Forest Carbon Partnership Facility (FCPF) Carbon Fund **ER Monitoring Report (ER-MR)**	
ER Program Name and Country:	Costa Rica
Reporting Period covered in this report:	*01-01-2020 to 31-12-2021*
Number of FCPF ERs:	3,341,413 t CO_2e^*
Quantity of ERs allocated to the Uncertainty Buffer:	506,274 t CO_2e
Quantity of ERs to allocated to the Reversal Buffer:	185,634 t CO_2e
Quantity of ERs to allocated to the Reversal Pooled Reversal buffer:	185,634 t CO_2e
Date of Submission:	*17-06-2024*
Version	2.0

WORLD BANK DISCLAIMER

The boundaries, colors, denominations, and other information shown on any map in ER-MR does not imply on the part of the World Bank any legal judgment on the legal status of the territory or the endorsement or acceptance of such boundaries.

The Facility Management Team and the REDD Country Participant shall make this document publicly available, in accordance with the World Bank Access to Information Policy and the FCPF Disclosure Guidance.

Table of Contents

Acronyms List

AC: Conservation Areas
ACC: Central Conservation Area
AD: Activity data
ADII: Asociaciones de Desarrollo Integral Indígena (Associations for Integral Indigenous Development)
AFOLU: Agriculture, Forests, and Other Land Use
ASP: Protected Wilderness Areas
ASVO: Volunteers Association
CATIE: Tropical Agricultural Research and Higher Education Center
CENIGA: National Geo-environmental Information Center
CIAgro: Colegio de Ingenieros Agrónomos (College of Agricultural Engineers)
CIRAD: Center for International Cooperation in Agricultural Research for Development
CONAC: The National Council of Conservation Areas
COVIRENA: Natural Resources Surveillance Committees
CREF: Contract for the Reduction of Forest Emissions
DCC: Climate Change Directorate
EF: Emission Factors
ER: Emission Reduction
ER-MR: Emission Reduction-Monitoring Report
ERPA: The Emissions Reduction Purchase Agreements
ER-PD: Emission Reduction Program Document
FCPF: Forest Carbon Partnership Facility
FONAFIFO: National Fund for Forest Financing
FREL/FRL: Forest reference emission level/forest reference level
IGN: National Geographic Institute
IMN: National Meteorology Institute
INEC: Institute of Statistics and Census
INF-CR: Costa Rica's Nacional Forest Inventory
INGEI: National GHG Inventory
IPCC: Intergovernmental Panel on Climate Change
LULCC: Land Use Land Cover Change
LULUCF: Land Use, Land-Use Change and Forestry
MAG: Ministry of Agriculture and Livestock
MCS: Land Cover Maps
MINAE: Ministry of Environment and Energy
MRV: Monitoring, Reporting, and Verification
NFMS: National Forest Monitoring System
ONF: Oficina Nacional Forestal (National Forest Office)
PES: Payment for Environmental Services
PGM: General Management Plans
PNCB: National Biological Corridors Program
PNE: State Natural Heritage Lands
PPC: Prevention, Protection, and Control Plans
PRE: Emission Reduction Program
PSA: Environmental Services Payment Program
RMSE: Root Mean Square Error
SAF: Agroforestry Systems
SATIF: Forest Fire Early Warning System

SEPLASA: Secretariat for Sector Planning for the Environment, Energy, Seas and Territorial Planning
SICAF: System for the Control of Forest Harvesting
SIMOCUTE: National Monitoring System for Land Use, Land Use Cover, and Ecosystems
SINAC: Sistema Nacional de Areas de Conservación (National System of Conservation Areas)
SINAMECC: National System of Climate Change Metrics of Costa Rica
SIPLAMA: System of Management Plans
SITADA: Integrated Environmental Complaint Processing System
SLMP: Satellite Land Monitoring Protocol
SLMS: Satellite Land Monitoring System
SPMH-ACLAC: Strategy and Action Plan for the Participatory Strengthening of the World Heritage Site of La Amistad Caribe
TREES: The REDD+ Environmental Excellency Standard
UMP: Primary Sampling Unit
UNFCCC: United Nations Framework Convention on Climate Change
USGS: United States Geological Survey

1 IMPLEMENTATION AND OPERATION OF THE ER PROGRAM DURING THE REPORTING PERIOD

1.1 Implementation status of the ER Program and changes compared to the ER-PD

Progress on the actions and interventions under the ER Program: There are no changes or deviations in the ER Program's design and critical assumptions compared to the description of the ER Program in the ER-PD. This section refers to FONAFIFO and SINAC's REDD+ actions implemented during the 2020-2021 period[1] (for further detail, see Annex 1).

ACTION 1.1. Strengthen the operation and financing of SINAC's Forest Fires Management Strategy inside and outside Protected Conservation Areas: SINAC is currently focused on implementing the National Fire Management Strategy 2012-2021. The aim is to achieve an integrated fire management approach involving stakeholders such as local and national government institutions, NGOs, the private sector, and civil society. As a result of this implementation, the following activities have been made:

- Development of the Forest Fire Early Warning System (SATIF)[2], which evaluates factors that could lead to a fire and predicts its potential behavior at a national level. The system was created using the Forest Carbon Cooperative Fund (FCPF) readiness funds, SINAC's budget, and administrative support from the National Fund for Forest Financing (FONAFIFO) and the REDD+ Secretariat. SATIF's official launch took place in February 2020.
- Every year, SINAC organizes national, regional, and local forest fire management campaigns. However, the COVID-19 pandemic and Ministry of Health regulations have impacted the campaign. To comply with safety regulations, the focus shifted to press conferences, broadcasting on national and regional TV channels, radio programs, recording and editing a play, and social media posts. Additionally, the institutional budget was reduced by 50% since 2020, forcing SINAC to rely on external resources provided by the Canada Fund[3] for local initiatives to carry out the Fire Prevention Campaign.
- SINAC promotes and coordinates volunteer forest fire brigades, including training for officials and volunteers. In 2020 and 2021, 27 training workshops were held, with 475 firefighters and forest firefighters (341 men and 134 women) participating. Despite the pandemic[4], 5 workshops were conducted in 2020, and 22 were held until November 15, 2021. SINAC has established the National Guide for the Training and Certification of Personnel in Comprehensive Fire Management, which sets the standard for fire management training and education[5]. Finally, SINAC allocated a budget for equipment to be provided for both institutional and voluntary forest firefighters. Additionally, funds have been allocated for hiring reinforcement brigades and maintaining firewalls in high-incidence areas that have been identified[6].

