented. Cultural mediators are indigenous people trained in topics related to REDD+, which have the ability of bringing simplified information in their own languages, using the same REDD+ conceptualization from their worldview. They developed this process through dialogues within the indigenous action plan. Additionally, cultural mediators performed using culturally appropriate materials, which were designed using a participatory approach, as a result of the participative communication plans that established the appropriate communication channels to spread the information. The second stage corresponded to *pre-consultation was* the space in which the analytical discussion on the indigenous special topics, safeguards, co-benefits and related aspects was undertaken. Finally, the *consultation* stage as so, is the final validation of REDD+ Strategy.

Likewise, in order to guarantee a sustainable dialogue with indigenous people, and upon their request, an indigenous committee shall be created. This entity will meet three times a year to keep an active dialogue with the government. The Committee's aim is to have a constant feedback in all REDD+'s stages.

Moreover, forestry and agro-forestry producers established their own participation structure as well. In 2012-2013, a series of informative activities regarding REDD+ and its relation with the small and medium agroforestry producers were held along the country's regions and sub-regions. The participants defined the sector's representative structure during said meetings. In 2014, six regional workshops and a national

workshop were held, as part of the early dialogue initiative, to discuss drivers of deforestation and degradation in each region. During the activities, they also analyzed REDD+'s strategic options, providing feedback and defining possible risks, according to the sector's needs and perspectives. The activities mentioned above contributed with the proper feedback to the elaborate the policies, actions and activities of Costa Rica's REDD+ National Strategy. These discussions deepened in 2015. During this process contributions were compiled into a payment for environmental services proposal, addressed to small forestry and agro-forestry producers. This proposal was included as a political action within the National REDD+ Strategy.

Understandable language and mechanism's cultural appropriate approach

As described in the preceding section, the information process is based on a participative communication strategy that contemplates the cultural mediators program, as well as the culturally appropriate communication channels, which were defined jointly with the indigenous people. In this sense, didactic materials, such as banners with information about climate change, the importance of carbon in forests and REDD+ activities were prepared to enhance the cultural mediator's performance. Furthermore, two informational videos were created, local radio stations were used to transmit advertisements and invitations for the meetings, several posters, brochures and local communication channels were developed to describe how indigenous people interpret REDD+ concept according to their worldview. Moreover, a web site and social networks were created and the, Bank Information Center developed a case study analyzing the whole process. National Mass Media has transmitted over 20 news broadcasts on this topic.

Since early stages, indigenous leaders stated that REDD+ was a very complex and technical process, and would present a challenge to guarantee the indigenous people full understanding. Because of these, the Bri-bri-Cabecar Indigenous Network, proposed to implement the *cultural mediators' program*. Cultural Mediators are indigenous people, who have been trained in matters related to REDD+ capable to provide the simplified information in their own language. This process is implemented through participative communication plans, in which the proper communication channels were defined to spread information, such as REDD+'s conceptualization according to their worldview. The main communication channels included banners, local media (radio) and dialogues among the community during the pre-consultation workshops. This initiative was implemented in the five indigenous blocks, according the organization structure defined.

The consultation process developed is considered a non-carbon benefit itself, because of the capacity building achieved. The activities undertaken were developed with culturally appropriate materials. These materials were possible, because of the indigenous people active participation, which analyzed ILO 169, and Cancun safeguards along with the government. This way they interpreted the elements mentioned above according to their reality and culture. As a result of this process an early dialogue among the indigenous people and the central government has begun. To improve communities' quality of life, their rights continue to guarantee transparency in the future. In the near future, the last stage of the consultation process will take place, as well as, broadcasting results, strengthening of women participation and the planning of the indigenous people special topics; A series of studies will be developed with REDD+, however, it is expected to be continue with the central government, since some of them, like land tenure go beyond REDD

Along the information and pre-consultation process with the small and medium agroforestry producers a didactic methodology and participatory approach has been undertaken. This way, the different concepts were understood by this sector allowing them to provide the proper feedback according to their needs.

Furthermore, different committees and a communication strategy have been created for each. This way the people and their have access to REDD+`s information. Regarding the small and medium forestry and agroforestry payment for environmental services proposal, it was the sector itself that carried out the analysis and production activities, as well as their socialization, with a methodology that considers their daily lives in productive activities. There is an initial proposal that will be considered in subsequent analyses and dialogues.

General vision for the consultations process and sessions during the Program's implementation

The definition of formal and informal participation structures that promotes the dialogue among the sector is one of the main milestones of the readiness phase, regarding the participation and consultation process with the relevant stakeholders. REDD+'s Executive Committee is one of these structures. This instance serves as a consultative committee that facilitates dialogue and participation between indigenous people, agro-forestry producers; land overexploited owners and the government.

Publications and other information sources used

The information process is based on a participative communication strategy that comprises appropriate communication channels, defined in plans that were produced with each relevant stakeholder. For the indigenous people, the main communication process is the cultural mediators program. On the other hand, for small and medium forestry and agro-forestry producers, a communication plan was defined for the informative stage and a communication committee was created. Furthermore, corporate communication elements were set for the private sector, government and academy.

A diversity of communication tools has been developed, such as informational banners on climate change, importance of carbon in forests and REDD+ activities. Three informational videos were developed to inform about REDD+'s general vision. The videos are about REDD+ readiness phase, the cultural mediators training process and the latest video is about lessons learned and main challenges. Additionally, posters on how indigenous people interpret REDD+ concept according to their worldview were prepared, advertisement in local radio, brochures and local media, such as posters and flyers. Also, a web site is available, as well as social networks. The Bank Information Center wrote a case study about the participation process and approximately 100 lectures have been presented in universities and state institutions. Approximately, 20 news in local media were transmitted.

During the implementation of the ~~Emissions Reduction~~Emission Reductions Program and the National REDD+ Strategy, the aim is to continue with a two-way communication process, broadcasting the initiative's progress through the communication committees and communication channels in state institutions. There is also an intention to create a learning process in referent issues to co-benefits and it is expected that the communities themselves will empower the communication process.

Mechanisms to receive and respond to feedback

Several mechanisms to sustain a permanent dialogue with the stakeholders were set, such as the Information, Feedback and Disconformities Mechanism (described in detail in **Section 14** of this document), Costa Rica's REDD+ website, cultural mediator's process, territorial coordinators and the Executive Committee. Additionally, product of the early dialogues with indigenous people and small agro-forestry producers, a direct relationship was established between the REDD+ Secretariat and the stakeholders, which has facilitated the achieved results and participatory processes. It is also important to mention the broadcasting process for technical documents and reports to obtain stakeholders' feedback. The process starts by sharing each document's draft along with a matrix, this way stakeholders can present their questions andof comments that the actors send with their consultations and/or remarks; they then present the documents developed in a workshop and finally, they are sent via e-mail and become available in the website.

Continuous and effective consultation process during the Program's implementation

Starting the readiness phase, the main challenge was to set the organizational and representative structures for each sector. However, upon completion of this phase, the challenge described above became one of its main results, because the stakeholders have their own structures or have strengthened the existing mechanisms.

Indigenous peoples created four territorial groups, defined according to their geographic location, culture, political vision and worldview. At the same time, they created a direct communication channel with the

Presidency Minister form Government, with a defined agenda, being REDD+ one of the items. Additionally, small forestry and agro forestry producers defined the participation platforms in six regions along the country.

During the ~~Emissions Reduction~~Emission Reductions Program, implementation, the aim is to facilitate three meetings per year to strengthen the structures and promote dialogue and information exchange on the progress of the processes. Regional communication committees will also remain active for both sectors and annual strategic and operational communication plans will be prepared for each sector.

Comprehensive and effective participation of the relevant stakeholders

Costa Rica's readiness phase has been highly participative. The relevant stakeholders' needs are taken into consideration. A cross-sectoral dialogue has been developed for over five years, with solid participation structures and feedback. The Executive Committee is one of these figures; it has representation of all the sectors and its purpose is to guarantee comprehensive and effective participation. The members of the Committee were selected through democratic procedures and it is consistent with Cancun safeguards.

It is of high importance that REDD+ opened the possibility to adapt the Payment for Environmental Services Program to the stakeholder's needs. This new proposal takes into account indigenous peoples and small agro forestry producers' needs according to their culture and daily life. In this sense, both sectors have produced a proposal for additional modalities of Payments for Environmental Services that are being analyzed for their development during the implementation stage.

Participation and Transparency processes for the discussing issues related to land tenure and resource

During a national workshop, the strategic options for emission reductions defined in the R-PP were presented, to the relevant stakeholders. In the activity, the stakeholders analyzed the proposal's social and environmental impacts. This way, the indigenous people defined five main risks that would be addressed as thematic axes or special topics in order to mitigate the risks. These topics are: land tenure, benefit sharing, natural resource management in indigenous territories, participative monitoring and the overlap between protected areas and indigenous territories. Even though these five topics described above are a priority to this sector, a critical route to address them within REDD+'s Framework was developed. To address some of these topics, studies have been conducted for the design of an Indigenous and Small forestry and agroforestry producers PES, topography training for indigenous people, analysis of the Dualok Kimo Program, for the monitoring and assessment topic. However, it is important to mention that the implementation of some of them such as land tenure will be implemented through the central government. In **Section 4.4** form this document is an exhaustive explanation of these points.

Transparency and participation process for the defining arrangements in benefit sharing

In 2011, an integral information and participation process began. During the process the stakeholders recommended benefit-sharing models beyond the Payment for Environmental Services Program. The recommendations promoted several discussions, leading to proposals of new financing mechanisms for the REDD+ National Strategy. The political actions defined consider the possibility to continue working on these initiatives in order to reach an appropriate framework for the benefit-sharing.

5.2. Summary of the comments received and how these views have been taken into account in the design and implementation of the ER Program

Following the workshops held during the information and pre-consultation stages with the relevant stakeholders (indigenous populations, small and medium forestry and agro forestry producers, government, private sector, academy), risks and opportunities were identified in relation to the 10 strategic options initially proposed in the R-PP. Once the risks and opportunities were identified, over 100 repeated topics were systematized and grouped in 27 larger topics, which were wider and more integral. Afterwards, five risk axes were identified. From this information, the REDD+ Secretariat proposed six policies that cover the risk and opportunities axes. It is important to mention that the Secretariat performed a consistency analysis of the

strategic options initially filed in the R-PP, with the policies, actions and tasks finally defined, finding compatibility amongst them. Finally, the six policies defined will be subject to the consultation process starting in November, 2015.

Additionally, and according to the practices implemented towards the participation of relevant stakeholders during the preparation stage, and following the guidelines of the consultation plan, a national workshop was held in order to have a first approach to the representatives of each sector and to show them the first version of the ~~Emissions Reduction~~Emission Reductions Program document. Members of the REDD+ Executive Committee, the Board of Directors of the Costa Rican Forestry Chamber, the National Forestry Office and the National Fund for Forestry Financing were invited, as well as the regional representatives, small and medium forestry and agro forestry producers, indigenous advisors to the REDD+ Secretariat, coordinators of indigenous territorial blocks, members of the business sector and government institutions. During the workshop, the Executive Director of the National Fund for Forest Financing welcomed the participants and explained that the activity represented a first approach and stated the relationship between the National REDD+ Strategy and the ~~Emissions Reduction~~Emission Reductions Program. Subsequently, the REDD+ Secretariat presented the first drafts of the Strategy and the Program, and finally, a space for questions and comments on both presentations was opened.

In extraordinary meeting of the Executive Committee held on September 10, elements of the ~~Emissions Reduction~~Emission Reductions Program were with the World Bank's Mission and it was agreed to send this section to the attendants so the section was validated.

Below, there is a systematization of the comments and feedback of the document for the ~~Emissions Reduction~~Emission Reductions Program during the meetings mentioned above. Additionally, it was decided that this activity would be executed with each sector.

Table 5.2.1. Matrix of the comments received during the first socialization workshop of the ~~Emissions Reduction~~Emission Reductions Program.

Interested stakeholder	Comment	Response
Government	The agricultural sector sees potential in the program, as the REED+ process has been quite productive and innovative, providing studies with relevant technical data and platforms that give rise to multi-sector discussions	The secretariat recognizes the importance of these multi-sector platforms and discussions and will promote said dialogue.
	It was determined that there are opportunities to identify pilot experiences in coffee and cattle agro forestry schemes that could be useful. It is also necessary to define the agro forestry systems that could be within the REDD+ scheme, since they are part of the agricultural sector and could trigger inter-sector coordination processes	Currently, these proposals are being supported with the design of the Peasant IPSA. Furthermore, it will consider the progress in the coffee and cattle NAMAs and in any other NAMA to be designed by the Ministry of Agriculture, in order to achieve seamless integration.
	The sector suggests considering the possibility to include carbon captured in the ground within the accounting because it is an important reservoir for the agricultural sector.	Notes are taken with possibilities on how it can be included.
Private forestry sector	The draft of the ~~Emissions Reduction~~Emission Reductions Program addresses only 3 of the 5 REDD+ activities (conservation, avoided deforestation, rising stock). The sector expressed its concern about the non-inclusion of forest management within the program and wishes to know the reason for this decision and in what time the remaining activities will be included.	Given the strong interest of the sector in including these activities, the ~~Emissions Reduction~~Emission Reductions Program was amended to incorporate the five REDD+ activities, including sustainable management of forests and the enhancement of carbon stocks from forest plantations. This must be supported with data and methods for the accounting of emission reductions for these activities, and for this reason, FONAFIFO has assigned REDD+ preparation budget and its development is expected for 2016.
	It is understood that both the REDD+ Strategy as well as the ~~Emissions Reduction~~Emission Reductions Program will be developed in the framework of the forest and rural development	The forest and rural development program is a political initiative of the present government which should be based on an appropriate legal framework. In the meantime the

Interested stakeholder	Comment	Response
	program (PBDR); however, it is necessary to clarify PBDR's legal framework.	National REDD+ Strategy and the ~~Emissions Reduction~~Emission Reductions Program will be conceptualized within the Forest and Rural Development Program, without implying an affectation to the strategic objectives of REDD+.
	The private forestry sector has participated in various activities for the preparation of the Strategy as well as in the follow-up consultancies to promote the sustainable use of wood. However, the sector considers that its participation in the construction of the proposed Program as well as in the drafting of document was not sufficient, which is reflected in the fact that forest management was not included in the draft program proposal which has a very strong focus towards conservation. Due to this circumstance, it is requested that these issues be included in the operational planning of the emission~~s~~ reductions program.	With the new resources from the donation, the dialogue process including local, regional and national levels will be strengthened.
	It is requested to include in the preparation package activities ($5 million), the reference levels and other requirements for the prompt incorporation of forest management, forest plantations, carbon stocks in wood products and agro forestry systems.	Notes are taken with possibilities on how it can be included.
	The private forestry sector requests that sector negotiations of the benefit distribution mechanism be started, so that it generates ownership and trust amongst the relevant stakeholders.	Notes are taken with possibilities on how it can be included.
	The definition of the strategic role for this Program is very ambitious, eradicate poverty and contribute significantly to the purchase of lands in ASP, this could disperse the foundation of REDD+ in Costa Rica in relation	REDD+, intends to contribute achieving the millennium goals, for instance, in reducing poverty, since eradicating poverty through REDD+ is in fact pretentious.

Interested stakeholder	Comment	Response
	with emissions reductions by deforestation and degradation of forests and the enhancement of carbon reserves, a key role of forest owners, located in private property.	
	To propose the reduction levels mentioned above in page 9, the country depends on the forests located in private property; however, as we will discuss below, the distribution of benefits is focused on promoting the consolidation of the ASP and other activities not linked to forest ecosystems, except the support they may receive through the payment for environmental services program.	Notes are taken with possibilities on how it can be included.
	It is evident that the country is unable to sustain its forest cover entirely with the PES program and maintaining forests in full protection, so it is essential to foster productive linkages, as properly stated in the strategic role of the Emissions ReductionEmission Reductions Program, namely: …strengthen the participation of all relevant stakeholders in the reactivation of production, processing, marketing and consumption of domestic wood, through a joint effort between the State and private forestry, in particular by fostering entrepreneurship amongst micro, small and medium producers. However, this is not reflected in the actions of the Program and is not either in the mechanism for the distribution of benefits. Reversing deforestation and forest degradation is only possible thanks to the effort of private owners. Hence the importance of resuming sustainable forest management with commercial purposes as	Notes are taken with possibilities on how it can be included.

Interested stakeholder	Comment	Response
	part of the emission~~s~~ reduction<u>s</u> program, otherwise it will not be sustainable, given that the owner obtains no rent for submitting his land to forest conservation. Added to the fact that the deforested area within the ASP is small and therefore has little impact.	
	Notice how at the level of deforestation drivers in private forests the lack of competitiveness of the forestry management is considered as well as the high income of agricultural products, nonetheless, there is an administrative ban to forest management that severely restricts the adoption of management plans, which is not mentioned in the document..	Notes are taken with possibilities on how it can be included.
	The argument for excluding sustainable management of natural forests is the lack of information, however, during the consultancy mentioned in the preparation stage, minimum information required was produced to generate a baseline for this activity. Which as we saw is very low, so there are enormous opportunities for this activity. The forestry sector considers unacceptable that this Program does not include sustainable forest management although it stands out as one of the most important barrier to address deforestation drivers.	Notes are taken with possibilities on how it can be included.
	On page 25, it is confirmed that the Program is mainly focused in solving the problems of lands purchases within the ASP, and its benefits will be limited to reduce the deforestation drivers in Costa Rica; it only produces a small relief to the government in view of its inability to solve this problem.	Notes are taken with possibilities on how it can be included.

Interested stakeholder	Comment	Response
	It is questionable that the Program contemplates prioritization of the PES for forest protection in ASP and to consider a possible increase of the amounts just because these are lands not properly expropriated by the government. Clearly, the purchase of some lands does not guarantee a significant impact on the reduction of deforestation, and it is clear that deforestation mostly takes place in private property lands. It is also unacceptable that it is intended to allocate a percentage of the mechanism resources of REDD+ distribution of benefits to the purchase of lands in ASP.	Notes are taken with possibilities on how it can be included.
	The Private Forestry Sector considers that the focus of the Program is institutional, since it seeks to strengthen the PES Program, the consolidation of Protected Wildlife Areas and the control programs of forest fires and illegal logging of SINAC; however, its impact is very limited in private property areas, which is where most of the deforestation and forest cover loss take place. It is requested to include activities that generate productive linkages, such as forest management, forest plantations and agro forestry systems. As these are the ones that can offer a greater contribution to improve the quality of life, rural development and forest sustainability. .	Notes are taken with possibilities on how it can be included.
	The CCF asks to develop the baseline for the productive sector; therefore, it is necessary to identify funding for this action, without decimating the scarce resources available to develop business models as proposed by the private forestry sector.	Notes are taken with possibilities on how it can be included.

Interested stakeholder	Comment	Response
	A period no longer than one year must be established to develop a full baseline of the country including the productive actions such as forest plantations and forest management.	
	According to the CCF, it is essential to set a clause in the cooperation agreement of the ~~Emissions Reduction~~Emission Reductions Program that in the course of a year will be presented as action plans for all the strategic actions of REDD+ including increased carbon with forest plantations and sustainable forestry management.	Notes are taken with possibilities on how it can be included.
	The CCF considers that the country baseline must be reviewed so the lack of data does not produce wrong estimates on basic concepts such as the identification of areas under deforestation risk to complete the criteria for the distribution of benefits.	Notes are taken with possibilities on how it can be included.
	The CCF sets that resources to develop business models of the forestry sector should receive priority in Costa Rica.	Notes are taken with possibilities on how it can be included.
Small and Medium forestry and agro forestry producers	The sector considers that FONAFIFO has made a good resource management and that it also has an executive secretariat with trustable technicians that have tried to train us on different subjects and have periodically informed of the process and their management. Additionally, the sector considers that both documents (the REDD+ Strategy and the Emission Reduction Program) are proposals, and consider they constitute good input; however,	One of the responsibilities of the Executive Secretariat is the periodical information of the progress on PIRs, as well as the strengthening of sectors' capacities. This document is a draft of the proposal which must receive feedback and be consolidated within the framework of the consultation process that is being performed with the PIRs. The process has a period for feedback on the proposals. The secretariat will

Interested stakeholder	Comment	Response
	they ask for time to be able to analyze the documents in their respective regions.	clearly inform the terms for said feedback.
	The REDD+ process has had wide participation and it is natural in processes that the biggest the number of participants, the biggest the challenge to reach agreements; however, the members of the Executive Committee have great expectations before REDD+ and have been able to work harmonically and to achieve an inter-sector dialogue space.	REDD+ is a participative construction process that must have high participation of the relevant stakeholders as defined by the forestry sector. It is intended to continue promoting this participation, strengthening the existing inter-sector, and governance entities' dialogues, such as the REDD+ Executive Committee.
	The sector requests that the decree for REDD+ Strategy be ready prior to the consultation, the orienting principles are good, but the policies differ from them. It is necessary to negotiate in the decree, the peasant PES, the mechanism for the distribution of benefits.	The recommendation is taken.
	The sector considers that the emission reduction program should be oriented towards the strengthening of the country productive center, and not only to strengthen the State natural heritage but that it should be more balanced between the different relevant stakeholders of the Costa Rican forestry sector. The sector considers that the agro forestry systems should contribute to the country's REDD+ strategy.	As soon as the data is obtained, the reference level will be produced and included.
	The sector considers that the policies developed in the emission reduction program must be coherent with the input compiled during the SESA process. In the current scheme, only one of the six policies is addressed to the small producers' sector. This group stated that policy 5 is the one	The measures included in the Program are policies, actions and specific tasks derived from a participative process with the relevant stakeholders, especially within the framework of the Environmental and Social Assessment of the information and pre-consultation of the REDD+ National Strategy. From

Interested stakeholder	Comment	Response
	that could affect the sector the most.	the participation workshops, a series of risks and opportunities were identified, related to the 10 strategic options preliminarily proposed at the Costa Rica's R-PP. This participation process includes indigenous lands, forestry producers, relevant public entities and the private sector. With the risks and opportunities identified, over 100 repetitive topics were systematized in 27 common topics which were broader and more integral[31]. Subsequently, five strategic axes were identified for the attention of these risks and the promotion of opportunities. From that information, REDD+ Executive Secretariat proposed six policies that cluster the groups and risk and opportunities axes. In addition to this, the Secretariat included other specific actions within the framework of the six policies for emission reduction, according to the country interests as defined by the Ministry of the Environment and Energy. It must be noted that the REDD+ Executive Secretariat performed a consistency analysis of the strategic options initially proposed at the R-PP, along with the policies, actions and tasks finally defined, and found full compatibility between both. Finally, the six policies defined will be subject to the consultation process. The sector is invited to start a dialogue in order to identify more clarity in the language of policies, actions and activities.

[31] There is a risks and opportunities matrix that allows observing the traceability of the risks, as identified by the relevant stakeholders, up their systematization, clustering and conformation in policies, actions and tasks.

Interested stakeholder	Comment	Response
		However, the Secretariat considers that the policies respond completely to the participation and consultation processes that the Government of Costa Rica has developed within the framework of REDD+.
	It is necessary to set a baseline through regional practical models for small producers. The suggestion is to use the peasant PES model as defined within the REDD+ framework (meaning the participation of the small producer at the social level, and his actual contribution to carbon rupture).	The sector will continue to receive support in order to refine the Peasant PES proposal.
	El sector considers that the Emission Reduction Program document has a good technical level; however, the background section should be better balanced to reflect the contribution of the rural sector and civil society to the achievements of the country in reducing deforestation.	Said section will be reviewed.
Indigenous populations	Within the framework of the REDD+ preparation process, the indigenous organizational structure was promoted. It is important to note that this sector has actively participated in the process by the development of regional meetings to analyze the documents. Notwithstanding this, the sector needs to consolidate the indigenous territorial block in a language that is culturally appropriate to guarantee the input collected in the field is duly entered in the Strategy and of the Emission Reduction Program documents.	Work will continue in the framework defined considering culturally appropriate spaces and reasonable times for feedback and for the systematization of the reports. The secretariat is making progress in the systematization of the resulting information of the reports per territory.
	It is important to clarify the section of orienting principles, since they mix-up with actions and methodological guidelines. One of these principles should be oriented towards the respect of indigenous populations' rights.	It will be answered clarifying this item.

Interested stakeholder	Comment	Response
	The agreement entered with the 19 indigenous populations dated September 10 and 12, 2012 should be remembered and respected; said agreement addressed the following: - Implementation of the program within the framework of indigenous Payment for Environmental Service. The execution of at least 34.000 hectares in indigenous territories. -This project will give priority to the most deforested indigenous lands.	It will be taken into account in its due process, in the mechanism for the distribution of benefits, through the Indigenous PES proposal.
	It is necessary to clarify the way in which the policies were defined, taking the SESA as the base. Additionally, there is a feeling that the policies do not give security to the consolidation of safeguards demanded by indigenous populations.	The SESA process included the participation of the PIRs, with which the most important concerns were compiled; these were entered into the existing policies and actions, however it is recognized that there might be gaps and said concerns could be satisfied during the consultation process. With respect to the safeguards, a socialization and consultation plan will be prepared about the MGAS in order to explain the practical applicability on how this instrument safeguards the Lands.
	What relationship does the Emission Reduction Program have with C-Neutrality? How will the topic of carbon rights for indigenous lands be addressed? It is necessary to identify the implications that this topic has for the indigenous populations and the rights acquired by purchasers.	The carbon rights issued is being addressed within the national legal framework in a way that it corresponds to the requirements of the different mechanisms in which the country might decide to participate. In this regards, the specific safeguards to protect the integrality of the Indigenous Lands will be applied. As this topic moves forward, the indigenous institutions with

Interested stakeholder	Comment	Response
		which the State is working will be trained.
	The indigenous sector stated its concern that the REDD+ processes allow for developed countries to continue polluting the atmosphere.	This is an important topic that is being addressed within the framework of the Framework Convention on Climate Change.

6. Operational and Financial Planning

6.1. Institutional and implementation arrangements

Institutional arrangements for REDD+ implementation

The required institutional arrangements for operating the ER-Program are based on the Organic Law of the Environment, the Forestry Law, the Biodiversity Law and the Indigenous Law[32], per **Section 4.5**. Thus, Costa Rica's institutional and legal frameworks serve as the base for implementing the ER-Program. In this way, the ER-Program's arrangements are closely linked to the current legislation and the tasks mandated to the different public entities. **Table 6.1.1**. shows the main and associate implementers for each policy action proposed.

All operating entities are part of the structure of the State Forestry Administration, and so are subject to the direction of the Minister of MINAE. Additional arrangements may be required outside the existing regulatory framework. For example, new operational procedures among SINAC, FONAFIFO and CENIGA must be agreed, especially for MRV and to operate the SIS. Other sub-arrangements will be required with public institutions, for example, with the Costa Rican Institute of Electricity (ICE), the National Institute of Rural Development (INDER), as well with other landowners that are part of the *State Natural Heritage*[33] but have not formally registered their lands yet.

Organization for the day-to-day operation of the ER-P

- The office of the Minister of MINAE is the political director of the ER-P,
- FONAFIFO will be in charge of managing the ER-P administratively and financially[34]
- The implementation of policies, actions and activities will be jointly coordinated by SINAC, FONAFIFO and CENIGA, according to their legal responsibilities. Each policy action has a leading implementation entity (**Table 6.1.1.**, based on **Section 4.3.**),
- With regards to MRV, CENIGA under the supervision of the high-level committee (**Section 1.3.**), will coordinate the follow-up of the reference level through the national land use/cover monitoring system (**Section 9**),
- Benefit sharing will be a responsibility of FONAFIFO, under the political direction of the Minister of MINAE and under supervision of the high-level committee,
- FONAFIFO will execute the Safeguards Plans and ensure compliance with the relevant World Bank's operational policies (**Section 14**),
- CENIGA will report how the Costa Rica addresses safeguards through the SIS,
- FONAFIFO runs the Feedback and Grievance Redress Mechanism (FGRM) through its Comptroller of Services,
- FONAFIFO is in charge of coordinating the consultation and information exchange process with stakeholders.

Other public entities/institutions will be involved in the implementation of specific policy actions, for example, the Ministry of Agriculture and Livestock (MAG), ICE and the Port Administration Board of the Atlantic Coast (JAPDEVA). These entities are part of the Environment Sector, according to an organization decree issued by the Executive Branch of the Government, and as such they are subject to the political direction of the Minister of MINAE. Moreover, these entities are subject to the political direction of the Minister through the

[32] If necessary, additional arrangements may be agreed with Indigenous Development Associations for Indigenous Territories.

[33] Article Nº15 of the Forestry Law determined that such lands must be immediately incorporated to the State Natural Heritage.

[34] FONAFIFO has ample experience managing financial operations. For example, Ecomercados I and II and the FCPF readiness grant.

Environment Sector Council (visit here for a brief history of MINAE and its relation to the Environment Sector Council).

Table 6.1.1. Main (IP) and associate implementers (IA) of specific activities. Table 4.3.1. showed policy actions; this table shows activities, a more detail level of the ER-P operations.

Activities	Entities/institutions (*see note below for definition of acronyms*)													
	MINAE	AFE	FONAFIFO	ONF	CIAGRO	SINAC	SNIT	RN-C	CONAGEBIO	DCC	MAG	ADI	CENIGA	IMN
1.1.1. Update the Illegal Logging Control and Forest Fires Management Strategies	IA					IP								
1.1.2. Capacity building workshops	IA					IP								
1.1.3. Assemble fire crews to control wildfires	IA					IP								
1.1.4. Purchase of equipment and supplies	IA					IP								
1.1.5. Improve control over critical forest areas (consider satellite technology)	IA					IP								
1.1.6. Conduct awareness campaigns	IA					IP								
1.1.7. Strengthen the role of SINAC's regional offices in fire management	IA					IP								
1.1.8. Strengthen institutional capacities (admin, human resources, financing, operational and technological)	IA					IP								
1.2.1. Implement the Illegal Logging Control Strategy	IA					IP								
1.2.2 Reactivate the Natural Resources Watch Committees and the Volunteers Associations and develop an action plan in coordination with SINAC	IA					IP								
1.2.3. Build capacity in public officers at CIAgro, the Police, the Prosecutor's Office, the Administrative Environmental Court, the Environmental Comptroller, courts, MAG, MINAE, the members of the Natural Resource Watch Committees and other organized groups			IA			IP								IA
1.2.4. Execute additional law enforcement operations to reduce the illegal use, exploitation and transportation of forest products						IP								
1.2.5. Design audit plans to guarantee transparency, fraud control and consistency of timber harvesting permits issued for forest management by the State Forestry Management and CIAgro					IA	IP								
1.2.6. Ensure additional financial resources to increase current accountability and control of measures by SINAC and CIAgro, related to the implementation of forestry activities					IA	IP								
1.2.7. Include additional mechanisms in the Grievance and Redress Mechanism for allowing citizens to participate in the identification of illegal forestry						IP								
1.2.8. Develop monitoring programs with indigenous peoples and other communities with high forest loss						IP								
1.2.9. Strengthen illegal logging control measures in Protected Conservation Areas and in the State Natural Heritage						IP								
1.2.10. Increase the participation of Environmental Regional Councils, SINAC's Regional and Local Councils in the sustainable management of forest.						IP								
1.2.11. Improve institutional capacities (management, human resources, financial, operational and technological) of SINAC and other entities related to logging control						IP								
1.2.12. Update regulations, operational and financial capacities to strengthen control measures by CIAgro					IP									

Activities	Entities/institutions (*see note below for definition of acronyms*)													
	MINAE	AFE	FONAFIFO	ONF	CIAGRO	SINAC	SNIT	RN-C	CONAGEBIO	DCC	MAG	ADI	CENIGA	IMN
1.2.13. Revise the comptroller role of SINAC and CIAGro in relation to indigenous territories					IA	IP								
1.2.14. Strengthen logging control by indigenous peoples through the *Dualök Kimö* program						IP						IA		
1.3.1. Design/adjust a national land use/cover monitoring system according to the methodological requirements of REDD+ and in consistency with the national GHG inventory and any other specific requirements defined by IMN						IA							IP	IA
1.3.2. Define a MRV strategy consistent with the requirements of REDD+						IA							IP	IA
1.3.3. Identify a financing and sustainability strategy to guarantee that the monitoring system (activity 1.3.1.) is able to regularly provide the information necessary for the REDD+ MRV						IA							IP	IA
1.3.4. Identify any potential additional institutional arrangements required to implement the monitoring system defined in activity 1.3.1.						IA							IP	IA
1.3.5. Implement a community-based monitoring strategy in areas with critical deforestation or forest degradation and that have high conservation value.						IP						IA		
1.3.6. Develop a participative M&E mechanism with Indigenous Territories						IP						IA		
1.3.7. Implement special C monitoring protocols for mixed lands (agriculture and forestry) and consider MRV for existing AFOLU[35] NAMAs						IP	IA	IA			IA			
1.3.8. Implement special C monitoring protocols for urban forest C stocks and stock changes (Settlements; S)						IA							IP	
1.4.1. Update (and improve) the State Natural Heritage's land inventory, especially for lands yet to be registered by MINAE						IP		IA						
1.4.2. Conduct a specific land-tenure analysis in the State Natural Heritage						IP								
1.4.3. Apply appropriate procedures for including public lands (pending formal registration) to the State Natural Heritage	IA					IP								
1.4.4. Perform a land use and land use potential analysis for the State Natural Heritage, in order to define specific REDD+ goals	IA		IA			IP					IA			
1.4.5. Develop management plans for lands in the State Natural Heritage, to increase REDD+ results, through a variety of interventions, including the need of additional institutional arrangements						IP								
1.4.6. Secure funding for transferring lands to the State National Heritage.	IA		IA			IP								
1.4.7. Develop a resource management strategy for the full incorporation of lands to the State Natural Heritage	IA		IA			IP								
1.4.8. Achieve consistency of delimitation and demarcation rules on areas under special land-tenure regimes						IP		IA						
1.5.1. Update the inventory of land under tenure by third parties in Protected Conservation Areas						IP		IA						

[35] AFOLU: Agriculture, Forestry and Other Land Uses, as defined by the 2006 IPCC Guidelines for national GHG inventories.

Activities	Entities/institutions (*see note below for definition of acronyms*)													
	MINAE	AFE	FONAFIFO	ONF	CIAGRO	SINAC	SNIT	RN-C	CONAGEBIO	DCC	MAG	ADI	CENIGA	IMN
1.5.2. Update the Protected Areas Project (PAP) and develop an implementation and financing strategy						IP								
1.5.3. Design and execute a long-term financing strategy for purchasing lands in Protected Conservation Areas						IP								
1.5.4. Prioritize PES payments in Protected Conservation Areas, and consider potential increases in payments			IP											
1.5.5. Increase the designated amount from the national budget for purchasing lands in Protected Conservation Areas						IP								
1.5.6. Promote the voluntary adherence to the state forest regime						IP								
1.5.7. Allocate REDD+ monetary benefits to purchase lands in Protected Conservation Areas						IP								
1.5.8. Update management plans for Protected Conservation Areas to promote REDD+ activities						IP								
1.6.1. Harmonize the National REDD+ Strategy, the National Biodiversity Strategy and the National Action Plan to avoid Desertification and Drought			IP			IA								
1.6.2. Harmonize the National REDD+ Strategy , the National Strategy on Climate Change and the National Adaptation Plan			IP							IA				
1.6.3. Integrate the National REDD+ Strategy and the planned framework for Sustainable Development Goals.	IA		IP											
1.6.4. Target REDD+ efforts in priority biodiversity conservation areas, watershed protection zones and priority land restoration areas, including the increase of restoration actions associated to endangered species			IA			IP					IA			
1.6.5. Implement strategies to communicate the importance of forest and biodiversity conservation, as well as other environmental services	IA					IP								
1.6.6. Support the Sustainable Biodiversity Fund (FBS) with REDD+ resources			IP											
1.6.7. Develop an assessment of low- environmental impact practices available for biodiversity conservation	IA					IP								
1.6.8. Direct REDD+ investments in priority biological corridors			IA			IP			IA					
1.6.9. Analyze SINAC's and FONAFIFO's operational efficiency to implement REDD+ and define first steps for operation			IP			IA								
1.6.10. Develop, jointly with relevant entities, monitoring mechanisms of social and environmental impacts of REDD+ actions in priority areas			IP											
1.6.11. Harmonize the National REDD+ Strategy with the Rural Landscape Restoration Strategy			IP											
1.7.1. Regularly update the deforestation and forest degradation driver analysis			IP											
1.7.2. Analyze, review and adjust public policies and incentives to diminish deforestation and forest degradation			IP											
1.7.3. Ensure consistency of forest-related policies with REDD+			IP											

Activities	Entities/institutions (*see note below for definition of acronyms*)													
	MINAE	AFE	FONAFIFO	ONF	CIAGRO	SINAC	SNIT	RN-C	CONAGEBIO	DCC	MAG	ADI	CENIGA	IMN
2.1.1. Update the National Forestry Development Plan with the participation of Indigenous Territories, according to the principles of Free, Prior and Informed Consent (FPIC)	IP		IA	IA		IA								
2.1.2. Identify gaps between national and international legal regulations in regards to resource management in Indigenous Territories	IA		IP									IA		
2.1.3. Adopt any appropriate modifications to the current National Forest Development Plan by means of a decree or a specific legal amendment	IA		IP									IA		
2.2.1. Support conflict resolution mechanisms for areas where land-tenure is disputed and consider the participation of the Ministry of Justice and Peace (MJP) and the Ombudsman Office, including the development of protocols where relevant	IA					IP								
2.2.2. Develop an alternative mechanism for settling land tenure disputes in indigenous territories and small agroforestry producers in relation to REDD+	IA		IP											
2.2.3. Improve and make widely available a mechanism to report disconformities by other public institutions and communal territories, as well as provide additional opportunities for its periodical assessment			IP			IA					IA			
2.3.1. Assess if limitations exists (legal, economic, technical, logistic) of small and medium agroforestry producers in areas under special land tenure regimes for participating in REDD+			IP											
2.3.2. Develop studies and implement plans for producing additional economic and social benefits through REDD+ or other policy actions for small and medium forestry producers			IP											
2.3.3 Develop a joint plan between MINAE, MAG and the private sector to inform, train, and assist efforts by farmers and small agroforestry producers, including indigenous territories, for marketing goods and services	IP										IA			
3.1.1. Develop guidelines and implementation plans for those components of the National Forestry Development Plan related to technological and managerial capacities, especially those related to timber industrialization	IA			IA		IP								
3.1.2. Update studies, start dialogues and capacity building processes to address current competitiveness weaknesses in the forestry sector across the production chain, and propose solutions	IA			IA		IP								
3.1.3. Conduct studies and implement strategies to identify markets for national and international timber and non-timber forest products and identify sources of financing for starting business models	IA					IP								
3.1.4. Strengthen the participation of research and academic centers to update knowledge on potential improvements to management, silvicultural and genetic management of tree species	IA			IA		IP								
3.1.5. Document successful experiences in silvicultural management by region, species, for tree plantations, forest management and agroforestry systems	IA			IA		IP								
3.1.6. Promote a dialogue with relevant stakeholders on the lessons learned in silvicultural management	IA					IP								
3.1.7. Foster exchanges between farmers and indigenous territories on forest and agroforestry system management	IA					IP						IA		
3.1.8. Design quality indicators for forest management and for evaluating PES reforestation	IA			IA		IP								

Activities	Entities/institutions (*see note below for definition of acronyms*)													
	MINAE	AFE	FONAFIFO	ONF	CIAGRO	SINAC	SNIT	RN-C	CONAGEBIO	DCC	MAG	ADI	CENIGA	IMN
3.1.9. Assess legal and administrative options to use fallen timber in forests, including in Protected Conservation Areas is adequate, mainly for increasing benefits for small organizations and forestry producers	IA			IA		IP								
3.2.1. Develop a joint MAG-MINAE plan to build capacity of forestry producers on sustainable management of forests, plantations and agriculture, including the reactivation of the Forest-Agriculture Commission	IA					IP					IA			
3.2.2. Develop a system to award timber produced in sustainable ways and supported with PES payments	IA		IA			IP								
3.2.3. Promote low-cost certification systems for forestry producers	IA					IP								
3.2.4. Strengthen regional and local organizations providers of genetically-improved trees				IA		IP					IA			
3.2.5. Develop good practice manuals for silvicultural production in collaboration with academia	IA			IA		IP					IA			
3.2.6. Improve outreach activities in MAG, CIAgro and MINAE to provide assistance to producers	IA					IP					IA			
4.1.1. Contribute to the update of land-tenure studies in all indigenous territories in coordination with the relevant government institutions			IP				IA	IA						
4.1.2. Support the development of a long-term plan for regularizing indigenous land rights			IP									IA		
4.1.3. Contribute to the design of a culturally- appropriate mechanism for settling legal disputes related to land tenure in indigenous territories; such mechanism will be designed in coordination with the Ombudsman Office, the Ministry of Justice and Peace and the Ministry of the Presidency			IP									IA		
4.1.4. Determine the status of rights to emission reductions and potential mechanisms for their transfer to the FCFP Carbon Fund			IP											
4.1.5. Support the design of a legal and cadastral assistance mechanism for indigenous territories, with the goal to help clarify land-tenure rights			IP											
4.2.1. Contribute in the assessment of land-tenure in every area under special land-tenure regimes (with the exception of indigenous territories			IP											
4.2.2. Support the development of a long-term plan for clarifying land-tenure rights in areas under special land-tenure regimes			IP											
4.2.3. Contribute to the design of a mechanism for settling legal disputes related to land tenure for areas under special land-tenure regimes (excluding indigenous territories); such mechanism will be designed in coordination with the Ombudsman Office, the Ministry of Justice and Peace and the Ministry of the Presidency			IP											
4.2.4. Determine the status of rights to emission reductions and potential mechanisms for their transfer to the FCFP Carbon Fund			IP											
4.2.5. Support the design of a legal and cadastral assistance mechanism for areas under special land-tenure regimes, with the goal to help clarify land-tenure rights			IP											
4.3.1. Develop a registry of public lands eligible for REDD+ implementation			IP				IA	IA						

Activities	Entities/institutions (*see note below for definition of acronyms*)													
	MINAE	AFE	FONAFIFO	ONF	CIAGRO	SINAC	SNIT	RN-C	CONAGEBIO	DCC	MAG	ADI	CENIGA	IMN
4.3.2. Assess public land-tenure regimes and determine institutional arrangements for the transferring emission reductions rights to the FCPF Carbon Fund			IP			IA								
4.4.1. Review current legislation to identify potential contradictory provisions on border delimitation in areas under special land-tenure regimes.			IP				IA	IA						
4.4.2. Propose legal and/or regulatory amendments to fix potential delimitation issues in conflict zones			IP				IA	IA						
5.1.1. Prioritize Costa Rica's territory according to its potential for REDD+, considering all REDD+ activities			IA			IP								
5.1.2. Harmonize criteria between the National Forestry Development Plan and the FBS for guaranteeing legal and political security to citizens when investing in REDD+	IP		IA			IA								
5.1.3. Develop public policy to add value to forests and forestry production to reduce pressure for land use change	IP		IA	IA		IA			IA					
5.1.4. Identify high REDD+ social and environmental co-benefits areas to prioritize investments			IP			IA								
5.1.5. Expand PES payments to other environmental services currently not defined in the Forestry Law, but with legal basis in other regulatory bodies (through a legislative or regulatory review).			IP											
5.1.6. Conduct information campaigns on the importance of PES, REDD+, the social and environmental benefits of sustainably managing forests, and the promotion of tree plantations and forest conservation.			IP											
5.1.7. Explore opportunities to expand PES payments to other activities and consider increases in current payments per activity			IP											
5.2.1. Identify options to broaden the scope of the PES to allow coexistence of productive activities, agricultural and forest conservation.			IP								IA			
5.2.2. Identify legal, technical and operational restrictions to expand PES and implement measures to allow for expansion.			IP											
5.2.3. Identify additional sources of finance beyond PES			IP											
5.2.4. Design innovative financing modalities, develop pilot applications and assess results			IP											
5.2.5. Design and test a mechanism for the integral management of agroforestry farms, by combining forest-related environmental services and agroecosystem services, with social benefits (i.e. a new PES modality).			IP								IA			
5.2.6. Design and test a culturally appropriate forestry management and financing mechanism for indigenous territories (i.e. new PES modality).			IP									IA		
5.2.7. Develop a capacity building program for farmers, agroforestry producers and indigenous peoples to improve knowledge on how to access benefits from these new financing mechanisms (see activity 5.2.5 and 5.2.6.)			IP	IA							IA	IA		
5.2.8. Explore further options to prioritize PES allocation to indigenous territories			IP			IA								
5.3.2. Identify ways for the Domestic Carbon Market (DMC) to finance REDD+ activities			IP							IA				

Activities	Entities/institutions (*see note below for definition of acronyms*)													
	MINAE	AFE	FONAFIFO	ONF	CIAGRO	SINAC	SNIT	RN-C	CONAGEBIO	DCC	MAG	ADI	CENIGA	IMN
5.3.4. Develop a long-term financing strategy for the full implementation of the National REDD+ Strategy			IP			IA					IA			IA
5.3.5. Operate and regularly assess the performance of the Benefit Sharing Mechanism (BSM) with participation of relevant stakeholders			IP											
6.1.1. Define a Safeguards Information System (SIS) to comply with REDD+'s safeguards under the UNFCCC and other applicable safeguards (i.e. World Bank and other implementation partners)	IA		IP			IA								
6.1.2. Clarify the variables, criteria and indicators of the SIS and a format for reporting to the UNFCCC	IA		IP			IA								
6.1.3. Develop a plan to integrate the SIS to the National Environmental Information System (SINIA) and determine if further arrangements are required for generating regular information	IA		IP			IA								
6.1.4 Share the design, results and reports derived from the SIS, including a Results and Reports Sharing Mechanism	IA		IP			IA								
6.1.5. Build capacity to ensure the timely generation of information as part of the SIS	IA		IP			IA								
6.1.6. Prepare regular SIS reports consistent with national and international requirements	IA		IP			IA								
6.2.1. Share with stakeholders and formally recognize (make official) the Social and Environmental Management Framework (ESMF) of the National REDD+ Strategy			IP											
6.2.2. Inform and build capacity in civil society and public officers involved in the operation of the FGRM			IP											
6.2.3. Implement and assess on an annual basis, with participation of the relevant stakeholders, the results of the ESMF and the FGRM			IP											
6.2.4. Develop a dialogue and systematic communication platform with relevant stakeholders.			IP											
6.3.1. Achieve consistency between REDD+ MRV and the National MRV Framework for informing the COP on Costa Rica's progress towards achieving the ultimate goal of the UNFCCC			IA			IA							IP	
6.4.1. Develop a strategy to further consider gender, and cultural diversity in REDD+, based on available preliminary studies	IP													
6.4.2. Develop information, training, outreach and obtain financing to promote the participation of women in REDD+	IP													

Entities/institutions: MINAE: Ministry of Environment and Energy, SINAC: National System of Conservation Areas, AFE: State Forestry Administration, FONAFIFO: National Fund for Forestry Financing, CENIGA: National Center for Geo-Environmental Information, IMN: National Meteorological Institute, ONF: National Forestry Office, CIAgro: Agronomists Association, SNIT: National System of Territorial Information, RN-C: National Registrar – Cadastral Office, CONAGEBIO: National Committee for Biodiversity Management, DCC: Climate Change Direction, MAG: Ministry of Agriculture and Livestock, ADI: Indigenous Development Associations.