ACTION 1.2: Strengthen the operation and financing of SINAC's Illegal Logging Control Strategy: SINAC is responsible for preventing illegal logging and overseeing sustainable forest management activities. SINAC implemented two online systems to grant logging permits on private land: the System of Management Plans (SIPLAMA[7]) for logging permits on forest lands and the Information System for the Control of Forest Harvesting (SICAF[8]) for logging permits on pasture and agricultural lands. During this reporting period, SINAC made improvements to SICAF based on suggestions from its users. This included maintenance and adjustments for better performance and adding new modules, such as those for harvesting fallen wood.

---

[1] See Policies, actions, and activities included in the ER-P and the National REDD+ Strategy, in Table 4.3.1 of the Emission Reduction Program Document.

[2] The SATIF is hosted on the server of the National Meteorological Institute (https://www.imn.ac.cr/alerta) and the geographic viewer can be accessed at the following link https://gestion.incendiosforestales.cr/mapa/mapa.

[3] Canada Fund for Local Initiatives – Costa Rica, Nicaragua and Honduras https://www.international.gc.ca/world-monde/funding-financement/cfli-fcil/2023/costa-rica-nicaragua-honduras.aspx?lang=spa

[4] During the COVID-19 pandemic, MINAE created a COVID-19 protocol to guide activities and prevent the spread of the virus. The protocol mandates a 1.80 distance between participants, the mandatory use of masks, frequent hand washing and use of alcohol, dining in open spaces with social distancing, and limiting capacity to less than 30%.

[5] https://www.acguanacaste.ac.cr/images/imagenes-noticias/proteccion/guía_nacional_de_capacitación_cr.pdf

[6] The practice of maintaining firebreaks is not synonymous with the removal of forested areas. Rather, it entails the strategic clearing of vegetation or land that plays a critical role in mitigating the potential for forest fires.

[7] SIPLAMA http://siplama.sirefor.go.cr/zf_GestionSolicitudes/Index/paginadebienvenida

[8] SICAF https://sicaf.addax.cc

Patrols and control operations were conducted, particularly during important dates like Easter and Christmas, when there is a higher risk of illegal activities such as forest burning and illegal logging. Complaints were also addressed, with forestry issues being the most common cause for concern.

SINAC continues implementing the Natural Resources Surveillance Committees (COVIRENA), engaging different actors at the national level in promoting participation in the protection and safeguarding of natural resources in compliance with the national legal framework. During this reporting period, SINAC trained COVIRENA's volunteers to use the Integrated Environmental Complaint Processing System (SITADA[9]), and 24 groups were accredited and prepared. Training in using this tool was also given to SINAC officers.

ACTION 1.5: Contribute to the consolidation of SINAC's Protected Areas System: SINAC has produced guidelines for establishing, expanding, modifying, and managing Protected Wilderness Areas. These documents serve as a reference for creating the General Management Plan and provide methodological guidance for developing Prevention, Protection, and Control Plans (PPC), sustainable tourism, waste management, research, natural resource management, and ecological integrity. Based on these instruments, 12 general management plans (PGM) were approved, which were: Dr. Archie Carr and Isla San Lucas National Wildlife Refuges, Chayote Protection Zone, Río Toro, and Abangares Protection Zones, Alberto Biological Reserve Manuel Brenes, Cerro Vueltas Biological Reserve, National Parks: Tapantí, Braulio Carrillo, Los Quetzales, La Cangreja, and the Guayabo National Monument.

In 2020, SINAC started implementing the "Strategy and Action Plan for the Participatory Strengthening of the World Heritage Site of La Amistad Caribe (SPMH-ACLAC)." This plan aimed to diagnose the interrelationships among populations in the conservation area, particularly in seven out of eight indigenous territories (two Bribri and five Cabécar). The plan considered the dynamics of the territories, their models of coexistence, care, and use of nature, and their culture of conservation to establish a governance structure. As a result, 12 additional general management plans (PGM) were approved.

SINAC launched in 2015 a tool for evaluating the effectiveness of managing Wilderness Protected Areas (ASP) [10]. SINAC implemented the use of this tool since 2016 to the present. This tool started with REDD+ preparation resources and helped with adaptive management. It also assisted in allocating resources more efficiently, promoting transparency and accountability to stakeholders, and involving strategic allies to promote ASPs. The tool fostered a learning culture within the organization. The application of this tool has resulted in obtaining reports on the management results of ASPs and Conservation Areas (CA), as well as their improvement plans. Workshops or work sessions were conducted in each evaluated ASPs in Costa Rica to develop the management effectiveness evaluation process. The ASP Administrators and their work teams attended these meetings to apply the corresponding instrument. In some cases, representatives of local actors who contribute to biodiversity conservation in these areas also participated.

In addition to managing ASP categories, SINAC also supports a second conservation strategy called Biological Corridors (CB), which is promoted through the National Biological Corridors Program (PNCB) and encourages participation.

In 2019, the creation of the ASP-PNE, which aims to protect natural heritage areas, began with the help of the REDD+ Readiness funds. In 2020, the design process for the ASP-PNE was also initiated. The National Council of Conservation Areas (CONAC) approved this chapter through agreement No. 11 of the Ordinary Session No. 07-2021 CONAC[11]. The ASP-PNE chapter will be included in the updated National Forestry Development Plan for the new execution period.

ACTION 1.4: Develop a strategy to integrate public lands to the State Natural Heritage: SINAC developed a Land Tenure Management System for State Natural Heritage Lands in protected wild areas with REDD+ readiness funds in 2019. However, the tool's computer structure and work guides were not fully adjusted until 2020. This system is a web platform for SINAC officers, which manages certifications, visas, purchases, donations, and vacant land registrations, with their respective review processes. This platform operates with high-security standards. The tool's implementation started with a pilot in the Central Conservation Area (ACC) in 2021. The system has a geospatial module for SINAC officers and another for the public. These modules contain layers such as the State Natural Heritage Lands (PNE), Conservation Areas (AC), Protected Wilderness Areas (ASP), forest types, and wetlands, among others. The layers and

[9] SITADA https://www.sitada.go.cr/denunciaspublico/

[10] Tool for evaluating the management effectiveness of Protected Wilderness Areas https://www.sinac.go.cr/ES/docu/ASP/Herramienta-Evaluacion-Efectividad-de-Manejo.pdf

[11] Oficio de aprobación del SINAC-CONAC-SA-155-07-2021 con fecha del 15 de julio de 2021 https://www.sinac.go.cr/ES/transprncia/Acuerdos%20CONAC%202021/ACUERDOS%20SO%20N%C2%B0%207-2021.pdf

tools for SINAC officials are more detailed than those available to the public and help to manage ASPs better. The information in this module may be helpful for ASP monitoring, research, and education purposes.

ACTION 5.2: Improve competitiveness of forestry and agroforestry financing mechanisms, also in relation to other land uses: FONAFIFO's Board of Directors has made significant decisions regarding forest conservation, including increasing the funds allocated towards conservation actions in 2020-2021. They are also considering implementing the Forest Emission Reduction Contracts scheme, which aims to involve more forest owners nationwide. Additionally, FONAFIFO has published a new manual for procedures to improve financial mechanisms within the Environmental Services Payment Program (PSA 2020) [12]. The manual includes several changes, such as updates to legislation, computer platforms, access to information, implementation of technological tools, new PSA sub-activities, and adjustments in processes and procedures. These changes highlight the improvements made to management in technical and legal issues.

Update on the strategy to mitigate and/or minimize potential Displacement: The risk of displacement is still considered minimal in Costa Rica, as the ER Program's implementation area covers the national territory. Policies, actions, and measures of the REDD+ National Strategy continued to focus on strengthening incentives and policies without corrective measures. Also, the benefit-sharing plan increases and expands stakeholders' opportunity to receive benefits from REDD+ activities and thus eliminates risks to curb deforestation and forest degradation. FONAFIFO continued promoting forest protection; it had a significant boost to increase coverage in 2020 and 2021. A FONAFIFO Board agreement raised PES funds for forest protection. Most indigenous peoples participated through information, pre-consultation, and consultation mechanisms. Also, REDD governance operated satisfactorily.

ACTION 6. Effectiveness of the organizational arrangements and involvement of partner agencies: In May 2021, the Government officialized[13] the SIMOCUTE (National Monitoring System for Land Use, Land Use Cover, and Ecosystems). SIMOCUTE is the official platform for coordination, linkage, and institutional and sectoral integration of the Costa Rican State, to facilitate the management and distribution of knowledge and information on land-use change and ecosystem monitoring.

The executive decree No. 42886-MINAE-MAG-JP [14] was published in March 2021, establishing the SIMOCUTE monitoring system under the responsibility of the Ministry of Environment and Energy (MINAE), in coordination with the Ministry of Agriculture and Livestock (MAG) and the Ministry of Justice and Peace (MJP). SIMOCUTE is led by the National Geo-environmental Information Center (CENIGA) of MINAE and is a part of Costa Rica's efforts to promote the use of information technologies and spatially explicit data. This important achievement marks a significant milestone in the development of the system.

SIMOCUTE is linked to critical national commitments, with Goal 42 of the National Biodiversity Strategy, the Monitoring of the National Decarbonization Plan for the Agriculture, Forestry, and Other Land Use sectors, and the commitments of the Support Program for the National Plan of Decarbonization. It is also considered one of the mechanisms for implementing the Agro-Environment Agenda and the Urban Environment Agenda.

Regarding strengthening technical capacities, training and projects have been carried out in collaboration with institutions such as the Center for International Cooperation in Agricultural Research for Development (CIRAD)[15] and the Tropical Agricultural Research and Higher Education Center (CATIE). In addition, work has been done on the development of a technological platform that will allow better monitoring and analysis of the coverage and use of land and ecosystems in Costa Rica.

Financial plan. The REDD+ National Strategy implementation plan requires an incremental investment of $95,362,967 to achieve REDD+ targets. A portion of this investment will be covered by the sale of emissions reduction with the

[12] New PSA 2020 procedures manual https://onfcr.org/wp-content/uploads/Manual-de-Procedimientos-PSA-2020-14-abril-2020.pdf

[13] Decreto Ejecutivo N° 42886-MINAE-MAG-JP available at http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=94331&nValor3=125551&strTipM=TC

[14] 42886-MINAE-MAG-JP http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=94331&nValor3=125551&strTipM=TC

[15] https://www.cirad.fr/en

Carbon Fund. However, more investment is required to complement activities within the Emissions Reduction Program. In this regard, the country is raising additional financial resources by accessing other carbon market mechanisms and instruments. In November 2020, the Green Climate Fund approved Costa Rica a $54.1 million Pay-per-Results project for 2014-2015 ERs.

As of 2020, there have been improvements in regeneration management by implementing a new PSA modality called Mixed Systems[16]. This modality aims to support the inclusion of micro-producers and producers in various forestry activities, including regeneration, forest protection, and Agroforestry Systems (SAF) on farms smaller than 15 hectares. By using this mechanism, the transaction cost for farm owners is reduced, which encourages their participation.

In addition, as part of the financial strategy it has been developing within the National REDD+ strategy, in November 2020, the Green Climate Fund approved a $54.1 million payment-for-results project for Costa Rica for emission reductions for 2014-2015[17]. In December 2021, the first disbursement of the results-based payment project was received for $23,933,019.97. Likewise, in 2021, the first disbursement of the ERPA with the Carbon Fund was received for $16,415,000.

1.2 Update on major drivers and lessons learned

Costa Rica decoupled agricultural production from deforestation by implementing solid legal frameworks, innovative agricultural and environmental policies, and Payment for Environmental Services schemes (REDD+ financial mechanisms), which together generated agricultural and livestock intensification, plus the growing development of Ecotourism. AFOLU emissions have decreased from 11.4 to 0.7 million tCO2-e yr-1 (see Figure 1).

- ***The Investment in REDD financial mechanisms promoted forest use over marginal agriculture***. By addressing drivers of forest loss, Costa Rica has demonstrated that emissions can be reduced effectively, as planned in the ER Program. During 2012-2021, the government of Costa Rica signed 448,407 ha[18] of PES contracts with private forest owners under the activities of Protection, Reforestation, Regeneration, and Forest Management. Deforestation in Costa Rica has historically been driven by **the lack of ecosystem service value** that incentivizes converting forest land to agriculture and pasture. And **Lack of property rights** prevented small landowners and indigenous people from being incorporated into the existing payment for environmental services (PES) programs[19]. There have not been any new deforestation drivers identified and those listed in ER-PD. Deforestation drivers are also being addressed through the recently released (2020) Benefit Sharing Plan in the National REDD+ Strategy[20]. Costa Rica has established, expanded, and improved the financial mechanisms to strengthen natural reforestation and foster forest management. Costa Rica expanded the PES scheme to include indigenous territories, allowing indigenous peoples to influence and benefit from REDD+ activities in the country. Like the action above, there is no risk of leakage as this activity improves financial incentives for all landowners. Stakeholders in these lands were part of a consultative process that led to implementing of a comprehensive government plan on socioeconomic and environmental safeguards[21], and the benefit-sharing mechanisms[22].
- ***The Intensification of agriculture and livestock*** helped to produce a positive balance of mature forests loss and forest regeneration, improving the agriculture sector's added value and exports (see Figure 1). Between 2012 and 2021, the loss of mature forest was 37,285 hectares (61% for grasslands), while 194,914 hectares of forest were regenerated mainly from pasture lands (51%).