Institutional capacity for the implementation of the Program

Operational arrangements of the ER-Program are based on current legislation, including specific tasks and capacities of the existing institutions. As detailed in **Section 1.3.**, institutions in charge of managing and implementing the ER-P have demonstrable technical, political and managerial capacities. For instance, MINAE is political director of the forestry sector. FONAFIFO executes the PES since 1997. SINAC has regional offices across the country and run numerous programs for the management of forest resources and emission reductions (*i.e.* illegal clearing and forest fire management).

The government's legal ability to sign an ERPA is explained in **Section 1.3**. and **Section 4.5**. Institutions such as FONAFIFO have institutional capacity to sign contracts with land-owners and market environmental services, *i.e.* PES is a benefit sharing mechanism and has been operating since 1997. Particularly for the ER-P, MINAE provides political direction, as well as technical, administrative and financial management capacities for benefit sharing.

The reference level was defined by FONAFIFO during the REDD+ Readiness Phase. SINAC has demonstrated ability to implement a national forest inventory (NFI). FONAFIFO runs a Service Comptroller and so can manage the FGRM, as well as follow-up on Safeguards Plans and the ongoing National REDD+ Consultation process.

Relationship of the national implementation framework for REDD+ with the implementation framework for the ER-Program

The National REDD+ Strategy is implemented through the ER-Program, so the implementation framework is the same. Both are based on the Environment Organic Law, the Forestry Law, the Biodiversity Law and the Indigenous Law, as well as relevant international legislation for REDD+. All REDD+ related emission reductions will be produced under the ER-Program. The ER-Program may go beyond the ERPA term and future innovations to the REDD+ Strategy will be consistent to the currently proposed REDD+ policy and program framework.

6.2. ER Program budget

The budget for the ER-Program was developed with the participation of key government actors responsible for REDD+ implementation, *i.e.* the Ministry of Environment and Energy through the National Forestry Financing Fund (FONAFIFO), the National Meteorological Institute (IMN), the National System of Conservation Areas (SINAC) and the Ministry of Agriculture and Livestock (MAG). From this group of organizations, we should indicate that FONAFIFO and SINAC provide mostly the regular funds for the Program of Emission Reduction. In the case of FONAFIFO it includes resources allocated to the Program of Payment for Environmental Services (PES). Regarding SINAC, there are four strategic programs that have a direct contribution to emission reductions: i) Measures to maintain and strengthen Protected Areas (ASP); ii) National Strategy for Integrated Fire Management; iii) Program of Legality Control of Forest Production and iv) Purchase of land to strengthen the State Natural Heritage. All these programs contribute not only to reducing emissions, but the maintenance of a variety of ecosystem benefits such as protection of biodiversity, soil, water and scenic beauty. Costa Rica is recognized as a country with substantially and steadily reversed deforestation, and this must be attributed to the strengthening of its institutions and policies.

The construction process of the Financing Plan started with a call to the institutions mentioned above to participate in two workshops on costs (May and September). The first workshop had several objectives: to analyze the methodology and financial model to use, the requirements of ER-PD, identify the necessary information for each institution for the financial planning and defining the mechanics of work and follow-up. The second workshop analyzed the first results of the financial exercise, to identify additional information, and primarily, to receive feedback from the institutions.

The selected methodology considers all costs and income sources, and identifies necessary financial resources for implementing the ER-P[36]. The financial planning was focused on the REDD+ policy framework presented in the ER-P (Section 4.3.)[37]. Each policy action was classified according to: i) Direct or indirect impact on emission reductions, ii) Land-tenure regime, iii) Whether the action is new, iv) Budget origin, v) Main implementer, vi) Financing planning level.

There are four financing planning levels:

- Level 1-REDD+ Program Administration: additional budget expenses of institutions managing the ER-P. Among the main financing lines we have: i) Project management and overview; ii) participation of Interested Parties; iii) safeguards monitoring; iv) compliance and grievance mechanism; v) distribution of benefits; vi) measurement, reporting and verification of the programs emission reductions (MRV).
- Level 2-REDD+ National Policies: comprising transaction costs to establish new policies, differentiating between implementation costs at level 3, to design, develop, communicate and implement policies that effectively support the implementation of the National REDD+ Program. For purposes of financial planning, Level 2 should take into account financial implications of policies that will have an overall impact on land use, but are not directly linked to the implementation at the field level. While Costa Rica has developed a legal system that supports many of the modalities of REDD+, the National REDD+ Strategy seeks to include a wider range of activities of the ~~Emissions Reduction~~Emission Reductions Program which may require additional policies and legal frameworks set. That is the case of activities such as those relating to address the direct and underlying causes of deforestation and forest degradation; improving legal instruments against illegal logging throughout the production chain; studies to identify the suitability and potential of financial management of forest in other PAs, to name a few.
- Level 3- REDD+ Sub-programs: costs are expected to implement the scheme of programmatic actions that the government provides for the implementation of policies. They are not policies or administrative actions. On the contrary, they are referring to government support provided directly to field actions such as expansion of the coverage of the Program of Payment Environmental Services, the creation of new forms of PES (Peasants PES, Indigenous PES); the purchase of private land pending payment in PAs; forestry development in indigenous territories; promoting quality improvement in the management of forestry in forests and plantations; strengthening the FONAFIFO forestry credit program, promotion of agroforestry systems for agriculture and livestock, among others.
- Level 4-REDD+ Activities: costs associated to the individual REDD+ activities to reduce emissions or enhance carbon stocks, including REDD+ activities promoted by REDD+ Sub-programs (Level 3). It is the case of non-governmental organizations such as the Association of Agronomists and Foresters (CIAgro), which develop operational plans (forest regencies) for the preservation and regeneration of forests, reforestation plantations and agroforestry systems, etc. Similar estimates can be developed for other subprograms, once specific plans are developed.

There is a group of activities of the National REDD + Strategy that require more definition to determine the costing, many of them require previous studies to conceptually define their objectives, scope and purpose. REDD+ Secretariat following high-level political guidance is working to develop specific operational plans for additional actions in order, for example, of: i) clarify land tenure and carbon rights in areas under special regimes; ii) improve the enforcement of laws regarding forest cover and deforestation; iii) promote sustainable forest management by addressing the illegal logging industry and developing markets for wood products and; iv) development of new sources of funding.

[36]Terra Global Capital: Description and Process of the Planning Financing Program for Emission Reduction (ER) in Costa Rica. June 2, 2015. Available here.
[37]Policies in the EN-REDD+ CR, V4 SEPT 24.

Currently an Implementation Plan of the National REDD+ Strategy is under development as a planning tool for long-term policies, actions and activities (tasks). This process is done with each of the organizations involved in the implementation of the EN-REDD+. This plan includes, inter alia: i) targets - indicators; ii) institutional responsibility and iii) cost and financing (total cost and source of funding) for the 134 tasks EN-REDD +.

Annex 1 corresponds to the Table of Financial Projections for the ERP (period 2010-2025) comprising: i) tons of carbon for sale and years of verification, ii) Costs of the Program for Emission Reduction, iii) Source of resources, mainly referred to FONAFIFO and SINAC and; a price per ton of carbon and revenues from emissions reductions. The exercise shows the cash flow of the program, the net flow and the cash balance for the period 2010-2025. Three scenarios were developed:

- Financing Plan at a price of US $ 5.00, which establishes the reference FCPF
- Financing Plan at a price of US$ 15.00, as an intermediate price
- Financing Plan at a price of US $ 30.00, which represents the breakeven

This financing plan shows the cost to Costa Rica for reducing one ton of carbon. This cost has historically been assumed by the Government of Costa Rica, specifically, by the Ministry of Environment and Energy through FONAFIFO and SINAC; through environmental and forest policies that are supported by a robust legal framework. All this allows to show significant progress in this sector over the last 20 years, beyond the forest, as a contribution to the mitigation of greenhouse gases and the generation of a variety of non-carbon benefits. Additional revenues related to the implementation of REDD+ in Costa Rica, will expand national efforts in the forestry sector, strengthen many existing forest policies and develop those that are required to achieve the objectives set in the National REDD+ Strategy and the Emission Reduction Program.

For Costa Rica, the main implementing agencies for the National REDD + Strategy and Emission Reduction Program, are FONAFIFO and SINAC. For the purposes of the Financial Plan, only these budgets were analyzed in detail what the expected income by revenues from emissions reductions is added. The objective of the financial planning process was to determine what the cost of reducing emissions over a period of time is, including ex-ante contributions from 2010 to 2015. In addition, it is required to determine the needs of cash flow and long-term financing for REDD+ program. Annex 1 is supported in the document can be found at this link.

It is assumed that as the implementation Plan advances more precise costs related to the National REDD+ Strategy and the Program of Emissions Reductions will be obtained, this is especially relevant in the case of SINAC, where institutional budgets were used, comprising mainly costs of major REDD+ activities: i) Measures to maintain and strengthen Protected Areas (ASP); ii) National Strategy for Integrated Fire Management; iii) Program for Control of Legality of Forest Production; iv) land purchase to strengthen the State Natural Heritage; but which also comprise other conservation activities.

Another aspect where more accuracy will be required, both in the design and costs, is related to the system to measure, report and verify emissions reductions (see section 9). This process will allow institutional strengthening and capacity building of the monitoring system on land use for different institutional goals.

7. Carbon pools, sources and sinks

The carbon pools included in Costa Rica's ER-Program are:

Carbon stocks	Selected?	Justification / Explanation

Above-ground biomass (AGB)	Yes	AGB contains the highest proportion of C stored in FL (between 50-79% of the total estimated C per ha). For more information please refer to the "FREL TOOL ~~CR~~", and go to the "C-STOCKS" tab, columns H and I.
Below-ground biomass (BGB)	Yes	On average, BGB represents ~~23.5~~18% of AGB C stocks per ha. For more information please refer to the "FREL TOOL ~~CR~~", and go to the "C-STOCKS" tab, columns J and K.
Litter	Yes	Even though litter represents <10% of emissions from FL conversion (and <10% of total C stocks), it was included in the FREL for completeness ~~purpuses~~purposes given the availability of high quality country-specific data~~because there are high quality data available~~. For more information please refer to the "FREL TOOL ~~CR~~", and go to the "C-STOCKS" tab, column O.
Deadwood	Yes	Even though deadwood contributes to <10% of emissions from FL conversion, deadwood was included in the FREL for completeness purpueses given the availability ofhigh quality country-specific data~~because there are high quality data available~~. For more information please refer to the "FREL TOOL CR", and go to the "C-STOCKS" tab, column L.
Soil C	No	Although a potentially significant carbon pool, organic soil C was excluded from the FREL due to lack of reliable national data to estimate the ~~exchange rates~~flux of C in the different land use change transitions. It is assumed that during the term of ERPA, C stock changes would not result in significant emissions. On the contrary, considering that *lands converted to FL* are greater than deforestation~~forest conversion areas~~, it is possible that soil C would be a net sink in Costa Rica. However, it is acknowledged that better national data is required for the estimation C stocks changes.

The GHG considered in Costa Rica's ER-Program are:

GHG	Selected?	Justification / Explanation
CO_2	Yes	Carbon dioxide is the main gas emitted by anthropogenic activities in the LULUCF sector; CO_2 is the only gas absorbed when forest C stocks are enhanced.
CH_4 and N_2O	Yes	Biomass burning in FL was the most accessible technology for forest conversion prior to 1997 when the current Forest Law was passed. After 1997, burning for FL conversion is assumed to be zero, according to national expert judgment. Non-CO_2 emissions from biomass burning may occur in FLFL, however these emissions are currently not part of the FREL. Please note that emissions/absorptions in FLFL may be revised for May 23rd, 2016, according to the text above.

8. Reference level

8.1. Reference period

The selected *historical reference period* is **1998-2011**.

End year (*2011*): according to Costa Rica's R-PP and ER-PIN[38], the country's National REDD+ Strategy began implementation in 2010. However, given that for 2009 Costa Rica does not have a map[39], the TAP recommended that Costa Rica selected the year 2011 instead to comply with the CF-MF. Costa Rica followed the TAP's recommendation.

Base year (*1998*): 1997 is the year when the current Forestry Law was passed, including key forest policy, instruments and mechanisms (*e.g.* PSA). 1998 is the closest date to 1997 for which Costa Rica has a map (please see previous footnote). Selecting 1998 as the base year of the historical reference period allows for the consideration of emission reductions that have resulted from the implementation of the current Forest Law. Because of this, the reference level can be used as a benchmark to measure emission reductions that are "additional" to the normal performance of current forest policies and programs. This date was strategically selected to show the impact of the Forestry Law, and has an important role in the FREL/FRL to be submitted to the UNFCCC.

~~Note: It is worth pointing out that Reference Period for forest reaming forest activities (degradation and forest carbon stock enhancements) are provisionally using a base year of 2005, but plans are to revise the base year in near future to align with land cover change activities (deforestation and reforestation) and empliy the base year of 1998.~~

8.2. Forest definition used in the construction of the Reference Level

The definition of "forest" used in the construction of the proposed FREL is:

- **Minimum area: 1.00 ha**
- **Minimum forest canopy cover: 30%**
- **Minimum height of trees: 5.00 m**

This definition is consistent with the forest definition reported by Costa Rica under the Clean Development Mechanism (CDM) and is also consistent with the forest definition used in the context of the national GHG inventory. However, this definition is not consistent with Costa Rica's reports to FAO's Forest Resources Assessment (FRA). Under FAO-FRA, Costa Rica defines "forest" as:

- Minimum area: 0.50 ha
- Minimum forest canopy cover: 10%
- Minimum height of trees: 5.00 m

[38] Approved by the Carbon Fund in its resolution CFM/5/2012/1, which acknowledged the high quality of the ER-PIN (para. 1) and granted additional financing to move towards the ER-P (para. 2 and 3). In addition, the annex of the resolution identified key issues, these do not include an objection to the start of the National REDD+ Strategy or the ER-P in 2010.

[39] According to the CF's TAP, the IPCC approach 3 included in **indicator 11.1** of the CF-MF requires countries to have spatially explicit information or a map. Costa Rica challenged this interpretation, but decided to follow the TAP's recommendation to shift the end-date of the historical reference period to 2011.

Costa Rica deemed more appropriate to maintain consistency in all its GHG-related reports and therefore decided that using the definition already applied in the context of the national GHG inventory and the CDM would be more appropriate in the context of the REDD+ than using the definition applied in FAO´s FRA.

Additionally, article 3 of Costa Rica's Forestry Law 7575 defines "forest" as a "*Native or indigenous ecosystem, intervened or not, regenerated by natural succession or other forestry techniques that occupies a surface of two or more hectares, characterized by the presence of mature trees of different ages, species and appearance, with one or more canopies covering over seventy percent (70%) of the area and with more than sixty trees per hectare with a diameter at breast height (dbh) of more than fifteen centimeters*". This definition translates to:

- Minimum area: 2.00 ha
- Minimum forest canopy cover: 70%
- Minimum height of trees: *N.A.*
- Minimum number of trees: 60 per hectare (with a diameter of at least 15 cm at breast height)

Although these definitions are not totally consistent, the definition of "forest" used in the context of REDD+ is broader and largely includes the definition in the law. In the context of the National REDD+ Strategy and the relevant national legislation, the definition of "forest" in the law is applicable for domestic purposes.

8.3. Definition of REDD+ activities considered in the Reference Level

Costa Rica will use the following operational definitions of the REDD+ activities:

REDD+ Activities	Included?	Justification / Explanation
Emissions from deforestation	Yes	According to the National GHG inventory and for purposes of the RL, deforestation was defined as *Forest land converted to other land use* categories in the year of conversion. Activity data for deforestation was obtained from a multi-year land use change time series. It is important to note that tree plantations are part of the sub-category "secondary forests", which are included in the *Forest land* category. Changes from secondary forests to other land uses are thus regarded as deforestation. If the land is allowed to regenerate back to a secondary forest or is planted again as part of a timber production regime, the event is recorded as conversion to *Forest land* at year 4 or 8, as appropriate. In Costa Rica, all forest conversion is illegal, so "legal" clear cutting only applies for forest plantations. Hence, natural forest management does not incur ~~in~~ forest loss at any point of the silvicultural regime. Emissions from deforestation were estimated assuming constant C stocks over time in primary *Forest land* and variable C stocks, according to forest age in secondary *Forest land*.
Emissions from forest degradation in forests remaining forests	Yes	According to MF indicator 3.3, these emissions are estimated using the best available data. ~~A proxy of gross e~~Emissions from forest degradation were estimated, using a visual assessment canopy cover density which classified primary forest areas as~~maps, to estimate the emissions from~~ intact, degraded, and very degraded ~~primary forests~~ in the forests remaining forest land.

REDD+ Activities	Included?	Justification / Explanation
Enhancement of forest C stocks in forests remaining forests	Yes	~~A proxy of gross emissions from~~Removals from forest enhancements in forest remaining forest is estimated using a visual assessment of canopy cover density on high resolution images (using the same methodology as that used to estimate emissions from forest degradation). As a conservative measurement, when a primary forest was detected ~~by this method~~ to have increased ~~or enhanced its~~in canopy cover ~~density~~, the increase in C stock was considered to be ~~maintained constant during that period~~from secondary forest rather than primary forest regrowth, resulting in less total removals.
Regeneration of forest C stocks in secondary forest	Yes	It was assumed that *Forest land* in transition complies with the definition of forest at years 4 and 8, for wet and dry forests, respectively (see **Section 4.1**. for more details on land classification). C stock enhancement in secondary[40] *Forest land remaining Forest land* was estimated using growth models developed in Costa Rica (Cifuentes, 2008)[41]. These models estimate C stocks as a function of age. Cifuentes' equations were applied by determining the age of the forest in the year of the conversion and tracking forest age along the AD time series (more details are presented in **Section 4.4**). Once a secondary forest is lost, this land is no longer considered under *Forest land remaining Forest land,* but under the land use category it converted to (*e.g.* Grassland). During this conversion, all *forest* C stocks were assumed to oxidize. However, post-deforestation, non-forest C stocks were considered. If later on in the time series, secondary forests were observed, this land was considered under *Forest land remaining Forest land.* Subsequent *forest* C stocks accumulation was considered under this category.
Conservation of forest C stocks	No	Not applicable.
Sustainable management of forests	No	Emissions/~~absorptions~~removals associated ~~to~~with the sustainable management of forests are excluded due to the lack of reliable data. At the same time, it is important to note that total area under forest management in Costa Rica is minimal (<500 ha yr^{-1}). Additionally, silvicultural practices are not stand-replacing, but remove partial timber volumes every 15 years. For these reasons, it is very likely that emissions/~~absorptions~~removals may not be significant.

~~Regardless, for all forest definitions, only the minimum area parameter can be measured using Landsat imagery. Tree height and the percent of canopy cover cannot be measured directly with Landsat imagery, although it is often assumed that lands classified as "forest" actually surpass the threshold values of the three parameters used for defining "forest". For this reason, a test was carried out to determine how well the analysis of remotely sensed data performed in classifying "forests" according to its definition. The test involved~~

[40] The term "secondary" refers to forests that regenerated from previously disturbed land. Secondary forests were completely cleared for agricultural production or due to natural disturbance events. The term "secondary" is helpful to distinguish these Forest lands from primary Forest lands, which are non-managed.

[41] Cifuentes, M. 2008. Aboveground Biomass and Ecosystem Carbon Pools in Tropical Secondary Forests Growing in Six Life Zones of Costa Rica. Oregon State University. School of Environmental Sciences. 2008. 195 p.

~~comparing areas classified as "forest" and "non-forest" with two canopy density maps prepared by an independent study[42] for the years 2001 and 2012. The result of this assessment revealed that 92.4% of the area classified as "primary forests" (*i.e.* old-growth forest) and 79.0% of the area classified as "new forest" (*i.e.* secondary forests and forest plantations) in 2001 presented ≥30% of canopy cover, while for 2012 the percentage was 93.5% and 79.3%, respectively. Results for "non-forest" areas showed that only 53.31% of the areas classified as "non-forest" in 2001 presented <30% of canopy cover, while for 2012 the percentage was 56.61%. This could be explained by the presence of wooded pastures and agroforestry systems in Costa Rica, and also by inherent error of the canopy-density maps.~~

8.~~4~~3. Average annual historical emissions over the Reference Period

Costa Rica's reference level applies historical average emissions and removals derived from a reference period, and thus fully complies with the indicator 13.2 which states: "*The Reference Level does not exceed the average annual historical emissions over the Reference Period, unless the ER Program meets the eligibility requirements in Indicator 13.2*."

The proposed reference period for estimation of average annual historical emissions is 1998-2011~~ for deforestation and reforestation, and 2005-2011 for degradation and forest carbon stock enahcnements~~. The reference period of 1998-2011 was elected for ~~land use change activities (deforestation and reforestation)~~ because a land use change map was produced for these dates and it complies with indicator 11.2 of the Methodological Framework: "…start-date for the Reference Period is about 10 years before the end-date…". Images used for the point sampling of forest remaining forest activities were aligned to the dates of the land use change maps so that all activities could maintain the same reference period (1998-2011).~~The reference period of 2005-2011 was elected for forests remaining forests activities (forest degradation and forest carbon stock enhancements) because the visual assessment of canopy cover was conducted using data from 2005 and 2015. Given the lack of data for any date before 2005, a decision was made to keep the start date aligned with date for which data from canopy cover was available (*i.e.* 2005). However, the end date was interpolated back to 2011 following IPCC's best practices and guidance on the use of interpolation of data in relation to the Reference Period of an ER program[43],, to align with end date of reference period for land use change activities. Although the 10-year condition for the forest degradation reference level period (6 years) is not met, this is a temporary situation, while the roadmap to review the estimation of emissions and removal from forest remaining forest are completed (see Section 8.8).~~

~~Costa Rica's proposed FREL ***equals*** the average annual historical emissions over the reference period 1998-2011; therefore, the FREL fully complies with the first part of indicator 13.2 which states: "*The Reference Level does not exceed the average annual historical emissions over the Reference Period, unless the ER Program meets the eligibility requirements in Indicator 13.2*."~~

Description of method used for calculating the average annual historical emissions over the Reference Period

~~[42] Agresta, Dimap, University of Costa Rica, Universidad Politécnica de Madrid, 2015. b. Index of cover as base for the estimate of degradation and increase of carbon stocks: Generating a consistent historical time series of activity data from land use change for the development of Costa Rica's REDD plus reference level. Consultancy report prepared for the Government of Costa Rica under the Carbon Fund of Forest Carbon Partnership (FCPF). 18 p.~~

~~[43] https://www.forestcarbonpartnership.org/sites/fcp/files/2016/June/FCPF%20Guidance%20document%20on%20the%20Methodological%20Framework%20number%201.pdf~~

The full description of the approaches, methods, and assumptions used for calculating the ***net average annual historical emissions*** over the Reference Period, including an explanation how the most recent IPCC guidance and guidelines have been applied as a basis for estimating forest-related greenhouse gas emissions by sources and removals by sinks, is included in Costa Rica's modified FREL submission[44] to the UNFCCC. Additional information may be found in the following technical report, as well as associated information ~~at~~ on the REDD+ website. For purposes of the ERPD, key summary information will be included as follows. Please note that under the UNFCCC, Costa Rica's FREL includes the historical reference periods 1986-1996 and 1997-2009. More information on how this relates to the proposed reference level to the FCPF Carbon Fund may be found in section 8.~~7~~6 of the ERPD.

The total RL has been estimated as sum of the **gross emissions and removals** from all REDD+ activities considered, resuling in the ***net annual average historical emissions*** for **1998-2011** (**Table 8.4.1**); the RL will be applicable for 2012-2025. ~~Emissions from degradation and enhacement of primary forests in forest land remaining forest land, for years 1998 to 2004, were extrapolated from the preliminary reference period for degradation, that was estimated for the period 2005-2011. RL for degradation will be updated before ER-PA signing, acording to Roadmap to improve emissions and removals from forest remaining forests (see section 8.8).~~

~~The FREL has been estimated as the ***net annual average historical emissions*** for **1998-2011** (Table 8.1, Figure 8.1.); the FREL will be applicable for 2012-2025.~~

~~According to the national GHG inventory and for purposes of the FREL, deforestation was defined as *FL converted to other lands* in the year of conversion. For enhancement of forest C stocks, it was assumed, based on expert judgment, that secondary vegetation in all forest strata, except dry forests, surpasses the minimum thresholds of the parameters used for defining "forest" at an age of 4 years after land abandonment (8 years for dry forests). *Land converted to FL* transitions to FLFL after 400 years.~~

~~C stock enhancement in *lands converted to FL* was estimated using growth models developed in Costa Rica by Cifuentes (2008)[45]; these models estimate C stocks as a function of age. Knowing the age of the forest in the year of the conversion and tracking forest age over time made it possible to apply these equations. Emission factors for deforestation were estimated assuming constant C stocks over time in primary forests and variable C stocks according to forest age in new forests.~~

Table 8.4.1. Total net emissions included in the reference level for 1998-2011 (in *tons of CO_2 equivalent).*

Year	Land Use Change		Primary forests in forest land remaining forest land ~~(proxy)~~		Total net ~~emissions~~flux (t CO2e/yr)
	Emissions from deforestation (t CO2e/yr)	~~Sequestration~~Removals in secondary forests ~~enhancements~~reforestation (t CO2e/yr)	~~Gross~~ eEmissions from forest degradation (t CO2e/yr)	Removals ~~Gross emissions~~ from forest enhancements (t CO2e/yr)	
1998	10,912,392 ~~15,332,515.42~~	-3,466,027~~-3,457,118.18~~	3,307,460 ~~2,083,940.59~~	-788,012~~-937,760.37~~	9,965,812 ~~13,021,577.46~~
1999	11,145,614 ~~15,565,138.58~~	-3,738,067~~-3,728,836.06~~	3,307,460 ~~2,083,940.59~~	-788,012~~-937,760.37~~	9,926,995 ~~12,982,482.74~~

[44] To made available online in January 2017.

~~[45] Cifuentes, M. 2008. Aboveground Biomass and Ecosystem Carbon Pools in Tropical Secondary Forests Growing in Six Life Zones of Costa Rica. Oregon State University. School of Environmental Sciences. 2008. 195 p.~~

2000	11,371,840 ~~15,790,766.47~~	-4,012,154 ~~-4,002,602.57~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	9,879,133 ~~12,934,344.12~~
2001	4,262,744 ~~5,837,685.53~~	-4,465,800 ~~-4,458,315.68~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	2,316,391 ~~2,525,550.07~~
2002	4,391,076 ~~5,965,803.03~~	-4,439,321 ~~-4,431,810.73~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	2,471,203 ~~2,680,172.52~~
2003	4,515,469 ~~6,089,981.82~~	-4,417,697 ~~-4,410,160.21~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	2,617,220 ~~2,826,001.83~~
2004	4,636,051 ~~6,210,349.65~~	-4,400,625 ~~-4,393,060.62~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	2,754,874 ~~2,963,469.25~~
2005	4,752,939 ~~6,327,024.01~~	-4,386,338 ~~-4,378,745.41~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	2,886,048 ~~3,094,458.82~~
2006	4,866,244 ~~6,440,115.95~~	-4,374,810 ~~-4,367,188.26~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	3,010,882 ~~3,219,107.91~~
2007	4,976,074 ~~6,549,732.45~~	-4,366,064 ~~-4,358,412.65~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	3,129,458 ~~3,337,500.03~~
2008	4,241,490 ~~5,475,112.67~~	-4,656,939 ~~-4,648,115.60~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	2,103,998 ~~1,973,177.29~~
2009	4,412,306 ~~5,645,651.53~~	-4,741,258 ~~-4,732,261.22~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	2,190,495 ~~2,059,570.53~~
2010	4,578,047 ~~5,811,115.46~~	-4,827,948 ~~-4,818,777.78~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	2,269,546 ~~2,138,517.90~~
2011	4,738,841 ~~5,971,633.85~~	-4,917,121 ~~-4,907,777.65~~	3,307,460 ~~2,083,940.59~~	-788,012 ~~-937,760.37~~	2,341,168 ~~2,210,036.42~~
TOTAL for 1998-2011	**83,801,126 ~~113,012,626.42~~**	**-61,210,170 ~~-61,093,182.60~~**	**46,304,436 ~~29,175,168.26~~**	**-11,032,168 ~~-13,128,645.18~~**	**57,863,224 ~~67,965,966.88~~**
Average for 1998-2011	**5,985,795 ~~8,072,330.46~~**	**-4,372,155 ~~-4,363,798.76~~**	**3,307,460 ~~2,083,940.59~~**	**-788,012 ~~-937,760.37~~**	**4,133,087 ~~4,854,711.92~~**

Activity data and emission factors used for calculating the average annual historical emissions over the Reference Period

8.4.1. ACTIVITY DATA (AD)

Land classification for deriving AD is consistent with the national GHG inventory (except for forest plantations, as explained below). The classes defined were:

1. Forest land and land converted to *Forest land*:
   - 1.1 Wet and Rain Forests (*Bosques muy húmedos y pluviales*)
     - 1.1.1 Primary Forest
     - 1.1.2 Secondary forests
   - 1.2 Moist Forests (*Bosques húmedos*)
     - 1.2.1 Primary forest
     - 1.2.2 Secondary forest
   - 1.3 Dry Forests (*Bosques secos*)
     - 1.3.1 Primary forest
     - 1.3.2 Secondary forest
   - 1.4 Mangroves (*Manglares*)

1.4.1 Primary forest
1.4.2 Secondary forest
1.5 Palm Forests (*Bosques de palma – Yolillales)*
1.5.1 Primary forest
1.5.2 Secondary forest

2. *Cropland*:
2.1 Annual crops
2.2 Perennial crops
3. *Grassland*
4. *Settlements*
5. *Wetlands*:
5.1 Natural wetlands
5.2 Artificial wetlands
6. *Other lands*:
6.1 Paramo
6.2 Bare soil
6.2.1 Natural bare soil
6.2.2 Artificial bare soil

FLFL since 1985/86 that was not classified as "secondary forest" in this year[46] was assumed to be old-growth forest or "**primary forest**". Primary forests are assumed to maintain constant C stocks per hectare over time, given that growth usually equals mortality. "**Secondary forests**" are ~~new~~ forests on lands previously classified as "non-forest". They also include forests that were classified as "secondary forest" already in 1985/86. Secondary forests in 1985/86 are assumed to be representative of all possible age classes, up to 400 years, with equal proportions of areas. To estimate C accumulation in these forests, it was assumed that all age classes grow old one year each year.

Secondary forests established after 1985/86 were assumed to have ~~a number of~~several age-classes equal to the number of years in the measurement period, *i.e*. 6 age classes for 1986-1991 and 1992-1997; 3 age classes for 1998-2000; 7 age classes for 2001-2007; 4 age classes for 2008-2011 and 2 ages classes for 2012-13. It was also assumed that, within a monitoring period, the same amount of area was established each year (*e.g.* for each hectare established between 1986 and 1991 it was assumed that 1/6 hectares were established annually).

Despite all efforts, it was not possible to keep forest plantation as a separate class in the land use change maps used to estimate activity data for deforestation and carbon stock enhancements in non-forest converted to forest. The quality of the satellite imagery employed was not sufficient to overcome the spectral confusion of forest plantation with secondary forests and certain agro-forestry systems. ~~As other sources of national information on forest plantation are neither spatially explicit nor complete for 1997-2009; therefore, forest plantations could not be considered in the FRELRL.~~ For these same reasons, some areas classified as "secondary forest" and as "permanent crop" may actually be forest plantations. ~~This issue will be addressed in the near future, and a robustn accurate RL for plantations will be developed before the ER-PA signature (see Roadmap in **Section 8.8**). Hence, the terminology "new forest" is considered more appropriate than "secondary forests". Given this situation, the emission factor(s) applied to "new forests" does not differentiate between tree plantations and secondary forests.~~ A separate analysis was completed to better understand the extent of forest plantations in Costa Rica[47]. This analysis employed visual interpretation of high-resolution aerial images to estimate the area classified as secondary forest in 2013 that was actually plantations. The

[46] To determine whether a forest was "primary" or "secondary" in 1985/1986, a map of the IMN depicting areas of secondary forests for 1978/1980 was employed.

[47] Ortiz Malavasi, E. 2017. Evaluacion visual multitemporal del uso de la tierra, cambio en el uso de la tierra y cobertura en Costa Rica Zonas A y B. Tarea; 3: Estimación del área de plantaciones forestales incluida en la categoría de bosques secundarios del mapa de cobertura del suelo 2013.

result was that plantations covered only an estimated 70,000 ha in the entire country. With this estimation, it was deemed low priority to better distinguish GHG fluxes in plantations from those in secondary forests, given that the estimated area of plantations is not significant (only about 6% of the secondary forest area in 2013).

The construction of the AD time series required the following sources of data:

- Remotely sensed data from four generations of the Landsat family (Landsat 4 TM, Landsat 5 TM, Landsat 7 ETM and Landsat 8 OLI/TIRS).
- A "Life Zones" map ~~according to~~following the classification system of Holdridge (1966)[48]. This map was used to stratify "Forests" into the three sub-categories: "Wet and Rain Forests", "Moist Forests" and "Dry Forests" (see **Figure 5**).
- Ancillary data (*i.e.* the various maps mentioned in the next section) to edit the results of the spectral classification of remotely sensed data and to further stratify the five forest categories "Wet and Rain Forests", "Moist Forests", "Dry Forests", "Mangroves" and "Palm Forests" into the sub-categories "primary forests" and "secondary forest.

AD was estimated based on the methodology summarized here; further information may be found in a separate report[49] available at Costa Rica's REDD+ Documentation Center.

Pre-processing:

- **Selection of satellite images**. To minimize the area covered by clouds and cloud shadows, low cloud-coverage Landsat images were combined. In most cases, the scenes were selected from the same year and season but, in some cases it was necessary to select scenes from different years within a 14-month timeframe.
- **Registration**. All images were registered to a common system of coordinates (CRTM05). Mean quadratic error in control points was less than one pixel (30 m). Maximum registration error was estimated at 2 pixels (60 m). Ground control points were obtained from ortho-photographs from year 2005.
- **Radiometric normalization**. To reduce radiometric differences between images due to atmospheric conditions and in the calibration of the sensors at the image acquisition dates, all images were radiometrically normalized, by applying the "Iteratively Reweighted Multivariate Alteration Detection" (IR-MAD), as described by Canty and Nielsen (2008)[50].

Classification:

- **Methodology**. "Random Forest" (RF) by Breiman (2001)[51] was employed. This was implemented in two phases: (1) training or adjustment of the RF classifier, and (2) image classification using the RF classifier.
- **Training of the RF classifier**. Training sites were created by digit~~al~~izing homogeneous areas that corresponded to the land use categories of interest for 2001 and 2014. The following sources of data

[48] Holdridge, L.R., 1966. The Life Zone System, *Adansonia VI: 2*: 199-203.

[49] Agresta, Dimap, Universidad de Costa Rica, Universidad Politécnica de Madrid, 2015.a. Informe Final: Generating a consistent historical time series of activity data from land use change for the development of Costa Rica's REDD plus reference level: Protocolo metodológico. Informe preparado para el Gobierno de Costa Rica bajo el Fondo de Carbono del Fondo Cooperativo para el Carbono de los Bosques (FCPF). 44 p.

[50] Canty, M. J. y A. A. Nielsen, 2008. Automatic radiometric normalization of multitemporal satellite imagery with the iteratively re-weighted MAD transformation. Remote Sensing of Environment 112 (2008):1025-1036.

[51] Breiman, L., 2001. Random Forests. Machine Learning, 45:5-3. Available at: http://link.springer.com/article/10.1023/A%3A1010933404324

were used to create these training sites: (1) systematic plot grid (*n* = 10,000) from the national Forest Inventory, (2) high-resolution Rapideye images for 2013; and (3) GoogleEarth imagery. Using these datasets, ground-control points for training were generated randomly.

- **Variables of the RF classifier**: 20 variables were used to adjust the RF classifier using information from the spectral bands, vegetation indexes, variables related to the image texture and variables derived from a digital elevation model.

Post-processing:

- **Minimum mapping unit**. To avoid the "salt and pepper" effect and comply with the minimum area parameter of the definition of "forest: (1.00 ha), the products of the digital classification were filtered in order to represent the land use categories with a minimum mapping unit of 0.99 ha[52].
- **Manual edit~~ion~~s**. ~~In order t~~To improve land use mapping, several edit~~ion~~s were made, largely aimed at decreasing high classification errors:
    (1) "*Forest Plantations*" were merged with the "*Forest land*" category (see Section 4.3.1.). This means that although initially classified as a separate class, "Forest Plantations" presented a very high classification error and, for purpose of GHG estimation, it was treated as Forest land".
    (2) For estimating the area of "*Coffee Plantations*", several ancillary maps were used from the Ministry of Agriculture (MAG), the Costa Rican Coffee Institute (ICAFE) and the Costa Rican Meteorological Institute (IMN). These maps were used to correct the classified areas for the years 2000/01, 2007/08, 2011/12 and 2013/14. For previous maps, a mask representing potential "*Coffee Plantation*" areas was created using the location and elevation of all areas mapped as "Coffee Plantations" considering all available sources of information (MAG, ICAFE and IMN).
    (3) "*Mangroves"* and "*Palm Forests"* are forest ecosystems that exist in very specific soil conditions (e.g. high water table and, in the case of Mangroves, high salinity and influence of tides). This makes conversions of Mangroves and Palm Forests to other forest types, and vice versa, highly unlikely. For this reason, masks were created to represent all potential areas of "*Mangroves*" and "*Palm Forests*". Within these masks, all pixels originally classified as "*Forest*" were reclassified either as "*Mangroves*" or as "*Palm Forests*"; all pixels classified as "*Mangroves*" or "*Palm Forests*" outside the two masks were reclassified as "*Forest*".
- The "*Mangroves*" mask was created by adding all areas classified as "*Mangroves*" for 1986-2009~~13~~ to the area classified as "*Mangroves*" according to the National Forest Inventory. Further, all areas <0 and > 20 m.a.s.l classified as "*Mangroves*" were reclassified as "Forest". The reclassification was then edited manually by visually comparing the areas classified as "*Mangroves*" with 2013 high-resolution Rapideye images.
- The "*Palm Forests*" mask was created using a similar approach. First all areas classified as "*Palm Forests*" for 1986-2013 were added to the area classified as "*Palm Forest*" according to the national Forest Inventory. The result was then manually edited by visually comparing the areas classified as "*Palm Forest*" with 2013 high resolution Rapideye images.
    (4) A mask was also created for "*Paramo*". "*Paramo*" is an ecosystem composed of shrubs and grasses that only occurs at high elevations, above the forest line. The area classified as "*Paramo*" in the National Forest Inventory was manually edited through visual interpretation using 2013 high resolution RapidEye images. Inside the mask, all pixels classified as "*Forest*" were reclassified as "*Paramo*"; conversely, all pixels classified as "*Paramo*" outside the mask were reclassified as "*Forest"*.
    (5) All masks representing "*Mangroves*", "*Palm Forests*" and "*Paramo*" have been compiled in a map of masks that will be kept in order to enable consistent map editions in future measurement and reporting (Figure 6).

[52] Due to the dimensions of the pixels in the Landsat images (30.00 m x 30.00 m) the minimum mapping area is 99 ha, which is equivalent to 11 pixels (11 x 30.00 m x 30.00 m).

(6) Areas classified as "*Urban Areas*" in 2013/14 were manually edited through visual interpretation of 2013 high resolution RapidEye images and creation of a mask representing "*Urban Areas*" in 2013/14. Pixels originally classified as "*Urban Areas*" outside the mask were reclassified as "*Bare Soil*" and conversely, pixels classified as "*Bare Soil*" inside this mask were reclassified as "*Urban Areas*". Additionally, under the assumption that "*Urban Areas*" never convert to other land use categories, all pixels within the 2013/14 "*Urban Areas*" mask that were classified as "*Urban Areas*" at some date between 1986 and 2013 were forced to remain "*Urban Areas*" in all posterior dates.

(7) ~~In order t~~To assign secondary forests to a forest type (Wet and Rain Forests, Moist Forests, Dry Forests, Mangroves, Palm Forests) a map of potential forest types was created. This map will also be used in future measurements for determining the forest type of secondary forests. The map of potential forest types (Figure 7) was created by combining the life-zones as shown in Figure 5 and then overlapping the map of the masks of potential areas of "*Mangroves*", "*Palm Forests*" and "*Paramo*" shown in Figure 6.

Methods for estimating activity data for land use change activities
~~Methods for determining AD from land use change~~

AD for land use change activities such as *deforestation* and *reforestation* were estimated by combining all land use maps created for 1998-2011 in a Geographical Information System (GIS) and then extracting from the combined set of multi-temporal data the values of the areas that remained in the same category or converted to other land use categories. The results of this operation are reported in land use change matrices prepared for each measurement period in the sheets "LCM 1986-91", "LCM 1992-97", "LCM 1998-00", "LCM 2001-07", "LCM 2008-11", and "LCM 2012-13" of the spreadsheets tool "FREL TOOL ~~CR.xlsx~~".

To obtain annual AD, the land use change matrices were interpolated as follows:

- For all cells of the land use change matrices (except for the cells in the top/left – bottom/right diagonal):

$$AD_t = AD_p/T$$

Where:

AD_t	Interpolated annual AD applicable to year *t* within the monitoring period *p*; ha yr^{-1}
AD_p	AD for the period *p*; ha in *p* years
T	Number of years elapsed in the period *p* (e.g. 6 years for period 1986-91); years

- For all cells in the top/left – bottom/right diagonal of the land use change matrices:

$$AD_t = A_{(t-1)} - \Sigma(ADleft_t) - \Sigma(ADright_t)$$

Where:

AD_t	Interpolated annual AD applicable to year *t* within the period *p*; ha yr^{-1}
$A_{(t-1)}$	Area of the initial land use category at the end of the previous year (*t-1*); ha
$\Sigma(ADleft_t)$	Sum of all annual AD of year *t* in the cells of the same line of the matrix at the left of the cell for which AD is calculated; ha
$\Sigma(ADright_t)$	Sum of all annual AD of year *t* in the cells of the same line of the matrix at the right of the cell for which AD is calculated; ha

The estimated annual AD are reported in the sheets “AD AAAA” of “FREL TOOL ~~CR.xlsx~~” (“AAAA” indicates the year).

Table 8.4.2. Annual loss of primary forests.

	Primary Forests	1986-91	1992-97	1998-00	2001-07	2008-11	2012-13
	Forest category	ha yr^{-1}	ha yr^{-1}	ha yr^{-1}	ha yr^{-1}	ha yr^{-1}	ha yr^{-1}
DF	Wet and Rain Forests	12,058.12	6,951.17	8,142.45	3,555.36	3,337.83	2,836.40
DF	Moist Forests	28,712.62	9,684.13	17,202.96	5,358.57	3,598.18	4,982.94
DF	Dry Forests	1,197.44	386.80	836.79	130.68	75.22	267.98
DF	Mangroves	366.25	116.04	225.18	77.88	62.15	54.23
DF	Palm Forests	2,215.37	1,224.44	1,786.35	638.27	713.25	368.24
DF	**Total primary forests**	**44,549.80**	**18,362.58**	**28,193.73**	**9,760.76**	**7,786.62**	**8,509.77**
NL	Wet and Rain Forests	214.52	93.45	66.63	66.56	111.22	51.35
NL	Moist Forests	116.88	27.63	38.73	52.60	48.04	54.68
NL	Dry Forests	0.51	0.57	0.75	0.08	-	2.93
NL	Mangroves	272.46	38.25	61.56	86.55	56.21	48.02
NL	Palm Forests	142.14	76.41	95.13	58.45	75.69	121.10
NL	**Total primary forests**	**746.50**	**236.31**	**262.80**	**264.24**	**291.15**	**278.06**
TL	Wet and Rain Forests	12,272.64	7,044.62	8,209.08	3,621.92	3,449.05	2,887.74
TL	Moist Forests	28,829.50	9,711.76	17,241.69	5,411.17	3,646.22	5,037.62
TL	Dry Forests	1,197.95	387.37	837.54	130.76	75.22	270.90
TL	Mangroves	638.71	154.29	286.74	164.43	118.35	102.24
TL	Palm Forests	2,357.51	1,300.85	1,881.48	696.72	788.94	489.33
TL	**Total primary forests**	**45,296.31**	**18,598.89**	**28,456.53**	**10,025.00**	**8,077.77**	**8,787.83**

- **DF** = Deforestation; **NL** = Non-anthropogenic loss; **TL** = Total Loss.

Table 8.4.3. Annual loss of ~~new~~ secondary forests and tree plantations.

	Secondary forest and tree plantations~~New Forests~~	1986-91	1992-97	1998-00	2001-07	2008-11	2012-13
	Forest category	ha yr^{-1}	ha yr^{-1}	ha yr^{-1}	ha yr^{-1}	ha yr^{-1}	ha yr^{-1}
DF	Wet and Rain Forests	1,926.02	3,511.47	6,842.97	3,350.26	5,143.64	5,984.73
DF	Moist Forests	4,342.31	6,170.09	17,245.50	9,403.29	10,906.81	17,860.41
DF	Dry Forests	61.43	165.42	539.22	146.02	383.69	609.62
DF	Mangroves	49.26	136.34	360.06	138.79	219.56	260.51
DF	Palm Forests	18.30	320.28	1,260.78	455.82	568.76	617.09
DF	**Total ~~new forests~~**	**6,397.31**	**10,303.59**	**26,248.53**	**13,494.19**	**17,222.45**	**25,332.35**
NL	Wet and Rain Forests	75.76	35.30	138.51	66.57	137.21	107.28
NL	Moist Forests	61.68	37.10	97.02	92.60	109.62	147.92
NL	Dry Forests	0.02	1.22	0.39	0.14	0.27	3.24
NL	Mangroves	9.59	28.05	178.32	71.60	92.00	177.30
NL	Palm Forests	0.08	12.77	98.43	58.36	89.93	149.27
NL	**Total ~~new forests~~**	**147.12**	**114.42**	**512.67**	**289.27**	**429.03**	**585.00**
TL	Wet and Rain Forests	2,001.78	3,546.77	6,981.48	3,416.84	5,280.84	6,092.01
TL	Moist Forests	4,403.99	6,207.18	17,342.52	9,495.89	11,016.43	18,008.33
TL	Dry Forests	61.44	166.64	539.61	146.16	383.96	612.86
TL	Mangroves	58.85	164.39	538.38	210.39	311.56	437.81
TL	Palm Forests	18.38	333.05	1,359.21	514.18	658.69	766.35
TL	**Total ~~new forests~~**	**6,544.43**	**10,418.01**	**26,761.20**	**13,783.46**	**17,651.48**	**25,917.35**

- **DF** = Deforestation; **NL** = Non-anthropogenic loss; **TL** = Total Loss.

Table 8.4.4. ~~New~~ Secondary forests and tree plantations existing at the end/start of each period.

	Secondary forest and tree plantations ~~New Forest~~		1985/86	1991/92	1997/98	2000/01	2007/08	2011/12	2013/14
		Cohort	ha	ha	ha	ha	ha	ha	ha
AE	Wet and Rain Forests	…-1985	155,736.63	143,725.95	136,417.86	132,867.36	128,482.38	126,376.83	125,269.65
		1986-91	0.00	72,110.52	58,138.02	47,139.30	41,460.12	38,342.52	37,202.85
		1992-97	0.00	0.00	34,012.71	27,617.49	20,833.38	18,387.81	17,642.25
		1998-00	0.00	0.00	0.00	36,330.75	29,261.16	23,815.08	21,976.92
		2001-07	0.00	0.00	0.00	0.00	47,171.34	39,162.78	35,067.78
		2008-11	0.00	0.00	0.00	0.00	0.00	31,148.91	27,890.46
		2012-13	0.00	0.00	0.00	0.00	0.00	0.00	43,937.19
AE	Moist Forests	…-1985	218,226.69	191,802.78	182,115.36	173,450.79	165,067.65	162,410.76	160,325.73
		1986-91	0.00	149,696.28	122,140.62	97,306.29	83,812.68	78,632.91	75,798.27
		1992-97	0.00	0.00	98,490.87	79,962.21	57,203.46	50,783.04	48,241.62
		1998-00	0.00	0.00	0.00	95,699.70	73,863.99	57,683.07	50,013.36
		2001-07	0.00	0.00	0.00	0.00	74,943.36	61,315.65	51,689.43
		2008-11	0.00	0.00	0.00	0.00	0.00	84,833.46	73,573.83
		2012-13	0.00	0.00	0.00	0.00	0.00	0.00	89,883.27
AE	Dry Forests	…-1985	5,926.41	5,557.77	5,350.68	5,104.71	5,051.52	5,031.18	5,000.22
		1986-91	0.00	6,750.81	5,958.09	4,979.79	4,745.70	4,639.77	4,517.91
		1992-97	0.00	0.00	5,242.23	4,847.67	4,510.62	4,338.63	4,214.70
		1998-00	0.00	0.00	0.00	6,739.11	6,340.32	5,428.26	5,216.04
		2001-07	0.00	0.00	0.00	0.00	2,882.70	2,557.17	2,167.92
		2008-11	0.00	0.00	0.00	0.00	0.00	2,152.89	1,805.40
		2012-13	0.00	0.00	0.00	0.00	0.00	0.00	1,853.19
AE	Mangroves	…-1985	2,683.17	2,330.10	2,183.40	2,088.36	1,982.34	1,938.24	1,928.52
		1986-91	0.00	4,665.33	3,825.72	3,262.14	2,895.21	2,727.63	2,647.62
		1992-97	0.00	0.00	2,816.82	1,860.30	1,327.95	1,148.76	1,074.87
		1998-00	0.00	0.00	0.00	1,394.64	927.18	710.73	635.58
		2001-07	0.00	0.00	0.00	0.00	1,858.50	1,219.59	1,024.02
		2008-11	0.00	0.00	0.00	0.00	0.00	1,862.55	1,421.28
		2012-13	0.00	0.00	0.00	0.00	0.00	0.00	2,126.43
AE	Palm Forests	…-1985	795.51	685.26	605.70	594.00	564.39	551.52	550.17
		1986-91	0.00	9,213.30	7,294.59	4,767.93	4,074.39	3,752.73	3,609.72
		1992-97	0.00	0.00	5,513.58	3,974.31	2,640.33	2,248.02	2,123.01
		1998-00	0.00	0.00	0.00	5,878.98	4,336.83	3,492.36	3,350.25
		2001-07	0.00	0.00	0.00	0.00	4,157.55	3,094.11	2,730.78
		2008-11	0.00	0.00	0.00	0.00	0.00	4,309.65	3,551.76
		2012-13	0.00	0.00	0.00	0.00	0.00	0.00	8,421.39
AE	Wet and Rain Forests		155,736.63	215,836.47	228,568.59	243,954.90	267,208.38	277,233.93	308,987.10
AE	Moist Forests		218,226.69	341,499.06	402,746.85	446,418.99	454,891.14	495,658.89	549,525.51
AE	Dry Forests		5,926.41	12,308.58	16,551.00	21,671.28	23,530.86	24,147.90	24,775.38
AE	Mangroves		2,683.17	6,995.43	8,825.94	8,605.44	8,991.18	9,607.50	10,858.32
AE	Palm Forests		795.51	9,898.56	13,413.87	15,215.22	15,773.49	17,448.39	24,337.08
AE	**Total ~~new forest~~**		**383,368.41**	**586,538.10**	**670,106.25**	**735,865.83**	**770,395.05**	**824,096.61**	**918,483.39**

AE = Areas with enhancement of forest C stocks.

Methods for estimating activity data for forest remaining forest

AD for forest remaining forest during the reference period were estimated[53] with a multi-temporal visual assessment of high resolution imagery to detect forest canopy cover change. ~~Following Olofsson[54], t~~The area ~~and accuracy~~ of degraded and enhanced forest areas were estimated by visual interpretation of sample areas using high resolution imagery from georeferenced aerial photos from 1998[55] and~~available in the~~ Google Earth via the Collect Earth software from 2011~~(this imagery is obtained from Google Earth and Earth Engine's database)~~, and then extrapolated to the forest area in the entire country through ~~the application of the Olofsson methodology~~proportional representation within the respective degradation classes (intact, degraded and very degraded) and forestry type. This exercise required defining the sampling design to identify areas for visual interpretation and the~~,~~ response design~~, and the analysis of the selected cover data through an error or confusion matrix~~.

- The sampling design to select the data points in region of interest (forest remaining forests in Costa Rica) consisted of a stratified random sampling using the variance estimator for user's accuracy in an iterative process. This process defined the proportional number of units within forest remaining forest between ~~2005~~1998 and 201~~5~~1 that fell into three degradation classes (intact, degraded, and very degraded) allocated within each of the forest types in the country (Wet and Rain Forests, Humid Forests, Dry Forests, Mangrove Forests, and Palm Forests). These degradation classes were determined based on the reduction of the forest canopy cover, by which intact forests have a cover of 85-100%~~.~~, degraded forests have a cover of 60-85%, and very degraded forests a cover of ~~30 -~~<60%. Thereby, primary forest areas showing decreases in canopy cover during the assessment period (~~2005~~1998-201~~5~~1) were considered degraded or very degraded forest areas, and primary forest areas showing an increase in canopy coverage were identified as forest enhancement areas.
- The response design defined a spatial assessment unit of ~~100~~90 x ~~100~~90 m plots (~~1~~ 0.98 ha) that corresponded with a 3x3 grid of Landsat pixels~~with a 20-m grid (5 x 5 points)~~. Within each plot, a subgrid of 7x7 points were used to assess canopy cover percentage for the entire plot. ~~The reference data for the current period (2014-2015-2016, the most recent dates available) are the high-resolution image repository from Google Earth and Earth Engine, accessible through the tool Collect Earth and Earth Engine scripts. The reference data for the previous period are the SNITCR ortophotos mosaics, 1-m spatial resolution, from 2005[56].~~
- An effort was made to exclude natural carbon fluxes in forest remaining forest. Fluxes from sampling points that were both inside protected areas and farther than 500 meters from a road[57] were considered as natural fluxes, and removed from reference level accounting.
- ~~The analysis through a confusion matrix estimated the accuracy of the site data point selection and the area of each degradation and enhancement category in the five forest types in Costa Rica.~~ The analysis yielded a total of ~~1029~~2,622 data points in forest remaining forest (excluding areas of natural fluxes) during the reference period~~of primary forests in 2005 remaining primary forests in the years 2014-2015-2016~~, representing a total of 1,440,939~~2,215,543.23~~ ha that were distributed among the

[53] Ortiz Malavasi, E. 2018. Evaluación visual multitemporal (EVM) del cambio en el uso de la tierra y cobertura en Costa Rica, Zonas A y B. Tarea 2: Estimacion del cambio en el porcentaje de cobertura de copas para bosques maduros en el mapa MC13 de AGRESTA, para los periodos 1998-2011-2016.~~Gonzalo (2017) Analysis of forest degradation in Costa Rica. Assessment of its relative importance in emissions accounting for the ER-PD.~~

~~[54] Olofsson et al. (2014) Good practices for estimating area and assessing accuracy of land change. *Remote Sensing of Environment* 148, 42-57.~~

[55] Aquilar Salas, LA. 2017. Estimación de la relación densidad de copas/stock de carbono, Segundo informe.

~~[56] Accesible through the WMS *http://geos0.snitcr.go.cr/cgibin/web?map=ortofoto.map*~~

[57] The latest and highest-resolution official roads map for Costa Rica was used for this exercise, which was completed in 2007. It is accessible via the National System of Territorial Information (SNIT) website: http://www.snitcr.go.cr/Metadatos/full_metadata?k=Y2FwYW1ldGFkYXRvczo6Y2FwYTo6SUdOXzU6OnZpYXNfNTAwMA==

five forest types as described in **Table 8.4.5.** ~~The confidence intervals and errors associated with these estimates are shown in **Table 8.4.6**.~~

Table 8.4.5. ~~Forest degradation~~Fluxes in forest remaining forest analysis based on canopy cover ~~decrease~~change in primary forests in Costa Rica during the reference period. Anthropogenic and natural fluxes are shown, however only anthropogenic fluxes are included in the reference level.~~, in the peiriod 2005-2015. Categories with currently no data available are indicated as *n.d.*~~

Condition		Anthropogenic fluxes		Natural fluxes	
1998	2011	Area (ha)	Flux (tCO2/yr)	Area (ha)	Flux (tCO2/yr)
Degradation					
Intact	Degraded	58,803	420,181	5,868	47,494
Intact	Very degraded	90,127	2,197,771	17,017	459,644
Degraded	Very degraded	34,073	540,612	1,760	41,032
Removals					
Very degraded	Intact	97,272	-567,310	29,340	-171,424
Very degraded	Degraded	19,784	-68,361	2,934	-9,299
Degraded	Intact	68,695	-130,628	22,298	-46,013
No condition change					
Intact	Intact	910,067	41,846	691,837	-935
Degraded	Degraded	34,622	20,097	4,694	1,906
Very degraded	Very degraded	127,497	65,241	16,430	32,858
Total		**1,440,939**	**2,519,448**	**792,180**	**355,263**

~~Canopy cover change~~		~~Area (ha)~~					
		~~Wet and Rain Forests~~	~~Mosit Forests~~	~~Dry Forests~~	~~Mangrove Forests~~	~~Palm Forests~~	~~Total~~
~~enhancement~~	~~> 35%~~	~~10,765.52~~	~~23,684.14~~	~~*n.d.*~~	~~*n.d.*~~	~~*n.d.*~~	~~**34,449.65**~~
	~~15 to 35%~~	~~32,296.55~~	~~49,521.37~~	~~2,153.10~~	~~*n.d.*~~	~~*n.d.*~~	~~**83,971.03**~~
	~~0 to 15%~~	~~968,896.46~~	~~658,849.59~~	~~19,377.93~~	~~45,215.17~~	~~73,205.51~~	~~**1,765,544.65**~~
~~degradation~~	~~< -15%~~	~~174,401.36~~	~~81,817.92~~	~~4,306.21~~	~~*n.d.*~~	~~*n.d.*~~	~~**260,525.49**~~
	~~-15% to -35%~~	~~23,684.14~~	~~25,837.24~~	~~*n.d.*~~	~~*n.d.*~~	~~*n.d.*~~	~~**49,521.37**~~
	~~> -35%~~	~~8,612.41~~	~~12,918.62~~	~~*n.d.*~~	~~*n.d.*~~	~~*n.d.*~~	~~**21,531.03**~~
	~~Total~~	~~**1,218,656.43**~~	~~**852,628.88**~~	~~**25,837.24**~~	~~**45,215.17**~~	~~**73,205.51**~~	~~**2,215,543.23**~~

Table 8.4.6. Results of the data assessment of primary forests remaining primary forests in the peiriod 2005-2015.

Canopy cover change		pi	Area (ha)	Confidence interval (95%)	Error %
enhancement	> 35%	0.01555	34449.7	16756.7	48.64
	15 to 35%	0.03790	83971.0	25862.7	30.80
	0 to 15%	0.79689	1765544.7	54488.4	3.09
degradation	< 15%	0.11759	260525.5	43627.5	16.75
	15% to 35%	0.02235	49521.4	20021.1	40.43
	> 35%	0.00972	21531.0	13286.5	61.71
Total		1.0000	2,215,543.23		

The activity data in forest remaining forests was measured for the period 2005-2015[58]. Since the reference period of the land use change activities is 1998-2011, interpolation was conducted by calculating a yearly rate of activity data of forests remaining forests activities (i.e. degradation and enhancements) and estimating the emissions and removals of these activities base for the period 2005-2011. As it is explained in **Section 8.8.**, Costa Rica will update the calculation of these emissions to include an extension of the period to an earlier date, for better fit with the RL.

[58] Gonzalo (2017) Analysis of forest degradation in Costa Rica. Assessment of its relative importance in emissions accounting for the ER-PD.

8.4.2. EMISSION FACTORS (EF)

Deforestation

Primary forests: The emission factor for deforestation of primary forest is derived from data collected during Costa Rica's first National Forest Inventory (INF-CR for its acronym in Spanish). The INF-CR is a multipurpose inventory seeking to enhance the understating of Costa Rican forest resources and generate data to monitor and quantify their provision of ecosystem services, such as climate change mitigation. The INF-CR was led by the National Conservation Area System (SINAC) with measurements taken between 2013 and 2015.

The INF-CR employed a stratified-systematic sampling approach covering the entirety of Costa Rica's continental territory. The stratification was based on a forest type map derived from RapidEye imagery (SINAC – Programa REDD-CCAD-GIZ (2015)) (Figure 8.4.2)~~Figure XXX)~~, and plots were equidistantly allocated within each stratum.

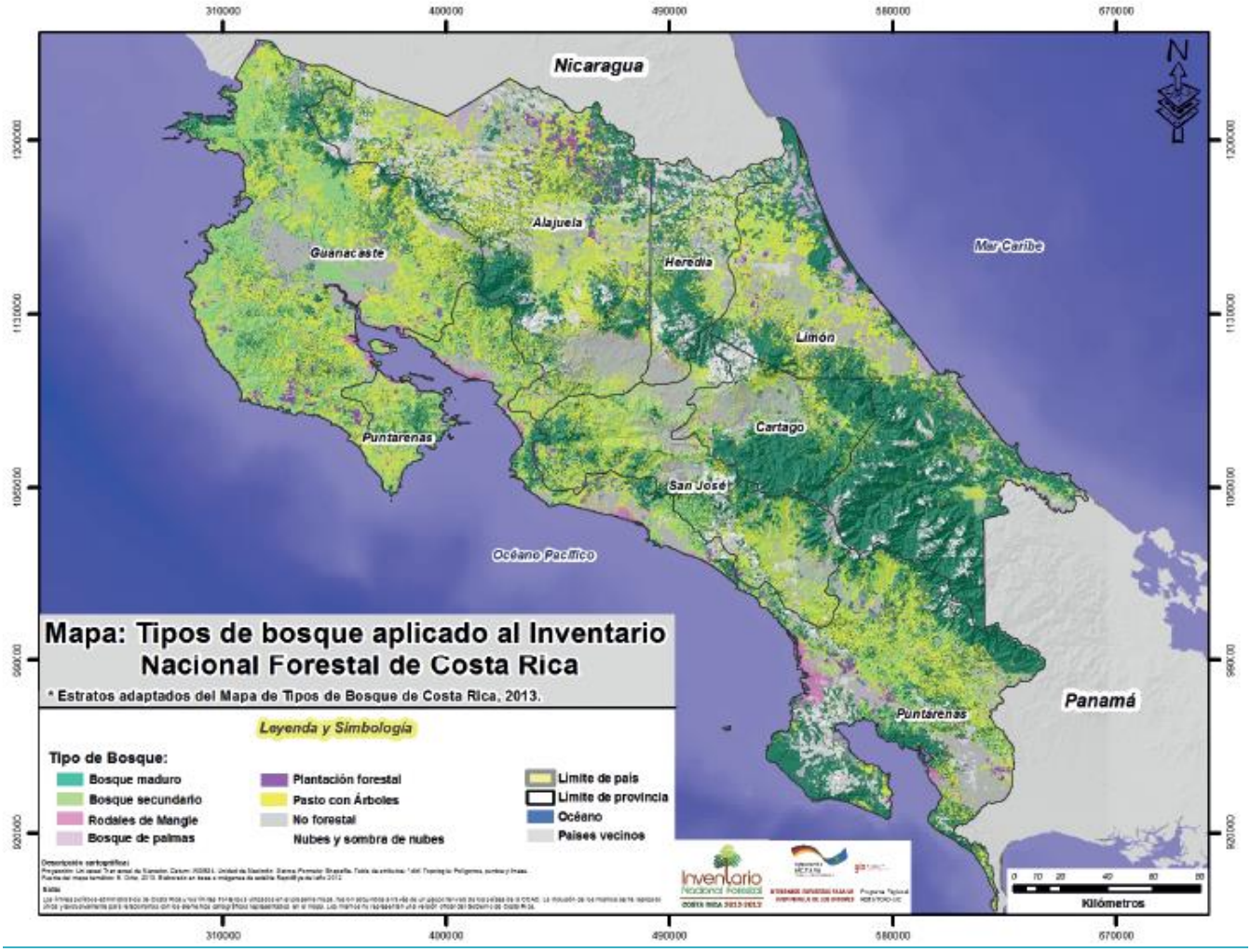
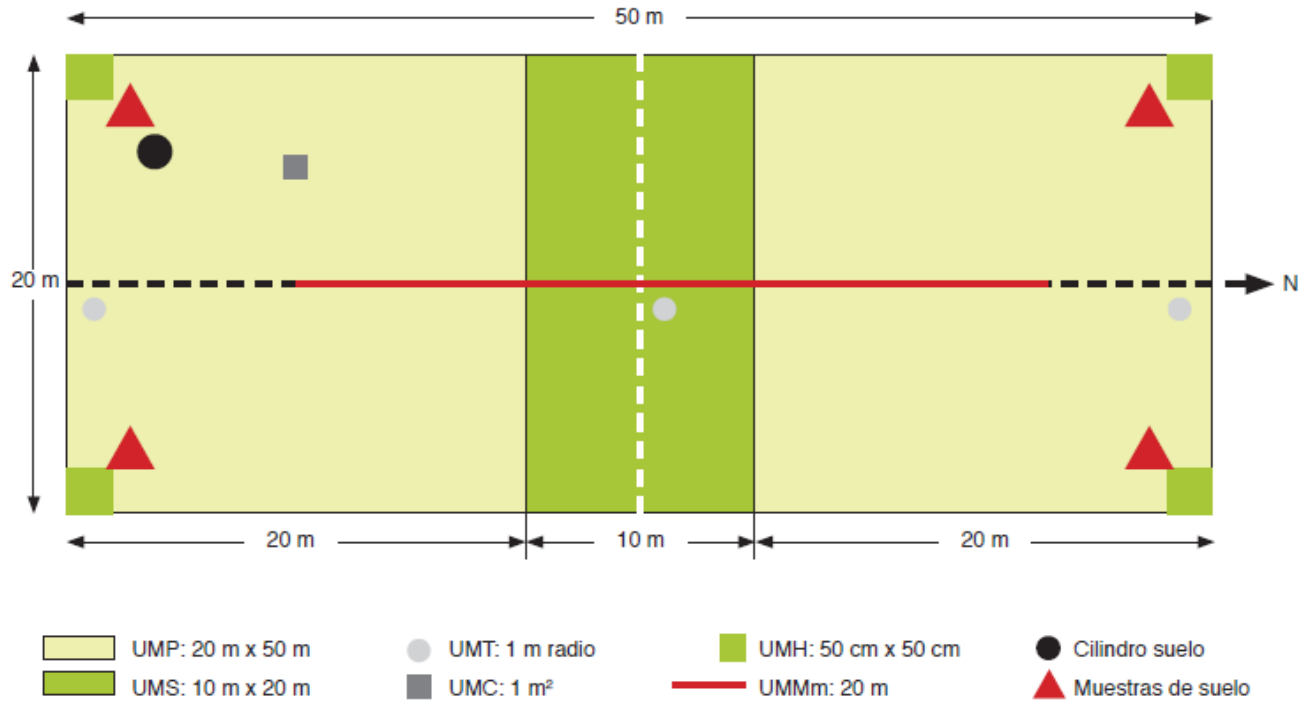


Figure 8.4.2:

A total of 286 single rectangularly shaped plots with an area of 0.1 ha (20m x 50m) were installed by the INF-CR. The schematic diagram of the plots can be seen in Figure XXX.



The plots design was conceptualized to allow measurements of various parameters as follows:

- Primary Sampling Unit (UMP for its acronym in Spanish): Where measurements of live tree DBH and height were taken for trees with DBH ≥ 10cm (light green area)
- Secondary Sampling Unit (UMS for its acronym in Spanish): Where measurements of saplings with 2cm ≤DBH<10cm and height >1.5m were taken (dark green area in center of the plot)
- Tertiary Sampling Unit (UMT for its acronym in Spanish): Where measurements of live non-tree vegetation, including seedlings (DBH<2cm and height<1.5m), were taken (light grey circles)
- Fourth-order Sampling Unit (UMC for its acronym in Spanish): Where abundance of species was measured (dark grey square)
- Fifth-order Sampling Unit (UMH): Where measurements of the litter layer were taken (dark green squares at the corners of the plot)
- Lying deadwood sampling (UMM): Where the diameter of the lying deadwood is measured where it crosses the 20m transect (red line)
- Soil sampling: Where a sample of the first 30cm of is extracted utilizing the cylinder method (red triangles).

The data collected by INF-CR was compiled into a Microsoft Excel database for analysis.

Aboveground biomass (AGB)

Aboveground biomass of each measured tree was estimated using Chave *et al.* (2005)[59] moist forests allometric equation as follows:

$$AGB = \exp(-2.977 + \ln(\rho * DBH^2 * HT))$$

[59] Chave J., Andalo, C., Brown, S., Cairns, M.A., Chambers, J.Q., Eamus, D., Fölster, H., Fromard, F., Higuchi, N., Kira, T., Lescure, J.-P., Nelson, b.W., Ogawa, H., Puig, H., Riéra, B., Yamakura, T. (2005). Tree allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia 145: pp. 87-99.

Where:
AGB: aboveground biomass (kg)
ρ: wood specific gravity (g/cm^3). Obtained from literature.
DBH: Diameter at breast height (cm)
HT: Tree height (cm)

AGB estimates at the tree level are then summed per plot, and extrapolated to a per hectare basis by applying a scaling factor of 10, which represents the proportion of a hectare (10,000 m^2) that is occupied by the plot as follows:

$$ScalingFactor = \frac{10{,}000m^2}{1{,}000m^2} = 10$$

Where:
10,000m^2: Area of one hectare (m^2)
1,000m^2: Area of INF-CR rectangular plot (20m x 50m)

Secondary forests: Carbon stocks of secondary forests are estimated assuming the forest stand accumulated biomass since its restoration. The AGB of Wet and Rain Forests, Moist Forests and Dry Forests were estimated using the equations developed by Cifuentes (2008) based on direct measurements in 54 plots located in age classes between 0 and 82 years. For Mangroves and Palm Forests, a linear function was assumed for estimating carbon stocks as a function of age. The following equations were applied:

Wet and Rain Forests (Cifuentes, 2008, Table 2.5, p. 42, equation for "*Tropical Wet*"):

$$TAGB_t = B_{max} * \left[1 - e^{(-0.0186*t)}\right]^1$$

Moist Forests (Cifuentes, 2008, Table 2.5, p. 42, equation for "*Tropical Permontane Wet Transition to Basal-Atlantic*"):

$$TAGB_t = B_{max} * \left[1 - e^{(-0.0348*t)}\right]^1$$

Dry Forests (Cifuentes, 2008, Table 2.5, p. 42, equation for "*Tropical Dry*"):

$$TAGB_t = B_{max} * \left[1 - e^{(-0.113*t)}\right]^{5.1411}$$

Mangroves and Palm Forest the following linear equation was applied:

$$TAGB_t = \frac{B_{max}}{100} * t, \text{ when } t <= 100$$

$$TAGB_t = B_{max}, \text{ when } t > 100$$

It was assumed that the maximum biomass in secondary forests (B_{max}) equals the biomass estimated for primary forests.

Belowground biomass (BGB)

Belowground biomass was estimated per plot using Cairns *et al*. (1997)[60].

[60] Cairns M.A., Brown S., Helmer E.H., and Baumgardner G.A. (1997). Root biomass allocation in the world's upland forests. Oecologia 111: pp. 1-11.

$$BGB = \exp(-1.085 + 0.9256 * \ln(\text{AGB}))$$

Where:
*BGB: belowground biomass (*t d.m. ha^{-1}*)*
*AGB: aboveground biomass (*t d.m. ha^{-1}*)*

This equation was applied to both, primary and secondary forests.

Out of the 286 plots, litter was sampled only in 54 plots, and lying deadwood was sampled only in 61 plots. Because of inconsistent sampling of all carbon pools across all plots and lack of confidence in data of the plots where litter and deadwood were in fact sampled (e.g. some plots presented zero as result for this biomass, but it was verified whether the represented in fact represente the absence of litter and deadwood in the plots or was a plot where these pool weren't sampled), as indicated in the plot design figure, a decision to consider only aboveground biomass from INF-CR was made.

The carbon stocks of litter and deadwood were estimated based on a compilation of values from published literature. The literature review employed the following criteria for compiling the reported value:

- The publication reported data from direct measurements carried out in Costa Rica
- Measurements were carried out after the year 2005
- Data were sufficiently disaggregated by reporting values of carbon stocks per land use categories and per carbon pool sampled
- The publications included information on uncertainties related to the carbon stock estimates

All C stock estimates from the consulted sources were compiled in tons of carbon per hectare (tC ha^{-1}), using IPCC's default carbon fraction (0.47) when the values were reported in tons of dry matter (t d.m. ha^{-1}). All information related to C stock estimates, such as information on land use, number of sampling units, plot size, allometric equation used, etc., were also recorded.

Dead wood (DW)

Primary forests: Many studies do not report the different types of DW, such as standing deadwood (DW.s) lying dead wood (DW.l) and below-ground dead wood (DW.b). For this reason, all selected values are reported as DW (in the column DW.s in the sheet "C-STOCKS" of the "FREL TOOL". As for AGB.t, the values were estimated as the area-weighted average of selected studies (except for Mangroves and Palm Forests, where a simple arithmetic mean was calculated).

Secondary forests: It was assumed that the DW/AGB.t ratio in primary forests also applies to secondary forests.

Litter (L)

As in the case of DW, carbon stocks per hectare per stratum of primary forests were estimated as the area-weighted average of the values reported in the selected studies (except for Mangroves and Palm Forests, where a simple arithmetic mean was calculated). For secondary forests, C stocks were estimated assuming the same L/AGB.t ratio found in primary forests.

Carbon stocks of non-Forest land uses

C stocks in these land use categories were estimated as the average values reported by the selected studies.

- **Cropland**: carbon stock values reported in selected studies showed high variability, depending on crop type (sugar cane, coffee, banana, cocoa, etc.). For this reason, the carbon stock data compiled

were weighted by the surface area of the respective crops in Costa Rica to produce a single estimate of carbon stocks from cropland.

- **Grassland:** carbon stocks were estimated as the average values reported in different carbon pools in the selected studies.
- **Settlements and (non forested) Wetlands:** no studies could be found reporting biomass values for these categories. It was assumed that their carbon stock is zero.
- **Other Land:** studies were found reporting carbon stocks for *Paramo.* In the case of *Bare Soil* it was assumed carbon stocks are zero.

For full detail please check BaseDeDatos_v5 and "FREL TOOL".

Methods for determining C stocks for activities in forest remaining forests

According to MF indicator 3.3, given the lack of reliable data accounting for the loss of forest carbon due to degradation and/or gains resulting from forest carbon stock enhancements, these emissions and removals are ~~provisionally~~ estimated according the variation in canopy cover (measured with the visual assessment using Collect Earth). ~~This estimation of aboveground C stocks is used as a proxy until field biomass data is collected in Costa Rica (see *Roadmap or "Hoja de Ruta"* in **Section 8.8.**), to recalculate standing stocks on each degradation and enhancement strata.~~

This estimate of aboveground C stocks as linear function of the variation in canopy cover assumes the following:

- Intact forests (forest with a canopy cover equivalent to 100-85%) keep, on average, 100% of the aboveground and belowground C stock estimates for primary forests of each forest type. Other pools are not affected by canopy cover change.
- Degraded forests (forest with a canopy cover of 85-60%) have, on average, 78.38% of the aboveground and belowground C stock estimates for primary forests of each forest type, following that:

$$\frac{\text{average C in degraded forests } (85\% - 60\%)}{\text{average C in intact forests } (100\% - 85\%)} = 78.38\%$$

- Very degraded forests (forest with a canopy cover below 60%) have, on average, 48.65% of the aboveground and belowground C stock estimates for primary forests of each forest type:

$$\frac{\text{average C in very degraded forest } (60\% - 30\%)}{\text{average C in intact forests } (100\% - 85\%)} = 48.65\%$$

The aboveground C stocks in the data points selected in the visual assessment exercise were calculated for both 1998 and 2011 ~~2005~~ following these assumptions. Changes in C stocks due to degradation during the reference period~~2005-2015~~ were estimated using the following steps ~~per the following criteria~~[61]:

- The average canopy cover from all sampled points was calculated for both 1998 and 2011 for each canopy cover class (intact, degraded and very degraded) within each forest type.
- Using the linear relationships developed between canopy cover and biomass, average biomass was calculated for each canopy cover class within each forest type for 1998 and 2011.

[61] Pedroni & Villegas (2015) Análisis de significancia de los cambios de existencias de carbono en bosques que permanecieron bosques. *http://reddcr.go.cr/sites/default/files/centro-de-documentacion/5-_significancia_de_la_degradacion_31.10.2015_0.pdf*

- Where there was a decrease in canopy cover(a move from a higher to a lower canopy cover class, such as intact to degraded) ~~decrease in 2015 compared to 2005~~during the reference period, the C stock was calculated using the *Stock-Difference Method* as mentioned below.~~as the linear function to canopy cover described above~~.
- Where there was an increase in canopy cover during the refence period, it is conservatively assumed that the increase in canopy cover was due to secondary forest growth. Therefore, the amount of canopy cover increase is multiplied by the carbon stock of a secondary forest stand containing 12 age classes (i.e. the removal rate applied assumes a secondary forest stand is equaly composed of 12 different age classes).~~Where there was no change of canopy cover between 2015 and 2005, the C stock was assumed to remain unchanged as well.~~

~~Where there was a canopy cover increase in 2015 compared to 2005, the C stock was considered to remain unchanged for conservative purposes and equivalent to a secondary forest with 10 age classes[62]. Despite maintaining the C stock, enhancements were actually accounted for through changes in the area of enhanced primary forests remaining forest, yielding a gross emission reduction that was accounted for in the RL.~~

Methods for determining EF from C stocks

C stock changes (*ΔC*) were estimated using the *Stock-Difference Method* by applying IPCC (2006) equation 2.5 (*cf.* Volume 2, Chapter 2, Section 2.2.1.). All results were multiplied by the stoichiometric ratio 44/12, as follows:

$$\Delta C = \frac{(C_{t2} - C_{t1})}{(t2 - t1)} * 44/12$$

Where:

ΔC C stock changes associated to the land use transition *i* in year *t*; tCO_2-e ha^{-1}

C_{t1} C stock at time *t1*, t CO_2 ha^{-1}
t1 in all cases was the 1st of January of each year *t*, *i.e.* C_{t1} is the C stock per hectare existing at the beginning of the year, before the conversion occurs. The estimated values are reported in the column K of the sheets "ER AAAA" (where "AAAA" stands for the year *t*) in the- FREL TOOL ~~CR.xlsx~~.

C_{t2} C stock at time *t2*, t CO_2 ha^{-1}
t2 in all cases was the 31st of December of each year *t*, *i.e.* C_{t2} is the C stock per hectare existing at the end of the year, after the conversion occurred. The estimated values are reported in the lines 19[63] and 20[64] of the sheets "ER AAAA" (where "AAAA" stands for the year *t*) in the FREL TOOL ~~CR.xlsx~~.

t2-t1 In all cases the C stock changes were estimated annually, *i.e. t2-t1* = 1 year.

Therefore:

$$C_{tot} = C_{AGB} + C_{BGB} + C_{DW} + C_L$$

Where:

~~[62] Cifuentes (2008). Aboveground biomas and ecosystem carbon pools in tropical secondary forests growing in six life zones of Costa Rica. PhD Dissertation, Oregon State University.~~

[63] The C stock values reported in line 19 represent total C stocks existing in secondary forest and tree plantation ~~new forests~~ at the end of the first year at which they meet the definition of "Forest", *i.e.* 4 years for all forest strata and 8 years for dry forests. These values are used to estimate *ΔC* in conversions of non-Forest land use categories to Forest land ~~(new forests)~~ and conversions of other land use categories to permanent crops.

[64] The C stock values reported in line 20 represent total C stocks existing in the land use categories at the end of the year. They are used to estimate *ΔC* in all land use transitions, except conversions of non-Forest land use categories to Forest land ~~(new forests)~~ and conversion of other land use categories to permanent crops.

C_{tot} Total C stock for the land use category *LU*; tCO_2-e ha^{-1}
C_{AGB} C stock in the above-ground biomass for land use category *LU*; tCO_2-e ha^{-1}
C_{BGB} C stock in the below-ground biomass for land use category *LU*; tCO_2-e ha^{-1}
C_{DW} C stock in dead wood for land use category *LU*; tCO_2-e ha^{-1}
C_L C stock in the litter for land use category *LU*; tCO_2-e ha^{-1}

It is important to note that for conversions of FL to other land use, C_{AGB} in in $Ctot_{t1}$ is estimated as follows:

$$C_{AGB_{t1}} = C_{AGB_{t1-1}} - C_{HWP.F4}$$

Where:
$C_{AGB_{t1}}$ C stock in above-ground biomass after harvest, but before conversion; tCO_2-e ha^{-1}
$C_{AGB_{t1-1}}$ C stock in the above-ground biomass before harvest; tCO_2-e ha^{-1}
$C_{HWP.F4}$ C stock in HWP, fraction 4 (saw wood) as estimated with Eq.10. Note: It is assumed that C stock in HWP.F4 is not oxidized.

In consistency with the National GHG Inventory, in conversions of permanent crops to secondary forests it was assumed that only the non-tree component of the biomass ($C_{AGB.n}$) of the permanent crop oxidizes. The tree component of the biomass ($C_{AGB.t}$) is assumed to continue as part of the secondary forest and is not oxidized.

Calculation of the average annual historical emissions over the Reference Period

The proposed ~~FREL~~ RL was defined as the net annual average historical emissions. Annual emissions or absorptions were estimated for all land transitions *i* by REDD+ activity, and then adding the results for all selected REDD+ activities for each year:

$$ER_{RA_t} = \sum_{i=1}^{I} \left(AD_{RA_{i,t}} * EF_{RA_{i,t}} \right)$$

Where:
ER_{RA_t} Emissions or removals associated to REDD+ activity *RA* in year *t*; tCO_2-e yr^{-1}
$AD_{RA_{i,t}}$ AD associated to REDD+ activity *RA* for the land use transition *i* in year *t*; ha yr^{-1}
$EF_{RA_{i,t}}$ EF associated to REDD+ activity *RA* applicable to the land use transition *i* in year *t*; tCO_2-e ha^{-1}
i A land use transition represented in a cell of the land use change matrix; dimensionless
I Total number of land use transitions related to REDD+ activity *RA*; dimensionless
t A year of the historical period analyzed; dimensionless

In the FREL TOOL ~~CR.xlsx~~, this procedure is performed in the sheets "ER AAAA" ("AAAA" = *t*). The allocation of each cell of the land use change matrices to a REDD+ activity is shown in the sheet "REDD+ ACT".