[16] The projects in Mixed Systems are aimed at small producers who carry out forest/tree cover protection activities of 0.5 ha to 5 ha, non-tree covered areas, or in the process of regeneration of 0.5 ha to 5 ha and up to 1,600 trees in agroforestry systems. https://www.fonafifo.go.cr/es/servicios/actividades-y-sub-actividades/

[17] FP144 Costa Rica REDD-plus Results-Based Payments for 2014 and 2015 https://www.greenclimate.fund/project/fp144

[18] Contratos de PSA por tamaño de proyectos https://www.fonafifo.go.cr/es/servicios/estadisticas-de-psa/

[19] Plan de Implementación de la Estrategia Nacional REDD+ Costa Rica. Secretaria Ejecutiva REDD+ Costa Rica. 2017. Available at https://ceniga.go.cr/wp-content/uploads/2020/02/plan_de_implementacion_enreddcr.pdf

[20] Benefit Sharing Plan, National REDD+ Strategy. June 2020. Ministry of Environment and Energy (MINAE), Costa Rica. Retrieved from http://documents1.worldbank.org/curated/en/785151594625278269/pdf/Benefit-Sharing-Plan.pdf

[21] Resumen del Diseño del Sistema de Información sobre Salvaguardas REDD+ en Costa Rica. 2017. FONAFIFO. 80 pp. http://reddcr.go.cr/sites/default/files/centro-de-documentacion/propuesta_sis-redd_informe_final_-_fonafifo.pdf

[22] ibid 5.

- ***Ecotourism facilitated the Internalization of the benefits of biodiversity conservation*.** Ecotourism in Costa Rica has become an effective forest conservation strategy. An explicit conservation mechanism, a local economic benefit, and strict monitoring and application of environmental regulations have accompanied ecotourism[23].

Regarding degradation, it is necessary to implement adjustments to reduce its emissions. The emissions due to forest degradation have increased during the first and second monitoring periods (see Table 1). Forest degradation from illegal logging has been addressed since 2002. MINAE established strategies to control illegal logging and grant wood harvesting permits in agricultural lands, shifting the sources of Costa Rica's wood supply entirely. It is estimated that 49% of wood products come from forest plantations, 34% are imported, 12% are from agricultural lands, and 5% are from natural forests[24]. Costa Rica is addressing degradation through the financing mechanisms of PES and sustainable timber production initiatives. No other degradation drivers have been identified.

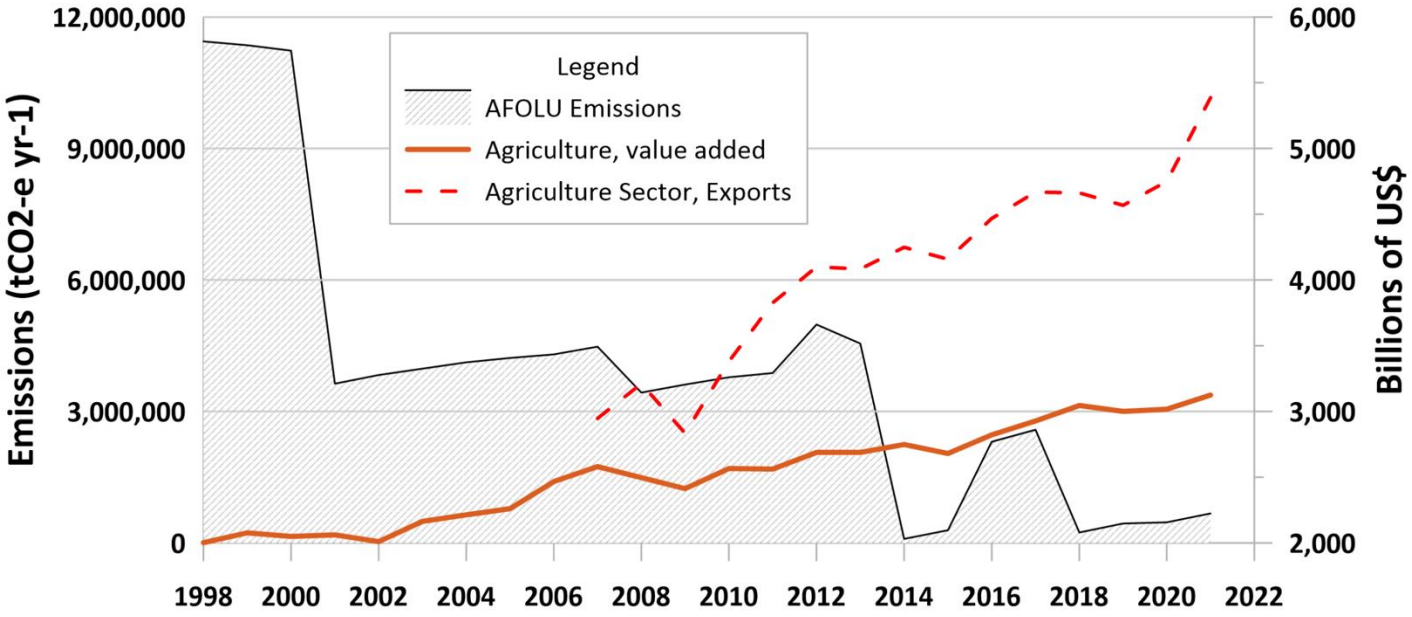


Figure 1*:* AFOLU emissions are decreasing while the agricultural sector's value-added and exports during 2012-2021 increased, showing that Costa Rica decouples deforestation from commodities production. Sources: World Bank (https://datos.bancomundial.org/indicador/NV.AGR.TOTL.KD), COMEX (https://www.comex.go.cr/estadísticas-y-estudios/comercio-bienes/exportaciones/), SINAMEC (http://sinamecc.opendata.junar.com/dashboards/21151/inventario-nacional-de-gases-de-efecto-invernadero-ingei/) and National Forest Monitoring System.

[23] Brandt, J. S., & Buckley, R. C. (2018). A global systematic review of empirical evidence of ecotourism impacts on forests in biodiversity hotspots. *Current Opinion in Environmental Sustainability*, *32*, 112–118. https://doi.org/10.1016/j.cosust.2018.04.004

[24] Santamaria et al. 2015. Mercado de la madera y derivados en Costa Rica. 216pp. https://onfcr.org/wp-content/uploads/media/uploads/documents/mercado-de-la-madera-y-derivados-en-cr-final.pdf

Table 1. Comparison of the emissions and sinks in the reference period (1998-2011) and the-ERPA monitoring periods (2018-2019 and 2020-2021).