Emissions from deforestation

Description of the parameter including the ~~time~~ period covered (e.g. forest-cover change between 2000 – 2005 or transitions between forest categories X and Y between 2003-2006):	• AD for anthropogenic deforestation • Average annual forest loss for 1998-2011
Explanation for which sources or sinks the parameter is used (e.g	Anthropogenic deforestation

deforestation or forest degradation):	
Data unit (e.g. ha/yr):	ha year^{-1}
Value for the parameter:	• Total anthropogenic deforestation: 30,438 ha yr^{-1} • Primary forest anthropogenic deforestation: 13,147 ha yr^{-1} • ~~New~~ Secondary forest and tree plantation anthropogenic deforestation: 17,292 ha yr^{-1}
Source of data (e.g. official statistics) or description of the method for developing the data, including (pre-) processing methods for data derived from remote sensing images (including the type of sensors and the details of the images used):	• Land-cover maps (LCM). The methods used to produce these maps are described in a separate report[65] • Land Use Change Matrices produced by intersecting LCM. These matrices may be reviewed in the FREL TOOL ~~CR~~. • Annualized Land Use Change Matrixes produced by interpolation of Land Use Change Matrices by period. These matrices can be reviewed in the FREL TOOL ~~CR~~.
Spatial level (local, regional, national or international):	National, differentiated by type, six forest types sub-divided in "primary" and secondary forest and tree plantations ~~"new forest"~~ sub-categories: age cohorts corresponding to the measurement periods (… - 1985, 1986-91, 1992-97, 1998-01, 2002-07, 2008-11, 2012-13).
Discussion of key uncertainties for this parameter:	The uncertainty of the deforestation activity data comes from the process of creating land use change maps. ~~As described in section **Section 12**, the uncertainty level of deforestation AD forest is very high.~~
Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of assumptions/methodology in the estimation:	~~The methods used to conduct the uncertainty analysis are~~As described in ~~detail in a separate report[66]. However, as described in section~~ **Section 12**, deforestation has ~~uncertainties associated to AD are very high, with~~ a relative error of 2~~8~~2% for the deforestation activity data, at a 90% ~~of the significance~~confidence level.

Enhancement of C forest stocks from forest reforestation (secondary forests)

Description of the parameter including the ~~time~~ period covered (e.g. forest-cover change between 2000 – 2005 or transitions between forest categories X and Y between 2003-2006):	• AD for forest C stocks enhancement • Annual average for period 1998-2011
Explanation for which sources or sinks the parameter is used (e.g deforestation or forest degradation):	Forest C stocks enhancement in ~~new~~ secondary forests and tree plantations~~.~~

[65] Agresta, Dimap, Universidad de Costa Rica, Universidad Politécnica de Madrid, 2015.a. Informe Final: Generating a consistent historical time series of activity data from land use change for the development of Costa Rica's REDD plus reference level: Protocolo metodológico. Informe preparado para el Gobierno de Costa Rica bajo el Fondo de Carbono del Fondo Cooperativo para el Carbono de los Bosques (FCPF). 44 p.

~~[66] CDI, 2015.b. Nivel de referencia de emisiones y remociones forestales de Costa Rica y metodología empleada para construirlo. Informe preparado para el Gobierno de Costa Rica bajo el Fondo de Carbono del Fondo Cooperativo para el Carbono de los Bosques (FCPF). 223 p.~~

Data unit (e.g. ha/yr):	ha year^{-1}
Value for the parameter:	Total ~~for new forests~~: 760,489 ha yr^{-1}
Source of data ~~-~~(e.g. official statistics) or description of the method for developing the data, including (pre-)processing methods for data derived from remote sensing images (including the type of sensors and the details of the images used):	• Land-cover maps. The methods used to produce these maps are described in a separate report[67]; • Land Use Change Matrixes produced by intersecting these maps. These matrices can be reviewed in the FREL TOOL ~~CR~~. • Annualized Land Use Change Matrixes produced by interpolating the land use change matrices. These matrices can also be reviewed in the FREL TOOL ~~CR~~.
Spatial level (local, regional, national or international):	National, stratified in six forest types and sub-categories "primary" and "~~new~~secondary forests and tree plantations"; the latter, divided in age cohorts:… - 1985, 1986-91, 1992-97, 1998-01, 2002-07, 2008-11, 2012-13.
Discussion of key uncertainties for this parameter:	The uncertainty of the deforestation activity data comes from the process of creating land use change maps.~~As mentioned for previous parameters, AD uncertainty is high.~~
Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of assumptions/methodology in the estimation:	As described in **Section 12**, deforestation has a relative error of 31% for the enhancement of C forest stocks from forest reforestation (secondary forests) activity data at a 90% confidence level.~~The methods for conducting the uncertainty analysis are fully described in a separate report[68]. The section dedicated to deforestation mentioned AD uncertainty is high, with a relative error of 20% for the AD in new secondary forests and tree plantations combined, with a 90% of confidence.~~

Emissions from forest remaining forests (degradation and enhancements)

Description of the parameter including the period covered (e.g. forest-cover change between 2000 – 2005 or transitions between forest categories X and Y between 2003-2006):	• AD for primary forest C stock degradation, based on tree canopy cover and associated changes in tree biomass. • Annual average for period ~~2005-2011~~1998-2011
Explanation for which sources or sinks the parameter is used (e.g deforestation or forest degradation):	Degradation of primary forests
Data unit (e.g. ha/yr):	ha year^{-1}
Value for the parameter:	Total: 96,553 ~~221,554~~ ha year^{-1}

[67] Agresta, Dimap, Universidad de Costa Rica, Universidad Politécnica de Madrid, 2015.a. Final Report: Generating a consistent historical time series of activity data from land use change for the development of Costa Rica's REDD plus reference level: Methodological Protocol. Report prepared for the Government of Costa Rica under the Carbon Fund of the Forest Carbon Partnership (FCPF). 44 p.

~~[68] CDI, 2015.b. Reference level of emissions and forest absorptions in Costa Rica and methodology used to construct it. Repor prepared for the Government of Costa Rica under the Carbon Fund of the Corest Carbon Partnership (FCPF). 223 p.~~

Source of data (e.g. official statistics) or description of the method for developing the data, including (pre-)processing methods for data derived from remote sensing images (including the type of sensors and the details of the images used):	Ortiz Malavasi, E. 2018. Evaluación visual multitemporal (EVM) del cambio en el uso de la tierra y cobertura en Costa Rica, Zonas A y B. Tarea 2: Estimacion del cambio en el porcentaje de cobertura de copas para bosques maduros en el mapa MC13 de AGRESTA, para los periodos 1998-2011-2016 ~~*Assessment of its relative importance in emissions accounting for the ER*. This study uses (1) the high-resolution image repository available through Google Earth and Earth Engine, accessible through the Collect Earth tool (*www.openforis.org*); and (2) the 1-m spatial resolution SNITCR orthophotos (*geos0.snitcr.go.cr/cgibin/web?map=ortofoto.map*),~~ • Pedroni & Villegas (2015) Análisis de significancia de los cambios de existencias de carbono en bosques que permanecieron bosques. In: http://reddcr.go.cr/sites/default/files/centro-de-documentacion/5-_significancia_de_la_degradacion_31.10.2015_0.pdf • Land cover maps developed by Agresta Cooperativa[69].
Spatial level (local, regional, national or international):	National level; primary forests stratified in five forest types.
Discussion of key uncertainties for this parameter:	As described in **Section 12**, the visual interpretation of the high-resolution images employed to measure canopy cover is assumed to have no uncertainty. The only uncertainty considered for activity data in the forest remaining forest accounting methodology is the area of forest remaining forest from the land use map time series (AGRESTA maps). This area is used for extrapolation.~~the uncertainty level for this degradation proxy is high, due to relatively high error % in the AD estimation and to a temporarily accepted linear relationship between canopy cover and biomass C stocks. As indicated in **Section 8.8.,** this degradation proxy will be updated with field data collected in the upcoming months, and the RL will be recalculated before the ER-PA signature.~~
Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of assumptions/methodology in the estimation:	• Visual interpretation is assumed to have no uncertainty because of the high-resolution photos being assessed and the manual nature of the exercise. Often this method is used to measure accuracy of automated map classifications because of its low uncertainty. The forest remaining forest class from the AGRESTA maps was measured using the Olofsson methodology as described in **Section 12**. The percent uncertainty for forest remaining forest at a 90% confidence interval is 6%.~~Since~~

[69] Agresta, Dimap, University of Costa Rica, Universidad Politécnica de Madrid (2015) Index of cover as base for the estimate of degradation and increase of carbon stocks: Generating a consistent historical time series of activity data from land use change for the development of Costa Rica's REDD plus reference level. Consultancy report prepared for the Government of Costa Rica under the Carbon Fund of Forest Carbon Partnership (FCPF). 18 p.

	the emissions from degradation are temporarily accounted for in this ER-PD as a proxy, uncertainties associated to this parameter are high. As indicated in **Section 8.8.,** this degradation proxy will be updated with accurate biomass data. The AD uncertainty was estimated following Olofsson[70], resulting in errors of 19%, 27%, and 58%, respectively for intact, degraded, and very degraded primary forests (as shown in **Table 12.1.1.** and described in **Section 12.1**). • The estimation of C stock in this proxy assumed a linera function between canopy cover variation and biomass C stock variation. This assumption needs to be validated with actual field data (field campaigns will be later this year, as outlined in **Section 8.8.**), that will result in a recalculation of the emission from forest degradation and the Reference Level of this ER-PD.

[70] Olofsson et al. (2014) Good practices for estimating area and assessing accuracy of land change. *Remote Sensing of Environment* 148, 42-57.

8.54. Upward or downward adjustments to the average annual historical emissions over the Reference Period

Costa Rica's ambitious forest policy in the last decades has resulted in decreasing emissions drom deforestation (Figure 8.5.1). According to indicator 13.1. of the CF-MF, this would be regarded as a "downward trend". In such cases, the CF-MF requires countries to consider this in the construction of the RL. To do this, Costa Rica selected the 1998-2011 reference level, which is a downward adjustment to the 1997-2009 FREL proposed to the UNFCCC. This adjustment represents a decrease of the 1997-2009 RL by 17.7%. It is also important to consider that by selecting the 1998-2011 historical reference period, results for years 2010-2011 would not be part of the ER-Program. Costa Rica considers that these measures appropriately address the downward trend identified since 1986.

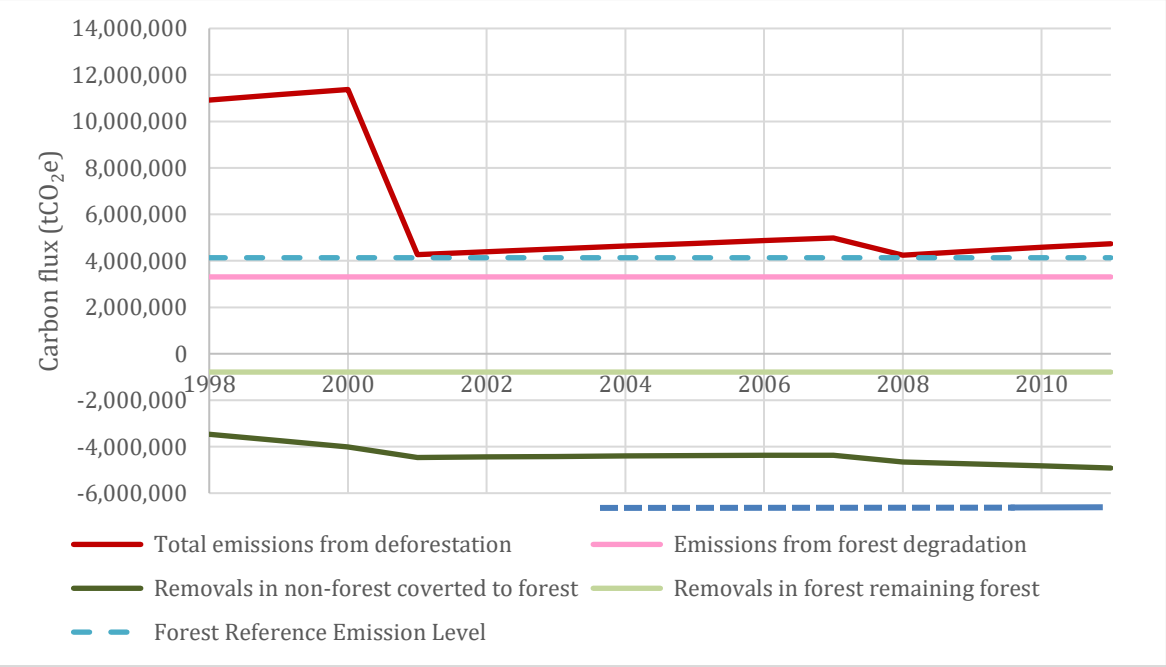
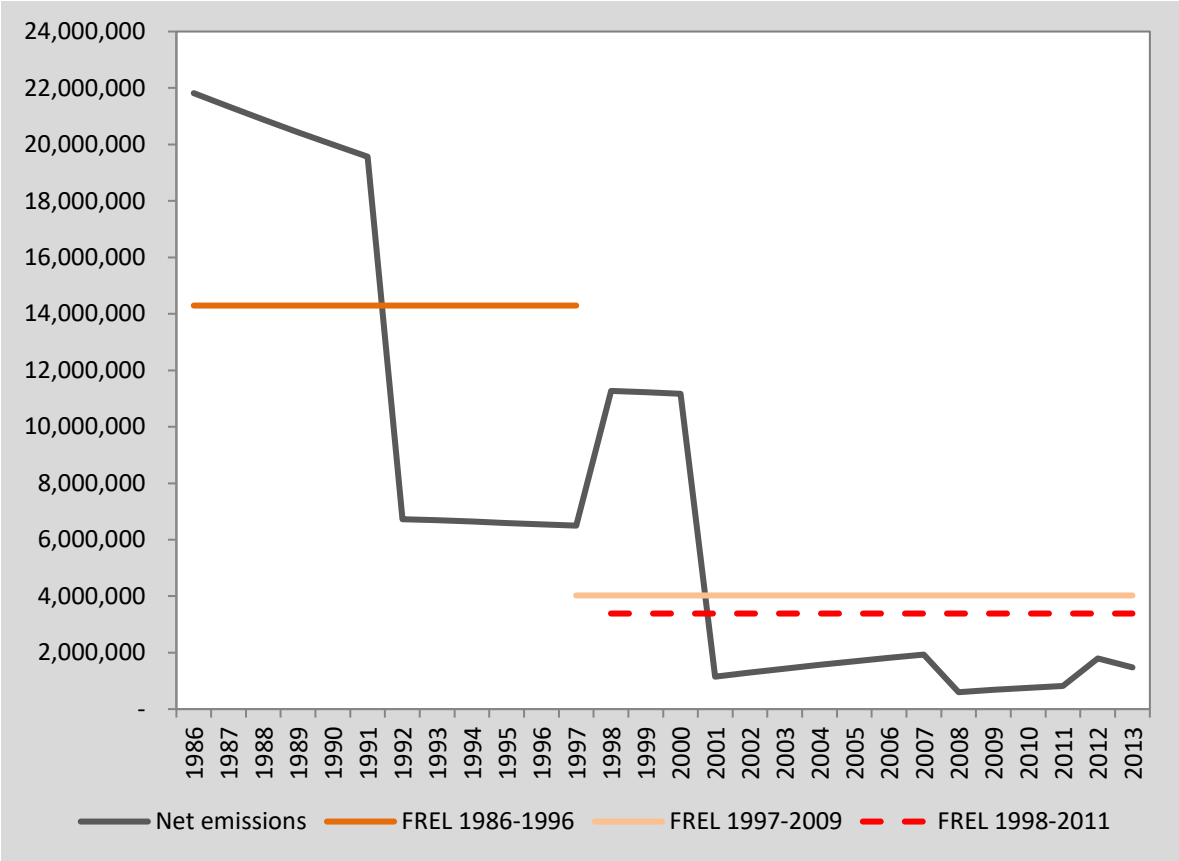


Figure 8.5.1. Historical net emissions and reference levels submitted by Costa Rica ~~to the UNFCCC~~during the reference period. The 1998-2011 reference level was specifically developed for the FCPF Carbon Fund. Forest Reference Emission Level 1997-2009 under UNFCCC is 14,911,467 t CO_2e/yr; Forest Reference Emission Level 2010-2015 under UNFCCC is 4,365,159 t CO_2e/yr; and Crediting line under FCPF-CF (ER-PD reference level) is 4,133,087 ~~4,281,622~~ t CO_2e/yr. ~~Costa Rica's ambitious forest policy in the last decades has resulted in decreasing emissions (Figure 8.12). According to indicator 13.1. of the CF-MF, this would be regarded as a "downward trend". In such cases, the CF-MF requires countries to consider this in the construction of the FREL. To do this, Costa Rica selected the 1998-2011 reference level, which is a downward adjustment to the 1997-2009 FREL proposed to the UNFCCC. This adjustment represents a decrease of the 1997-2009 FREL by 17.715,9%. It is also important to consider that by selecting the 1998-2011 historical reference period, results for years 2010-2011 would not be part of the ER-Program. Costa Rica considers that these measures appropriately address the downward trend identified since 1986.~~



~~Figure 8.12. Historical net emissions and reference levels submitted by Costa Rica to the UNFCCC. The 1998-2011 FREL reference level was specifically developed for the FCPF Carbon Fund.~~

8.65. Estimated Reference Level

The RL was calculated by adding the emission sources and subtracting sinks at the national level. The sources of land use change were due to deforestation, while the sinks were due to reforestation. Similarly, in the forest remaining forests there were emissions due to degradation in primary forests and sinks due to enhancements. Data is summarized in **Table 8.4.1**. As described in ~~this s~~**Section 8.4**, an annual emission rate was calculated for each activity to obtain a yearly RL emission. During the reference period 1998-2011, an average emission from forests was calculated and used as RL for the crediting period, to assess emission reductions from this RL. Thereby, the RL is 4,133,087 ~~4,854,711.92~~ tCO_2e per year.

To avoid double-counting of reference period emissions between deforestation and forest degradation, the following steps were taken:

- The analysis of degradation was only performed on the area of forest remaining forest according to the land use change (AGRESTA) maps. This avoided any measurements of degradation that was also accounted for under deforestation.
- Deforestation emission factors for primary forest were taken from NFI plots rather than from literature studies of untouched primary forest. Given that many forests in Costa Rica undergo degradation prior to deforestation, areas that are deforested likely do not have their full stock (which they would have as untouched forests) at the moment of deforestation. However NFI plots most likely represent forests that have been disturbed or degraded given the NFI sampling was concentrated in areas with greater accessibility (106 plots were sampled within 500 meters of non-forest, whereas 45 plots were sampled beyond 500 meter of non-forest areas) and sampling

campaigns took place after the reference period had already ended (between 2013 and 2015). This gives a more accurate estimation of a primary forests' carbon stock prior to deforestation than untouched forest carbon stock would.

8.7~~6~~. Relation between the Reference Level, the development of a FREL/FRL for the UNFCCC and the country's existing or emerging greenhouse gas inventory

Consistency with the National GHG Inventory

Important efforts have been conducted to harmonize GHG reporting under the UNFCCC, including National GHG inventories and REDD+. Namely, the historical data mentioned in **Section 2.2.** and further described in **Section 4.3**. were used to recalculate the years 2005, 2010 and 2012 of the 2012 GHG inventory, included in Costa Rica's first BUR (2015). Due to time and resources constraints, only these inventory years were considered in the recalculations. The years 1990, 1995 and 2000 will be recalculated as well and reported in the country's next National Communication to the UNFCCC.

For the AFOLU sector and in relation to REDD+, the current GHG inventory included the following sources and sinks:

- GHG emissions and CO_2 absorptions from carbon stock changes in biomass, dead organic matter and mineral soils, for managed lands;
- CO_2 and non-CO_2 emissions from biomass burning, in managed lands;

The following sections provide a description of the latest National GHG Inventory.

Forest land remaining Forest land

C stock changes were estimated for tree plantations. AD were derived from the 2014 National Agriculture Census, *i.e*. Tier 2. Emission factors (EF) were identified for the 8 most important tree species planted in Costa Rica, while all other species were grouped in "others" and were assigned a generic EF. All EF are IPCC Tier 1, according to Tables 4.11.A and 4.13, p. 4.61 and 4.64 of Chapter 4, Vol. 4, IPCC 2006. The carbon fraction employed was 0.47 and the root-to-shoot ratio 0.25. The CO_2 emissions from HWP were estimated according to national statistics. In 2012, -1,451 Gg CO_2 were absorbed in 74,625 ha of tree plantations, CO_2 emissions from HWP were 575 Gg, and carbon losses due to other disturbances were 608 Gg. Overall, a net removal of -267 Gg of CO_2 was estimated for tree plantations.

In a future update to the FREL/FRL, fluxes from both degradation and carbon stock enhancements in forest remaining forest will be added using the same methodology employed in the reference level discussed in this document. This will further harmonize this ERPD and the UNFCCC FREL/FRL. The National GHG Inventory will begin looking at ways to include these fluxes as well in the next monitoring phase.

Lands converted to Forest land

Forest regeneration in Cropland and Grassland was included in the GHG inventory. AD were derived from the 1986-2013 land use change analysis developed for REDD+ (**Section~~s~~ 2.2**. and **Section 3.4.**). For estimating the EF, IPCC default factors were used (Table 10, p.4.59, Chapter 4, Vol. 4, IPCC 2006). In 2012, removals of -9,062 Gg of CO_2 were estimated for five forest types in 794,729 ha. C losses due to disturbances were 1,891 Gg. Overall, removals of -7,170 Gg of CO_2 were estimated for forests that re-grew in non-Forest lands.

Forest lands converted to other land use categories

For Forest lands converted to Cropland and Forest lands converted to Grassland, AD were derived from the 1986-2013 land use change analysis. In 2012, total CO_2 emissions were 2,238 Gg and 3,053 Gg, respectively. Overall, these emissions occurred from the conversion of 33,840 hectares of forest.

Non-CO_2 emissions

CH_4 and N_2O emissions were estimated from biomass burning in Forest lands. AD were obtained from the National Fire Management Program. In 2012, a total of 9,998 ha were burned, resulting in 3.00 Gg of CH_4 ~~and <0.00 Gg of N_2O~~.

~~Important efforts have been conducted to harmonize GHG reporting under the UNFCCC, including national GHG inventories and REDD+. For example, data and methods used for estimating AD and EF in the REDD+ FREL were used to recalculate the GHG inventories for years 2005, 2010 and 2012 included in Costa Rica's first BUR [71]. Due to time and resources constraints, only these inventory years were considered in the recalculations. The remaining years of the time series: 1990, 1995 and 2000 will be recalculated and reported in the country's next National Communication to the UNFCCC.~~

Achieving consistency of the REDD+ ~~FREL~~ RL with the GHG inventory is a work in progress. Costa Rica aspires to receive results-based payments for as many REDD+ activities as possible. This requires continuous work on harmonizing MRV of emissions and absorptions within the AFOLU sector, as well as potential re-submissions to the UNFCCC. Additionally, related mitigation actions still require further work to be fully consistent. For example, the different agriculture NAMAs (livestock, coffee, banana, etc.) need to be reflected in the GHG inventory and in consistency with REDD+. This will be achieved through recalculations, when improved data and methods become available.

Considering the current FREL submission to the UNFCCC and RL to the FCPF Carbon Fund, the following remain key areas of work for improving consistency:

- The current National GHG inventory comprises the years 2005, 2010 and 2012, while the ~~FREL~~ reference level (RL) to the FCPF Carbon Fund covers 1998-2011
- ~~Post- 1997~~ CH_4 and N_2O emissions from biomass burning in *FL remaining FL* ~~and *lands converted to FL*~~ were explicitly considered in the GHG inventory but not in the REDD+ ~~FREL~~RL. Such emissions were reported for year 2012 in the National GHG Inventory. These estimates were derived from national statisticas which are not spatially explicit and only cover 2011-2013[72]. Hence, for the REDD+ ~~FREL~~RL, there was not enough information to complete the time series for 1998-2011
- Forest plantations were ~~included~~ identified as part of *FL remaining FL* in the GHG inventory. For the estimation of C stock changes in plantations, ancillary information from the 2014 Agricultural Census was used specifically for 2012. As for CH_4 and N_2O emissions from biomass burning, complete information was lacking for 1998-2011 to enable the incorporation of specific information on forest plantations.

~~Therefore, these were merged with secondary forests ("new forests") or *land converted to FL*. Costa Rica recognizes that plantations may suffer quite a different management regime than forests and that plantation clear-cutting does not represent "deforestation" but should be considered as a temporal loss of canopy cover as part of a management regime in *FL remaining FL*.~~

~~[71] Ministerio de Ambiente y Energía (MINAE), Instituto Meteorológico Nacional (IMN), 2015. Costa Rica: informe bienal de actualización ante la Convención Marco de las naciones Unidas sobre el Cambio Climático. San José (Costa Rica), 106 p. Available at: http://unfccc.int/resource/docs/natc/crinir2.pdf~~

[72] Additional information for different periods is available here: http://www.sirefor.go.cr/?page_id=1051

~~The data and methods used for estimating HWP emissions in the National GHG Inventory differ from those employed in the REDD+ FREL. The GHG inventory used national statistics on timber harvesting for the year 2012. This information was used to determine C losses associated to timber extraction in *FL remaining FL*. For the REDD+ FREL, this information was insufficient as it is only available for 2011-2013[73], so an assumption was made on the percentage of valuable timber harvesting that occurs as part of *FL conversion*. These assumptions have been explained in previous sections.~~

Finally, most differences in methods and data found are due to data gaps and the use of specific databases for building estimates for specific years. This has been necessary due to the lack of a continuous forest monitoring system in the country. As explained in **Section 9** of the ERPD, Costa Rica initiated a plan to build such a system that would help streamline the improvement of methods and data for the GHG inventory, REDD+ MRV and NAMA MRV. Costa Rica strives to develop an all-lands monitoring system suitable to report progress on AFOLU mitigation actions, as well as address other important reporting requirements such as other international conventions, the sustainable development goals and national reporting. More information can be found in **Section 9**.

Consistency with REDD+ FREL submitted to the UNFCCC

Costa Rica's FREL submission to the UNFCCC includes two historical reference periods: 1986-1996 and 1997-2009. For the FCPF Carbon Fund and the ER-Program, Costa Rica proposes a 1998-2011 reference level. Emission reductions sold to the FCFP Carbon Fund would be deducted from the total emission~~s~~ reductions post-2010 based on the 1997-2009 ~~FREL~~RL. Hence:

$$Total\ ER_{Post-2010} = ER_{CF} + ER_{Others}$$

Where:

- *Total ER* $_{Post-2010}$: total emission reductions after 2010 estimated with the 1997-2009 REDD+ ~~FREL~~ RL as submitted to the UNFCCC, in t CO_2e
- ER_{CF}: emission~~s~~ reductions sold to the FCFP Carbon Fund as of 2012, in t CO_2e
- ER_{OTHERS}: remaining emission reductions, in t CO_2e

This implies that for years 2010-2011 no emission reductions may be part of the ER-Program, and that such emissions are all ER_{OTHERS}. For emission reductions occurring after 2012, a portion is sold to the FCPF Carbon Fund and the country keeps a portion for other purposes. More information is presented in Section 13.

In terms of methods and data, all remain constant for all ~~FREL/FRL~~RLs, including the reference level to the FCPF Carbon Fund.

8.8. Planned modifications to the forest remaining forest accounting methodology ~~degradation proxy~~ to update the ER-PD

Due to the high uncertainty of the linear relationship currently used to derive biomass from canopy cover in the forest remaining forest accounting methodology, steps will be taken to refine this relationship. Temporary plots will be established in degraded and very degraded forests to measure their carbon stocks and canopy cover. This will allow for a more robust relationship to be created that will reduce the uncertainty of the forest remaining forest activities. Once the new relationship is validated, the refrence levels for these activities will be updated.

~~[73] This information is available at SINAC's SIREFOR: http://www.sirefor.go.cr/?p=1161~~

The timeline of this planned activity in the Roadmap is depicted in Table 8.8.1. This fieldwork will be done ~~under a set~~as a part ~~of eight~~seven consultancies (E0, E1, E2, E3, E4, E5, E6~~, E7~~) that ~~will~~ accomplished the accurate estimation of RLs for deforestation and degradation~~, plantations and sustainable forest management, and enhancements. Since it was necessary to make changes to the procurement plan of the grant agreement.~~

Costa Rica anticipated~~s~~ that this field campaigns ~~will~~ occur in the second half of 2017 and that the new RL would~~ill~~ be estimated by February 2018. However, the roadmap included in the earlier version of the ERPD (July 2017), was not implemented within the foreseen deadlines due to delays in the hiring processes, climatic problems that delayed field work andmethodological challenges.

~~8.1.The REDD+ Secretariat performed a preliminary analysis to assess previous land use of the land defined as "Secondary Forest Land" in the ER-PD. In this exercise, the Secretariat found that in stratum bmh-P and bmh 9% of secondary forests in 2011-2013 were originated from land also classified as secondary forest in 2007. This is consistent with the observation made by the TAP Director ("*a pixel classified as 'new forest' can change from being a forest (new or primary) to a non-forest and then change again to a 'new forest' within 4-8 years*"). This case was exposed to the TAP Director, with the inquire of allowing the possibility of having a reforestation-deforestation-reforestation trend in a secondary forest category that includes forets plantations. Costa Rica grows genetically modified fast-growing trees such as *Gmelina arborea* (melina), and private companies grow them to produce HWP after clear cutting the planted land. For this reason, de Jong recommended that the 'new forest' category differentiates between actual new forests (secondary) and forests that are temporarily without canopy cover (plantations). Thereby, it was agreed among that the REDD+ Secretariat, the technical team of the World Bank, and the TAP Director, that before the ER-PA signature the following imporvements would be made to the RLs:~~

- ~~Use the SIMOCUTE network to differentiate between plantations and secondary forests~~
- ~~Define temporal aspects of REDD+ activities (deforestation, degradation, and enhancements~~
- ~~Develop a monitoring system using SIMOCUTE to track changes in biomass and in land use.~~
- ~~Change the term 'new forest' to 'secondary forests'~~

8.8.1~~2.10~~ Other planned modification to Reference Level

In addition to the RL improvements addressed in **Section 8.8 ~~and 8.8.1~~**, the REDD+ Secretariat will take the necessary steps to comply with the observations made to the RL technical evaluation by the ~~CMNUCC~~UNFCCC (*Report of the technical assessment of the proposed forest reference emission level of [Party]* submitted in 2016), following the Methodological Framework of the Carbon Fund and updating the ER-PD accordingly. Thereby, by ~~by~~ the first monitoring event,~~FebrurayDecember of 2018~~7 the REDD+ Secretariat intends to have developed complete RLs of forest plantations and of managed forests, and to have revised and updated the RL of secondary forests ~~(See Table 8.8.1)~~.

It is expected that in 2018 the HWP emissions will be incorporated by the first monitoring event~~to the RL as well~~.

~~Adicionalmente a las mejoras al NR, consignadas en las Secciones 8.8 y 8.9, la Secretaría REDD+ esta realizando las acciones necesarias para dar cumplimiento a las observaciones del proceso de evaluación tecnida del NR de Costa Rica ante la CMNUCC (Report of the technical assessment of the proposed forest reference emission level of [Party] submitted in 2016), siguiendo los lineamientos del Marco Metodológico del Fondo de Carbono y realizando los respectivos ajustes en el Documento de Programa. Como parte de dichas acciones, la Secretaría Técnica REDD+ tiene planeado completar para diciembre 2017, la construcción e incorporación de los siguientes Niveles de Referencia (NR):~~

- ~~Plantaciones forestales (construcción)~~

- ~~Bosques bajo manejo forestal sostenible (construcción)~~
- ~~Aumento de existencias de carbono en bosques secundarios (revisión)~~

~~Durante el 2018, se espera poder incorporar las emisiones por Harvested Wood Products (HWP) al RL.~~

Table 8-8- 1: Roadmap to recalculate RLs before the signature of the ER-PA

Num	Task	Time (days)	Start	End	Predecessors	Progress
1	Degradation Analysis Review (Gonzalo, 2017)	6	2/13/17	2/20/17		Completed
2	Development of a Methodological Proposal for the Evaluation of Forest Degradation	7	2/21/17	3/1/17	1	Completed
3	Development of Preliminary NR of Degradation using data from Gonzalo(2017)	10	2/27/17	3/10/17		Completed
4	First ER-PD update	13	3/1/17	3/17/17		Completed
5	Delivery of ER-PD to the FMT, including provisional NR of Forest Degradation	0	3/17/17	3/17/17		Completed
6	Delivery of ER-PDF to Carbon Fund Donors	0	4/24/17	4/24/17		Completed
7	Preparation of ToR E0, E1, E2, E3 and E6	65	3/20/17	6/16/17	4	75%
8	Updating Procurement Plan	60	3/20/17	6/9/17	4	Completed
9	Approval of adjustments to the Procurement Plan by the World Bank	0	6/5/17	6/5/17		Completed
10	Consultation of Terms of Reference of Studies E1 and E3 in Technical Groups of the SIMOCUTE	45	4/3/17	6/2/17		Completed
11	Tender process for E0, E1, E2, E3 and E6	40	6/9/17	8/3/17	7	20%
12	Implementation of E0 Technical and scientific support to update the RL by International Company	180	7/17/17	3/23/18	11	
13	Implementation of E6 Technical coordination of the execution of studies E1, E2, E3, E4 and E5.	200	6/16/17	3/22/18	11	
14	Implementation of E1: Multitemporal visual assessment of forest degradation, land use, land use change.	60	8/14/17	11/3/17	11	
15	Implementation of E2: Estimation of the ratio carbon stock/ canopy density	40	8/14/17	10/6/17	11	
16	Implementation of E3: Field visit of 1850 points of SIMOCUTE Grid, to separate plantations from secondary forest	60	8/14/17	11/3/17	11	
17	Preparation ToR Studies E4 and E5	20	7/17/17	8/11/17	11	
18	Tender process for E4 y E5	40	8/14/17	10/6/17	17	
19	Implementation of E4: Establishment of temporary plots for estimating the carbon stock in secondary forest	60	11/6/17	1/26/18	16,18	
20	Implementation of E5: Establishment of temporary parcels to estimate the carbon stock is intact, degraded and highly degraded forests.	60	11/6/17	1/26/18	14,18	
21	RL Update	80	11/6/17	2/23/18	14,15,16	
22	Second ER-PD update	20	2/26/18	3/23/18	21	
23	Delivery of ER-PD with improved RL.	0	3/23/18	3/23/18	22	

n	Activities	Status	Observations
1	**Estimation of the relationship between canopy cover density and carbon stock (E2).**	Delivered	
1.1	*Scan 205 aerial photos to a resolution of 1,200 dpi to complete the 1,400 photos required to estimate the Reference Level for Forest Emissions.*	Delivered	
1.2	*Georeference 1,400 of existing 1,855 aerial photos from the TERRA 97 mission using available control points.*	Delivered	
1.3	*Estimate the relationship between canopy cover and measured biomass in the plots established during the National Forest Inventory 2014-5 and other available sources such as the National University , FUNDECOR and CODEFORSA.*	Delivered	Of the 795 biomass observations in permanent plots, it was possible to evaluate cover in only 138. Of these observations, only 15 had canopy cover values between 65-95%. A regression with a similar slope to the biomass loss model used by CDI was obtained to estimate degradation emissions (see Excel sheet with results).
2	**Visual multitemporal evaluation of land use, land use/cover change in 5,083 points in zone A, north of country section and in 5,083 points in zone B, south of country section, identified as mature forest, secondary forest and non-forest (E1; analysis of the SIMOCUTE grid).**	Delivered	
2.2	*(ii) Estimate the change in percent canopy cover in mature forests for the periods 1998-2011 and 2012-2016.*	Delivered	
2.3	*(iii) Estimate the area of forest plantations included in the secondary forests category of the 2013 land use map.*	Delivered	The area of plantations resulting from the visual analysis is small at the national level (approximately 70,000 ha) compared to the area of secondary forests. The current measuring intensity of SIMOCUTE (3 km) along with the lack of historical data impedes the preparation of a reliable baseline. In addition, the E3 consultancy analysis, which visited 1,850 points to separate forest plantations from secondary forest, has been completed. Given the low representation of plantations with respect to the area of secondary forests, it is not recommended to separate the two in terms of activity data and instead consider weighted emissions factors.
3	Field visits for 617 points to separate forest plantations from secondary forests in zone A which corresponds to the North Caribbean region, North and Central Valley Zone and 617 points in zone B, which corresponds to the North Pacific and Central Pacific regions and 618 points in zone C, which corresponds to the Central Pacific region and South zone, which were identified as secondary forests and forest plantations using remote sensing.	Delivered	

n	Activities	Status	Observations
3.1	*(i) Verify the field condition (existing land use/cover) of points that were identified as secondary forests using remote sensing in the REDD+ Secretariat's land use historical series.*	Delivered	
3.2	*(ii) Using the establishment of temporary plots (circular with a radius of 10m) evaluate the density (number of trees, dominant height, DBH, basal area and canopy cover) of the sites corresponding to the location of points that currently have forest cover (5% verified).*	Delivered	
4	**Technical and scientific assistance to the REDD+ Secretariat to ensure completion of the CFM/14/2016/2 resolution's observations (E0)**	**10/30/2018**	
4.1	Update, revision and validation of the emission factors using NFI data.	Finished	
4.2	Estimation, revision and validation of the relationship between canopy cover and biomass.	Finished	From the activity data E2 (iii)
4.3	Estimation, revision and validation of deforested areas.	Finished	
4.4	Forest degradation uncertainty analysis, revision and validation.	Finished	From the activity data E1 (ii)
4.5	Estimation, revision and validation of the degradation reference level.	Finished	Approach: estimations using canopy cover. Estimation of the degradation RL: a linear relationship of 0-100% biomass directly proportional to canopy density is assumed, using the NFI EFs for each forest type (very humid rain forests, humid forests, dry forests, yolillales and mangroves) as the carbon stock at 100% canopy cover.
4.6	Estimation, revision and validation of the deforestation reference level.	Finished	Revision of the deforestation RL: aboveground biomass values from the NFI were used instead of literature values, given that it is assumed that the NFI plots more accurately represent deforested forests subject to prior anthropogenic degradation, whereas literature values mostly represented primary, untouched forests that are not generally deforested (such as those in protected areas).
4.7	FREL estimation including uncertainty.	Finished	
4.8	ER-PD update	Finished	The sections related to the FRL and the MRV system are considered the upated.

n	Activities	Status	Observations
5	ER-PD revision	15/Oct/2018	

9. Approach for Measurement, Monitoring and Reporting

9.1. Measurement, monitoring and reporting approach for estimating emissions occurring under the ER Program within the Accounting Area

Application of changes to the MRV framework

Costa Rica's MRV framework is under continuous improvement and is subject to updates and methodological refinements. To ensure consistency in time, any changes included in the system are applied to the time series, through recalculations. For example, for Costa Rica's first Bie~~a~~nni~~u~~al Update Report (BUR), the National GHG Inventory included changes to the land base information improved through additional remote sensing work done in the context of REDD+ and the FCPF.

This version of the ER-PD includes a slightly different MRV approach due to changes to the estimation procedure that resulted from the technical assessment of Costa Rica's FREL under the UNFCCC. This modification excludes emissions from Harvested Wood Products (HWP). Hence, it is assumed that after deforestation, AGB carbon is oxidized immediately after forest land conversion. However, HWP emissions are expected to be included again, as a result of the implementation of the MRV improvement program under construction by the REDD + Secretariat (See **Secction 8.8.2**).

As presented in **Section 2**, Costa Rica already conducted a monitoring event and estimated emission reductions as part of the ER-Program. The methods and data employed are identical to the ones used for the construction of the reference level, including the updates mentioned above. These methods and data are explained in depth in **Section 8** and related references. The country will implement these same procedures for future monitoring events; once the methodology to measure degradation is~~is revised and~~ validated, forest plantations are separated from secondary forests, the timeframe of REDD activities (deforestation, degradation and reforestation) is defined, and the Reference Level for Forest Plantations, Natural Forest Management and Carbon Enhancement are updated.

Further, the FREL TOOL ~~CR.xlsx~~ contains a list of values and parameters (including their source and associated level of uncertainty) that were used to calculate the reference level and that are exployed during the MRV. These values will not change during the term of the ERPA ~~since any change to any of them would imply changing the reference level~~. Note that these parameters are currently applicable to land use change AD; AD in forest remaining forest will be included in this tool as well in the near future.
~~If a change to the values of any of the parameters and variables that are not future activity data becomes necessary, as part of the continued improvement process, it will be necessary to submit the changed reference level to the Carbon Fund for consideration.~~

Parameter:	$DA_{AAAA\text{-}AA}$
Description:	Activity data ($DA_{AAAA\text{-}AA}$) of each category represented in the land use change matrixes "MC AAAA-AA" of the FREL TOOL CR~~.xlsx~~.
Data unit:	hectares

Source of data or measurement/calculation methods and procedures to be applied (e.g. field measurements, remote sensing data, national data, official statistics, IPCC Guidelines, commercial and scientific literature), including the spatial level of the data (local, regional, national, international) and if and how the data or methods will be approved during the Term of the ERPA	• Land-cover maps to be created on a biennial basis for all of the accounting area • Land Use Change Matrixes ("MC AAAA-AA") that must be completed every 2 years in the "FREL TOOL ~~CR v.1~~"tool, starting in the year 2014/15.
Frequency of monitoring/recording:	Every two years
Monitoring equipment:	Outsourced
Quality Assurance/Quality Control procedures to be applied:	According to the protocol described in Agresta *et al.* (2015.a)[74].
Identification of sources of uncertainty for this parameter	Evaluations on the accuracy of the land-cover maps will be performed, as was done for the most recent maps of the historical series. The activity data are the largest source of uncertainty in the reference level and will also be so in the program results report. However, it will not be possible to reduce the uncertainty associated with the activity data until a better method becomes available to quantify them.
Process for managing and reducing uncertainty associated with this parameter	In preparation.

Parameter:	$DA_{F\text{-}F}$
Description:	Activity data of changes in canopy cover in forests remaining forests. These data will be used for the forest degradation and carbon stock enhancements activities.
Data unit:	Canopy cover percentage (%)
Source of data or measurement/calculation methods and procedures to be applied (e.g. field measurements, remote sensing data, national data, official statistics, IPCC Guidelines, commercial and scientific literature), including the spatial level of the data (local, regional, national, international) and if and how the data or methods will be approved during the Term of the ERPA	• Measurements will be done via visual interpretation of high-resolution imagery, either via Google Earth/Collect Earth or purchased imagery. • The measured points will coincide with the grid of monitoring points established by SIMOCUTE.
Frequency of monitoring/recording:	Every two years
Monitoring equipment:	Outsourced

[74] Agresta, Dimap, Universidad de Costa Rica, Universidad Politécnica de Madrid, 2015.a. Final Report: Generating a consistent historical time series of activity data from land use change for the development of Costa Rica's REDD plus reference level: Methodological Protocol.Report prepared for the Government of Costa Rica under the Carbon Fund of the Forest Carbon Partnership (FCPF). 44 p.

Quality Assurance/Quality Control procedures to be applied:	Monte Carlo uncertainty analysis will be performed using key sources of error.
Identification of sources of uncertainty for this parameter	Visual interpretation of high-resolution imagery is considered to have very high accuracy. Accuracy assessment of such interpretation is difficult given that higher resolution imagery to check accuracy does not exist. Therefore, incertainty of this data will be assumed to be zero. However, uncertainty from the emissions derived from these data will be included in uncertainty calculations.
Process for managing and reducing uncertainty associated with this parameter	It is assumed that uncertainty will be reduced as higher-quality imagery becomes available on Google Earth and other sources. Given the low uncertainty of visual interpretation, efforts to reduce uncertainty will be focused on refining the canopy cover – biomass relationship rather than improving the visual assessment.

~~The FREL TOOL CR.xlsx contains a list of values and parameters (including their source and associated level of uncertainty) that were used to calculate the reference level. These values will not change during the term of the ERPA since any change to any of them would imply changing the reference level. If a change to the values of any of the parameters and variables that are not future activity data becomes necessary, as part of the continued improvement process, it will be necessary to submit the changed reference level to the Carbon Fund for consideration.~~

9.2. Organizational structure for measurement, monitoring and reporting

Organizational structure, responsibilities and competencies

FONAFIFO will outsource all work related to conducting future monitoring events. ~~, until a new monitoring system is design (Section 9.3.). In this sense,~~ FONAFIFO will be the coordinating agency and ~~, but~~ will work closely with National Center for Geospatial Information (CENIGA). To ensure that this work is conducted appropriately, FONAFIFO will establish a technical group of experts, based on the group of experts that participated in the technical assessment of Costa Rica's FREL/FRL under the UNFCCC. This group is composed of the National Meteorology Institute, FONAFIFO, ~~and CATIE, although it can be expanded to include~~ SINAC, CENIGA and other agencies, as necessary.

9.3. Relation and consistency with the National Forestry Monitoring System

~~Consistency with the national forest monitoring system~~

Costa Rica's National Forestry Monitoring System (NFMS) has not been formally created. Since 1998, SINAC has implemented monitoring programs for specific land use and land use change issues, such as forest fires and, to a lesser extent, illegal logging. With the implemementation of the country's first National Forest Inventory (NFI), the NMFS is closer to becoming a reality.

To accelerate the creation fo the NFMS, in 2015 Costa Rica ~~has~~ initiated an inter-institutional process to design a ~~new~~ monitoring system that would cover all land uses and land use changes at the national level. This process was mandated by Ministerial Guideline DM-417-2015. ~~The~~ CENIGA was appointed as the leading institution to develop this system, 20~~+13~~ other institutions and academic organizations participate as well.

~~For~~ To develop~~ing this~~ of this ~~new~~ system, Costa Rica has received support from the US Forest Service and FAO. A beta version ~~of the system is expected to be ready for June, 2016~~has been completed and is currently

being discussed within MINAE. Early implementation of the system would be possible in ~~December, 20162~~2017. Once the system is operational, Costa Rica will develop a strategy to run ~~this system and~~ streamline MRV processes, while the MRV protocol and provisions for the CF will not be affected. This may require updating the REDD+ FREL/FRLs submitted to the UNFCCC ~~and the FCPF Carbon Fund~~.

~~To confirm,Because this system is in its design phase, t~~The ~~MMR~~ MRV proposal for the FCFP Carbon Fund is based on the data and methods detailed in **Section 8**. More information (in Spanish) on the status of the design of the monitoring system may be found here.

9.4. Participation of other players in a variety of actions related to forest control and monitoring

The ~~national forest monitoring system~~NFMS, conceived as an official information system, must adhere in its design and function to the current standards applicable to the processes of generating official information, which are regulated by several corresponding entities: The National Geographic Institute (IGN) and its national territorial information systems, the National Institute of Statistics and Census (INEC) regarding data usage, etc. That is why in principle, community participation is not expected in these systems, unless it becomes necessary at some points to fill gaps in the generation of data that may involve these forms of participation.

However, the ~~Emission Reduction Program~~ER-Program envisions supporting measures that lead to robust participation by communities and organizations in control actions related to forest resources. For example, actions to strengthen the participation of communities in firefighting have been incorporated, through the so-called "Forest fire brigades" that are mainly composed of volunteers in zones with high susceptibility to these phenomena. Efforts will also be made to strengthen the "Natural Resources Monitoring Committees" (COVIRENAS) and the activities of the Volunteers Association (ASVO), non-government entities that contribute through different activities coordinated with the appropriate government agencies, monitoring compliance with government legislation, in the first case, and in supporting the management of protected areas in the second.

In addition to this, the Colegio de Ingenieros Agrónomos (Agronomists' Association) as the governing entity of the "Certified Foresters" who are responsible for preparing and following-up on the management plans of the different modalities of payment for environmental services agreements, have an essential task in monitoring the beneficiaries´ compliance with their respective commitments or actions they have agreed to take with regard to conservation, restoration, reforestation or management. In that same sense, there are many local and regional forestry producer organizations that provide regency services to interested parties, and that have their capacities strengthened through PES. It is envisioned to strengthen these capacities through different lines of work incorporated in policies, actions and tasks of the PRE.

10. Displacement

10.1. Identification of risk of Displacement

No displacement risks were identified in the Emission Reduction Program, since the reference level and the ~~measurement, report and verification~~MRV are at the national scale. Any non-planned source of emission taking place product of a policy, action or activity proposed in the Program will be accounted and incorporated as part of the result in tCO_2-e $year^{-1}$. It is important to remember that the interventions proposed for the Program have a global impact on emission reductions, internalizing any displacement[75].

The methodology for forest d~~D~~~~Considering that d~~egradation that is currently ~~is now~~ included ~~not explicit included~~ in the reference level is still considered to have high uncertainty~~as a proxy~~. Therefore, t~~T~~here is still a theoretical risk that the activities designed to reduce deforestation may ~~stimulate~~ trigger a change in the conduct of some deforestation agents that might result in a higher level of emission for degradation of forests. This risk is considered minimum in Costa Rica, considering that the activities of the emission reduction program are based mainly on a strengthening of incentives instead than on coercive measurements. ~~On the other hand, considering that land use change is illegal in Costa Rica, it is unlikely that the deforestation agents of one reference historical period might reach their goals by starting a degradation process. In fact, it is unlikely that the productive activities that require open space to be implemented might be implemented under the shade of trees.~~

~~It is important to note that during the first years of implementation of the forest law, in addition to the State Forestry Administration, the Municipalities and the Regional Environmental Councils were authorized to granting some kinds of related forestry permits, however, given that abusive practices were detected in this regard, generating illegal exploitation of forest resources and consequently deforestation or degradation, such authorization was suspended a few years later.~~

10.2. ER Program design features to prevent and minimize potential Displacement

Whereas the risk of displacement is considered minimal (see **Section 10.1**), the ER-Program and in general the National REDD+ Strategy of Costa Rica, has specific actions to ensure that "goods and services" derived from deforestation, are obtained without need for deforestation outside our borders. As example, at the level of actions the following can be cited:

- *Action 2.3 Mechanisms to encourage participation of agro-forestry and rural producers in REDD+*: includes activities such as: Develop studies and design and implement plans to generate economic and social benefits through REDD+ or other policy actions for agroforestry and rural peasant populations; and develop a joint plan of information, training, technical assistance and agroforestry extension between the environment sector, agriculture and private sector to support efforts of farmers and small agro producers, including Indigenous Peoples, including management issues and national and international marketing plan for goods and services.
- *Action 3.2 Strengthen policies for the promotion and recognition of sustainable agricultural and agroforestry practices*: includes activities such as: Develop a joint plan with the MAG to promote, advise and assist farmers and small producers in the introduction and improvement of sustainable

[75] Leakage or displacement is defined as the net change in antrophogenic emissions by sources of greenhouse gases (GHG) that occurs in the outer limits of the project and that is measurable and attributable to the project activity.

production practices on integral farms with forestry component, including the reactivation of the Agro-environmental Commission and strengthen technical assistance and extension in MAG, CIAgro and MINAE to provide technical assistance services and support to producers regarding silvicultural management and best practices in the use and management of wood-producing species.

- Action 5.2 Improving competitiveness of financing mechanisms for forest and agroforestry ecosystems in relation to other land uses: It includes actions such as: design and test a mechanism for integrated management of agroforestry peasant farm that combines recognition of environmental services and other agro-ecosystem services with social and environmental benefits (peasant PES); and how to develop a training plan for farmers, agroforestry producers sectors and indigenous peoples to improve knowledge of access to benefits of new financing mechanisms.

In addition, the NE supports the implementation of the policies of the National Forestry Development Plan, which has a strong component of support, promotion, positioning, competitiveness and sustainability of the forest sector and the private sector in the entire production chain of timber and of forest services.

With Preparation Funds a series of activities are been implemented with the aim to secure private sector involvement in the production, processing and marketing of timber, promoting agroforestry systems, etc.

All these measures ensure that rural areas have sustainable livelihoods, and involve structural changes to ensure lower rates of deforestation without displacement (deforestation and degradation in other countries).

11. Reversals

11.1. Identification of risk of Reversals

Definition of "reversal"

A "reversal" takes place ~~when~~ under the following circumstances ~~take place~~:

- At the end of a measurement and report period annual emissions higher than the reference level are reported;
- In a prior measurement and report period emission reductions were verified and paid. In this case, it would be considered that the emission reductions paid were reversed.

According to this definition, it is not possible consider a "reversal" the case of a measurement and report period with annual emissions exceeding the reference level if in prior periods the country has not received payment for results.

"Reversal" risk factors

- ~~There are two risk factor groups that can cause reversal:~~
- ~~Natural factors: Costa Rica is exposed to several types of natural disturbances that may cause loss in forest areas of higher or lower importance. For that reason, the country does not want the results of its emission reduction program be affected by high-scale natural event that no program could control.~~
- ~~Less intense natural disturbances are more frequent and cause small and diffuse impacts that cannot be easily differentiated from the impacts caused by anthropogenic factors. Amongst them, the most frequent are landslides and collapses that often take place in mountain areas of the country and maybe some cases of forest fires caused by lightning. The emissions caused by this type of natural disturbance were included in the reference level and will also be included in future measurement reports of the program results.~~
- ~~On the other hand, there are larger natural disturbances that might occasionally cause significant impact although their frequency is lower. Amongst them we can find: volcanic eruptions, earthquakes, tsunamis and extreme climate events. Most of the impacts of this type of disturbance are easily identifiable in the Landsat images and can be clearly separated from the impacts caused by anthropogenic activities. For this reason, the impacts on forests caused by these natural disturbances have been excluded from the reference level, following the steps described in section 4 of the CDI, 2015.b[76], although they are transparently reported. The same will be done in future reports on the measurement of the program results. Therefore, emissions clearly attributable to natural disturbances are not considered a reversal risk, since they are excluded from the reference level and from the calculation of future emissions of the program, in a transparent and verifiable way.~~
- ~~Anthropogenic factors: The evolution of national and international circumstances in a way that the country forest cover might suffer negative impacts generating GHG emissions that could not be stopped by the emission reduction program cannot be discarded. These factors include the increase of population dependent on agricultural activities for their income, a significant increase of agricultural product prices, an important reduction of the ability of the State to control and enforce the law, etc.~~

~~[76]CDI, 2015.b. Reference level of forest emissions and absorptions in Costa Rica before the FCPF Carbon Fund: methodology and results. Report prepared for the Costa Rican Government under the Carbon Fund of the Forest Carbon Partnership (FCPF). 223 p.~~

The FCPF Emission Reduction Program Buffer Guidelines[77] identifies a set of Risk Factors and uses the *Reversal Risk assessment tool* to determine the Reversal Risk Set-Aside Percentages for each of them. These risk factors are listed and evaluated in Table 11.1.1, and summarized in Table 11.1.2.

Table 11.1.1: Determination of "reversal" risk set-aside percentage in Costa Rica (FCPF Reversal Risk assessment tool).

Risk Factors	Examples	Risk level and percentage associated	Assessment
1. Default Risk	Not applicable	10%	This is the minimum % of reversal risk set by the FCPF.
2. Lack of broad and sustained stakeholder support	Land tenure conflicts, carbon rights conflicts, insufficient stakeholder consultation	Low (0%)	Costa Rica is undertaking REDD+ readiness activities targeting governance issues, such as the land tenure and carbon rights conflict that affect the forest land owned by indigenous people in the country. These activities entail adopting improved governance structures and processes[78] that aim to eliminate the conflict and abate the risk it poses, thereby enhancing the long-term effectiveness of the REDD+ program. In addition, the mechanism to resolve carbon right disputes is defined in the REDD+ Decree No. 40464, which states the mechanisms of carbon trading and REDD+ Strategy financing (see also **Section 2.2** and **Section 6**). The strategies to reduce deforestation have been developed in consultation with groups with land tenure/rights conflicts in the country through FONAFIFO's safeguards system, i.e. indigenous peoples and agroforestry producers (see **Section 5**).
3. Lack of institutional capacities	Insufficient experience implementing	Low (0%)	FONAFIFO (Fondo Nacional de Financiamiento Forestal) is the focal point for the REDD+ program in Costa

[77] FCPF ER Program Buffer Guidelines (2015), 22 p. Available at: https://www.forestcarbonpartnership.org/sites/fcp/files/2015/December/FCPF%20ER%20Program%20Buffer%20Guidelines.pdf

[78] Rodríguez Zúñiga and Arce Benavides, 2017. Marco de Gestión Ambiental y Social (MGAS) para el Plan de Implementación de la Estrategia Nacional REDD+ de Costa Rica. FONAFIFO, MINAE. 95 pp.

Risk Factors	Examples	Risk level and percentage associated	Assessment
and/or ineffective vertical/cross sectoral coordination	programs and policies, lack of cross-sectoral cooperation and between gov. levels		Rica, with several other government agencies playing supporting roles across sectors and government levels. FONAFIFO also defined the reference level during the REDD+ readiness phase, runs a Service Comptroller, and manages both the Feedback and Grievance Redress Mechanism (FGRM) and the ongoing National REDD+ Consultation process. In addition, the national REDD+ program proposes to expand the PES (Payment for Ecosystem Services) program, which has been ongoing since 1997. The PES program regulated through FONAFIFO evidences Costa Rica's capacity to successfully coordinate and implement forest protection programs at the national scale.
4. Lack of long term effectiveness in addressing underlying drivers	Limited decoupling of deforestation and degradation from economic activities, lack of laws and regulations conductive to REDD+ objectives	Medium (3%)	Costa Rica has developed a REDD+ Strategy Implementation Plan[79] that defines priority actions under the Emissions Reduction Program. One of these priority actions entails promoting deforestation-free supply chains of commodities and subsistence activities driving deforestation in the country. Additional actions planned to address drivers of deforestation and degradation and result in emission reductions and/or removals are listed in **Section 4.3.** While deforestation agents such as agroforestry producers have been included during the stakeholder consultation process, representative agents of deforestation (i.e. crop and livestock farmers) or degradation (i.e. illegal selective loggers) have not, as indicated in **Table 5.2.1**. This results in a potential reversal risk that is mitigated in part by the multiple laws and regulations and governance frameworks in place in the country to meet REDD+ objectives[80], which aim to ensure the

[79] Plan de Implementación de la Estrategia Nacional REDD+ Costa Rica. 2017. Versión 7. 57 pp.
[80] Decreto No. 40464, Reglamento Para la Ejecución de la Estrategia Nacional REDD+. 2017.

Risk Factors	Examples	Risk level and percentage associated	Assessment
			continuity and long-term effective functioning of the REDD+ Program.
5. Exposure and vulnerability to natural disturbances	Exposure and vulnerability to natural disturbances and disasters, limited capacity and/or experience in preventing them	Low (0%)	Costa Rica considers the following natural risks affecting its forest lands: Low intensity and high intensity: • Low-intensity natural disturbances are frequent and cause small and diffuse impacts that cannot be easily differentiated from the impacts caused by anthropogenic factors. The most frequent are landslides that often take place in mountain areas of the country, followed by forest fires caused by lightning. Fire is a minor risk in Costa Rica. The emissions caused by the other low-intensity natural disturbances (i.e. landslides) are measured through the degradation accounting approach but excluded from the degradation reference level (**Section 8.6**) and will be excluded in future measurement reports of the Program results, thereby posing no risk of reversals. • The high-intensity natural disturbances that can occasionally result in significant impact occur at a lower frequency. Examples of these disturbances are volcanic eruptions, earthquakes/tsunamis and extreme climate events. Most of the impact areas of volcanic eruptions are easily identifiable in the Landsat images and can be clearly separated from the impacts caused by anthropogenic activities. For this reason, the impacts on forests caused by these volcanic events have

Risk Factors	Examples	Risk level and percentage associated	Assessment
			been excluded from the reference level, following the steps described in Section 4 of the CDI, 2015.b [81], although they are transparently reported. The same will be done in future reports on the measurement of the program results. Since these areas have been excluded, their risk of reversals in Costa Rica is zero. Geological and extreme weather risks, on the other hand, are low.

This analysis reveals that the overall risk of reversals in the country is 13% (Table 11.1.2):

Table 11.1.2: Overall risk of "reversals" in Costa Rica.

Risk Category		Risk (%)
1	Default mínimum	10
2	Lack of broad and sustained stakeholder support	0
3	Lack of institutional capacities and/or ineffective vertical/cross sectoral coordination	0
4	Lack of long term effectiveness in addressing underlying drivers	3
5	Exposure and vulnerability to natural disturbances	0
	Overall Risk	**13**

11.2. ER Program design features to prevent and mitigate Reversals

Costa Rica's active Forestry Law ~~in force~~ contains a prohibition of changing land use. Article 19 of the Law reads: "In lands covered by forest, land use change will not be allowed, nor to establish ~~T~~tree plantations…" ~~Due to its nature, t~~This is the main measurement to prevent reversals in those forests that are conserved and regenerated in country. ~~In order to~~To strengthen the implementation of the law, the National System of Conservation Areas has control mechanisms such as the illegal clearing control strategy, as well as regular operations in roads and the functioning of multiple geographical information systems[82] and that are part of the regular operations and budget of the institution. This is the strongest measurement against reversals; however, recognizing that the country still experiences deforestation, the Program includes a series of policies, actions and activities to halt deforestation, among which illegal logging control, as well as community control through the participative volunteer committees are a strong component. Additionally, as detailed in ~~sub-s~~**Section 6.1** many of these measures are a continuation and enhancement of existing programs properly institutionalized by current legislation.

[81] CDI, 2015.b. Reference level of forest emissions and absorptions in Costa Rica before the FCPF Carbon Fund: methodology and results. Report prepared for the Costa Rican Government under the Carbon Fund of the Forest Carbon Partnership (FCPF). 223 p.

[82] www.sirefor.go.cr

Furthermore, the country has circumstances that ensure non-reversals from REDD+ actions:

- An updated NFDP that is issued each 10 years containing long term goals
- INDCs including the forestry sector and aimed to achieve carbon neutrality. The Intended National Determined Contributions (INDC) represents the commitment of countries to contribute to a new climate regime after 2020, according to own capacities and realities. As part of its commitment Costa Rica is reaffirming its aspiration to shift its economic path towards carbon neutrality in 2021 as part of its voluntary actions pre-2020. This date will represent a critical milestone towards the de-carbonization of the economy by 2050. It is also proposing the ambitious target of reducing of 25% of emissions related to 2012 by year 2030[83].
- We have already mentioned the maintenance of current legal restrictions in the future, including the ban on the conversion of forests to other uses, as well as forest fires management and illegal control updated strategies and other measures included in the forestry law no. 7575.
- There are also ongoing negotiations with the WB to finance a $100 million Program for inclusive green growth in productive rural territories for 10 years.
- The PES program is currently institutionalized and with regular domestic budget that guarantees an important operational basis as described in ~~sections~~ **Section 4** and **Section 6**.
- The Program is expected to create the required cross-sectoral and vertical coordination structure to ensure the proper operation of related agencies during and after the duration of the program.

11.3. Reversal management mechanism

Selection of Reversal management mechanism

Costa Rica proposes the mechanism to handle reversals described as follows.

Reversal management mechanism	**Selected (Yes/No)**
Option 1: The ER Program has in place a Reversal management mechanism that is substantially equivalent to the Reversal risk mitigation assurance provided by the ER Program CF Buffer approach	No~~Yes~~
Option 2: ERs from the ER Program are deposited in an ER Program-specific buffer, managed by the Carbon Fund (ER Program CF Buffer), and based on a Reversal risk assessment.	Yes~~No~~

For option 1, explanation of Reversal management mechanism

N/A~~In case of a reversal (per the definition given in **Section 11.1**), Costa Rica proposes compensating the t of CO_2-e reversed by overruling an equivalent number of tons of CO_2-e in its unpaid emission reduction reserve ("buffer"), while the supplies last. If this was not enough to compensate the reversals, Costa Rica proposes not to receive any additional payments until non-compensated reversals are voided with emission reductions of subsequent periods.~~

~~Costa Rica can start its emission reduction program under the FCPF Carbon Fund with a positive balance in its emission reductions reserve or "buffer". In fact, its emission reduction program started on January 01, 2010 and by the end of 2013, the program had already produced 8,889,739 tons of CO_2-e in emission reductions~~

[83] Press release from the Ministry of the Presidency, September 2015: Available here: http://presidencia.go.cr/prensa/comunicados/costa-rica-presenta-plan-y-propuestas-que-llevara-a-convencion-sobre-cambio-climatico/

~~(see **Section 2.2**), out of which 8,534,150 t CO_2-e would be available after the discounts for uncertainty per the criteria of the Methodological Framework of the FCPF Carbon Fund (see **Section 13.1**).~~

~~Taking into account that the FCPF Carbon Fund may not allow payments for results for emission reductions produced before the signature of the ERPA, it is proposed that the emission reductions that the country generated in its public lands between o1.01.2010 and 12.31.2012 (i.e. 32% of the total emission reductions, equaling 2,044,137 t CO_2-e, after the discount of uncertainty) be used as a "buffer" reserve to compensate eventual future reversals of emission reductions compensated under the FCPF Carbon Fund. This amount of emission reductions corresponds to 20% of the emission reductions forecasted in public lands until 2025 (see **Section 13.1**, showing a table with calculated values). The reserve to compensate future eventual reversals could be directly managed by the country or be deposited in the "buffer" of the Carbon Fund (ER Program CF Buffer), as agreed in the ERPA.~~

~~It must be highlighted that between 01.2013 and 12.31.2016 some 2,519,826 t CO_2-e of emission reductions would be produced in public lands (already adjusted by the deduction for uncertainty). These emission reductions – out of which 27.25% correspond to emission reductions of year 2013, have been achieved – would be available for the country to dispose of them as it may consider it appropriate, including their possible inclusion in a payment for results agreement, either with the FCPF Carbon Fund or another entity.~~

For option 2, explanation of Reversal management mechanism

In case of a reversal (per the definition given in **Section 11.1**), Costa Rica proposes manage Reversal Risks through the use of an ER Program CF Buffer. In this sense, it will be established a buffer reserve accounts for this purpose in an appropriate ER Transaction Registry (**See Section 13.1**).~~N/A.~~

11.4. Monitoring and reporting of major emissions that could lead to Reversals of ERs

Per the definition in **Section 11.1,** reversals will be detected by comparing the annual average emissions in a measurement and report period with the reference level. The interpretation of results in this comparison will be done as follows:

- If the annual average emissions reported for a measurement and report period are lower than the reference level, it will consider~~ed~~ that no reversals took place and the country might receive payment for results, unless it is necessary to still compensate for reversals of prior periods, in which case the payment will only be made for the difference between the emission reductions achieved in the period and the reversions to compensate from prior periods.
- If the annual average emissions reported for a measurement and report period exceed the reference level and the country did not receive any payment for results in prior periods, it will also be considered that no reversals took place but the country will receive no payment for results.
- If the annual average emissions reported for a measurement and report period exceed the reference level and the country received payments for results in prior years, it will then be considered that the emissions exceeding the reference level reversed a number of tCO_2-e ~~tons~~ equivalent to the number of tons paid. In this case:
- If the emissions over the reference level exceed the tons paid, only the tons paid will be considered reversals, and the country will have to compensate for them by applying the mechanisms explained in **Section 11.3**, only for the tons issued exceeding the reference level that are equivalent to the number of tons paid in prior years. Subsequently, the country may again have access to payments for results if it reports annual average emissions below the reference level.

  If the emissions over the reference level are lower than the tons paid, only the tons over the reference level will be considered reversals and the country will compensate them by applying the mechanisms explained in **Section 11.3**, all the tons emitted over the reference level.

Subsequently, the country may again have access to payments for results if it reports annual average emissions lower than the reference levels.

- ~~The monitoring and reporting of emissions from forests remaining forests will be included in the ER-PD before the signature of the ER-PA at the end of the year~~

12. Uncertainties of the calculation of emission reductions

12.1. Identification and assessment of sources of uncertainty

Here we separately consider uncertainties associated with ~~Considering that the historical and future emissions are calculated by combining~~ activity data and emission factors~~, the two big sources of uncertainty are in fact those related to activity data and to emission factors~~:

~~1.~~ **Activity Data**: The uncertainties of the activity data for land use change activities (deforestation and reforestation) and for forest remaining forest activities (degradation and enhancements in forests) come from the uncertainties associated with~~to~~ the ~~land use maps production~~ process creating land use change maps from which the activity data are obtained~~A~~n~~. Per GOFC-GOLD REDD Sourcebook[84] the possible sources of uncertainty would be the quality of satellite data, interoperability of the different sensors, image processing, cartographic and thematic standards, location and co-registration, the interpreting procedure, and the post-processing. All these sources can generate systematic and random errors, being controlled by standard operation procedures (as required by indicator 8.1 of the methodological framework of the FCPF) and the second ones being partially compensated. The aggregate of all these uncertainty sources can be directly estimated in the final product through an accuracy analysis by suing reference data.~~

~~In the case of the reference level, as indicated in **Section 12.2**, an analysis of~~An accuracy was carried out for ~~made on several land use maps and an analysis of~~ the land-cover change map 2001/02 – 2011/12 using the guidelines from Olofsson et al (2014)[85]. The uncertainty estimation for each land cover change class was derived from the results of the accuracy assessment. In the assessment of degradation level in forests remaining forests, it was assumed that there was no uncertainty associated with the visual interpretation of sample areas because this procedure employed visual classification of canopy cover using high resolution imagery, as described in Section 8.4.

~~. The analysis of accuracy showed an underestimate of the deforested area and of the new secondary forest and tree plantations area (26% and 51%, respectively), which was determined with an accuracy of 22% and 20% respectively, even though the estimated deforestation area was not far from being significantly different, not in the case of Secondary forest and tree plantationsnew forests, for which the overestimation is clear. Therefore, the activities of carbon stocks increases in secondary forest and tree plantations new forests and of deforestation show a relative uncertainty of 20-22% due to the activity data, while the forest conservation activity will present an uncertainty of 4%.~~

~~For activities in forest remaining forest, the activity data uncertainty is derived from the visual assessment of canopy coverage using high resolution imagery in the Collect Earth software[86], used to identified intact, degraded, and very degraded primary forests. The uncertainty of identifying these classes was estimated by applying the Olofsson et al., 2014 methodology and produced an error of 19% for mapping intact forests, 27% for mapping degraded forests, and 58% for mapping very degraded forests respectively, as shown below in **Table 12.1.1**.~~

~~Regardless of the forest definition, only the minimum area parameter can be measured using Landsat imagery. Tree height and the percent of canopy cover cannot be measured directly with Landsat imagery, although it is often assumed that lands classified as "forest" surpass the threshold values of the three parameters used for defining "forest". For this reason, a test was carried out to determine~~

~~[84] GOFC-GOLD. 2014. REDD Sourcebook COP 20. Page 118.~~

[85] Olofsson et al. (2014) Good practices for estimating area and assessing accuracy of land change. *Remote Sensing of Environment* 148, 42-57.

~~[86] Gonzalo (2017) Analysis on forest degradation in Costa Rica. Assessment of its relative importance in emissions accounting for the ER-PD.~~

how well the analysis of remotely sensed data performed in classifying "forests" according to its definition. The test involved comparing areas classified as "forest" and "non-forest" with two canopy density maps prepared by an independent study[87] for the years 2001 and 2012. The result of this assessment revealed that 92.4% of the area classified as "primary forests" (*i.e.* old-growth forest) and 79.0% of the area classified as secondary forests and forest plantations in 2001 presented ≥30% of canopy cover, while for 2012 the percentage was 93.5% and 79.3%, respectively. Results for "non-forest" areas showed that only 53.31% of the areas classified as "non-forest" in 2001 presented <30% of canopy cover, while for 2012 the percentage was 56.61%. This could be explained by the presence of wooded pastures and agroforestry systems in Costa Rica, and by inherent error of the canopy-density maps.

In a later study[88], the validity of these canopy density maps to differentiate between "non-forest" and "forests" was assessed following Olofsson's method[89] to estimate accuracy of area estimates. This study revealed that, while overall map accuracy was high (77%) at the 95% significnace level, the accuracy differentiating between forest degradation classes (intact, degraded, and very degraded, depending on canopy coverage) was very low (1% and 5% accuracy in degraded and very degraded forests; **Table 8.1.1**). These canopy cover maps, however, were accurate in differentiating between degradation categories when only the unique stratum of forest remaining forest was used. This methodology is explained in detail in **Section 8.4.**, and its uncertainty is described in **Section 12**.

Table 12.1.1. Confussion matrix comparing fitness of forest reference points from 100 x 100 m NFI plots (columns) with map prediction points (rows).

Emission factors: Considering that the emission factors are calculated as the difference between two estimates of average carbon stocks per hectare, what determines the uncertainty of the emission factors is, mainly, the uncertainty associated to the carbon stocks estimates in each deposit. This, on the other hand, depends on several factors, including (Cunia 1987)[90]: the measurement errors (biometric or estimate variables of basic density, for instance), the prediction error of the allometric model (uncertainty of the model parameters), and the sampling error. The uncertainties of different parameters used to estimate the emissions a fraction of carbon should be added as well The uncertainty of the aboveground biomass carbon stock for primary forests used to estimate deforestation emission factors from Costa Rica's first NFI is derived from its sampling error[91].

[87] Agresta, Dimap, University of Costa Rica, Universidad Politécnica de Madrid, 2015. b. Index of cover as base for the estimate of degradation and increase of carbon stocks: Generating a consistent historical time series of activity data from land use change for the development of Costa Rica's REDD plus reference level. Consultancy report prepared for the Government of Costa Rica under the Carbon Fund of Forest Carbon Partnership (FCPF). 18 p.

[88] Gonzalo (2017) Analysis of forest degradation in Costa Rica. Assessment of its relative importance in emissions accounting for the ER-PD.

[89] Olofsson et al. (2014) Good practices for estimating area and assessing accuracy of land change. *Remote Sensing of Environment* 148, 42-57.

[90] Cunia, T. 1987. Error of forest inventory estimates: its main components. *In* E.H. Whraton & T. Cunia, eds., *Estimating tree biomass regressions and their error. Proceedings of the workshop on tree biomass regression functions and their contribution to the error of forest inventory estimates, May 26–30, 1986, Syracuse, N.Y. – Part E*. Broomall, PA, USA, USDA Forest Service, Northeastern Forest Experiment Station, General Technical Report no. NE-117, pp. 1–14. 34, 39, 46, 184

[91] For dry forest, there was only one observation and, therefore, no sampling error. The sampling error for moist forests was applied as a percentage to estimate the uncertainty of aboveground biomass in dry forests because it had the highest error among the other 4 life zones and therefore was a conservative estimate.

. As ~~indicated~~ discussed in **Section 8**, for deforestation and reforestation, the carbon stocks in other pools and strata and their associated uncertainty are based on data from scientific literature.~~to estimate carbon stocks, because there were not gross data from different sources available, it was only possible to consider the statistical uncertainty reported for each source. Said~~ The statistical uncertainty reported in these documents ~~only~~ takes into consideration the sampling error. Therefore, the current version of the reference level only considers ~~said~~ this error source ~~along to the uncertainty of the parameters (constant) used to determine the emissions. As it can be seen in **Table 12.2.15**, the uncertainties (error relative to 90% of trust) of carbon stocks vary from 1% to 148%. The uncertainty on the BARA reservoir (main reservoir) in forests does not exceed 22% being applicable to forests other than Mangrove and Yolillal, and 8% to 90% trust level. However, in case of deforestation activity, this high precision is diluted when combining it with very inaccurate values for the categories of crops, which present values of 71% in the case of permanent crops.~~

For forest degradation and enhancements in forests remaining forests, the major source of uncertainty is the linear model used to estimate biomass based on canopy cover. In addition to the canopy cover-biomass model error, for forest degradation and enhancements in forests remaining forests, there is also the uncertainty of the percent canopy cover estimates which are applied in the linear models to estimate biomass. The percent canopy cover uncertainty is derived from the sampling error of the data collected in Ortiz Malavasi (2018)[92]. Finally, uncertainty for removal factors in enhancement in forests remaining forests were derived from error estimates taken from scientific literature.

~~Additional uncertainties on estimated emissions factors related to the forest degradation proxy need to be taken into account, since it assumes C stocks are a linear function of the canopy cover (due to the lack of on-the-ground data and the lack of correlation between canopy cover and either large-scale biomass maps or NFI biomass plots). This preliminary estimate was temporarily accepted by the TAP, as long as biomass field data is collected during 2017 to recalculate emission factors associated to degradation and removal factors associated with enhancements (see **Section 8.8.**) before the ER-PA signature at the end of the year.~~

~~Considering the foregoing, it can be proved that the conservation activity of forest has a final positive effect since the uncertainty of the activity data (4%) and of the stocks (8-22%) at 90% trust level is too low. In contrast, the activities of carbon stock increases in secondary forest and tree plantation and deforestation show high uncertainties because of the uncertainties of the activity data (22% and 20% respectively) and the very high uncertainties of non-forest classes (BARA of 71% in the case of permanent crops). It is important to take into account that these uncertainties do not include the uncertainty associated with~~

[92] Ortiz Malavasi, E. 2018. Evaluación visual multitemporal (EVM) del cambio en el uso de la tierra y cobertura en Costa Rica, Zonas A y B. Tarea 2: Estimacion del cambio en el porcentaje de cobertura de copas para bosques maduros en el mapa MC13 de AGRESTA, para los periodos 1998-2011-2016

degradation of forests remaining forest. In the near future, however, the uncertainty for all the activities as well as the uncertainty of the RL will be calculated and reported.

Considering the foregoing, it can be proved that the conservation activity of forest has a final positive effect since the uncertainty of the activity data (4%) and of the stocks (8-22%) at 90% trust level is too low. In contrast, the activities of carbon stocks increases in secondary forest and tree plantation new forests and deforestation show high uncertainties because of the uncertainties of the activity data (22% and 20% respectively) and the very high uncertainties of non-forest classes (BARA of 71% in the case of permanent crops).

To improve the accuracy of future estimates, the following areas can be already identified as priority for the process of continued process:

Priority 1: Sources with a larger impact on global uncertainty.

Secondary forest and tree plantation New forests activity data: This class shows a very high uncertainty as it can be seen in the preceding results. As indicated in **Section 8.3**, Tree plantations and secondary forests were merged because the maps produced for said categories were not reliable. This is an indication of the lack of accuracy in these categories.

Carbon stocks in non-forest categories. The uncertainties of non-forest categories for the BARA and BARS reservoirs are very high (>50%). It will be necessary to complete the data available at this moment with more data in order to reduce the uncertainties.

Priority 2: Sources with lower impact on the global uncertainty.

Dead wood: Dead wood presents very high uncertainties in all cases, being Yolillales the highest with 100% and over 50% in dry forests and grasslands. Even though the global uncertainty impact is lower since it is a reservoir that proportionally has little carbon, it will be necessary to collect more data to reduce associated uncertainties.

Non-CO_2 – N_2O gases: The uncertainties on N_2O emissions are higher than 100% practically in all cases. In comparison, this source of emissions is lower, but a reduction of associated uncertainties should be sought, basically passing by the taking of data for the production of specific emission factors for the country or the region.

12.2. Quantification of uncertainty in Reference Level setting

Calculating Uncertainty of land cover maps and of the activity data

To assess the uncertainty for activity data, the accuracy of land cover maps was estimated as well as the accuracy of land use change matrixes. Due to the limited availability of control data to assess the uncertainties, the accuracy analysis of land cover maps was limited to the maps of years 1985/86, 2001/02 and 2012/13 and to the accuracy analysis of the activity data to the matrix for period 2002-2012, which is a combination of the maps for 2001/02 and 2012/13.

The methods used to perform the uncertainty analysis and the results obtained are fully described in section 7 of the CDI report (2015.b)[93]. The data used for assessing the accuracy are shown in Table **12.2.1**.and in **Figure 12.2.1**. It is important to take into account that the RL uncertainty does not currently include the uncertainty associated with degradation of forests remaining forest, which will be included at a later stage.

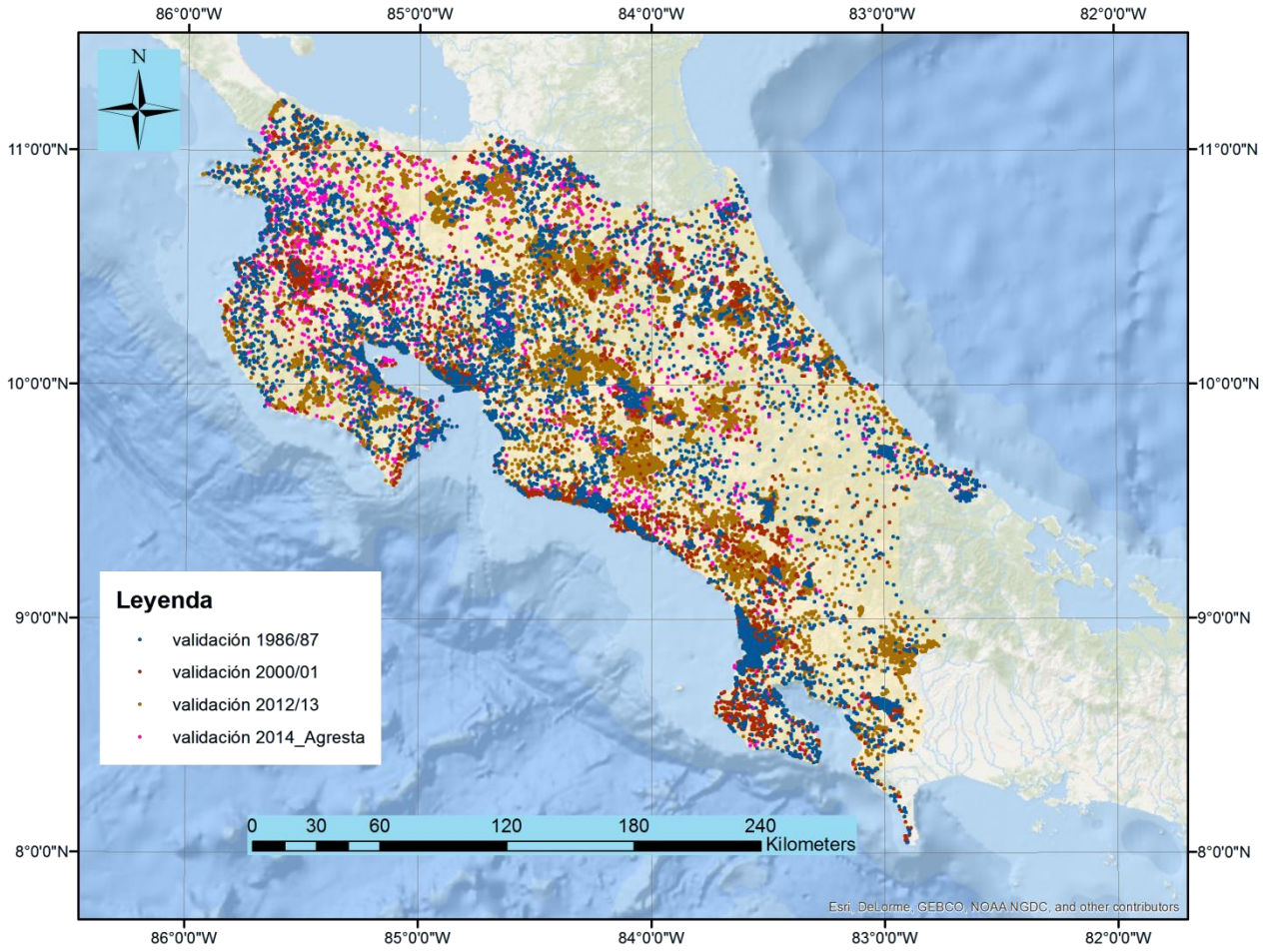
[93] CDI, 2015.b. Reference level of forest emissions and absorptions in Costa Rica and methodology used to construct it. Report prepared for the Government of Costa Rica under the Carbon Fund of the Forest Carbon Partnership (FCPF). 223p.

Chart Table 12.2.1. Sampling design applied to the assessment of the MCS uncertainty for years 1985/86, 2000/01 and 2012/13.

Land cover maps	Sampling design	Explanation
1985/86	NO	5,396 control points. Said control points were developed by INBIO for the elaboration and verification of the maps generated within the framework of the project "Lessons learned and development of capacities to apply REDD+ initiatives, Costa Rica's experience." CATIE gave Agresta these points and the meth-data were not complete; therefore, there is no evidence that a statistically robust sampling design was applied.
2000/01	NO	7,463 control points. Said control points were developed by INBIO for the elaboration and verification of the maps generated within the framework of the project "Lessons learned and development of capacities to apply REDD+ initiatives, Costa Rica's experience." CATIE gave Agresta these points and the meth-data were not complete; therefore, there is no evidence that a statistically robust sampling design was applied.
2012/13	NO	8,536 control points compiled by Agresta as part of the consultancy "Generating a consistent historical time series of activity data from land use change for the development of Costa Rica's REDD plus reference level". These control points were compiled by uniting the control points developed by INBio and the control points for year 2012/13, validated in the field, developed by SINAC within the framework of the preparation of the forest type maps of Costa Rica. There is no evidence that a statistically robust sampling design was applied since two different sources were combined that would have used different designs in its case.
2012/13bis *	YES	The map for 2012/13 marks some 9,208 control points obtained from a compilation made by the National Meteorological Institute in 2013 and 2014. The sampling design applied was a stratified random sampling using a land use map for the stratification criteria, generated by the Institute for 2013.

Note: There are two analyses for the land-cover map 2012/13 with two independent databases; the second of these analyses is identified as 2012/13bis.

Figure 12.2.1. Spatial distribution of control points used for the analyses of uncertainty of MCS and activity data.



The assessment of land-cover maps accuracy was only performed for the "forest" and "non-forest" categories, with the except forexception of year 2013bis in which uncertainty values were also reported for six categories of the IPCC. The results are shown in the following tables.

TableChart 12.2.2. Accuracy indicators of the land-cover map 1985/86

~~**TableChart 12.2.7**. Adjusted areas and their trust intervals for land-cover map 2012/13~~
~~The results of the accuracy analysis for land-cover map 2012/13 by using the control points of the National Meteorological Institute (i.e. land-cover maps 2012/2013bis) are shown in the following tables.~~

~~**TableChart 12.2.8.** Accuracy indicators of land-cover map2012/13.~~

~~**TableChart 12.2.9.** Adjusted areas and their trust intervals for land-cover map 2012/13.~~

~~Considering the errors matrix with the six categories of IPCC, it is observed that the total accuracy is lower, due to the fact that the grassland user accuracy is reduced, which have led to confusion with the Crops class.~~

~~**TableChart 12.2.10**. Accuracy indicators of land-cover map2012/13 considering the land use IPCC categories. With regards to the areas, the conclusions are similar to the preceding, even though there are very significant differences with the cultivation classes and grassland classes. While the Cultivation class has been underestimated, the grassland class has been overestimated.~~

~~**TableChart 12.2.11.** Adjusted areas and their trust intervals for land-cover map 2012/13 considering the land use IPCC categories.~~
~~It must be stated that the Methodological Framework of the FCPF Carbon Fund or the IPCC specify minimum thresholds of accuracy to be reached in the land-cover maps and activity data. To obtain an indication on the acceptability of the accuracy levels found per recognized international standards, the estimated accuracy values were compared to the minimum accuracy values required for jurisdictional and Nested REDD+ procedures of the Verified Carbon Standard. In conclusion, the maps of all the assessed periods would be in accordance with the JNR requirements of the VCS since the full accuracy in forest/non-forest classification was always higher than at least 75%.~~

Due to the large number of land use change transitions hey were aggregated into four change classes to be used in the accuracy assessment following the guidelines provided in Olofsson et al (2014): Deforestation (forest to non-forest), new forests (non-forest to forest), stable forest (forest remaining forest), and stable non-forest (non-forest to non-forest).
The validation of land use change between the years 2000/2001 and 2010/2011 was carried out through photointerpretation using Landsat images corresponding to the validation dates, aerial orthophotography from 2005 and Rapideye imagery from 2011 and 2012. These reference data are in accordance with the guidelines of Olofsson et al. (2014) since they have higher quality and spatial resolution than the maps and are independent of the sample used to produce the maps.