Period	Average emissions from deforestation, t CO_2e/y	Average removals from reforestation (Secondary forests), t CO_2e/y	Average emissions from degradation, t CO_2e/y	Average emissions from enhancements (forest remaining forests), t CO_2e/y	Net forest land cover change emissions, t CO_2e/y	Net forest remaining forests emissions, t CO_2e/y	Total net emissions, t CO_2e/y
Reference period (1998-2011)	5,985,795	-4,372,155	1,383,974	-411,896	1,613,640	972,078	2,585,717
Monitoring period, pre-ERPA (2018-2019) [1]	840,167	-5,607,368	2,563,242	-406,144	-4,767,201	2,157,098	-2,610,103
Monitoring period, pre-ERPA (2020-2021)	558,827	-5,199,765	2,764,822	-509,222	-4,640,938	2,255,600	-2,385,338

[1] Average emissions from degradation have been updated after fixing an error in the canopy cover reference dataset produced during the importing process between the Collect Earth Desktop app and the Excel degradation tool.

2 SYSTEM FOR MEASUREMENT, MONITORING AND REPORTING EMISSIONS AND REMOVALS OCCURRING WITHIN THE MONITORING PERIOD

2.1 Forest Monitoring System

2.1.1 Organizational structure

Costa Rica's National Forest Monitoring System (NFMS), which generates information for the REDD+ Monitoring, Reporting, and Verification (MRV), has already been created following the Warsaw Framework for REDD-plus to access result-based payments. The country submitted NFMS for REDD+ to the UNFCC in November 2019[25]. The process started in 2015 when the National Center for Geospatial Information (CENIGA) initiated the designing process of the NFMS to cover all land uses and land-use changes at the national level, following IPCC's 2003 Good Practice Guidelines[26].

The NFMS is part of the SIMOCUTE platform (National Monitoring System for Land Use, Land Use Cover, and Ecosystems, see Figure 2). SIMOCUTE is the official platform for coordination, linkage, and institutional and sectoral integration of the Costa Rican State management and distribution of knowledge and information on land-use change and ecosystem monitoring (see Figure 3). SIMOCUTE provides technical guidance for the monitoring, reporting, and verification (MRV) of land-use change in the AFOLU sector (agriculture, forests, and other land use). SIMOCUTE is now a fully operational platform[11] that will integrate the MRV systems of GHG emissions from the AFOLU sector, including the national REDD+ program, the NAMAs, the national carbon trading system, and the progress of NDC implementation[27].

The NFMS is composed of two data collection mechanisms:

- The first is the Satellite Land Monitoring System (SLMS), which collects land use and land use change data. The agencies/institutions responsible for the SLMS are the National Meteorology Institute (IMN) and the REDD+ Secretariat, composed of the Fondo Nacional de Financiamiento Forestal (FONAFIFO) and the Sistema Nacional de Areas de Conservación (SINAC). The Instituto Metereológico Nacional (IMN) is also responsible for Costa Rica's National GHG Inventory (INGEI) and the development and submission of Biennial Update Reports (BURs). Therefore, the collaboration between IMN and FONAFIFO is crucial to maintain consistency between the REDD+ reporting and the national GHG inventory. The IMN is also tasked with developing indicators that follow IPCC's Good Practice Guidelines and SIMOCUTE´s structure.
- The second data collection mechanism is the National Forest Inventory (NFI), which gathers forest field data to estimate and update the country's emission factors. This piece of the NFMS is led by the SINAC, which is also responsible for promoting sustainable forest management, logging permits, and control of illegal logging.

Other government entities involved in the REDD+ Program are: Ministerio de Ambiente y Energia (MINAE), which gives political support to the process; Colegio de Ingenieros Agrónomos (CIAgro), which supervises forestry professionals in charge of REDD+ Program implementation; Oficina Nacional Forestal (ONF) is the interlocutor between these government entities and the private sector; and Asociaciones de Desarrollo Integral Indigena (ADII), which supports indigenous groups. The inter-institutional REDD+ Board of Directors is responsible for issuing policies, making decisions, and resolving conflicts or grievances related to REDD+.

[25] https://redd.unfccc.int/files/4863_2_sistema_nacional_monitoreo_forestal_costa_rica.pdf
[26] Available at: https://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html [11]
Accessible at https://simocute.go.cr/
[27] https://simocute.go.cr/acerca/

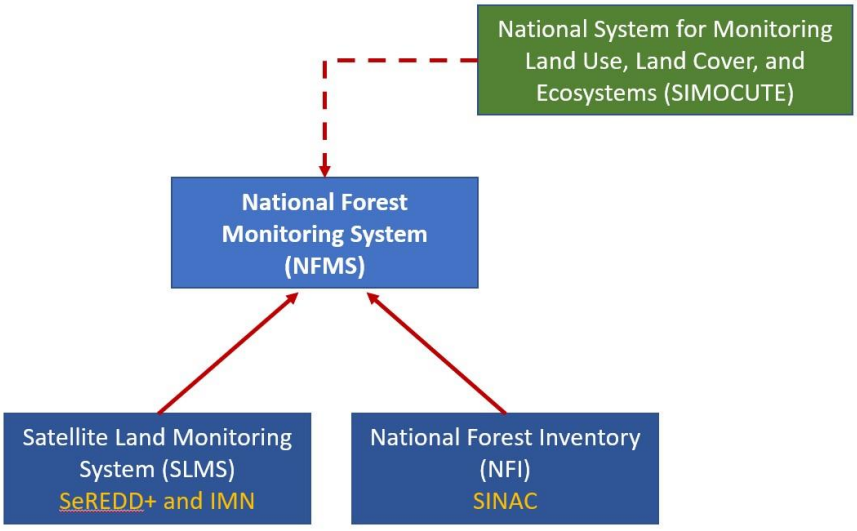


Figure 2: Organizational structure of the National Forest Monitoring System in Costa Rica.

Figure 3*:* Conceptual Framework of Costa Rica's SIMOCUTE (National Monitoring System for Land Use, Land Use Cover, and Ecosystems). Source: MINAE 2017.