~~Regarding the accuracy of activity data in the land use change matrixes, t~~The results of the accuracy assessment show ~~quite~~ high total accuracy values (0.85) although this is due mainly to the high accuracy in the stable categories (i.e., forest remaining forest and non-forest remaining non-forest). The categories that changed show ~~reduced~~ lower accuracies, under 0.6, which indicate~~s a pretty~~ higher uncertainty of the activity data (**TableChart 12.2.1~~2~~**) were deforestation and reforestation.

TableChart 12.2.1~~2~~. Accuracy statistics for cover changes in land-cover map2001/02 and land-cover map 2011/12.

Class	User Accuracy (#)	~~Trust level~~ Confidence interval at 90% (#)	Producer Accuracy (#)	~~Trust level~~Confidence interval at 90% (#)
Deforestation (*Forest to Non-Forest*)	0.62	0.49 - 0.75	0.49	0.38 - 0.6
New forests (*Non-Forest to Forest*)	0.75	0.64 - 0.86	0.50	0.4 - 0.6
Stable forest (*Forest remaining Forest*)	0.88	0.84 - 0.91	0.94	0.92 - 0.96

Class	User Accuracy (#)	~~Trust level~~ Confidence interval at 90% (#)	Producer Accuracy (#)	~~Trust level~~Confidence interval at 90% (#)
Stable non-forest (*Non-Forest remaining Non-Forest*)	0.85	0.81 - 0.89	0.84	0.8 - 0.87

Total Accuracy (#)	~~Trust~~ Confidence interval at 90% (#)
0.85	0.83 - 0.87

~~Regarding the adjusted areas, the results are similar. While there is an underestimation of the stable forest area and of the consistency of non-stable forest areas, the deforestation areas and the new forests show new biases and significant uncertainties. The deforestation during the period analyzed has been underestimated in 26% (with a relative error of 22% at the 90% trust level) mean while new forests have been underestimated in 51% (with a relative error of 20% at the 90% trust level). Keeping the relative errors in mind, it is very feasible that the deforestation bias could have been substantially reduced with an increase of the sample numbers, while new forests have been underestimated in at least 31%, which is very significant.~~

Table~~Chart~~ 12.2.~~2~~13. ~~Adjusted~~ Estimated areas and their error at 90% confidence levels ~~trust intervals~~ for land use ~~the cover~~ changes between land-cover map 2001/02 and land-cover map2011/12 considering the forest and non-forest change categories.

Class	Estimated area (ha)	Uncertainty~~Error relative~~ at 90% ~~of the significance~~ confidence interval~~level~~ (ha)	~~Error relative~~Uncertainty at 90% o~~f the significance level~~confidence interval (%)
Deforestation (*Forest to Non-Forest*)	222,418	63,086	~~22~~28%
New forests (*Non-Forest to Forest*)	208,162	64,028	~~20~~31%
Stable forest (*Forest remaining Forest*)	2,848,954	101,885	4%
Non-stable forest (*Non-Forest remaining Non-Forest*)	1,718,880	99,201	6%

~~The uncertainty analyses of land-cover maps and of the activity data presented above are valid as well for the activities "forest carbon stocks increase" and "forest carbon stocks conservation" so they will not be repeated in the following sections, with regards to the reference level for those two activities.~~

Calculating ~~U~~uncertainty of emission factors

~~Considering that the emission factors are calculated as the difference between two average carbon stocks estimates per hectare, what determines the uncertainty of the emission factors is, in essence, the uncertainty associated to the carbon stocks estimates in each deposit. It depends on several factors, including the following (Cunia 1987)[94]:~~

- ~~Measurement error: The measurement error differs from statistical errors in that measurement error is the difference between the actual value and the computed value for a sampling unit. Said error has a random component and a systematic one. While the first one will tend to zero as the sampling units are measured (i.e. errors are compensated), the second one is more important and is hard to quantify. The only way of reducing it, as indicated by 2006 IPCC[95], is establishing a quality assurance/quality control plan (QA/QC). In the case of the establishment of sufficient controls, it can be assumed that said systematic part is also zero although some studies such as Chave et al. (2004)[96]state that the measurement error can be equal to 16% considering the error of heights, diameters and measurement of basic densities.~~
- ~~Alometric model error: In general, biomass above the land is not measured directly; variable biometrics on the vegetation that serve as the entry in a model that estimates biomass are measured. In this case, there are also two possible errors: the error associated to the selection of the model; the error associated to the prediction of said model. The first type of error consists in the fact that there are several models available to estimate the biomass which contributes with estimates that can have wide differences. This error may have very high values as indicated by Van Breugel et al. (2011)[97] who obtained associated errors between 5 and 35% depending on the model selected to do the estimate. The second class of errors is the uncertainty associated to the prediction of the model that according to~~from Picard et al. (2013)[98] ~~depends on two factors: the sampling plan and the estimator. This way, two sampling plans or two different estimators will throw different estimates keeping identical the rest of the factors.~~
- ~~Sampling error: The sampling error must be added to the measurement and prediction errors mentioned above; this one is used to perform the inference to estimate the biomass/carbon at the level of the area of interest. This error depends[99] of: (a) the sampling design; (b) the size of the sampling; (c) the type of estimator used; (d) the variability inherent between the sampling units. This sampling error is the only error that is usually reported in the studies.~~

~~The Methodological Framework of the FCPF Carbon Fund does not clearly indicate what errors must be considered in the assessment of the accuracy of the emission factors. IPCC 2006 guidelines, on the other hand,~~

~~[94] Cunia, T., 1987. Error of forest inventory estimates: its main components. *In* E.H. Whraton & T. Cunia, eds., *Estimating tree biomass regressions and their error. Proceedings of the workshop on tree biomass regression functions and their contribution to the error of forest inventory estimates, May 26–30, 1986, Syracuse, N.Y. – Part E*. Broomall, PA, USA, USDA Forest Service, Northeastern Forest Experiment Station, General Technical Report no. NE-117, pp. 1–14. 34, 39, 46, 184~~

~~[95] Capítulo 3, Volumen 1, 2006 IPCC.~~

~~[96] Chave, J., Condit, R., Aguilar, S., Hernandez, A., Lao, S. & Perez, R., 2004. Error propagation and scaling for tropical forest biomass estimates. *Philos. Trans. R. Soc. Lond., B Biol. Sci.*, 359(1443): 409–420. 40, 46, 50~~

~~[97] Van Breugel, M., Ransijn, J., Craven, D., Bongers, F. & Hall, J.S., 2011. Estimating carbon stocks in secondary forests: Decisions and uncertainties associated with allometric biomass models. For. Ecol. Manag., 262(8): 1648–1657. 40, 43, 46, 50~~

~~[98] Picard N., Saint-André L., Henry M., 2012. Manual for building tree volume and biomass allometric equations: from field measurement to prediction. Food and Agricultural Organization of the United Nations, Rome, and Centre de Coopération Internationale en Recherche Agronomique pour le Développement, Montpellier, 215 pp.~~

~~[99] Introducción - Cunia, T. 1987.~~

~~contain a description of good practices in the calculation and consideration of the uncertainties, but do not include either a clear requirement of what sources of uncertainties should be considered.~~

~~As stated above, for the estimate of carbon stocks the IFN values were used as well as other sources with quantified uncertainties. Said uncertainties, in all cases, were statistical uncertainties associated to the sampling and did not consider the measurement uncertainties or the uncertainties of the allometric models applied.~~

~~With these premises, the uncertainty analysis was made as follows:~~

~~Uncertainty estimate of entry parameters: First of all, the entry parameters in the calculation sheet were estimated; these are the~~ For values that were obtained from the bibliography that served as ~~entry~~ input parameters for the equations used to estimate ~~the~~ carbon stocks~~ contents. In this case~~, the ~~estimate of~~ uncertainty estimates were~~ies was~~ made by following the IPCC guidelines (Chapter 2, Volume 1 of IPCC GL 2006). The uncertainties described in the different publications or determined from the forest inventory data were identified, and when it was necessary to ~~in case of the~~ combin~~eation of~~ values from different sources, ~~the error spread was made following Method~~approach 1 of the IPCC guidelines, propagation of errors, was applied. ~~for the spreading of uncertainties. This means, i~~ In the case of ~~a~~ summing ~~of~~ two parameters x and y, ~~it was considered that~~that the square of their uncertainties ~~σU_x~~ and~~y~~ ~~σU_y~~ were summed and then the square ~~ould be combined with the~~ root of the sum ~~of the squares~~was calculated:

$$\text{Uncertainty } (x + y) = \sqrt{U_x^2 \sigma_x + U_y^2 \sigma_y}. \quad (8)$$

In case of a multiplication of parameters x and y, it was considered that their uncertainties σ_x y σ_y, would be combined using ~~with~~ the following equation:

$$\text{Uncertainty } (x * y) = \frac{\sqrt{(U_x \times x)^2 + (U_y \times y)^2}}{|x+y|} \sqrt{\left[\frac{\partial f}{\partial x}\sigma_x\right] + \left[\frac{\partial f}{\partial y}\sigma_y\right]}. \quad (9)$$

These equations are equivalent to those indicated in Chapter 3~~2~~ of Volume 1 of IPCC GL 2006.

The uncertainties of the aboveground biomass values for the different forest types were calculated by estimating the standard error of the biomass estimates from the Costa Rica NFI data.

The uncertainties of these~~said~~ parameters are shown in Table 12.2.3 and 12.2.4. As these tables show, the uncertainties (the margin of error for a 90% confidence level divided by the estimate) of carbon stocks vary from 1% to 152%. The uncertainty of aboveground biomass (the pool with the largest carbon stock) in the different forest types has the highest uncertainty reaching 152% at the 90% confidence level.

For degradation and enhancements in forest remaining forest, the standard error of canopy cover percent was calculated from the data collected in Ortiz Malavasi (2018)[100]. To quantify the error of the canopy cover-biomass model, observed data points falling between the canopy covers of 100% and 0% (16 in total) from a study combining a visual assessment of high-resolution imagery with NFI plot data[101] were plotted with the linear models of the associated forest type. The root mean square error (RMSE) was then calculated using the observed plots as the residuals of the model. There were only observed points for wet and rain forests (12 in total) and moist forests (4 in total)[102]. For the other forest types, the RMSE of bosque humedo was

[100] Ortiz Malavasi, E. 2018. Evaluación visual multitemporal (EVM) del cambio en el uso de la tierra y cobertura en Costa Rica, Zonas A y B. Tarea 2: Estimacion del cambio en el porcentaje de cobertura de copas para bosques maduros en el mapa MC13 de AGRESTA, para los periodos 1998-2011-2016

[101] Aquilar Salas LA. 2017. Estimación de la relación densidad de copas / stock de carbono: segundo informe.

[102] The RMSE for wet and rain forest values is 604.1. For all other forest types, it is 2036.2.

applied since 1) it was assumed that the relationships between canopy cover and biomass in these forest types would be more similar to BH than to BMHP; 2) the RMSE was higher for BH, therefore applying it to the other forest types was the conservative approach. The uncertainties of these parameters are shown in Table 12.2.5.

The resulting uncertainty estimates with a 90% confidence level range from 170% to 9,121% as can be seen in **Table 12.2.5**. Due to the high uncertainty of this linear canopy cover-biomass function, Costa Rica is currently collecting more field data to improve the model, thereby lowering uncertainty.

The quantified uncertainties for the different emission factors were then used to generate Monte Carlo simulations which were applied to the emissions equations as described in the following section.

~~sheet "4. Parameters Table" of Excel file "CARBON DATABASE". These uncertainties refer to the calculations of uncertainties performed in sheet "3. Carbon Densities" of the same file.~~

~~1. Estimate of the uncertainty of carbon stocks: The same equations from above (8 and 9) were applied to calculate all the parameters used in the equations used to estimate carbon stocks. This allowed estimates for each category estimated for each land use category. The aggregate or propagation of uncertainties was done by following Method 1 of the IPCC guidelines mentioned above.~~

~~The uncertainties spread for each category and carbon deposit are reported at the end of the sheet "CARBON" of the "FREL TOOL CR v.1" tool between cells Y15: AN6053.~~

~~2. Correction of carbon stocks estimates with high level of uncertainty: According to the requirements of JNR of VCS[103], carbon stocks estimates must be adjusted in a conservative sense[104] when the estimate of the relative error exceeds 20% of the estimate average at the 90% trust level or the 30% to 95% of the trust level.~~

~~The tool "FREL TOOL CR v.1" allows applying the corrections required by the VCS when the relative error exceeds 20% of the estimated average value at 90% of the trust level. These corrections are automatically done in the sheet "CARBON" (between cells AP15: BD6053) **when the option "VCS" is selected in the cell "B49" in the sheet "DECISIONS"; while they do not take place if the option "IPCC" is selected (this is the option selected in the context of the construction of the reference level under the FCPF Carbon Fund).**~~

~~The equations to be applied to correct carbon stocks estimates with an uncertainty level higher than 20% to 90% of the trust level differ in case the carbon stocks estimates are used for the reference level or for the calculation and report of results of the emission reduction program.~~

- ~~In the case of emission factors estimated for the reference level, the correction required by VCS is calculated as follows:~~

~~Si: $\frac{CIC_k(CS)}{C_k(CS)} > 0.10 \rightarrow C'_k(CS) = (1 - \frac{CIC_k(CS)}{C_k(CS)} + 0.10) \times C_k(CS)$ (10)~~

- ~~In the case of emission factors estimated to report the result of the emission reduction program, the correction required by VCS is calculated as follows:~~

~~[103] Section 3.14.12 (4) of VCS-JNR, v3.2 of October 20, 2014.~~

~~[104] In the context of the reference level, the adjustments must be made downwards in the case of carbon stocks values estimated for the forest categories, and upwards in case of carbon stocks values for non-forest categories, with the exception of the case of harvested Harvested Wood products products, in which the sense of adjustment is upwards. In the context of results of the emission reduction program, the sign of the adjustment is opposite to the sign used in the context of the reference level.~~

~~If: $\frac{CIC_k(CS)}{C_k(CS)} > 0.10 \rightarrow C'_k(CS) = (1 + \frac{CIC_k(CS)}{C_k(CS)} - 0.10) \times C_k(CS)$ (11)~~

~~If: $\frac{CIC_k(CS)}{C_k(CS)} \leq 0.10 \rightarrow C'_k(CS) = C_k(CS)$ (12)~~

~~Where:~~

~~$CIC_k(CS)$ Half of the trust interval at 90a% of the level trust of the carbon density of the *k* deposit or source for a land use category/stratum (CS), $tCO_2 ha^{-1}$~~

~~$C_k(CS)$ Carbon density of the *k* deposit or source for a land use category/stratum (CS), $tCO_2 ha^{-1}$~~

~~$C'_k(CS)$ Carbon density adjusted according to the VCS JNR of the *k* deposit or source for a land use category/stratum (CS), $tCO_2 ha^{-1}$~~

~~*k* *k* deposit or emission source.~~

~~The application of said correction is shown in tool "FREL TOOL CR v.1", in the sheet "CARBON", between cells AP15: BD6053.~~

~~The results are reported in **Table 8.3.22.** and T~~**~~8~~**~~Table 8.3.22. Chart Table 8.3.22.~~ presents the uncertainty values at 90% of trust in $tCO_2 ha^{-1}$ forfor each deposit and category. **Table 8.3.23.** presents the relative uncertainties (%) at 90% of the trust level.~~

Table~~Chart~~ 12.2.~~14~~3. ~~Average u~~Uncertainty at 90% confidence interval~~trust level~~ of carbon stocks estimated for each category and pool~~, deposit and gas~~ by using Method 1 of IPCC.

Notes: **TF & TFC** = Forest Lands and Lands turned into Forest Lands; **C** = Crops: **P** = Grasslands; **H** = Wetlands; **AU** = Settlements; **OT** = Other Lands; **SI** = Without Information. **Bhp** = ~~Very w~~Wet and rain~~pluvial~~ forests; **Bh** = Rain forests; **Bs** = Dry forests; **Man** = Mangroves; **Bp-Y** = Palm forests – Yolillales; **bp** = primary forests; **bs~~n~~** = scondeary forests~~new forests; **smf** = without sustainable management of forest; **cmf** = with sustainable management of forest~~; **i** = intact; **~~d~~ = degraded; ~~md~~ = very degraded; int** = intervened; **1 … 400** = age in years; **an** = annual; **per** = permanent; **~~zll~~ = rainy zone (> 2000 mm year^{-1}); ~~zh~~ = wet zone (1000-2000 mm year^{-1}); para** = Moors; **sd** = Bare lands;; **nat** = natural; **art** = artificial; **BARA** = Aboveground tree biomass; **BNAA** = ~~Aerial~~ Aboveground Non-Arboreal Biomass; **BARS** = ~~Underground~~ Belowground Arboreal Biomass; **BNAS** = ~~Underground~~ Belowground Non-Arboreal Biomass; **MMA** = Aboveground~~Aerial~~ Dead Wood; **MMS** = ~~Underground~~ Belowground Dead Wood; **H** = Litter; SOC = Soil organic carbon; ~~**PM.F1** = Harvested Wood products, Fraction 1 (paper products); **PM.F2** = Harvested Wood products, Fraction 2 (non-structural panels); **PM.F3** = Harvested Wood products, Fraction 3 (structural panels, veneer, plywood); **PM.F4** = Harvested Wood products, Fraction 4 (sawmill wood);~~**CO_2**= carbon dioxide~~; **CH_4** = Methane; **N_2O** = Nitrose Oxide~~.

				Aboveground Biomass		Belowground Biomass		Dead Wood		Litter	Total
				BARA	BNAA	BARS	BNAS	MMA	MMS	H	
				Include	Include	Include	Include	Include	Include	Include	
				tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}
TF & TCF	Bhp	bp	i	470.64	-	14.58	-	8.75	-	0.94	65.78
		bs	1	0.75	-	0.22	-	0.08	-	0.02	0.79
			2	1.48	-	0.42	-	0.16	-	0.04	1.55
			399	37.44	-	8.32	-	4.06	-	1.17	38.59
			400	37.45	-	8.32	-	4.06	-	1.17	38.59
	Bh	bp	i	310.11	-	6.43	-	23.25	-	1.04	48.91
		bs	1	0.88	-	0.26	-	0.58	-	0.03	1.12
			2	1.73	-	0.48	-	1.15	-	0.07	2.19
			399	28.20	-	6.43	-	18.72	-	1.04	34.47
			400	28.20	-	6.43	-	18.72	-	1.04	34.47
	Bs	bp	i	302.80	-	4.22	-	21.92	-	0.61	47.39
		bs	1	0.00	-	0.00	-	0.00	-	0.00	0.00
			2	0.00	-	0.00	-	0.00	-	0.00	0.01
			399	17.96	-	4.22	-	7.74	-	1.85	20.09
			400	17.96	-	4.22	-	7.74	-	1.85	20.09
	Man	bp	i	235.78	-	7.25	-	2.05	-	0.24	32.75
		bs	1	0.31	-	0.10	-	0.03	-	0.01	0.34
			2	0.62	-	0.19	-	0.05	-	0.01	0.67
			399	31.21	-	7.25	-	2.51	-	0.69	32.78

				Aboveground Biomass		Belowground Biomass		Dead Wood		Litter	Total
				BARA	BNAA	BARS	BNAS	MMA	MMS	H	
				Include	Include	Include	Include	Include	Include	Include	
				tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}
			400	31.21	-	7.25	-	2.51	-	0.69	32.78
	Bp-Y	bp	i	185.44	-	9.74	-	7.02	-	1.13	26.68
		bs	1	0.41	-	0.14	-	0.08	-	0.01	0.28
			2	0.82	-	0.26	-	0.17	-	0.03	0.56
			399	40.89	-	9.74	-	8.40	-	1.37	27.30
			400	40.89	-	9.74	-	8.40	-	1.37	27.30
C	an			-	9.69	-	2.45	-	-	-	9.99
	per		1	6.8	2.95	2.02	0.93	0.07	-	0.60	7.76
			2	13.60	5.91	3.84	1.77	0.14	-	1.20	15.47
			3	20.40	8.86	5.59	2.58	0.21	-	1.81	23.15
			4	27.20	11.82	7.29	3.36	0.29	-	2.41	30.82
			5	34.00	14.77	8.97	4.13	0.36	-	3.01	38.48
			6	40.80	17.72	10.62	4.89	0.43	-	3.61	46.14
			400	40.80	17.72	10.62	4.89	0.43	-	3.61	46.14
P				-	-	-	-	6.29	-	-	-
AU				-	-	-	-	-	-	-	-
H			nat	-	-	-	-	-	-	-	-
			art	-	-	-	-	-	-	-	-
OT		para		-	2.16	-	0.53	-	-	-	-
		sd	nat	-		-	-		-	-	-
			art	-		-	-		-	-	-
SI				-		-	-		-	-	-

Table~~Chart~~ 12.2.~~154~~. Average relative uncertainties (%) at 90% confidence interval~~trust level~~ of estimated carbon stocks~~s~~ for each category and pool ~~, deposit and gas~~ by using Method 1 of the IPCC.

Notes: **TF & TFC** = Forest Lands and Lands turned into Forest Lands; **C** = Crops: **P** = Grasslands; **H** = Wetlands; **AU** = Settlements; **OT** = Other Lands; **SI** = Without Information. **Bhp** = Wet and raom forests; **Bh** = Rain forests; **Bs** = Dry forests; **Man** = Mangroves; **Bp-Y** = Palm forests – Yolillales; **bp** = primary forests; **bn** = new forests; **i** = intact; **int** = intervened; **1 … 400** = age in years; **an** = annual; **per** = permanent;; **para** = Moors; **sd** = Bare lands;; **nat** = natural; **art** = artificial; **BARA** = Aboveground tree biomass; **BNAA** = Aboveground non-Arboreal Biomass; **BARS** = Belowground Arboreal Biomass; **BNAS** = Belowground Non-Arboreal Biomass; **MMA** = Aerial Dead Wood; **MMS** = Underground Dead Wood; **H** = Litter; SOC = Soil organic carbon; **CO_2**= carbon dioxide.~~**TF & TFC** = Forest Lands and Lands turned into Forest Lands; **C** = Crops: **P** = Grasslands; **H** = Wetlands; **AU** = Settlements; **OT** = Other Lands; **SI** = Without Information. **Bhp** = Very wet and pluvial forests; **Bh** = Rain forests; **Bs** = Dry forests; **Man** = Mangroves; **Bp-Y** = Palm forests – Yolillales; **bp** = primary forests; **bn** = new forests; **smf** = without sustainable management of forest; **cmf** = with sustainable management of forest; **i** = intact; **d** = degraded; **md** = very degraded; **int** = intervened; **1 … 400** = age in years; **an** = annual; **per** = permanent; **zll** = rainy zone (> 2000 mm year^{-1}); **zh** = wet zone (1000-2000 mm year^{-1}); **para** = Moors; **sd** = Bare lands;; **nat** = natural; **art** = artificial; **BARA** = Aboveground biomass; **BNAA** = Aerial Non-Arboreal Biomass; **BARS** = Underground Arboreal Biomass; **BNAS** = Underground Non-Arboreal Biomass; **MMA** = Aerial Dead Wood; **MMS** = Underground Dead Wood; **H** = Litter; SOC = Soil organic carbon; **PM.F1** = Harvested Wood products, Fraction 1 (paper products); **PM.F2** = Harvested Wood products, Fraction 2 (non-structural panels); **PM.F3** = Harvested Wood products, Fraction 3 (structural panels, veneer, plywood); **PM.F4** = Harvested Wood products, Fraction 4 (sawmill wood);**CO_2**= carbon dioxide; **CH_4** = Methane; **N_2O** = Nitrose Oxide.~~

				Aboveground Biomass		Underground Biomass		Dead Wood		Litter	Total
				BARA	BNAA	BARS	BNAS	MMA	MMS	H	
				Include	Include	Include	Include	Include	Include	Include	
				tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}
TF & TCF	Bhp	bp~~BP~~	i	150%	-	20%	-	18%	-	9%	15%
		bs~~BN~~	1	8%	-	8%	-	8%	-	24%	6%
			2	8%	-	8%	-	8%	-	24%	6%
			399	8%	-	8%	-	8%	-	24%	6%
			400	8%	-	8%	-	8%	-	24%	6%
	Bh	bp~~BP~~	i	152%	-	21%	-	48%	-	13%	16%
		bs~~BS~~	1	8%	-	8%	-	48%	-	16%	7%
			2	8%	-	8%	-	48%	-	16%	7%
			399	8%	-	8%	-	48%	-	16%	7%
			400	8%	-	8%	-	48%	-	16%	7%
	Bs	bp	i	152%	-	21%	-	39%	-	3%	15%
		bs~~n~~	1	8%	-	8%	-	29%	-	9%	6%
			2	8%	-	8%	-	29%	-	9%	6%
			399	8%	-	8%	-	29%	-	9%	6%

				Aboveground Biomass		Underground Biomass		Dead Wood		Litter	Total
				BARA	BNAA	BARS	BNAS	MMA	MMS	H	
				Include	Include	Include	Include	Include	Include	Include	
				tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}	tCO_2-e ha^{-1}
			400	8%	-	8%	-	29%	-	9%	6%
	Man	bp	i	93%	-	13%	-	29%	-	25%	10%
		bsa	1	13%	-	13%	-	37%	-	101%	10%
			2	13%	-	13%	-	37%	-	101%	10%
			399	13%	-	13%	-	37%	-	101%	10%
			400	13%	-	13%	-	37%	-	101%	10%
	Bp-Y	bp	i	81%	-	11%	-	118%	-	117%	9%
		bsa	1	11%	-	11%	-	125%	-	117%	9%
			2	11%	-	11%	-	125%	-	117%	9%
			399	11%	-	11%	-	125%	-	117%	9%
			400	11%	-	11%	-	125%	-	117%	9%
C	an			-	12%	-	12%	-	-	-	10%
	per		1	71%	68%	71%	68%	35%	-	48%	39%
			2	71%	68%	71%	68%	35%	-	48%	40%
			3	71%	68%	71%	68%	35%	-	48%	40%
			4	71%	68%	71%	68%	35%	-	48%	40%
			5	71%	68%	71%	68%	35%	-	48%	40%
			6	71%	68%	71%	68%	35%	-	48%	40%
			400	71%	68%	71%	68%	35%	-	48%	40%
P				-	-	-	-	76%	-	-	10%
AU				-	-	-	-	-	-	-	-
H			nat	-	-	-	-	-	-	-	-
			art	-	-	-	-	-	-	-	-
OT		para		-	2%	-	2%	-	-	-	1%
		sd	nat	-	-	-	-	-	-	-	-
			art	-	-	-	-	-	-	-	-
SI				-	-	-	-	-	-	-	-

Table 12.2.5. Average relative uncertainties (%) at 90% confidence interval of percent canopy cover and of the carbon stocks (in $tCO_2e\ ha^{-1}$). The carbon stock uncertainty was calculated by applying root mean square errors to estimate the margin of error of the stocks.

Forest type		1998				2011				
Name	Condition	Canopy cover		Carbon stock		Condition	Canopy cover		Carbon stock	
		% Mean	% Uncertainty	$tCO_2e\ ha^{-1}$	% uncertainty		% Mean	% Uncertainty	$tCO_2e\ ha^{-1}$	% uncertainty
Wet and rain forests	Intact	99.3%	0.1%	643.33	170%	Intact	99.5%	0.1%	644.87	170%
Wet and rain forests	Intact	96.8%	1.5%	628.80	174%	Degraded	77.5%	1.9%	516.71	212%
Wet and rain forests	Intact	99.0%	0.5%	641.73	171%	Very degraded	33.3%	17.1%	259.14	423%
Wet and rain forests	Degraded	76.1%	1.4%	508.24	215%	Intact	98.3%	0.8%	637.96	172%
Wet and rain forests	Degraded	76.8%	2.2%	512.82	214%	Degraded	75.1%	2.7%	502.74	218%
Wet and rain forests	Degraded	76.1%	2.2%	508.24	215%	Very degraded	31.0%	24.5%	245.76	446%
Wet and rain forests	Very degraded	32.4%	12.0%	254.08	431%	Intact	98.4%	0.5%	638.45	172%
Wet and rain forests	Very degraded	38.7%	24.1%	290.42	377%	Degraded	75.9%	2.4%	507.17	216%
Wet and rain forests	Very degraded	24.2%	14.7%	206.22	531%	Very degraded	21.8%	15.6%	192.19	570%
Moist forests	Intact	99.1%	0.2%	642.30	926%	Intact	98.7%	0.2%	640.37	928%
Moist forests	Intact	97.7%	1.0%	634.41	937%	Degraded	77.1%	1.5%	514.36	1156%
Moist forests	Intact	98.9%	0.5%	641.37	927%	Very degraded	28.2%	13.8%	229.60	2590%
Moist forests	Degraded	76.9%	1.6%	513.07	1159%	Intact	97.9%	0.9%	635.18	936%
Moist forests	Degraded	76.0%	2.1%	507.89	1171%	Degraded	74.5%	2.2%	499.07	1191%
Moist forests	Degraded	75.4%	2.2%	504.68	1178%	Very degraded	40.2%	15.5%	299.44	1986%

Forest type	1998					2011				
Name	Condition	Canopy cover		Carbon stock		Condition	Canopy cover		Carbon stock	
		% Mean	% Uncertainty	$tCO_2e\ ha^{-1}$	% uncertainty		% Mean	% Uncertainty	$tCO_2e\ ha^{-1}$	% uncertainty
Moist forests	Very degraded	28.5%	14.3%	231.01	2574%	Intact	98.3%	0.6%	637.87	932%
Moist forests	Very degraded	37.4%	25.5%	283.11	2100%	Degraded	75.3%	3.1%	504.01	1180%
Moist forests	Very degraded	26.3%	12.0%	218.12	2726%	Very degraded	27.9%	11.6%	227.76	2611%
Dry forests	Intact	100.0%	0.0%	647.70	918%	Intact	96.8%	1.3%	629.30	945%
Dry forests	Intact	97.7%	4.0%	634.10	938%	Degraded	77.0%	5.7%	513.72	1157%
Dry forests	Intact	100.0%	0.0%	647.70	918%	Very degraded	18.9%	71.8%	175.22	3393%
Dry forests	Degraded	*78.0%*	*54.4%*	519.54	1144%	Intact	94.0%	*38.3%*	612.75	970%
Dry forests	Degraded	*78.0%*	*54.4%*	519.54	1144%	Degraded	78.0%	*46.2%*	519.54	1144%
Dry forests	Degraded	N/A	N/A	N/A	N/A	Very degraded	N/A	N/A	N/A	N/A
Dry forests	Very degraded	32.0%	359.9%	251.59	2363%	Intact	96.7%	5.3%	628.28	946%
Dry forests	Very degraded	0.0%	0%	65.16	9121%	Degraded	84.0%	42.9%	554.49	1072%
Dry forests	Very degraded	20.0%	76.0%	181.69	3272%	Very degraded	25.3%	138.8%	212.76	2795%
Mangrove	Intact	98.9%	1.1%	641.39	927%	Intact	99.2%	0.7%	642.84	925%
Mangrove	Intact	N/A	N/A	N/A	N/A	Degraded	N/A	N/A	N/A	N/A
Mangrove	Intact	N/A	N/A	N/A	N/A	Very degraded	N/A	N/A	N/A	N/A
Mangrove	Degraded	80.0%	*11.6%*	531.19	1119%	Intact	94.0%	*9.9%*	612.75	970%
Mangrove	Degraded	72.0%	35.1%	484.59	1227%	Degraded	76.0%	33.2%	507.89	1171%
Mangrove	Degraded	N/A	N/A	N/A	N/A	Very degraded	N/A	N/A	N/A	N/A

Forest type	1998					2011				
Name	Condition	Canopy cover		Carbon stock		Condition	Canopy cover		Carbon stock	
		% Mean	% Uncertainty	$tCO_2e\ ha^{-1}$	% uncertainty		% Mean	% Uncertainty	$tCO_2e\ ha^{-1}$	% uncertainty
Mangrove	Very degraded	N/A	N/A	N/A	N/A	Intact	N/A	N/A	N/A	N/A
Mangrove	Very degraded	N/A	N/A	N/A	N/A	Degraded	N/A	N/A	N/A	N/A
Mangrove	Very degraded	N/A	N/A	N/A	N/A	Very degraded	N/A	N/A	N/A	N/A
Palm forest	Intact	99.4%	0.7%	643.92	923%	Intact	99.3%	0.7%	643.60	924%
Palm forest	Intact	N/A	N/A	N/A	N/A	Degraded	N/A	N/A	N/A	N/A
Palm forest	Intact	99.2%	1.7%	643.04	925%	Very degraded	0.0%	0%	65.19	9121%
Palm forest	Degraded	74.0%	68.3%	496.24	1198%	Intact	100.0%	0.0%	647.70	918%
Palm forest	Degraded	72.0%	*45.9%*	484.59	1227%	Degraded	68.0%	N/A	461.29	1289%
Palm forest	Degraded	77.3%	10.1%	515.66	1153%	Very degraded	10.0%	515.5%	123.44	4817%
Palm forest	Very degraded	28.4%	43.7%	230.88	2575%	Intact	99.9%	0.2%	647.05	919%
Palm forest	Very degraded	N/A	N/A	N/A	N/A	Degraded	N/A	N/A	N/A	N/A
Palm forest	Very degraded	15.8%	56.7%	157.22	3782%	Very degraded	0.8%	155.9%	69.67	8535%

* Certain percent canopy cover uncertainties are italicized. Because there was only 1 observation in the dataset to estimate the canopy cover for particular forest classes (e.g., degraded dry forest in 1998 that stayed degraded in 2011), their error could not be estimated. As a result, the highest measure of error (the standard deviation) found in that forest type was applied to this class. The standard deviation was then multiplied by 1.645[105] to come up with an approximate value of the percent uncertainty. N/A values indicate when there were no observations of the class (e.g., no intact palm forests in 1998 were observed to become degraded palm forests in 2011).

[105] This value is used because, for normal distributions, 90% of the area will be within 1.645 times the standard deviation.

					CO_2												Non-CO_2 Gas		Total
					Aerial biomass		Underground biomass		Dead wood		Litter	C Land	Harvested Wood products: use change crops				Biomass burn		
					BARA	BNAA	BARS	BNAS	MMA	MMS	H	COS	PM.F1	PM.F2	PM.F3	PM.F4	CH_4	N_2O	
					Include	Include	Include	Include	Include	Exclude	Include	Exclude	Include	Include	Include	Include	Include	Include	
					%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
TF & TCF	Bhp	BP	Smf	i	8%		8%		18%		0%	0%			2%	20%	23%	137%	0%
				d	8%		8%		18%		0%	0%			1%	20%	22%	135%	0%
				md	8%		8%		18%		0%	0%			1%	20%	19%	134%	0%
			Cmf	int	8%		8%		23%		0%	0%			1%	20%	23%	137%	0%
		BN	Smf	1	8%		8%		8%		0%	0%			1%	23%	22%	117%	0%
				2	8%		8%		8%		0%	0%			1%	22%	20%	117%	0%
				399	8%		8%		8%		0%	0%			2%	22%	21%	116%	0%
				400	8%		8%		8%		0%	0%			2%	22%	21%	116%	0%
	Bh	BP	Smf	i	8%		8%		48%		0%	0%			2%	21%	22%	138%	0%
				d	8%		8%		48%		0%	0%			1%	20%	21%	136%	0%
				md	8%		8%		48%		0%	0%			1%	20%	18%	138%	0%
			Cmf	int	8%		8%		48%		0%	0%			2%	21%	23%	138%	0%

				CO_2												Non-CO_2 Gas		Total
				Aerial biomass		Underground biomass		Dead wood		Litter	C Land	Harvested Wood products: use change crops				Biomass burn		
				BARA	BNAA	BARS	BNAS	MMA	MMS	H	COS	PM.F1	PM.F2	PM.F3	PM.F4	CH_4	N_2O	
				Include	Include	Include	Include	Include	Exclude	Include	Exclude	Include	Include	Include	Include	Include	Include	
				%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
	BS	Smf	1	8%		8%		48%		0%	0%			1%	23%	19%	123%	0%
			2	8%		8%		48%		0%	0%			2%	22%	20%	119%	0%
			399	8%		8%		48%		0%	0%			2%	22%	21%	118%	0%
			400	8%		8%		48%		0%	0%			2%	22%	21%	118%	0%
	bp	Smf	i	8%		8%		78%		0%	0%			2%	20%	22%	168%	0%
			d	8%		8%		78%		0%	0%			1%	20%	20%	172%	0%
			md	8%		8%		78%		0%	0%			2%	20%	18%	188%	0%
		Cmf	int	8%		8%		29%		0%	1%			1%	20%	22%	145%	0%
Bs	bn	Smf	1								0%							
			2	0%		0%		0%			0%							0%
			399	8%		8%		29%		0%	1%			2%	22%	20%	125%	0%
			400	8%		8%		29%		0%	1%			2%	22%	20%	125%	0%
	bp	Smf	i	12%		12%		29%		0%	0%			2%	25%			0%

				CO_2												Non-CO_2 Gas		Total
				Aerial biomass		Underground biomass		Dead wood		Litter	C Land	Harvested Wood products: use change crops				Biomass burn		
				BARA	BNAA	BARS	BNAS	MMA	MMS	H	COS	PM.F1	PM.F2	PM.F3	PM.F4	CH_4	N_2O	
				Include	Include	Include	Include	Include	Exclude	Include	Exclude	Include	Include	Include	Include	Include	Include	
				%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Man	bn	Smf	d	12%		12%		29%		0%	0%			2%	25%			0%
			md	11%		11%		29%		0%	0%			2%	24%			0%
		Cmf	int	12%		12%		37%		0%	0%			2%	25%			0%
		Smf	1	12%		11%		43%		0%	0%			0%	25%			0%
			2	12%		12%		36%		0%	0%			2%	25%			0%
			399	12%		12%		37%		0%	0%			2%	24%			0%
			400	12%		12%		37%		0%	0%			2%	24%			0%
Bp-Y	bp	Smf	i	22%		22%		118%			0%							0%
			d	21%		21%		118%			0%							0%
			md	21%		21%		118%			0%							0%
		Cmf	int	22%		22%		122%			0%							0%
	bn	Smf	1	22%		22%		133%			0%							0%
			2	22%		21%		142%			0%							0%

				CO_2												Non-CO_2 Gas		Total
				Aerial biomass		Underground biomass		Dead wood		Litter	C Land	Harvested Wood products: use change crops				Biomass burn		
				BARA	BNAA	BARS	BNAS	MMA	MMS	H	COS	PM.F1	PM.F2	PM.F3	PM.F4	CH_4	N_2O	
				Include	Include	Include	Include	Include	Exclude	Include	Exclude	Include	Include	Include	Include	Include	Include	
				%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
			399	22%		22%		141%			0%							0%
			400	22%		22%		141%			0%							0%
	an				12%		12%											
		zll	1	71%	68%	70%	69%	33%			47%							
			2	71%	68%	70%	68%	33%			47%							
			399	71%	68%	71%	68%	35%			48%							
C			400	71%	68%	71%	68%	35%			48%							
	per	zh	1	71%	68%	70%	69%	33%			47%							
			2	71%	68%	70%	68%	33%			47%							
			399	71%	68%	71%	68%	35%			48%							
			400	71%	68%	71%	68%	35%			48%							
P								76%										
AU																		

				CO_2												Non-CO_2 Gas		Total
				Aerial biomass		Underground biomass		Dead wood		Litter	C Land	Harvested Wood products: use change crops				Biomass burn		
				BARA	BNAA	BARS	BNAS	MMA	MMS	H	COS	PM.F1	PM.F2	PM.F3	PM.F4	CH_4	N_2O	
				Include	Include	Include	Include	Include	Exclude	Include	Exclude	Include	Include	Include	Include	Include	Include	
				%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
H			nat															
			art															
OT		para			2%		2%											
		sd	nat															
			art															
SI																		

Uncertainty of the reference level

The uncertainty of the reference level is estimated by combining the uncertainty of activity data and emission factors as described in the previous section. Following the requirements of MF-FCPF, this combination of uncertainties has been done through Approach 2 of the IPCC 2006 Guidelines, employing Monte Carlo simulations, and the uncertainties are reported in terms of 90% confidence intervals.

The following steps were conducted to estimate final uncertainty:

1. Estimation of activity data uncertainty: The results of the accuracy assessment of the land use change maps were used to estimate uncertainty. The 90% confidence interval was reported relative to the estimated area of each land use change class.
2. Estimation of the uncertainty of the input data to estimate emission factors: As explained in the previous section, the emission factor input data were estimated using the Costa Rica NFI, and the values obtained from the bibliography for non-forest land uses. For forest remaining forest activities, the percent canopy cover values and the canopy cover-biomass model were used. The errors of all these input data were estimated using a 90% confidence interval.
3. Monte Carlo simulations: Monte Carlo simulations were run 10,000 times for each activity data and emission factor value and applied to the equations used to identify the final distributions of emissions and removal estimates in the different activities using the Monte Carlo simulation software SimVoi[106]. The following assumptions were made about each value: a) that they had a normal (i.e., Gaussian) distribution and b) the estimated values are the means of the normal distributions. The simulated distributions were also truncated to prevent unrealistic values from being generated. For all parameters where the value could not be less than 0, such as activity data, the distributions were truncated to a minimum value of 0. For the simulation of carbon stocks in the activities forest degradation and enhancements in forest remaining forest, because the uncertainties were so large, it was also necessary to truncate the values by setting maximum values to ensure that values produced were not unrealistically high. The maximum values were established as three times the estimated value of the carbon stock in intact forests at 100% canopy cover. These carbon stock values were taken from the bibliography.
4. Uncertainty estimation: Based on the Monte Carlo simulations produced for emissions and removals in the different activities, the 90% confidence interval was identified by running a bootstrapping analysis. In this analysis, the means of the different Monte Carlo simulations were resampled 1,000 times, and the confidence intervals were derived by subtracting the the 5% percentile value from the 95% percentile value of the distribution of resampled means. The bootstrapping analysis was conducted using the R package "resample". Half the confidence intervals (i.e. the margins of error) were then divided by the mean of the distribution and then multipled by 100% to come up with the percent uncertainty.

~~The total uncertainty of the reference level was estimated with the Montecarlo method by considering the combined uncertainty of the activity data and of the emission factors. For this purpose, two macros of the "FREL TOOL CR v.1" tool were incorporated. The first one calculates the uncertainty level in the "FREL&FRL" sheet (see line 469) and the second one calculates the uncertainties of the emission reduction program results in the "RESULTS" sheet (see line 132).~~

~~**Table Chart 12.2.16.** shows the parameters defined in one of the Montecarlo simulations performed, with 10,000 iterations. Table **12.2.19.** shows the results of the Montecarlo simulations for each REDD+ activity by using the setting of Table **12.2.16**. The results are shown at 90% trust.~~

~~**Table Chart 12.2.20.** shows the final relative uncertainties of the reference level considering all the activities included.~~

~~**Table Chart 12.2.16**. Configuration of the Montecarlo simulation performed.~~

[106] https://treeplan.com/simvoi/

~~Date~~	~~9/17/2015 15:35~~	
~~Iterations~~	~~10,000~~	-
~~Trust level~~	~~0.9~~	-
~~Include activity data uncertainty~~	~~Yes~~	-
~~Include emission factor data uncertainty~~	~~Yes~~	-

Tabe **12.2.7.** shows the results of the Monte Carlo simulations for each REDD+ activity **when including both activity data and emission factor uncertainty**. The results are shown at the 90% confidence interval.

In order to determine the relative contribution of the activity data to the total uncertainty of the reference level, 10,000 Monte ~~c~~Carlo simulations were also run including the uncertainties just associated with the activity data ~~performed with the configuration shown in **Table 12.2.17**~~ (*i.e*. ignoring the uncertainty of the emission factors). **Table 12.2.~~21~~ 8** shows the results of the Monte ~~c~~Carlo simulations using these settings. Likewise, Monte ~~c~~Carlo simulations were run including just the uncertainties of the emission factors ~~performed with the configuration shown in **Table 12.2.18**~~ (*i.e*. ignoring the uncertainty of the activity data). **Table 12.2.~~22~~ 9** shows the results of these Monte ~~c~~Carlo simulations ~~using these settings~~.

~~**TableChart 12.2.17**. Configuration of the Montecarlo simulation performed to determine the relative contribution of the activity data to the total uncertainty of the reference level.~~

~~Date~~	~~10/20/2015 4:55:37 PM~~	
~~Iterations~~	~~10,000~~	-
~~Trust level~~	~~0.9~~	-
~~Include activity data uncertainty~~	~~Yes~~	-
~~Include emission factor data uncertainty~~	~~No~~	-

~~**TableChart 12.2.18**. Configuration of the Montecarlo simulation performed to determine the relative contribution of the activity data to the total uncertainty of the reference level.~~

~~Date~~	~~10/31/2015 7:05:01 AM~~	
~~Iterations~~	~~10,000~~	-
~~Trust level~~	~~0.9~~	-
~~Include activity data uncertainty~~	~~No~~	-
~~Include emission factor data uncertainty~~	~~Yes~~	-

Table~~Chart~~ **12.2.~~19~~6.** Uncertainty of the reference level. ~~Mean and percentiles~~Percent uncertainty for each REDD+ activity, ~~according to~~following the 10,000 Monte ~~c~~Carlo ~~simulations performed with the settings shown in Table 12.2.16~~.

Activity	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total anthropogenic deforestation	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%
Anthropogenic deforestation of primary forests	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%
Anthropogenic deforestation of new forests	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%
Forest Degradation	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%
Regeneration of forest C stocks in secondary forest	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%
Enhancement of forest C stocks in forests remaining forests	1.61%	1.61%	1.61%	1.61%	1.61%	1.61%	1.61%	1.61%	1.61%	1.61%	1.61%	1.61%	1.61%	1.61%
Total reference level	14.01%	14.01%	14.01%	14.01%	14.01%	14.01%	14.01%	14.01%	14.01%	14.01%	14.01%	14.01%	14.01%	14.01%

Activity		Statistical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
DF_an	Total anthropogenic deforestation	Mean	7,212,197	7,212,197	7,212,197	7,212,197	7,212,197	7,212,197	7,212,197	7,212,197	7,212,197	7,212,197	7,212,197	7,212,197	7,212,197	7,212,197
		Percentile 95%	8,953,035	8,953,035	8,953,035	8,953,035	8,953,035	8,953,035	8,953,035	8,953,035	8,953,035	8,953,035	8,953,035	8,953,035	8,953,035	8,953,035
		Percentile 5%	5,541,494	5,541,494	5,541,494	5,541,494	5,541,494	5,541,494	5,541,494	5,541,494	5,541,494	5,541,494	5,541,494	5,541,494	5,541,494	5,541,494
	Anthropogenic deforestation of primary forests	Mean	5,289,882	5,289,882	5,289,882	5,289,882	5,289,882	5,289,882	5,289,882	5,289,882	5,289,882	5,289,882	5,289,882	5,289,882	5,289,882	5,289,882
		Percentile 95%	6,548,580	6,548,580	6,548,580	6,548,580	6,548,580	6,548,580	6,548,580	6,548,580	6,548,580	6,548,580	6,548,580	6,548,580	6,548,580	6,548,580
		Percentile 5%	4,060,428	4,060,428	4,060,428	4,060,428	4,060,428	4,060,428	4,060,428	4,060,428	4,060,428	4,060,428	4,060,428	4,060,428	4,060,428	4,060,428
	Anthropogenic deforestation of new forests	Mean	1,922,315	1,922,315	1,922,315	1,922,315	1,922,315	1,922,315	1,922,315	1,922,315	1,922,315	1,922,315	1,922,315	1,922,315	1,922,315	1,922,315
		Percentile 95%	2,421,850	2,421,850	2,421,850	2,421,850	2,421,850	2,421,850	2,421,850	2,421,850	2,421,850	2,421,850	2,421,850	2,421,850	2,421,850	2,421,850
		Percentile 5%	1,450,398	1,450,398	1,450,398	1,450,398	1,450,398	1,450,398	1,450,398	1,450,398	1,450,398	1,450,398	1,450,398	1,450,398	1,450,398	1,450,398
AE_bs	Carbon stocks increase in new forests	Mean	(4,419,941)	(4,419,941)	(4,419,941)	(4,419,941)	(4,419,941)	(4,419,941)	(4,419,941)	(4,419,941)	(4,419,941)	(4,419,941)	(4,419,941)	(4,419,941)	(4,419,941)	(4,419,941)
		Percentile 95%	(3,983,346)	(3,983,346)	(3,983,346)	(3,983,346)	(3,983,346)	(3,983,346)	(3,983,346)	(3,983,346)	(3,983,346)	(3,983,346)	(3,983,346)	(3,983,346)	(3,983,346)	(3,983,346)
		Percentile 5%	(4,885,601)	(4,885,601)	(4,885,601)	(4,885,601)	(4,885,601)	(4,885,601)	(4,885,601)	(4,885,601)	(4,885,601)	(4,885,601)	(4,885,601)	(4,885,601)	(4,885,601)	(4,885,601)
CO	Forests conservation	Mean	1,258,696,796	1,251,542,408	1,244,442,359	1,237,396,141	1,230,403,248	1,223,463,183	1,216,575,450	1,209,739,563	1,202,955,037	1,196,221,394	1,189,538,161	1,182,904,868	1,176,321,052	1,169,786,254
		Percentile 95%	1,342,540,737	1,334,837,280	1,327,327,134	1,319,899,695	1,312,399,076	1,305,055,812	1,297,825,884	1,290,568,060	1,283,393,761	1,276,358,170	1,269,262,058	1,262,194,945	1,255,180,549	1,248,142,803
		Percentile 5%	1,175,666,956	1,169,027,346	1,162,329,815	1,155,689,658	1,149,116,031	1,142,577,551	1,136,100,291	1,129,683,954	1,123,309,074	1,116,982,217	1,110,691,470	1,104,470,790	1,098,285,340	1,092,145,175
FREL	Total reference level (only flows)	Mean	2,792,256	2,792,256	2,792,256	2,792,256	2,792,256	2,792,256	2,792,256	2,792,256	2,792,256	2,792,256	2,792,256	2,792,256	2,792,256	2,792,256
		Percentile 95%	4,399,996	4,399,996	4,399,996	4,399,996	4,399,996	4,399,996	4,399,996	4,399,996	4,399,996	4,399,996	4,399,996	4,399,996	4,399,996	4,399,996
		Percentile 5%	1,198,082	1,198,082	1,198,082	1,198,082	1,198,082	1,198,082	1,198,082	1,198,082	1,198,082	1,198,082	1,198,082	1,198,082	1,198,082	1,198,082

Table~~Chart~~ **12.2.~~20~~7.** Relative uncertainty at 90% ~~trust~~ confidence intervalof the reference level **considering the combined uncertainty of the activity data and of the emission factors**~~, per the configuration of the Montecarlo simulations shown in Table 12.2.16~~.

Statistical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
% uncertainty	14.01	14.01	14.01	14.01	14.01	14.01	14.01	14.01	14.01	14.01	14.01	14.01	14.01	14.01

~~Statistical~~	~~2010~~	~~2011~~	~~2012~~	~~2013~~	~~2014~~	~~2015~~	~~2016~~	~~2017~~	~~2018~~	~~2019~~	~~2020~~	~~2021~~	~~2022~~	~~2023~~
~~Higher level to 90% significance~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~	~~57.58 %~~
~~Lower level to 90% significance~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~	~~57.09 %~~

Table~~Chart~~ **12.2.~~21~~8.** Relative uncertainties at 90% ~~of the trust level~~confidence interval of the reference level **only considering the activity data** ~~per the configuration of the Montecarlo simulations shown in Table 12.2.17~~.

Statistical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
% uncertainty	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08

~~Statistical~~	~~2010~~	~~2011~~	~~2012~~	~~2013~~	~~2014~~	~~2015~~	~~2016~~	~~2017~~	~~2018~~	~~2019~~	~~2020~~	~~2021~~	~~2022~~	~~2023~~
~~Higher level to 90% significance~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~	~~57.45 %~~
~~Lower level to 90% significance~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~	~~55.56 %~~

Table~~Chart~~ **12.2.~~22~~9.** Relative uncertainties at 90% ~~of the trust level~~confidence interval of the reference level **only considering the emission factors**~~, per the configuration of the Montecarlo simulations shown in Table 12.2.18~~.

Statistical	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
% uncertainty	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00

~~Statistical~~	~~2010~~	~~2011~~	~~2012~~	~~2013~~	~~2014~~	~~2015~~	~~2016~~	~~2017~~	~~2018~~	~~2019~~	~~2020~~	~~2021~~	~~2022~~	~~2023~~
~~Higher level to 90% significance~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~	~~14.12 %~~
~~Lower level to 90% significance~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~	~~14.16 %~~

As shown in Tab**les 12.2.~~20~~7., 12.2.~~21~~8. y 12.2.~~22~~9.**, the biggest contributor to ~~most important proportion of~~ the estimated total uncertainty for the reference level at a ~~trust level~~confidence interval of 90% (~~57.09% - 57.58%~~14%) is ~~attributable to~~ the uncertainty of the emission factor~~activity data, since by.~~ ~~I~~Ignoring the uncertainties of the activity data ~~emission factors~~, the total uncertainty of the reference level ~~is~~ at a confidence interval ~~trust level~~ of 90% is 11%. In contrast, ignoring the uncertainties of the emission factors, the total uncertainty of the reference level at a confidence level of 90% is just 0.08%. Furthermore, Table **12.2.6** shows that the uncertainties of forest degradation and enhancements in forest remaining forest are higher than the land use change activities. This can be explained by the larger uncertainties in the linear models used to calculate biomass based on canopy covers, resulting in greater uncertainties associated with the emissions from degradation and enhancements of forest carbon stocks in forest remaining forests than the uncertainties for the activities that did not apply this model, i.e. deforestation and regeneration of forest carbon stocks in secondary forests. The linear model uncertainty also explains why the emission factor uncertainties are higher.~~, within the rank of 57.45% - 57.56%, while by ignoring the uncertainties of the activity data, the total uncertainty of the reference level is at a trust level of 90%, within the rank of -14.12% - 14.16%. From this analysis, it is concluded that improving the accuracy of the land use change maps is the most appropriate strategy to increase the accuracy on determining estimated emissions and absorptions.~~

To improve the accuracy of future estimates, the following areas can be already identified as priority to continue making the data more precise:

- Because the errors of the canopy cover-biomass models being used are large, Costa Rica is currently collecting more field data to improve the model, thereby lowering uncertainty. Improving this model is the most appropriate strategy to reducing the uncertainty in determining estimated emissions and removals.
- Certain uncertainties associated with the canopy cover values also are quite high, which indicates that more data should be collected through the sampling of more plots.
- The uncertainties of the aboveground biomass pool in primary forests and the aboveground and belowground biomass pools in non-forest categories are high (>50%). It will be necessary to sample plots throughout the country to measure biomass in these categories to reduce the uncertainties.

13. Calculation of Emission Reductions

13.1. Ex-ante estimation of Emission Reductions

~~Ex-ante estimation of emission reduction will be updated once the RL improvements in **Section 8.8** are implemented. Preliminarily, and without considering these changes, the t~~Total expected emission reductions for the ER-Program are shown in **Table 13.1**. Ex-ante emission reductions are projected for 2014-2025, based on the actual measurements for 2012-2013 (**Table 2.2.~~1~~2**). To project emission reductions for 2014-20~~1~~25, it was assumed that annual ~~net~~ emission reductions throughout this period equaled the average of ~~net~~ emission reductions measured for 2012-2013 (~~2,079,946~~1,924,080 ~~1,752,620~~ 2,332,241t CO_2e yr^{-1}). Total emission reductions expected under the ER-Program are ~~7,795,305~~8,275,081 ~~24,536,680~~ 7,393,554 t CO_2e.

~~It is important to note that the same average of net emissions from degradation has been considered for the reference period (1998-2011) and for the measurement period (2012-2013). Therefore, the uncertainty buffer of emission reduction only considers the change in emissions from deforestation and reforestation. Thereby, a~~According to **Section 12**, total uncertainty of measured emission reductions was 14.01%~~varies between 17,5% and 26,1%, depending on the year.~~ ~~-~~Considering Criterion 22 of the CF-MF, a 40% discount was applied (Table 13.1).

~~Considering that T~~itle transfer ~~may only be possible fo~~was assumed for 32% of total emission reductions (~~**Section 17,** **Table 13.1**~~).~~, a total of 7,537,668 t CO_2e transferrable emissions would be generated in 2012-2025.~~

In terms of risks of reversals, it was assumed to be ~~20~~13%. Costa Rica proposes manage Reversal Risks through the use of an ER Program CF Buffer. In this sense, it will be established a buffer reserve accounts for this purpose in an appropriate ER Transaction Registry.~~Costa Rica proposes that emission reductions from the period 2012-2016 are accepted for the buffer for managing reversal risk. Hence, no additional deductions apply to the total of 8,275,081 t CO_2e 7,537,668 t CO_2e transferrable emissions in 2012-2025.~~

Table 13.1. Expected volume of transferrable emission reductions to the FCPF Carbon Fund.

ERPA term year t	Reference level (t CO2e/yr) (A)	Estimation of expected forest-related emission reductionss and absorptions under the ER Program			Estimation of expected set-aside to reflect the level of uncertainty associated with the estimation of ERs during the Term of the ERPA			Transferrable Estimated emission reductions			Estimated results of the program under the FCPF Carbon Fund		
		Transferrable (C=0.32*I)	Non transferr-able (D=0.68*I)	All lands (B=C+D)	Transferra ble (F=0.04*C)	Non transferr-able (G)	All lands (E=F+G)	Transferr-able (I=C-F)	Non transferr-able (J=D-G)	All lands (H=I+J)	Emission reductions for result-based payments (O)	Reserve to compensate possible future reversals (R=0.2*O)	Total estimated results on public lands (S=O-R)
2012	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	–	–	638,959
2013	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	–	–	638,959
2014	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	–	–	638,959
2015	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	–	–	638,959
2016	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	–	–	638,959
2017	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	638,959	127,792	511,168
2018	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	638,959	127,792	511,168
2019	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	638,959	127,792	511,168
2020	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	638,959	127,792	511,168
2021	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	638,959	127,792	511,168
2022	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	638,959	127,792	511,168
2023	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	638,959	127,792	511,168
2024	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	638,959	127,792	511,168
2025	4,854,712	665,583	1,414,363	2,079,946	26,623	–	26,623	638,959	1,414,363	2,053,323	638,959	127,792	511,168
-	67,965,967	9,318,158	19,801,085	29,119,243	372,726	–	372,726	8,945,431	19,801,085	28,746,517	5,750,634	1,150,127	7,795,305

ERPA term year t	Reference level (t CO2e/yr) (A)	Estimation of expected forest-related emission reductions under the ER Program			Estimation of expected set-aside to reflect the level of uncertainty associated with the estimation of ERs during the Term of the ERPA			Transferrable emission reductions			Estimated results of the program u the FCPF Carbon Fund		
		Transferrable (B=0.32*C)	Non transferr-able (D=0.68*B)	All lands (C~~B~~)	Transferr able (F=0*C)	Non transferr-able (G)	All lands (E=F+G)	Transferr-able (I=C-E)	Non transferr-able (J=D-G)	All lands (H=I+J)	Emission reductions for result-based payments (O=I)	Reserve to compensate possible future reversals (R=0.13*O)	Tot estima result pub lands R)
2012	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	0	0	576
2013	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	0	0	576
2014	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	0	0	576
2015	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	0	0	576
2016	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	0	0	576
2017	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	576,271	74,915	501
2018	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	576,271	74,915	501
2019	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	576,271	74,915	501
2020	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	576,271	74,915	501
2021	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	576,271	74,915	501
2022	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	576,271	74,915	501
2023	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	576,271	74,915	501
2024	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	576,271	74,915	501
2025	4,133,087	576,271	1,224,575	1,800,846	0	0	0	576,271	1,224,575	1,800,846	576,271	74,915	501
	57,863,224	8,067,791	17,144,055	25,211,846	0	0	0	8,067,791	17,144,055	25,211,846	5,186,437	674,237	7,393

14. Safeguards

14.1. Description of how the ER Program meets the World Bank social and environmental safeguards and promotes and supports the safeguards included in UNFCCC guidance related to REDD+

Safeguards are instruments aimed to create conditions to increase the benefits and mitigate the risks of forest owners and other relevant stakeholders involved in the implementation of activities under the REDD + strategies for any project eventually developed in the territories and has potential to affect them, in this case the Emission Reduction Program. For this program, as described in the following figure (**Figure 14.1.1**) the attention to safeguards in Costa Rica, is based on the full implementation of relevant regulations, ranging from general instruments such as the Safeguards agreed under the UNFCCC, the applicable World Bank Operational Policies, the National Legal framework and its subsequent institutional framework.

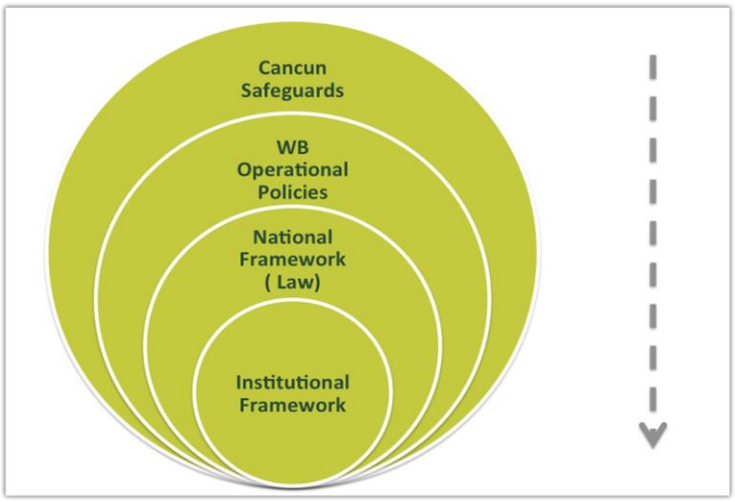


Figure 14.1.1. Design of the approach of UNFCCC Safeguards and the Operational Policies of the World Bank in in CR.

Compliance of World Bank's operational policies

The design and implementation of the ~~Emissions Reduction~~Emission Reductions Program has been developed in accordance with the Environmental and Social Management Framework (ESMF), which addresses the identification and definition of the application of UNFCCC safeguards as per Decision 1/CP.16 and its Appendix 1 and the World Bank Operational Policies, applicable in the country.

The World Bank's Operational Policies activated in the Integrated Safeguard Data Sheet (ISDS[107]) for the case of Costa Rica are the following:

- Environmental Assessment (OP 4.01)
- Forests (OP 4.36)
- Natural Habitats (OP 4.04)
- Involuntary relocation (OP 4.12)
- Indigenous peoples (OP 4.10).

[107] INTEGRATED SAFEGUARDS DATA SHEET ADDITIONAL FINANCING. APPRAISAL STAGE. Report No.: ISDSC6044. December 2015.

- Pest Control (OP 4.09)

On the other hand, the following operational policies were not activated in the case of Costa Rica:

- Physical cultural resources (OP 4.11): Because the team has found no evidence that the activities of REDD+ National Strategy will be implemented in forestry lands declared physical cultural resources by the Government of Costa Rica.
- Hydroelectric Dams' Safety (OP 4.37): Because the REDD+ Strategy will not fund the construction or rehabilitation of hydroelectric dams nor depends on the performance of existing ones.
- International Navigational Waters (OP 7.50): REDD+ Strategy will not perform activities to affect the amount or quality of international navigational waters.
- Projects in Areas in Dispute (7.60): The REDD+ National Strategy will not fund activities in areas in dispute as defined in the World Bank's policy.

As we have already mentioned, the way in which the environmental and social safeguards of the World Bank are complied with is set forth in the Environmental and Social Management Framework (MGAS), an instrument where an analysis is performed and the procedures to follow are set in the case of applicable operational policies. For the implementation and approach to these operational policies, the natural legal framework is used in the first instance, and as a complement, the guidelines, rules and principles set in the operational policies mentioned were considered. Below, there is a brief explanation of each operational policy and a summary or how these policies are complied with within the Framework of the Emission Reduction Program. For more details, the MGAS can be consulted.

OP 4.01 Environmental Assessment

This operational policy is approached through the application of national legislation for being too comprehensive: Environment Organic Law N° 7554 of 1995; Executive Decree N° 31849-MINAE-SALUD-MOPT-MAG-MEIC; General Regulations on the Environmental Impact Assessment Procedures (EIA). It is considered that this regulatory framework is sufficiently comprehensive and complete, ensuring the proper implementation of the required environmental assessment policy and is broadly consistent with the safeguards.

OP 4.01, sets four categories; for the case of Costa Rica, Category B is applicable, whose possible environmental repercussions on human populations or zones with ecologic importance are less adverse than those of category A. This is because the nature of the activities defined in the Emission Reduction Program and in the REDD+ National Strategy could have adverse repercussions in the population. Due to the foregoing, and as part of the actions to implement this safeguard, Costa Rica performed a Social and Environmental Strategic Assessment (SESA) for which propose a series of workshops took place with the Relevant Interested Parties (RIPs) to obtain feedback in the preparation of the REDD+ National Strategy and as part of the SESA process and the Social and Environmental Management Framework (MGAS in Spanish). The SESA process has been performed consistently with the World Bank's (safeguards) social and environmental operational policies.

The MGAS was developed during 2014-2015; it is the instrument under which the social and environmental impacts identified in the SESA were examined and their management was proposed through implementation procedures of safeguard and monitoring plans to mitigate them, as well as the different frameworks developed such as the Involuntary Relocation and Process Framework and the Planning Framework for Indigenous Peoples. In addition to that, a series of studies on the historic and current environmental situation have been performed such as the causes of deforestation, which have contributed to improve the proposals for the Emission Reduction Program and the REDD+ National Strategy.

OP 4.04: Natural Habitats

The operational Natural Habitats Policy is enforced through the application of the national legislation that is comprehensive: Environment Organic Law N. 7554 de 1995; Forestry Law N. 7575, de 1996; Biodiversity Law N° 7788 de 1998.

It is expected that the REDD+ National Strategy positively influence on the maintenance and increase of natural habitats in Costa Rica, defining actions for the maintenance and broadening of the Payment for Environmental Services program (PES in Spanish), the efforts to improve the protected areas system and the State natural heritage, along with the reinforcement of national strategies on fire management and illegal clearing control, as well as the incorporation of the natural regeneration and of Tree plantations within the framework of the policies and actions to be promoted, supposes an improvement of the natural capital of the country. This means a positive affectation on carbon stocks and other environmental co-benefits. In the specific case of the Emission Reduction Program for Costa Rica, through the application of this operational policy and the application of the national legislation, the aim is to assure the maximization of protection activities and the broadening of natural habitats as well as the services they provide to the population. This criterion is compatible with the provisions in Article 11 of the Biodiversity Law.

In this sense, the SESA's participatory and analytical process did not highlight any potential risk associated to the policies and actions of the REDD+ National Strategy in Protected Wildlife Areas (ASP in Spanish) forest habitats, besides other sensitive forest habitats under private or communal control. During the implementation of the Emission Reduction Program the relevant stakeholders will be consulted (PIRs), in order to identify possible negative and positive implications of the policies and actions on natural habitats, including monitoring activities to assure that critical natural habitats are not affected. Indicators have been included in the follow-up and assessment process proposed in MGAS to assess possible impacts prior to the execution of any action performed in sensitive sites. The way this operational policy is complied with is set forth in the MGAS.

OP 4.09: Pest control

This safeguard is implemented by applying the national legislation which is very comprehensive: Law for the Development, Promotion and Enhancement of Agricultural Activities N° 8591 of 2007; Phytosanitary Protection Law N°7664 of 1997; Regulations on the Registration, use and control of agricultural plaguicides and adjuvants, Decree No. 24337-MAG-SALUD de 1995.

The World Bank promotes the biological management of plagues in order to reduce dependency on synthetic pesticides. In the projects approved by the Bank, the management of pests must be attended within the context of the environmental assessment. The Bank assesses the capacity of the regulatory and institutional frameworks of the beneficiaries in order to define their capacity to manage pests in an environmentally "friendly" way and promotes the integrated pest management (IPM).

This operational policy is activated because it is considered that the establishment of tree plantations, agro-forestry systems and other silvi-cultural activities are considered forecasted as part of Emission Reduction Program could suppose in specific cases, the need of dealing with pests, and an element that must be approached in a specific manner during the implementation and cannot be predetermined. Currently, there are no plans to promote actions to explicitly cause an increase on the use of pesticides or other chemicals. However, it is possible that some sustainable management of forest practices used in plantations may be used in silvi-cultural practices with pesticides. The impacts and risks associated to the possible use of any chemical product in forestry management, if necessary, will be analyzed and mitigated through actions contained in the forestry management plans.

OP 4.10: Indigenous peoples

OP 4.10, is complied with the development of the organization and consultation process, in compliance with OIL Convention 169 described in section 5.1.

All projects proposed for funding by the World Bank affecting Indigenous peoples must execute a prior consultation procedure, free and informed, aiming to obtain broad support from the indigenous community potentially affected.

With the SESA results, the Social and Environmental Management Framework (MGAS in Spanish) was prepared and filed before the World Bank; it serves as a guiding instrument for the implementation of the REDD+ National Strategy and for future investments in activities for land demonstration. The MGAS includes the Planning Framework for Indigenous Peoples (MPPI in Spanish) and its purpose is to address the problems that might arise from specific investments during the implementation of the Emission Reduction Program. Under this policy, the indigenous peoples affected by the REDD+ National Strategy must be consulted in an appropriate cultural manner and must provide wide community support. Costa Rica is also committed to comply with its duties under ILO Convention 169 regarding tribal and indigenous peoples.

OP 4.12: Involuntary Relocation Instruments

This policy covers the direct economic and social effects resulting from the investment projects that may derive in involuntary land deprivation and the involuntary restriction of access to zones qualified by the Law as parks or protected zones, with the subsequent adverse effects for the subsistence of the people displaced.

To comply with the involuntary relocation policy, a Framework of the Process (PF) will be prepared as part of the MGAS in order to manage the potential access restriction of local communities to rural resources. Additionally, an Involuntary Relocation Framework (MRI in Spanish) was prepared face the potential relocation of private land owners currently living in protected areas and the possible relocation and compensation of private land owners in indigenous territories.

In addition, the REDD+/CCAD/GIZ Program supported the development of "Action Plans for Land Reclamation in indigenous territories", which are a guide from the cadastral and legal perspective, that provides guidelines and relevant information about how each of the indigenous territories can take action regarding the recovery of their lands, according to current regulations.

These plans include land registry studies, which have provided a significant contribution to identify the problems of tenure in each of indigenous territories as well as the legal and/or administrative provisions necessary to address each specific situation, which seeks to generate greater profits for the various indigenous groups participating in REDD +, to the extent that the situation of land tenure of their territories is more consolidated.

OP 4.36: Forests

The purpose of OP 4. 36 is assisting the beneficiaries in using the potential of forests in the fight to reduce poverty in a sustainable manner, to integrate them into the sustainable economic development and to protect their values and environmental services, at the local and global levels. This policy applies to projects that might affect eh quality or life of forests; that affect populations depending on forest resources; and whose goal is to generate change in the management, protection or use of natural forests or plantations, public, private or communal. In this sense, the Bank does not fund projects implying forest degradation, disappearance or exploitation. In order to determine the possible negative environmental impacts on forest ecosystems, the Bank sets the assessment and mitigation guidelines through OP 4.01.

The Emission Reduction Program and the REDD+ National Strategy will be based on FONAFIFO's experience with the PES program and the principles, criteria and national indicators applicable to sustainable management of forest. During the preparation stage, these and other forest and rural development initiatives have been assessed by incorporating lessons learned in the design of the REDD+ National Strategy and the potential social and environmental risks associated to REDD+ in the MGAS. For this purpose, the contributions of participants of the different sectors in the participatory workshops were feedback of the highest importance. In the case of the Emission Reduction Program, being an initiative actively involving forests, these OP is of particular significance. Due to the foregoing, operational policy 4.36 serves as the parameter to assess all the forest management activities implying poverty reduction.

Approach to the safeguards of the United Nations Framework Convention on Climate Change

Costa Rica has broad institutional and legislative experience in the development and implementation of environmental and social safeguard mechanisms. Many of the principles set in the environmental and forest legislation of the country were issued almost 20 years ago to operationalize compliance of the constitutional obligation of granting the inhabitants of the country the enjoyment of a healthy and ecologically balanced environment, compatible with the safeguards of REDD+ under the Convention[108]. The policies and actions incorporated into the Emission Reduction program will support the respect of the aforementioned safeguards, and the full functioning of a transparent and robust information system according to COP's requirements. Specifically, policy 6 contains a series of actions towards reinforcing the foregoing. This policy is related to participation, transparency and accountability (**Section 4.3.**).

As mentioned above, the Emission Reduction Program is part of a political prioritizing initiative led by the Ministry of the Environment and Energy, seeking to prioritize efforts in the implementation of some strategies set in the Forestry National Development Plan in force, therefore guaranteeing the compatibility of both instruments. Additionally, the PRE sets clear work guidelines to improve the synergies between the objects of the main global environmental conventions of which the country is a party. National legislation sets the explicit prohibition of forest land change, guaranteeing an effective action against reversals. Finally, the PRE is envisioned as an additional effort that the country will start to strengthen its actions towards improving life quality of its population and the reduction of poverty, emphasizing in rural areas. This way, a proposal consistent with the general framework of safeguards application is presented.

From the perspective of forest governance and participation mechanisms of relevant stakeholders, it is important to recognize that the legal framework in force in the country is extremely rich in establishing mechanisms to facilitate dialogue between government entities and civil society. For instance, the Forest Law establishes the creation of the Forestry National Office as the entity to facilitate dialogue around forest policies in the country. This office is comprised by representatives of small and medium producers, private sector, industrial sector and non-government organizations. Likewise, the relevant stakeholders will be represented before the Board of Directors of the National Forest Financing Fund, through democratic nomination mechanisms internally in each sector. Besides, in a broader scenario, representatives of the civil society participate in the Conservation Areas Regional Councils and in the Conservation Areas National Council, which is one of the entities for decision making on the national policies on natural resource conservation, including the topics related to forest ecosystems.

The institutional framework of participation mentioned above has been specifically strengthened to promote a higher participation of the PIRs in all of REDD+ efforts, including the Emission Reduction Program, through the creation of an Executive Committee by means of a decree that broadens the participation of small and medium sized peasants and strengthens the participation of indigenous peoples. The Committee has been the main referent for the dialogues between the Government and the relevant stakeholders and is a mechanism intended to remain valid during the implementation of the PRE in a constant manner.

[108]Anex I of decision 1/CP.16.

The scope of the Emission Reduction Program, in fact, is oriented towards safeguarding the Convention, since it contains specific actions that: a) complement the implementation of the Forestry National Development Plan and the main global environmental conventions, b) starts by recognizing forest governance formal and transparent structures set forth in the Forestry Law in force, c) starts by recognizing the rights and cultural scopes of indigenous peoples and assists the needs of local communities, d) strengthens participation mechanisms of the relevant stakeholders, particularly indigenous peoples, e) reinforces actions to guarantee the conservation of forests and avoid their conversion into other uses consistently with the legislation in force and promotes environmental and social goals beyond emission reductions, and f) contains specific actions to prevent reversals and leaks. The table below describes the application of the Cancun Safeguards in the MGAS.

UNFCCC REDD+ Safeguards	*Application in the MGAS*
Safeguard a: the complementarity or compatibility of the measurements with the goals of national forestry programs and of the international conventions and agreements on the subject matter.	The analysis of the national and international Legal Framework applied this safeguard, setting its compatibility with national forestry programs and the international conventions on the subject matter.
Safeguard b: The transparency and efficacy of national forestry governance structures, considering national legislation and sovereignty.	This safeguard is considered one of the follow-up indicators.
Safeguard c: Respect of knowledge and of the rights of indigenous peoples and of the members of their local communities, taking into account pertinent international obligations and circumstances, and the national and international legislation.	The application of the national and international regulations is set for the indigenous topic. Additionally, the procedures for applying the Indigenous peoples OP and the BM and safeguard plans are set.
Safeguard d: The full and effective participation of the interested parties, particularly indigenous peoples and local communities.	The application of the national and international regulations is set for the indigenous topic. Additionally, the procedures for applying the Indigenous peoples OP and the BM and safeguard plans are set.

~~Figure~~ Table **14.1.1.** Application of mitigation measures of the Environmental and Social Management Framework and its relationship with the safeguards defined for REDD+ under the CMNUCC.

The country has made progress in identifying a broad framework of indicators to feed the SIS. Currently we are fine-tuning the key indicators, which will be the basis for the design of the technological platform for the system operation. As appropriate it will be expanded to cover other indicators, and even meet requirements deriving from other international initiatives. It is also defined a roadmap to advance on the next steps to enable the operation of the SIS in its first phase.

14.2. Description of arrangements to provide information on safeguards during ER Program implementation

Safeguard plans and their implementation during the Program

Costa Rica developed a series of workshops with different PIRs, in which a series of indicators that could be applied under the guidelines of Cancun were identified, also defining the different existing institutional structures to house the Safeguards Information System with generating actors and their respective institutions.

Costa Rica has reiterated its full political commitment to addressing and respect all UNFCCC safeguards during the various stages of implementation of the National REDD+ strategy (design, piloting and full implementation). Likewise, the country will report at least biannually to the UNFCCC on their progress in

addressing and respecting safeguards, and ~~also~~ plans to provide annual summaries in the context of REDD+ website established at the UNFCCC.

The Organic Law of the Environment (Nº7554, Article 2) states that the State shall promote the implementation of an "Information System with environmental indicators" aimed at measuring the evolution and correlation with economic and social indicators for the country. According to Decree No. 29540-MINAE, in April 2001, the National Center for Geo-~~environmental~~Environmental Information (CENIGA) is established as the technical unit of MINAE designed to promote proper management of national environmental information.

The country has decided that the Safeguards Information System (SIS) will be part of the National Environmental Information System, as it is an official system, and will be open, accessible, transparent and robust. In addition to the specific requirements of the UNFCCC and other actors supporting REDD+ action in the country, the SIS must also comply with the current regulatory framework for official information.

National Center for Geoenvironmental Information (CENIGA)

Whereas the REDD+ strategy has a national status, the proposed indicators to report to the Convention would also have a national scale. In this sense, the indicators will help to determine and report transparently on the respect and compliance with safeguards- Eventually, as the implementation process progresses, the institution responsible for REDD in Costa Rica could take the decision to develop descriptive indicators or aggregates for projects run at regional or local level, in which case local indicators such as those contained in the PROMEC for conservation areas could be used.

Statistics and processed data would be provided by the competent institutions on REDD+ issues. As the SINIA consists of a coordination platform between the different nodes of information, the designation of a node for REDD+ Safeguards, responsible for drawing up reports at the intervals and preset requirements would be required. The following figure shows an outline of how the SIS could be implemented.

Figure 14.1.3. Costa Rica. Proposal for inclusion of indicators Node of safeguards for REDD+, within the framework of environmental information.

The safeguard plans cover social and environmental issues and include the mitigation measures of adverse environmental and social impacts identified during the national preparation process in SESA and MGAS, derived from the implementation of the REDD+ National Strategy and the Emission Reduction Program taking into consideration the institutional and regulatory frameworks in force. These safeguard plans have been prepared simultaneous to the preparation of the Emission Reduction Program and are reflected in the MGAS supporting the REDD+ National Strategy incorporating the environmental and social safeguards World Bank´s ISDS international activities.

In the MGAS, the topics identified as risky to produce environmental or social impacts pertinent to the specific context of the Emission Reduction Program are described below with their corresponding mitigation measurements, and are the product of a systematization of the consultation processes that started with the SESA workshop in 2011 and the subsequent participation processes. For each risk axis the specific actions and tasks proposed as part of the Emission Reduction Program are mentioned.

Risk axis 1. *Governance, operational management, administrative and silvicultural capacities, and coherence of policies in the public and private sector.*

Actions that can generate environmental and/or social impact: 1.2 Strengthen the deforestation control, degradation, clearing control, processing and illegal commercialization of forest products program both operationally and financially. 1.3 Strengthen the National Forest Monitoring System. 1.5 Contribute to the consolidation of the Protected Areas National System. 1.7 Develop and execute implementation plans for actions addressing direct and subjacent causes for deforestation and degradation. 2.1 Prepare the Forestry Development Plan in Indigenous Lands. 2.2 Develop and strengthen mechanisms for the solution of controversies in the implementation of REDD+. 3.1Assist in the implementation of the PNDF policies related to the improvement of management capacities in support to the implementation of REDD+. 3.2 Strengthen promotion and recognition policies on sustainable agricultural and agro-forestry practices.

Mitigation measurements proposed in the MGAS:

- **Application of the following legislation:** Forestry Law N° 7575; Environment Organic Law N°7554; Regulation Decree N° 25721-MINAE; Decree N° 27998-MINAE (Principles, Criteria and Indicators for the Sustainable Management of Secondary Forests and Forestry Certification in Costa Rica); Executive Decree N° 27388-MINAE (Criteria and Indicators for the Use and Management of Forests and Certification); Executive Decree N° 34559- MINAE, (Sustainability Standards for the Management of Natural Forests); Regulations of Forestry Regencies; Decree N° 38444-MINAE; Executive Decree N° 25700-MINAE (ban for endangered tree species); Decree N° 38444-MINAE of 2014 (forestry regents); Biodiversity Law N° 7788 (creation of SINAC and establishment of its functions and organic structure, Article 22); Indigenous Law No. 6172; Law N° 7316 Approval of ILO Convention 169; Convention on Biologic Diversity (CDB) ratified by law N°7416; Application of Expropriations Law N° 9286.
- **Safeguard plans:** a) Prepare a Procedural Framework for Resources Restriction per OP 4.12 of the BM. b) Prepare a Social Assessment Plan. c) Prepare a Plan for Indigenous peoples as applicable. d) Prepare an Involuntary Relocation Framework according to OP 4.12 of the BM. In case of voluntary submission to the forestry regime, the owner does not lose his right of ownership over the land; he just submits it voluntarily to regulations that guarantee the protection of forests, and for that purpose it must be recorded at the Registrar kept by SINAC. e) Prepare a Plan for Indigenous peoples.

Risk axis 2. *Absence of legal security, recognition and regularization of land tenure and carbon in TI rights, ABRE zones, other private zones and public lands.*

Actions that can generate environmental and/or social impact: 4.1 Address land tenure and the rights of emission reduction in indigenous lands. 4.3 Address land tenure and rights of emission reduction in the Public Sector. 4.4 Promote consistency of delimitation and demarcation rules in ABRE (Areas under Special Regimes) zones.

Mitigation measurements proposed in the MGAS:

- **Application of the following legislation:** Environment Organic N°7554; Forestry Law N° 7575; Biodiversity Law N° 7788; Indigenous Law N 6172; Expropriations Law N° 9286; Law N° 7316 ratification of Convention 169.
- **Safeguard plans:** a) Prepare an Involuntary Relocation Framework according to OP 4.12 of the BM. b) Prepare a Procedural Framework for access restriction. c) Prepare a land donation protocol. d) Prepare a Social Assessment. e) Prepare a Plan for Indigenous peoples according to OP 4.10 Indigenous peoples of the BM.

Risk axis 3. *Limitations in the modalities, amounts and scope of the existing financing mechanisms, ~~in particular~~particularly the PES and need of improving competitiveness of the sector. Distribution of benefits to guarantee REDD+ social and environmental goals.*

Actions that can generate environmental and/or social impact: 5.1 Forest ordering in all national territory according to their contributions to the REDD+ goals. 5.2 Improve competitiveness of financing mechanisms for forest and agro-forestry ecosystems in relation to other land uses.

Mitigation measurements proposed in the MGAS:

- **Application of the following legislation:** Environment Organic N°7554; Forestry Law N° 7575; Biodiversity Law N° 7788; Indigenous Law N 6172; Expropriations Law N° 9286; Law N° 7316 ratification of Convention 169; Convention on Biologic Diversity (CDB) ratified by Law N°7416.
- **Safeguard plans:** a) Prepare a Social Assessment. b) Prepare a Planning Framework for Indigenous peoples. C) Prepare a Plan for Indigenous peoples per OP 4.10 Indigenous peoples of the BM.

Risk axis 4. *Please note that the Risk Axis # 4 is not included since no relevant potential impacts were identified or were already addressed in other Risks Axis, thus it was finally discarded*

Risk axis 5. *Transparency, accountability, follow-up and consistency with the REDD+ implementation framework.*

Actions that can generate environmental and/or social impact: 6.2 Implementation and follow-up of the Environmental and Social Management Framework. 6.4 Incorporate the scope of gender, youth participation and other relevant groups into the REDD+ strategy.

Mitigation measurements proposed in the MGAS:

- **Application of the following legislation:** Biodiversity Law N° 7788; Indigenous Law N° 6172; Law N° 7316 ratification of Convention 169; Biologic Diversity Convention (CDB) ratified by Law N°7416; Law N°7416. Service Comptroller Offices Law.
- **Safeguard plans:** a) Perform a Social Assessment. b) Develop a Plan for Indigenous peoples per the OP 4.10Indigenous peoples of BM.

As described above, the MGAS sets the modalities and procedures to manage possible substantial environmental and social risks in the implementation of activities of the REDD+ National Strategy, by associating them with their corresponding mitigation measures that use better practices. The MGAS also included procedures for (i) the permanent consultation with the pertinent interested groups; (ii) the measures for capacity strengthening; and (iii) the selection, assessment and institutional responsibility criteria to manage environmental and social impact among others.

In addition to that, a series of self-assessment workshops have been developed with multiple interested parties, including the preparation of the results report included in the R-Package. Other significant progress achieved regarding social issues and the consultation plan of indigenous peoples of the REDD+ National process include the following: (1) Setting a Participatory Focus; (2) Performance of analytical studies; (3) Definition of a Consultation Plan for Indigenous Peoples; (4) Preparation of an Information, Feedback and Disconformities Mechanism (MIRI in Spanish).

14.3. Description of the Feedback and Grievance Redress Mechanism (FGRM) in place and possible actions to improve it

Existing mechanisms to receive claims and provide information

After analyzing the existing mechanisms in Costa Rica to solve claims of the population related to the quality of service provided by the institutions of the Executive Branch, it is concluded that since 1992, Costa Rica has an Ombudsman Office, institution in charge of caring for the conformity of the population with regards to the public institutions and their duties assigned by law. The Ombudsman Office is entitled to address non-compliance and non-conformity issues and to provide responses to the persons affected, by asking the corresponding actions to the respective entity.

The Ombudsman Office of the Republic of Costa Rica has the National Services Comptroller's Office System, comprised by the service comptroller offices as ordered by Law in all public institutions to receive claims and complaints and their processing as appropriate. Currently, the service comptrollers of the Executive Branch are coordinated by the Ministry of Planning, which must submit a report on the performance and a summary of the claims filed by the users.

Complementary to the Ombudsman Office of the Republic and the National Services Comptroller's Office, the National Fund for Forest Financing is the pilot of an Information, Feedback and Disconformities Mechanism (MIRI), a mechanism specifically designed for the REDD+ National Strategy and the Emission Reduction Program. The MIRI responds to a participative process performed with the relevant stakeholders, so its implementation responds to the conditions proper of each group. In this sense, its contribution was important to set the reception and spread channels, prepare different use friendly channels, and to prepare informational and promotional material in a language appropriate to each group. This way, legitimacy, accessibility, transparency and capacity to address the claims are guaranteed.