REDD+ Secretariat counts with the Costa Rica REDD-plus Result-Based Payments Project (RPB Project) support. This project will provide additional human resources and material inputs such as satellite imagery, hardware, software, and field monitoring equipment necessary for the REDD+ MRV implementation. This activity will strengthen national REDD+ monitoring, reporting, and verification capacities. Furthermore, this project will also provide support to meet the requirements of emerging market standards such as "The REDD+ Environmental Excellency Standard" (TREES) within the scope of the "Architecture for REDD+ Transactions" (ART)Program. RBP project will combine the market standards with Warsaw Framework for REDD+ results-based payments to maximize REDD+ financing for Costa Rica. Indeed, these

standards can be made consistent with UNFCCC decisions for REDD+ while also including additional rules that reduce uncertainties and the risks of leakage and reversals. This activity will also support the verification of results by independent third parties. More specifically, this support will include:

- Development and implementation of a diversified strategy for capturing REDD+ results-based payments from market and non-market sources based on international partnerships in line with the San Jose principles.
- Updating the FREL for future submission, methodological improvements in response to technical assessment recommendations, and consolidating methodological consistency with the national GHG inventory and the NDC monitoring framework.
- Preparation of the second technical annex of REDD+
- Support for participation of Costa Rica in market mechanisms including the REDD+ Environmental Excellence Standard (TREES) of the Architecture for REDD+ transaction programme (ART).
- Support for validation and verification processes.

2.1.2 Processes for collecting, processing, consolidating, and reporting GHG data and information.

The processes for collecting, processing, consolidating, and reporting GHG data and information employed during the monitoring period will be identical to the ones used for the construction of the reference level. Costa Rica will monitor the same activities and carbon pools and will implement these same procedures for future monitoring events. The entities responsible for collecting, processing, consolidating, and reporting GHG data and information are the following:

- **Obtaining activity data (AD):** Instituto Meteorológico Nacional (IMN) has produced to date all land use cover maps and national GHG inventories in Costa Rica. The REDD+ Secretariat has been the entity responsible for developing the land use cover maps for the historical series that were used to develop the FRL/FREL submitted to the UNFCCC.
- **Obtaining emission factors (EFs):** SINAC is responsible for Costa Rica's NFI, which regularly determines the forest stocks in the country. The NFI outcomes are used to develop emission factors for Costa Rica's REDD+ MRV. SINAC will update the NFI to allow future resampling of a portion of the existing plots, with the support of US Forest Service (USFS) and FAO, which will consist on a resampling of a portion of SIMOCUTE's 10,588 sampling plots. Costa Rica intends to start as soon as possible with the measurement of 441 sampling points over a 5-year period to estimate biomass transitions[28].
- **Estimating emissions and sinks:** IMN, responsible for the national GHG inventories in Costa Rica, maintains the capacity to estimate GHG from AFOLU (agriculture, forestry, and other land use) and LULUCF (land use, land use change, and forestry).
- **Reporting:** Technical reports and annexes on REDD+ are developed by the REDD+ Secretariat and supported by IMN experts estimating emissions and sinks. These include reports to the FCPF Carbon Fund (FC), safeguards reports, and BURs for payment for performance under REDD+. The results from these reports then undergo a verification process by external reviewers and the REDD+ secretariat along with the IMN work team must adjust the FREL/FRL as needed.

To calculate the average annual historical emissions over the reference period, Costa Rica followed an activity-based approach where emissions and removals are estimated based on spatially explicit gross activity data and on net emission factors. Activity data was entered in land use matrices (see below) to ensure representation of all land use transitions and avoid double counting or omissions.

[28] MINAE, 2019. Technical Annex of the Republic of Costa Rica, in accordance with the provisions of Decision 14 / Cp.19. 64pp. Retrieved from https://unfccc.int/sites/default/files/resource/4863_3_iba-2019-anexotecnico_Edited.pdf .

	FL	LCFL	CL	GL	SL	WL	OL
FL	*CO*	*NA*	*DF.1*	*DF.1*	*DF.1*	*DF.1*	*DF.1*
LCFL	*EC.3*	*EC.2*	*DF.2*	*DF.2*	*DF.2*	*DF.2*	*DF.2*
CL	*NA*	*EC.1*	*NA*	*NA*	*NA*	*NA*	*NA*
GL	*NA*	*EC.1*	*NA*	*NA*	*NA*	*NA*	*NA*
SL	*NA*	*EC.1*	*NA*	*NA*	*NA*	*NA*	*NA*
WL	*NA*	*EC.1*	*NA*	*NA*	*NA*	*NA*	*NA*
OL	*NA*	*EC.1*	*NA*	*NA*	*NA*	*NA*	*NA*

***FL**, Forest Land; **LCFL**, Land Converted to Forest Land; **CL**, Cropland, GL, Grassland; **SL**, Settlements; **WL**, Wetlands; **OL**, Other Land; **CO**, Conservation of forest C stocks; **EC**, Enhancements of forest C stocks (.1, EC in conversions of non-forest land to forest land; .2, EC in LCFL remaining LCFL; .3, EC in LCFL converting to FL); **DF**, Deforestation (.1, DF of old-growth forests; .2, DF of secondary forests); **NA**, Not Applicable in the REDD+ context.*

Once AD and EFs for the forest that remains forests and forest cover change are generated and the corresponding GHG fluxes estimated with Excel-based calculators, the uncertainty of the estimates is assessed by IMN and technical advisors from academia as needed.

To develop NFMS methods and protocols, SIMOCUTE considered the IPCC guidelines specifically the AFOLU requirements for monitoring land use change emissions and establishes technical working groups to determine the procedures to implement methodologies and protocols and update them if needed. These technical working groups are conformed by experts from the institutions involved in monitoring ecosystems and land use/land cover.

The key elements of the SLMS and the NFI, including methods, protocols, source of data, and the frequency of monitoring can be found in the section 3 of this report, the Annex 4 of the first Emission Reduction Monitoring Report[29] and Technical Annex Document[30]. There are QA/QC procedures for the AD and FE calculation as follows:

- **Activity Data:** The QA/QC procedures applied during the calculation of AD for the reference and monitoring period are summarized in Tables 2, 3, 6, and 7, further information may be found in Agresta (2005)[31], Ortiz-Malavassi (2017)[32], and Aguilar (2020)[33].

[29] The FCPF's first ER Monitoring Report of Costa Rica ER program can be accessed at the following link: https://www.forestcarbonpartnership.org/system/files/documents/costa_rica_fcpf_er_monitoring_report_1st_rp_final_0.pdf

[30] MINAE, 2019. Technical Annex of the Republic of Costa Rica, in accordance with the provisions of Decision 14 / Cp.19. 64pp. Retrieved from https://unfccc.int/sites/default/files/resource/4863_3_iba-2019-anexotecnico_Edited.pdf

[31] Agresta, Dimap, Universidad de Costa Rica, Universidad Politécnica de Madrid. 2015. 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 pp. https://www.dropbox.com/s/ygjw6zq00a1qtbm/Informe_tecnico_feb_2015.pdf?dl=0

[32] Ortiz-Malavassi, E. (2017). Evaluación Visual Multitemporal (EVM) del Uso de la tierra, Cambio en el Uso de la Tierra y Cobertura en Costa Rica Zonas A y B Tarea 1: Estimación del área de cambio de uso de la tierra durante el periodo 2014-2015. Retrieved from https://drive.google.com/file/d/1GXdN43f-DNKelkM8y7gBLrKou-f7LI-G/view?usp=sharing

[33] Aguilar, L. (2020). Evaluación Visual Multitemporal para la determinación de la degradación forestal para los periodos 2014-2015-2017-2019 y determinación de datos de referencia para periodo 2017-2019. Tercer Informe. Retrieved from https://drive.google.com/file/d/1ERutZo6vNI6MXUCmlrky7wiaeOqOLMqh/view?usp=sharing

- **Emission Factors:** The QA/QC procedures applied during the calculation of EF for deforestation and degradation are summarized in Tables 4 and 5, further information may be found in Ministerio de Ambiente y Energía (2015)[34], Rodriguez (2018)[35], Coto (2018)[36], and Obando (2019)[37].

Costa Rica's first National Forest Inventory (NFI) was finished in 2015, under the supervision of SINAC. The NFI plots have been found to pose challenges for SINAC to conduct forest change assessments over time because of an uneven plot distribution among forest strata[38] and thus, SINAC is currently evaluating changes to the NFI structure through redistributing the plots to enhance compatibility with SIMOCUTE.

2.1.3 Role of communities in the forest monitoring system:

The 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, ER-Program envisions supporting measures lead to robust participation by communities and organizations in control actions related to forest resources. For example, SINAC efforts to strengthen the involvement of communities in firefighting through the so-called "Forest fire brigades" that are mainly composed of volunteers in zones with high susceptibility to these phenomena (see section 1.1). Also, SINAC efforts to strengthen the "Natural Resources Monitoring Committees" (COVIRENAS) and the activities of the Volunteers Association (ASVO), nongovernment 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.

SINAC engaged different actors at the national level to promote participation in protecting and safeguarding natural resources. It is a mechanism that allows state institutions responsible for ensuring these resources to establish surveillance actions together with communities in compliance with the national legal framework. During 2019, SINAC held a series of training workshops to reactivate COVIRENAS, aimed at local actors interested in their formation and training in using integrated environmental reporting process systems (its acronym in Spanish is SITADA), among others.

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 concerning conservation, restoration, reforestation, or management. In that same sense, many local and regional forestry producer organizations provide regency services to interested parties and have their capacities strengthened through PES. It is envisioned to strengthen these capacities through different lines of work incorporated into policies, actions, and tasks of the PRE.

[34] Ministerio de Ambiente y Energía. (2015). Volumen 4 Marco conceptual y metodológico para la Inventario forestal nacional de Costa Rica. Retrieved from https://www.sirefor.go.cr/pdfs/Volumen4-MarcoC-Imprenta.pdf

[35] Rodríguez, J. (2018). INFORME FINAL DE CONSULTORÍA Estudio de parcelas temporales para estimar el stock de carbono en bosques intactos, degradados y altamente degradados en zona A. (Contrato N°020-2018-REDD). Retrieved from https://drive.google.com/file/d/1dSyL8Dldwym5VN1jXpnAbmPovUW3AiTu/view?usp=sharing

[36] Coto, O. (2018). INFORME FINAL DE CONSULTORÍA. Estudio de parcelas temporales para estimar el stock de carbono en bosques intactos, degradados y altamente degradados en zona B. (Contrato N°019-2018-REDD). Retrieved from https://drive.google.com/file/d/1svYPJGEoBHpLn72sg4ejpf6uZkp6lllM/view?usp=sharing

[37] Obando, G. (2019). COORDINACIÓN GENERAL DE LA IMPLEMENTACIÓN DEL PLAN DE MEJORA DEL NIVEL DE REFERENCIA. Tercer Informe de Consultoría N ° 016-2018-REDD. Retrieved from https://drive.google.com/file/d/1MEHZ6dvQKY52X58UtlG02o4Uw9x1HV6v/view?usp=sharing

[38] Recomendaciones para la Medición, Reporte, y Verificación (MRV) de REDD+. 2016. Report from the CDI, US Forest Service, and FAO UNREDD. 33 pp.

2.2 Measurement, monitoring, and reporting approach

2.2.1 Line Diagram

The diagrams below show a step-by-step description of the measurement and monitoring approach applied for the establishment of the Reference Level and estimating Emissions and Emissions reductions during the Monitoring / Reporting Period for estimating the emissions and removals from the Sources/Sinks, Carbon Pools, and greenhouse gases selected in the ER-PD (Figure 4).

Costa Rica has developed a tool to estimate emissions and removals from deforestation and reforestation - FREL & MRV TOOL CR.xlsx[39], and another for the estimate of emission and removals from degradation in permanent forest lands – Herramienta-degradacion.xlsx[40].

FREL tool: Details of the FREL tool can be found in the START spreadsheet and its manual (Manual de la Herramienta FREL & MRV Tool – UNFCCC.pdf in Spanish[41]). The tool is organized in the following sections:

Setting sections that users must not modify:

i. START: This spreadsheet explains the general information of the Tool: i. name and contact information of the person who made the last modification of the Tool, ii. date of the changes, and iii. keyword used to lock spreadsheets.

ii. FREL&FRL: In this spreadsheet, the user can recalculate the FREL/FRL by selecting i. carbon gases and reservoirs to be included in the FREL/FRL; ii. REDD + activities to be included in the FREL/FRL; iii. the years of the historical reference period of the FREL/FRL.

iii. C-STOCKS: This spreadsheet aims to calculate the carbon stocks (in tCO_2-e ha^{-1}) of the land use categories represented in the Land Cover Maps (MCS) of Costa Rica. The calculation is done separately for each gas and carbon pool, whether it is included in the FREL/FRL. The spreadsheet also reports uncertainty values, at 90% or 95%, associated with estimates of average carbon existence. The calculations of these uncertainty values are made in a separate Excel file ("Carbon Database> 4. Carbon Densities"[42]) using the IPCC uncertainty propagation method (Equation 3.1 and 3.2 of IPCC-GL, 2006 - Volume 2). At the end of the spreadsheet, all the data, parameters, and default values used in calculating carbon stock estimates and their respective sources are listed.

iv. REDD+ ACT: This spreadsheet defines REDD + activities in such a way that it is not possible to count the same source or the same GHG sink in more than one REDD + activity and ensure, at the same time, that all GHG sources and sinks are considered in the analysis. The approach taken to meet this objective is to represent in a matrix of land use changes all possible transitions between land use categories and then assign each cell in the matrix to a single REDD + activity.

v. LIST: This spreadsheet contains the drop-down lists that appear in the rest of the Tool's pages and additional information related to the stratification of Costa Rica's forests. No calculation is made on this sheet.