Additionally, to guarantee better access, and upon request of the PIRS, an institutional link with the Ministry of Agriculture and Cattle Farming was open so their offices act as a point to receive the forms i addition to those of FONAFIFO. The response procedure and the resolution of disconformities is a proceeding that is handled by the Services Comptroller of the Institution and it is done, according to Law, within a term of 5-15 work days at a maximum, as the case may be, starting with the reception of the form at the Comptroller Office. The relevant stakeholders are entitled of watching for its compliance at any time they might consider it appropriate before that same instance and may have access to the reports issued twice a year through the REDD+ Costa Rica web site[109].

Functioning of the Information, Feedback and Concerns Mechanism

The MIRI intends to implement an accessible and transparent information, feedback and disconformities mechanism for the relevant stakeholders to favor the participation and dialogue to implement the REDD+ Costa Rica Strategy, respecting the existing legislation. The following figure shows a summary of the MIRI operation process. .

[109] www.reddcr.go.cr

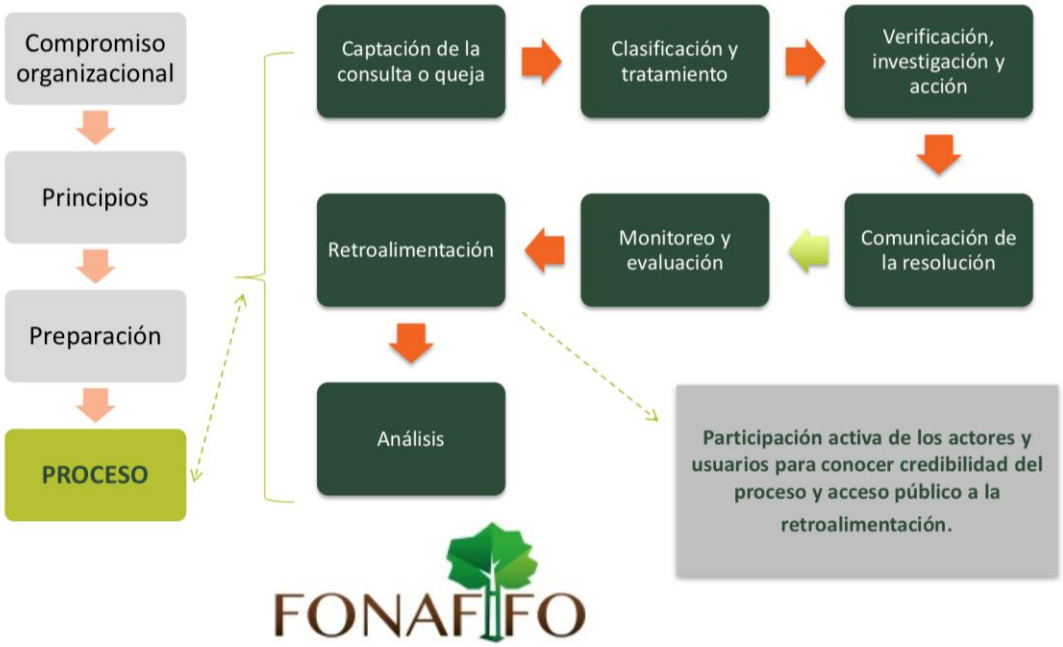


Figure 14.1.2. Macro process of the implementation of the Information, Feedback and Concerns Mechanism.

To guarantee accessibility to the mechanism, it has the following channels:

1. **Telephone line**: a telephone line will be open at the headquarters of FONAFIFO to receive actions. Staff in charge of receiving the telephone requests will comprehensive the form electronically, available at the REDD+ web site, or will receive the information in an electronic form that will be forwarded to the Service Comptroller.
2. **Online form:** the REDD+ web site has a section for the relevant stakeholders to obtain a form and file their questions, feedback or disconformity regarding the REDD+ process. This is a generic form to be used by all relevant stakeholders. The platform designed is friendly and simple for the use of the relevant stakeholders. Additionally, it has an option to consult about the situation of the processes through the web site in the platform. Regarding transparency of the processes, the platform automatically issues statistics that will support the preparation of reports by the Service Comptroller regarding processes filed by that means. As an annex, the user manual of the platform is facilitated, exclusive for Comptroller staff and FONAFIFO. The user of this platform will have a full copy of the form he/she sends with the action, as well as single number assigned for follow-up.
3. **Reception at sub-regional offices of MAG and FONAFIFO:** FONAFIFO has nine regional offices available for the use of MIRI, and MAG has 22, for a total of 32 offices throughout the country. Additionally, the Indigenous Development Associations of the different indigenous lands have also been authorized to receive claims and have the forms to facilitate access of the population to indigenous peoples, who can have the assistance of the cultural ~~mediators for~~mediators for ~~due~~ completion of the forms.
4. **E-mail:** The person that performs the action can send it directly to the Secretariat of REDD+ and the Service Comptroller of FONAFIFO or use this means for follow-up of their actions filed.

Page 38 of the document "Information, Feedback and Concerns Mechanism" shows in detail the implementation of this mechanism.

Reference to the Safeguard Information System

One of the potential applications of the Information, Feedback and Disconformities Mechanism is contributing with information and feedback to the Safeguard Information System. The system design contemplates keeping this information platform to receive feedback on how safeguards are being addressed and respected during the implementation stage of the REDD+ National Strategy and the Emission Reduction Program, as well as for the socialization of the drafts to be submitted.

Actions to improve the Information, Feedback and Grievance Mechanism

The Mechanism incorporates regular activities to assess the improvements that can be incorporated in its design or functioning, and to facilitate a better access of the interested parties by broadening the institutional cover to other central and regional offices of the Ministry of the Environment or through the systematization of the most frequent actions filed. As of this date, there has been no active use of the mechanism, so it is expected that the next stage will be to address the issue of better communication and disclosure with the relevant stakeholders so that there are better elements for its subsequent improvement.

15. Benefit sharing arrangements

15.1. Description of benefit-sharing arrangements

Costa Rica is currently preparing the political and conceptual framework, as well as the legal elements required to guarantee an appropriate development and functioning of a Benefit Sharing Mechanism that complies with the principles of equity, justice and participation of the relevant stakeholders. The Mechanism will include potential investments in policies, actions and activities of the REDD+ National Strategy, including those of the Emission Reduction Program.~~,~~

The Mechanism recognizes two main criteria for its functioning: 1) result-based payments received, from the compliance of requirements set forth in the COP of the United Nations Framework Convention on Climate Change and of the FCPF or any other donor, and 2) the distribution of benefits, responding to the sovereign decisions of the country, according to its legislation and national circumstances. For the reception of result-based payments, in the case of the FCPF and other similar mechanisms, it is necessary to have legal capacity for the transfer of titles of the emission reductions. For the purposes of the FCPF, it will be negotiated and agreed as part of the Commercial Conditions of the Emission Reduction Payments with the World Bank.

On the distribution of benefits, the country has defined that it should be addressed to public and private owners, including indigenous peoples as communal owners, with special attention but not exclusively to people with property or possession rights that can be verified and developing actions directly linked to the measurements to generate emission reductions. Taking this into consideration, the Mechanism would fund the actions that directly or indirectly support national efforts on reducing emissions coming from:

- Public owners of Protected Wildlife Areas or areas which are part of the State Natural Heritage managed by the Ministry of the Environment and Energy.
- Other government institutions that own forested lands.
- Private owners or possessors of lands with agreements previously signed.
- Communal land owners (i.e. indigenous lands)

Costa Rica has not defined yet the monitoring type, scale, criteria, processes, terms and mechanisms for the distribution of benefits, although it is expected that a significant amount of the resources will be distributed among private and communal owners, particularly through strengthening the Environmental Services Payment program, in which case the regulations are applied according to the national legal framework, in special the Procedural Manual of the program. Before the signing of the Emission Reduction Payment Agreement, the country will submit to the FCPF Carbon Fund a Benefit Sharing Plan.

In this regard, it is worthwhile to note the difficulty to define the volume and types of resources allocation through the Benefits distribution mechanism in advance, in a situation like the present, where is unpredictable the volume and conditions of receipt of potential payments for results. To act in a contrary manner could lead to legal and political responsibilities to the authorities, ~~in~~ particularly before potential beneficiaries.

Considering this, it is possible to anticipate that a significant proportion of the resources to be received as REDD+ result-based payments will be managed by public institutions. It will be aligned with the applicable legal framework for resource management by public entities, including the principles of transparency, accountability to competent comptroller entities, ~~in~~ particularly the Ministry of Finance and the Comptroller's Office of the Republic. Likewise, these provisions would be applicable to those non-government institutions that receive public funds.

Some considerations been considered in the early design of the Mechanism have identified the intention of financing the beneficiaries who directly contribute with the implementation of the policies, actions and activities that address the drivers of deforestation and degradation.

In the case of the Emission Reduction Program, the Benefit Sharing Mechanism would work by using the following financing programs, based on the valid legal framework and on the recommendations from actors and sectors involved in the information and pre-consultation process of the REDD+ strategy:

- **Strengthening the Payment for Environmental Services Program** in all its modalities, including possible new modalities (i.e. payment for specialized environmental service for indigenous and peasant lands and a payment for environmental services to public institutions[110]). Currently, the Payment for Environmental Services program includes the modalities of forest conservation, sustainable management of forest and carbon stocks enhancements through reforestation and the planting of trees in agro-forestry systems that can obtain any of the 16 specific modalities set in the respective operation regulations of the program. From the technical and political perspective of the program, the Payment for Environmental Services program is based on the identification of criteria that allow the prioritization of investments, following both ecological and socio-economic criteria. From the ecological point of view, the priorities are defined mainly by the need of protecting lands located in biological corridors and in sites where conservation gaps have been identified by studies that are updated on a regular basis. Other criteria consist on the importance of water conservation in the properties and of priority basins. From the socio-economical point of view, small and medium owners are privileged, in particular those located in the cantons with lower Human Development. The program will continue supporting the achievement of other environmental benefits such as water conservation, the protection of biodiversity and the maintenance of landscape beauty.
- **Design of new modalities or financial schemes**[111] to address the needs and ~~particular~~ specific characteristics of population segments showing difficulty to comply with the requirements of the Payment for Environmental Services program. ~~In particular, t~~The new modalities or schemes are addressed to small producers and peasants, so that entrepreneurship is promoted as well as the silvicultural and business efficiency of all the production value-chain in the forest sector.
- **Identification of monetary and non-monetary investment opportunities** to promote and increase the participation of other relevant stakeholders in the implementation of policies, actions and activities of REDD+. This includes communal actions, participative mechanisms to address deforestation drivers and the strengthening of organization capacities of local communities and indigenous lands.
- **Strengthening of investments in public lands** and identification of financing mechanisms to promote or broaden the participation of competent entities in the implementation of a variety of investments, both monetary and non-monetary. The foregoing, to contribute with achieving the goals and purposes of the REDD+ National Strategy and including the strengthening of the existing mechanisms such as the Forestry Fund, the Fund for Sustainable Biodiversity of the Ministry of the Environment and Energy or the program of Environmental Benefits Recognition of the Ministry of Agriculture and Cattle Farming.

15.2. Summary of the process of designing the benefit-sharing arrangements

Benefit Sharing is one of the more relevant elements derived from the information and pre-consultation process of the National REDD+ Strategy. The initial proposals of the Emission Reduction Program (ER-PIN) were in a large extent centered in broadening the cover of the Payment for Environmental Services program. Many representatives of the relevant stakeholders were concerned for the possible exclusion of some

[110] Still under analysis process in Costa Rica.

[111]These new modalities or schemes will be designed as necessary, and considering their political and financial feasibility.

segments of the population, which are unable to comply with the legal and technical requirements of the program. These population segments include the poorest persons and those without consolidated tenure rights over lands, as well as small owners with less than two forest hectares (i.e. minimum area required to enter ~~into~~ the program). Another limitation of the Payment for Environmental Services program is the recognition of only four environmental services in the Forestry Law in force. It excludes other benefits such as sustainable land management and environmentally sound productive practices and/or oriented to emission reductions.

Indigenous peoples stated their concerns related to the lack of clarification of ownership rights and the presence of non-indigenous population in their lands. Other restrictions identified were the impossibility of exercising their cultural practices in the management of forest resources and biodiversity. These restrictions are originated on the Forestry Law and in the contracts of the Payment for Environmental Services program.

Participative process to define additional needs in the distribution of benefits

During the initial consultation stages, small forest producers and the indigenous peoples started dialogues with the Government to explore the possibility of new financing modalities. These new modalities would be adapted to the specific needs and concerns of both population groups and would be aimed to defeating the current restrictions posed by the Payment for Environmental Services Program. The proposal of the indigenous lands highlights the need of defining investment plans of the resources to be obtained for their contributions to REDD+ policies and actions according to investment priorities previously identified in several areas including environmental, infrastructure, telecommunications, health, culture, etc. However, not any financing proposal responding to new modalities will necessarily comply with the basic requirements of quality and control consistent with the applicable legislation on public resource management.

Payment for environmental services to small forestry producers

Its conception started during the Social and Environmental Strategic Assessment and would consider the socio-economic and environmental conditions of the sector, in order to reduce poverty, and to present an additional option to rural development. Facilitated by a consultant selected by the sector representatives, a series of regional workshops was organized to identify the main elements of the new financing mechanism. A total of 202 participants, in 5 different regions of the country were part of the process (134 males and 68 females). This sample represents a wide variety of relevant stakeholders (i.e. local associations for water management, local development associations, producer associations and agricultural cooperatives, assistance centers, unions, private foundations, government institutions and other technical assistance entities). As a result, a proposal was received that will be subject of feasibility, political and technical analysis, as well as the assessment of financial and operational implications. Through the Emission Reduction Program, the design activities of the mechanism proposal will receive follow-up and political dialogue will be promoted ~~in order to~~for the design of a mechanism that results satisfactory to the sector.

Payment for environmental services to indigenous lands

Its conception starts with the early REDD+ dialogue with the indigenous peoples and has continues up to date. The representatives of indigenous territories and the Indigenous Development Associations, with the facilitation of an indigenous consultant, participate in a permanent dialogue to identify the main characteristics of the new financing mechanism. The process has been widely promoted by the representatives of indigenous peoples. The REDD+ Secretariat will assess the necessary steps to identify the potential legal, operational and financial implications of the mechanism, and of the need of increasing the currently dialogues with the goal of integrating the results into the Benefit Sharing Mechanism of the Emission Reduction Program. A specific proposal of Payments for Environmental Services has been developed for the indigenous lands that results from the internal process in the lands, and therefore it is culturally appropriate. During the second stage of dialogue, the technical, administrative, financial and legal implications of the mechanism proposal must be analyzed, ~~in order~~ to guarantee consistency with the current legal framework.

Payment for environmental services to public institutions

Beyond the current of REDD+ readiness process, it is necessary to develop an assessment to determine its feasibility. A first analysis stage is the inventory and cadaster of public lands in the State Natural Heritage, but

also of those lands managed by public institutions not yet transferred to the Heritage. A specific modality of payment for environmental services to institutions could be an option.

15.3. Description of the legal context of the benefit-sharing arrangements

Compliance of applicable laws, including the international conventions and agreements and customary law

The investments of results-based payments from the Emission Reduction Payment Agreement with the Carbon Fund of the World Bank will take place according to the legislation in force, including international rules and customary rights formally recognized by the national legal system. The Payment for Environmental Services program is an instrument covered by the Forestry Law, with 18 years of effective application and has received public and private investments. The program covers private and communal owners of lands, but excludes public lands. Additionally, the Forest Fund and the Fund for Sustainable Biodiversity and institutions covered by the legislation in force that could include a wide variety of investments related to the implementation of the Emission Reduction Program

It is forecasted that additional arrangements will be needed to incorporate new financing modalities into the legal framework in force. However, such considerations will depend on the results of the analysis and dialogues pending development during the continuation of the readiness stage.

16. Non-Carbon Benefits

16.1. Outline of potential Non-Carbon Benefits and identification of Priority Non-Carbon Benefits

Prioritization of the Program's non-carbon benefits

Non-carbon benefits have been discussed with all stakeholders involved in the REDD+ process, from the SESA workshop held in May, 2011. These non-carbon benefits are identified from the different strategic options identified for the R-PP, in which the positive impacts of its implementation were highlighted, however, additional work is required to define priorities, assessment and forms of recognition thereof, which in turn will depend on the willingness of the international community to provide additional resources for these benefits, if appropriate.

The primary co-benefits of the Emission Reduction Program have been defined by the current legal framework in Costa Rica and they correspond to those generated in the Protected Wildlife Areas System, in forest lands part of the State Natural Heritage and in the Payment for Environmental Services program. Specifically for the Payment for Environmental Services Program, there are three main co-beneficiaries: landscape beauty, conservation of biodiversity and water protection; however, the environmental service of land conservation derived from the Land Conservation Law and the social and environmental benefits derived from implementing the Payment for Environmental Services program in indigenous lands and local communities are recognized also.

One of the best recognized co-benefits is related to the organizational capacity and improved participation due to the implementation of the programs and public policies. For instance, the Payment for Environmental Services program serves for forest organizations to actively participate. Additionally, they promote productive activities in the sector chain, such as forest nurseries and the genetic improvement of species for reforestation or induced regeneration, both with commercial and native species. In many cases, these programs are linked to communal programs on environmental education and cantonal tree planting projects along roads in country.

The environmental services recognized by the Payment for Environmental Services program, as the provisions of the Forestry Law, are:

1. GHG mitigation (benefit)
2. Water protection (co-benefit)
3. Biodiversity conservation (co-benefit)
4. Landscape beauty (co-benefit)

There are multiple environmental benefits at a series of scales in Protected Wildlife Areas. For instance, the conservation of biodiversity, the protection of water resources, the contribution to biological connectivity, the protection of volcanic areas, the prevention of fires, the conservation of lands in marine-coastal areas. All these co-benefits contribute to increase resilience before climate change, both of ecosystems and of communities. These same environmental services are promoted through the Payments for Environmental Services program in private lands.

In the case of PES investments in indigenous territories, due to the communal nature of land tenure, the social and economic impact of non-carbon benefits is easily identifiable, since organized communities decide in a meeting the destiny given to the resources received and, in many cases, they are invested in education, health, infrastructure improvements such as roads and bridges, etc. It is not the same case with private owners, who individually decide the destiny of the payments received.

To the extent that the ER-P has been designed on the basis of current legal and policy frameworks, the primary co-benefits of the Emission Reduction Program have been defined by the current legal framework in Costa Rica and they correspond to those generated in the Protected Wildlife Areas System, in forest lands part of the State Natural Heritage and in the Payment for Environmental Services program. Specifically, for the Payment for Environmental Services Program, there are three main co-beneficiaries: landscape beauty, conservation of biodiversity and water protection; however, the environmental service of land conservation derived from the Land Conservation Law and the social and environmental benefits derived from implementing the Payment for Environmental Services program in indigenous lands and rural communities are recognized also.

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Improvement of co-beneficiaries during the implementation of the Program

The conservation of primary forests and the increase of forest cover in country will have a positive effect in other environmental, social and economic co-benefits of the populations linked to the Emission Reduction Program activities and the country in general. ~~As a whole~~Overall, the Program looks to promote co-benefits to improve resilience of the ecosystems and of the populations dependent on forests before climate change. The prioritization criteria of investments in the Payment for Environmental Services program are still centered on two main pillars: a) the protection of the forest zones in areas where biodiversity conservation gaps have been identified, and b) in areas where it is necessary to improve the biological connectivity between Protected Wildlife Areas. Additionally, the program privileges water resource protection zones, fundamental for biodiversity and communities.

Besides, the ER-P proposes an increase in the Payment for Environmental Services coverage with activities that covers from the establishment of forestry plantations up to the farm reorganization or even a new payment mechanism, costomized for each sector such as de Payment for Environmental Services for Indigenous Communities and the Payment for Environmental Services for small agroforestry producers. All aiming to develop actions that lead to more productive landscapes with a diversity of activities, which means work opportunities in the rural area and an enhancement in the producer's farm economy.

Description of how non-carbon benefits are culturally appropriate, take the gender scope into account and are inclusive in intergenerational terms

During the pre-consultation stage, the relevant stakeholders identified potential positive impacts or co-benefits that can derive from the implementation of REDD+. Most of the positive impacts highlight the improvement that broadening sustainable management activities of forest resources resulting from REDD+ might mean in the maintenance and improvement of the country natural heritage in a wide sense, addressing different dimensions of the national environmental policies, including the conservation of biodiversity and of water resources, stop land erosion, improve the integrity of Protected Wildlife Areas, the restoration of landscapes, etc. The co-benefits related to the potential broadening of the financing mechanisms beyond PES were also mentioned, that can play a significant role for the better distribution of richness and contribute to the improvement of life quality in rural populations such as indigenous peoples and small peasants. The participation of the population in general in actions towards a better recognition of the virtues of sustainable environmental practices, including the possibility to increase their participation in control and protection actions of natural resources and fire management, the generation of additional work sources in rural areas and improved access to resources according to their traditional use, particularly in indigenous lands.

Additionally, the relevant stakeholders highlighted the potential that REDD+ has to contribute in solving or mitigate problems derived from lack of land tenure right regularization in several areas of the country, in particular in indigenous lands and in lands under special regimes, without ignoring the need of strengthening institutional capacities in several areas, both governmental and non-governmental, allowing the State to provide better services to citizenship and to accompany them in their efforts, and to assist in the generation of capacities in social sectors, control organizations and communal and private groups that will be key players in the broadening of the REDD+ activities, so the national goals are achieved.

The better valuation of the forest and the creation of new or more inclusive compensation mechanisms through the recognition of environmental services and similar may have a positive impact in the reduction of migratory processes, especially of young populations, towards urban centers, most of the times looking for better work and income conditions, which weakens the traditional peasant family structure and that promotes abandonment of the production culture. The improvement of socio-economic benefits of the rural producers contributes to maintaining peasant family integration and the intergenerational transfer of rights and of productive culture, which is also applicable to indigenous communities.

Regarding gender inclusiveness in the co-benefits of the program, some pilot experiences have been developed, especially in indigenous communities that will be used as referent to broaden efforts in other socio-economic realities in country. In this sense, the development of a gender strategy is conceived for the second stage of the readiness phase, in order to guarantee that the strategy and the ~~Emissions Reduction~~Emission Reductions Program incorporate this dimension as a transversal axis.

16.2. Approach for providing information on Priority Non-Carbon Benefits

The National System for Conservation Areas has promoted since May, 2004 a Proposal for Territorial Planning for the Conservation of Biodiversity in Costa Rica[112]; the initiative has had the support and cooperation of prestigious national and international organizations and projects.[113]. This initiative has produced two fundamental products for the definition of biodiversity conservation national strategies and to define investment prioritization criteria through the payment for environmental services program: analysis of conservation gaps and need for connectivity trails. The gaps are areas considered important for the conservation of biophysical environments and that are not under any effective conservation initiative yet, either public or private. The identification of the areas with gaps is associated to the need of maintaining representative samples of the natural environments biodiversity in the country and the conservation goals defined for each case, which is specified in the methodology of the Proposal. In addition to the conservation gaps, the Proposal analyses the connectivity at the national level in which lower cost trails are suggested to establish biological corridors, considering that the alteration of the surface and the presence of human activity impose different difficulty levels for the displacement of plant or animal species or species groups from one place to another, depending on the type of alteration or human intervention in each place.

Based on the analyses derived from the Proposal, the parameters are set to determine the investment priorities of the Payment for Environmental Services program, given that the resources available are not sufficient as to attend all the demand. The main goal of the Payment for Environmental Services Program is investing in areas where diversity conservation gaps have been identified and attend the biological connectivity requirements amongst Protected Wildlife Areas in country, and to privilege the assignment of Payments for Environmental Services to those lands in Protected Wildlife Areas that have not been paid by the State and that are subject to use restrictions. In summary, the criteria are not exclusively carbon; there is a special emphasis given to social and environmental co-benefits.

[112] Also called Project GRUAS II.

[113] *i.e.* National Biodiversity Institute, The Nature Conservancy, Conservation International, the National Fund of Forest Financing and the project Forest Conservation and Sustainable Development in Buffer Zones in the North Caribbean of Costa Rica.

Since in the case of Payment for Environmental Services three environmental services are incorporated in addition to the carbon benefits and that this mechanism will be used as the main axis of the Emission Reduction Program, Costa Rica will provide regular information on the generation or improvement of non-carbon benefits through the mechanisms agreed, as produced with the existing monitoring information systems of the Payments for Environmental Services program.

Costa Rica has carried out the definition of a set of policies, actions and measures for REDD+ implementation in the country, within the framework of the national REDD+ strategy. The definitions are the product of the analysis of the benefits and risks identified by relevant stakeholders as part of the process of preparing the Social and Environmental Strategy Assessment (SESA). As part of the systematization that was performed, a series of social and environmental benefits were identified that go beyond climate change mitigation or potential risks associated with the implementation of the same. With support from the UN-REDD Program and the National Forestry Financing Fund (FONAFIFO), a set of analyses were carried out aimed at evaluating the spatial convergence of multiple benefits prioritized at the national level, namely:

- Mitigation of greenhouse gases
- Natural scenic beauty for tourism
- Biodiversity conservation
- Support to communities vulnerable to water stress
- Potential for socio-economic improvement
- Control of soil loss by water erosion
- Potential for improving governance

This assessment of benefits will be used as input in the development of the EN-REDD+ Implementation Plan.

17. Title to emission reductions

17.1. Authorization of the ER Program

Name of entity	Ministry of the Environment and Energy
Main contact person	Dr. Edgar Gutierrez-Espeleta
Title	Minister
Address	Vista Palace building, Street 25. Avenues 8 and 10, San José, Costa Rica
Telephone	+506-22334533
Email	ministrominae@minaet.go.cr
Website	www.minae.go.cr
Reference to the decree, law or other type of decision that identified this entity as the national authority on REDD+ that can approve ER Programs	The appointment of Dr. Edgar Gutiérrez Espeleta was issued by agreement N° 001-P, of May 8, 2014, issued by the Presidency of the Republic. The Minister of Environment and Energy is entitled to contracts or agreements on behalf of his Ministry, per the Political Constitution and the General Law of Public Administration of 5/2/78.

17.2. Transfer of Title to ERs

Legal considerations for the transfer of titles to emission reductions

In the context of a restrictive interpretation of emission~~s~~ reductions and its recognition at the national level on the basis of land property rights, emission reduction from deforestation and increasing of sinks through the regeneration of forests is done by the forest owners, either a natural or a legal person, and this is based on the Costa Rican legislation, the Constitutional principle on private property reflected in article 45, developed in the common and special legislation related to the payment for environmental services set forth in articles 3 paragraph k) and 46 and 47 of the Forestry Law in force. Under this condition as owners, and in the exercise of their dominion competencies, they will transfer the Ministry of Environment and Energy the capacity to claim or negotiate over their rights to emission reductions. **This initial interpretation is being analyzed in the country in order to allow identifying other ways of applying the concept to allow greater equity and inclusiveness in the claiming and distribution of benefits based on result-based payments. In this regard, the relevant provisions of the UNFCCC on the issue of transfer of titles are been analyzed in depth, because in principle there does not seem to be an explicit provision in this direction.**

Therefore, the competent entity to exercise the claim and transfer of titles for emission reduction will be, according to the Forestry Law and the Biodiversity Law, the State Forestry Administration. As set forth in article 5 of the Forestry Law, the institution in charge is the Ministry of the Environment and Energy and its two competent offices per the Regulations to Forestry Law, Executive Decree 25721-MINAE are the National Fund for Forest Financing and the National System of Conservation Areas. In this regard, we must promptly comply with the procedure for defining the Focal Point or Designated National Authority for these effects to the UNFCCC.

This way, the State Forestry Administration will be entitled to transfer titles of emission reductions, in the following cases: a) as owner of the emission reductions produced in Protected Wildlife Areas; b) in private

lands by virtue of titles derived from the assignment of rights on environmental services agreements[114] either in PES agreements or other similar; c) in lands owned by the State institutions and national reserves; and d) in indigenous lands that have granted right assignments through payment for environmental services agreements. If finally the appropriate and flexible legal mechanisms are identified, these powers could be expanded considerably, particularly in those cases where emission reductions cannot be attributed to any particular person.

Plan for transferring titles to the Carbon Fund and implications of land tenure regimes and resources

Considering that in Costa Rica the Emission Reduction Program is country-wide, the Entity of the Program can only transfer the titles of emission reductions taking place in public lands and in the case of private lands (owners inside or outside of indigenous lands) are those that though an agreement or any other legal instrument have legally assigned the title to emission reductions. For this reason, the Entity of the Program will not be able to show the capacity of transferring the title on the total accounting area[115] if the above mentioned restrictive interpretation prevails.

In principle, the percentage of national territory in which a transfer of title of emission reductions would be possible is 32,2%(1.645.173 hectares). This includes 1.332.677 (26%) hectares in Protected Wildlife Areas, 299.720 hectares (6%) under forest conservation of the Payment for Environmental Services program and 12.776 hectares (0,2%) under forest regeneration of the same program. Without prejudice of the foregoing, the executing entity of this project reserves the right of including in the program area other areas outside of the ones described, as long as they are incorporated by means of an agreement of payment for environmental services and another similar to that with its legitimate owners.

The next update of the ER-PD will include the potential increase of ER titles that can be transferred to the Carbon Fund through by including:

a. Public lands under the administration of other government institutions (ICE, IFAM, INDER, etc.)
b. Private lands attached to peasant or environmental organizations such as Reservation Network, Indigenous Reserves. Codeforsa, Fundecor, etc.

Identified conflicts on tenure regarding the transfer of title

Regarding land tenure and non-recorded rights, there are some problems related to lands under the administration of State institutions, as the case of lands managed by the Port Management and Economic Development Board of the Atlantic Coast, the border zone, the title projects of the Rural Development Institute[116] and the possession rights of lands considered State Natural Heritage such as the Maritime-Terrestrial Zone. In these cases, the legislation in force is uncertain regarding the right of title on behalf of their possessors. These situations have taken place because specific heritage has been attributed to some institutions without previously analyzing land tenure, those lands have been occupied by private parties or there has been tolerance of the State and lack of knowledge of the civil society on the legislation in force.

The potential solution of these conflicts will depend on the nature of the negotiations set for the payment of results verified within the National REDD+ Strategy and the Emission Reduction Program (i.e. flexibility level

[114] Like the rights assignment that takes place through an agreement between the land owner and the National Fund of Forest Financing, in order to transfer the rights on environmental services during the duration of the agreement. For instance, clause sixth of the forest protection agreement for the Payment for Environmental Services program waives that the National Fund for Forest Financing be expressly entitled to commercialize in any way and with any person, natural or legal, national or international, regarding the rights assigned.

[115] See indicator 36.3 of the Carbon Fund Methodological Framework

[116] Previously Agrarian Development Institute

set in the general and commercial terms of the Payment for Emission Reduction Agreement within the framework of the FCPF Carbon Fund). The experience in country through the Payment for Environmental Services program has shown that most of these tenure conflicts cannot be solved at the administrative level and it has been necessary to go to the judiciary. Other conflicts require solution at the legislative level.

Related to the foregoing, there are two implications. In the first one, the properties show no legal conflict, in which case the assessment of their condition will lead to the approval of their participation in the program, with no obstacles for the transfer of title, which are the most. In the second case, the properties do show conflicts related to land tenure, which will also have implications, since in these cases the owners do not have sufficient support accrediting their right and therefore it is not possible to legally execute the transfer of title, and for that reason they will not be included in the Program.

Measurements that would be defined to enable the transfer of titles on areas with difficulties

For private areas outside of the Payment for Environmental Services program, Costa Rica will develop legal mechanisms for the assignment of rights, if so decided by private owners. The ongoing legal study will determine the options for this effect, which will be operational prior to a transfer to the FCPF Carbon Fund. In case of lands under legal dispute, the Emission Reduction Program will support the measurement as possible.

Environmental integrity of emission reductions

Due to the fact that the Carbon Fund requires of the transfer of title of emission reductions, and in case Costa Rica incurs in a transfer to the World Bank, it will only be for single emission reductions not used for other purposes, such as the recognition of payments resulting from REDD+ through bilateral or multilateral agreements, the Costa Rican Carbon Domestic Market or other mitigation initiative, such as the nationally appropriate mitigation actions in course. However, the emission reductions will be reflected in the GHG national inventory and might be considered for the proposal of the national determined international contributions.

18. Data management and registry systems

Costa Rica's REDD+ registry system is under development. This registry will be part of the contry's national registry for all sectors, to ensure the environmental integrity of UCC (Costa Rican Compensation Units) in the context of the Domestic Carbon Market. This market is being reviewed and, hence, there is a need to advance in the consolidation of the market to be able to have clarity on how REDD+ credits under the FCPF-CF will be *registered*. This registry system will ensure that each ER is appropriately issued, serialized, transferred, retired, and/or cancelled; and ensure that ERs are not issued, counted, or claimed by more than one entity. The REDD + Secretariat will contract a consultant for the development of this registry in coordination with the Climate Change Direction (DCC / SINAMECC[117]).

~~The country has not yet specifically defined how it will operate the Registry of emission reductions resulting from the implementation of the National REDD+ Strategy, so as to ensure transparency and confidence that there will be no double counting and no double charging of such reductions as a result of the existence of several initiatives linked to both existing market mechanisms at national level (PES and other similar domestic market) as voluntary initiatives or those regulated internationally. However, Costa Rica has assumed responsibility for all information systems and registries in this area to fully comply with criteria of robustness, transparency and sufficient reliability to properly meet the requirements of environmental integrity.~~

~~In that sense, it is working on the design of a national registry system that addresses the needs to adequately monitor reductions resulting from actions to be implemented in various sectors in accordance with the National Climate Change Strategy, efforts that are related thereto with the functioning of a national carbon market as an instrument to strengthen the country's capacity to progress in achieving the goal of carbon neutrality.~~

~~Clearly one of the objectives of the national registry is to articulate, standardize and ensure coherence and consistency between different existing information management systems (e.g. FONAFIFO PES database, databases of the Department of Climate Change on national carbon markets, SINAC forest inventories, etc.) with international requirements, including commitments that the country will take to the UNFCCC on nationally defined contribution (INDC). In this context, the Registry of emission reductions for REDD+ is expected to be a module that feeds the national registry. Similarly, all efforts made in the agricultural sector (NAMAs) and have synergies with forest emissions reductions should be promptly clarified and regulated so as to avoid any risk of double counting.~~

18.1. Participation under other GHG initiatives

Other transfers or transfer plans of emission reductions and other GHG mitigation initiatives

Costa Rica has the project "Carbon Sequestration in Small and Medium Farms in the Brunca Region, Costa Rica", recorded in the United Nations Framework Convention on Climate Change within the Clean Development Mechanism, which is producing emission reductions with afforestation/reforestation activities. This project is expected to generate a total emission reductions of 176.050 t CO_2e in a 20 year term, o 8.803 t CO_2e per year, in an area of 892,42 hectares during period 2006-2026.

In relation to the aforementioned project, Costa Rica has transferred to the Clean Development Mechanism of the CER in serial rank CR-6-961312-1-1-1-7572 al CR-6-984395-1-1-1-7572, according to the monitoring report of August 2006 through December 2012.

This is the only project formally recorded under the Convention or other official entity. At this time, the Emission Reduction Program does not contemplate the 892,42 hectares included in the project nor the 176.050 t CO_2e produced up to 2012. Due to the scope of the reference level presented to the Carbon Fund, this is a double-accounting, which will be solved once the reference level is recalculated based on the results

[117] National System of Climate Change Metrics

of the GHG national inventory presented in the framework of the first Updated Biannual Report before the Convention. As mentioned in **Section 8**, the gas inventory will be complete by October 31, 2015.

18.2. Data management and Registry systems to avoid multiple claims to ERs

Existing records applicable to REDD+

Currently, the Payment for Environmental Services program keeps full record of all properties that have formalized an agreement with FONAFIFO. The information maintained in this registry complies with the requirements set forth in Indicator 37.2, i, ii, not including aspects related to carbon reservoirs and the reference level, however, said records can be adjusted including the information missing in order to record the REDD+ projects.

Another important registrar for REDD+ is the State National Heritage registrar. The National System of Conservation Areas attends and guarantees that the legal provisions issued in the Environment Organic Law, the Forestry Law, the Biodiversity Law on acquisitions, management and administration of lands of the State Natural Heritage within Protected Wildlife Areas be executed under technical, administrative and legal principles and procedures in force.

As of this date there is no Registry of Transactions; however, it is completely necessary to develop it, since it has been defined it will be a country registry centralized in the Climate Change Office, that will comply with all the requirements of transparency and traceability necessary and that must be designed including all the sectors that take part in emission reductions such as energy, industry and forestry.

However, it must be mentioned that in relation to the Domestic Carbon Market, there is an ongoing successful experience operated by FONAFIFO and in coordination with the Climate Change Office, Costa Rica is in the process of designing a national registry of emission reductions to comply with the registration requirements of the Domestic Carbon Market. The registry is expected to be applicable to REDD+ as well.

Arrangements to avoid multiple claims to emission reduction titles

The country reports its emission reductions and mitigation impacts in the Biennial Update Report before the Convention. Both emissions and absorptions in the GHG inventory are reported there transparently and complete, as well as the progress made by the country in reducing emissions in all sectors. This includes the AFOLU sector and the results obtained in the implementation of REDD+. Since the Update Biennial Report is presented every 2 years, it will be possible to report before the Carbon Fund with the same periodicity until 2050 or upon the conclusion of the Payment for Emission Reduction Agreement.

Program Management System and Project Data

Costa Rica does not have an integrated program and project management system; each institution involved in the REDD+ program must construct the registrar for its own programs and projects. In this sense, the forestry sector already has a registrar for the Payment for Environmental Services Program kept by FONAFIFO and that includes information on all the properties that have formalized an agreement with the institution. This registrar includes the registration data of the property, cadastral plan officially recorded at the national cadaster, owner´s name that can be a natural or legal person, the political-administrative location, the property total area and the effective area on which the agreement as executed; there is also a geo-referenced digital file of the property based on FONAFIFO's geo-spatial database. Since 1997, the program has registered over 14.713 agreements with an area of 1.052.867 hectares, in addition to the payment for the establishment of over 6.015.710 trees in agro-forestry systems. There is also the registrar of the State Natural Heritage, related to the management and protection of Protected Wildlife Areas. In addition to those, as part of the management of the National System of Conservation Areas (SINAC), all actions responding to the different

forest protection and management programs are registered and receive follow-up; these include the actions related to fire prevention and control and illegal clearing.

According to indicator 37.1. of the Methodological Framework of the Carbon Fund and the national circumstances, Costa Rica will use the Biennial Update Report as a program and data management system of the project, as defined above. The transparency and formality with which the Convention is informed is sufficient to assure the Carbon Fund on the emission reductions transferred or managed and of the ongoing projects and programs in country. It is important to highlight the commitment the country has to guarantee environmental integrity and to avoid double-accounting.

The Biennial Update Report provides information on the entity producing the emission reductions, the geographical field of these emission reductions, the methods and assumptions of accounting and the reference level used, in compliance with indicator 37.2. Likewise, the Biennial Update Report is a public document and follows indicator 37.3. Finally, since the Biennial Update Report is subject to revision processes by the Secretariat through International Consultation and Analysis within the framework of the Convention, there is compliance of indicator 37.4.

These considerations are both to comply with the requirements of a program and data management system of the project, and for the registration of emission reductions, in compliance with criterion 38.

Annex 1: Financial Projections Table for ER-PD

This Annex provides the financial projections for Costa Rica's REDD+ Program using the inputs detailed in the "Costa Rica REDD+ Financial Plan Methods and Detailed Inputs" document which has sensitive information and has provided confidentially to the government of Costa Rica and Carbon Fund/World Bank.
The budgets prior to 2015 are incomplete.

Table~~Chart~~ A1.Financial projections of the Emission Reduction Program.

SUMMARY FINANCIALS (USD)	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
PROGRAM	7 Yr	8 Yr	9 Yr	10 Yr	11 Yr	12 Yr	13 Yr	14 Yr	15 Yr	16 Yr
Tons Available for Sale (Net*) - by Vintage	-	-	538,405	-	1,076,810	-	1,076,810	-	1,076,810	-
Verification Years	-	-	V	-	V	-	V	-	V	-
Tons Available for Sale (Net*) - per Verification	-	-	538,405	-	1,076,810	-	1,076,810	-	1,076,810	-
ER PROGRAM CASH FLOW OUT										
REDD+ Program Management Costs										
Staffing Costs	$136,801	$107,319	$112,685	$118,319	$124,235	$130,446	$136,969	$143,817	$151,008	$158,558
Key Consultancies and Studies	$233,333	$233,333	$153,333							
Travel for Program Management	$30,240	$30,220	$29,560	$29,560	$29,560	$29,560	$29,560	$29,560	$29,560	$29,560
Stakeholder Engagement	$279,149	$231,164	$292,474	$292,584	$293,994	$294,004	$294,904	$294,004	$543,404	$543,404
Safeguards Monitoring	$477,240	$111,090	$116,645	$122,477	$128,601	$135,031	$141,782	$148,871	$156,315	$164,131
Grievance and Redress	$53,820	$53,820	$53,820	$53,820	$53,820	$53,820	$53,820	$53,820	$53,820	$53,820
Benefits Management	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Emission Reduction Quantification, Verification and Is	$1,341,000	$105,000	$1,341,000	$105,000	$1,341,000	$105,000	$1,341,000	$105,000	$1,341,000	$105,000
Total REDD+ Program Management	$2,551,583	$871,946	$2,099,516	$721,759	$1,971,209	$747,861	$1,998,035	$775,072	$2,275,107	$1,054,473
REDD+ Program Measures										
FONAFIFO Payment of Environmental Services (PSA)	$33,129,045	$34,583,292	$46,329,976	$37,665,482	$40,222,923	$40,132,581	$40,445,272	$42,444,415	$44,543,516	$46,747,571
SINAC Increased Governance/Size of Protected Areas	$79,156,032	$87,071,636	$95,778,799	$105,356,679	$115,892,347	$119,369,117	$122,950,191	$126,638,697	$130,437,858	$134,350,993
TOTAL ER PROGRAM CASH FLOW OUT	$114,836,661	$122,526,873	$144,208,291	$143,743,920	$158,086,479	$160,249,559	$165,393,498	$169,858,184	$177,256,480	$182,153,037

Reference Price per ton	$ 15.00	$ 15.00	$ 15.00	$ 15.00	$ 15.00	$ 15.00	$ 15.00	$ 15.00	$ 15.00	$ 15.00
ER Sales to Carbon Fund	$0	$0	$8,076,073	$0	$16,152,146	$0	$16,152,146	$0	$16,152,146	$0
Sources of Funds to FONAFIFO	$33,129,045	$34,583,292	$46,329,976	$37,366,943	$36,980,666	$38,494,880	$40,071,412	$41,712,841	$43,421,857	$45,201,258
Sources of Funds to SINAC	$76,303,798	$82,408,102	$89,000,751	$96,120,811	$103,810,475	$106,924,790	$110,132,533	$113,436,509	$116,839,605	$120,344,793
Readiness Funds from World Bank	$1,887,700	$3,181,300	$511,000							
Other - International Cooperation to SINAC	$7,751,179									
TOTAL PROGRAM CASH FLOW IN	$119,071,722	$120,172,694	$143,917,799	$133,487,754	$156,943,288	$145,419,670	$166,356,091	$155,149,351	$176,413,607	$165,546,051
NET PROGRAM CASH FLOW (NPCF)	$4,235,062	($2,354,179)	($290,492)	($10,256,167)	($1,143,191)	($14,829,889)	$962,593	($14,708,834)	($842,873)	($16,606,987)
CASH BALANCE (CUMULATIVE NPCF LESS PAYOUTS)	$4,235,062	$1,880,883	$1,590,391	($8,665,776)	($9,808,967)	($24,638,856)	($23,676,263)	($38,385,097)	($39,227,970)	($55,834,956)

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