Input section:

vi. LCM AAAA-AA: In this spreadsheet, the activity data of the "AAAA-AA" period are reported, where "AAAA and AA" are the beginning ("AAAA") and end ("AA") years of the period. This is done by filling in a matrix of land use changes with all possible transitions. The matrix structure is identical to the matrix presented in the "REDD + ACT" spreadsheet, which allows the activity data to be related to REDD + Activities. The "LCM AAAA-AA" spreadsheets are the only ones that must be filled in for REDD + monitoring. When activity data is entered in the matrices of the "LCM AAAA-AA" sheets, the Tool will automatically calculate the annual activity data ("AD

[39] The FREL Tool can be accessed in the following link: https://docs.google.com/spreadsheets/d/103jZDLVaK3bKC-OQwBV4CmSYj_sSZ5nh?rtpof=true&authuser=mrvreddcr%40gmail.com&usp=drive_fs

[40] Degradation tool can be accessed in the following link: https://docs.google.com/spreadsheets/d/11r7J0a6BHZx5aWyzC45UatWy3XAlnfp0?rtpof=true&authuser=mrvreddcr%40gmail.com&usp=drive_fs

[41] A copy of the FREL Tool Manual can be download at the following link: https://drive.google.com/file/d/14CsE_rpBBrEJgyUTplziKKsGGVm_YtL_/view?usp=sharing

[42] A copy of Carbon Densities database can be download at the following link: https://drive.google.com/file/d/1LJ8pbd0EuiVoS7JuMc8ps_OwlD12MUuH/view?usp=sharing

AAAA" sheets) and annual emissions and removals ("ER AAAA" sheets) up to the "AA" year (= last year of the "AAAA-AA" period). The "FREL & FRL" sheet will be updated with the data calculated up to the "AA" year and the results of the mitigation actions (or emission reduction program) on the "RESULTS" sheet.

Calculation section:

vii. AD AAAA: In this sheet, the annual activity data are calculated from the values entered in the "LCM AAAAAA" sheets. The calculation is made in matrices of land use changes and assumes that in the "AAAA-AA" period, the areas converted annually are equal.

viii. ER AAAA: These spreadsheets calculate GHG emissions and removals related to the land use change summarized by forest type and REDD + activities. The calculation is performed automatically in each of the cells of the land use change matrices by multiplying the activity data by their corresponding emission factors. The activity data are the values calculated in the matrices of the "AD AAAA" spreadsheets. The emission factors are calculated as the difference between the carbon contents existing at the beginning and end of the year, taking the carbon stock values of the "C-STOCKS" spreadsheet.

Results sections:

ix. RESULTS: This spreadsheet calculates and shows the results of the mitigation action. Results are calculated considering the same gases, carbon reservoirs, emission factors and REDD + activities that were included in the FREL / FRL. The calculation of the results is simply the difference between the actual emissions / removals and the emissions / removals of the FREL/FRL.

x. CHARTS: This spreadsheet contains graphs and tables that were included in the FREL / FRL description documents of Costa Rica that were submitted to the UNFCCC (MINAE, 2016). The content of this sheet is informative and there are no parameters that the user can change (except the working language) or calculations that are not performed on other spreadsheets.

Uncertainty analyses are performed in a separate tool using Monte Carlo simulation as described in section 5.

Degradation tool: Costa Rica used a methodology of visual interpretation of high-resolution images to detect changes in the canopy of permanent forest areas to estimate emissions and removals from degradation. This analysis resulted in a database of canopy cover percentages in 4,377 points in forest lands of Costa Rica for several years. Details of the Degradation tool can be found in Winrock International, (2018)[43]. The tool facilitates the following calculations:

- Segregation of interpretation points between anthropic and natural carbon flux areas to eliminate natural changes from emissions accounting since the ER program cannot control them.
- Calculation of the number of points in each forest state transition. In this step, the canopy interpretation assessment of the three forest status classes of the initial year and the final year of the monitoring period are classified. The three classes of forest status are: a. Intact: forest areas with canopy percentage between 85-100%; b. Slightly degraded: forest areas with canopy percentage between 60-85%; c. Very degraded: forest areas with canopy percentage less than 60%.
- Extrapolate the area of each transition of forest states. This step is necessary to extrapolate the carbon flows detected at the interpretation points to the entire permanent forest area for the monitoring period.
- Calculation of the average canopy percentage for each forest state. In this step, the tool calculates the average canopy percentage of each forest state for the beginning and the end of the monitoring period.
- Estimation of carbon fluxes (emissions and removals) of each type of transition is the final step. The tool uses the relationship between the percentage of canopy cover and biomass to estimate carbon fluxes in each transition from forest state.

The Degradation tool is organized as follows:

[43] Winrock International. (2018). Ejercicio : estimación de emisiones por actividades en bosques que permanecen como tales. Retrieved from https://drive.google.com/file/d/1Mk8MACXEKDROXQg2UP7t4FDqQmc8Q5S9/view?usp=sharing

i. Descripcion_Variables: This sheet contains descriptions of the High-Resolution Image Visual Interpretation Analysis database attributes. Take note of the attributes *Arbol+Palma_AAAA* variables. These attributes show the percentage of canopy cover in the initial and final year of the monitoring period.

ii. Base_de_Datos: This sheet contains the database for the visual interpretation of high-resolution images.

iii. Resumen_de_puntos: This sheet calculates the number of points and extrapolates the area for each transition from the forest state.

iv. Deg_ems_antro_RP_AA-AA: This sheet calculates the average canopy percentage of each forest state and the anthropic carbon fluxes (emissions and removals) of each type of transition for the Reference Period.

v. Deg_ems_nat_RP_AA-AA: This sheet calculates the average canopy percentage of each forest state and the natural carbon fluxes (emissions and removals) of each type of transition for the Reference Period.

vi. Deg_ems_antro_MP_AA-AA: This sheet calculates the average canopy percentage of each forest state and the anthropic carbon fluxes (emissions and removals) of each type of transition for the Monitoring Period. vii. Deg_ems_nat_MP_AA-AA: This sheet calculates the average canopy percentage of each forest state and the natural carbon fluxes (emissions and removals) of each type of transition for the Monitoring Period.

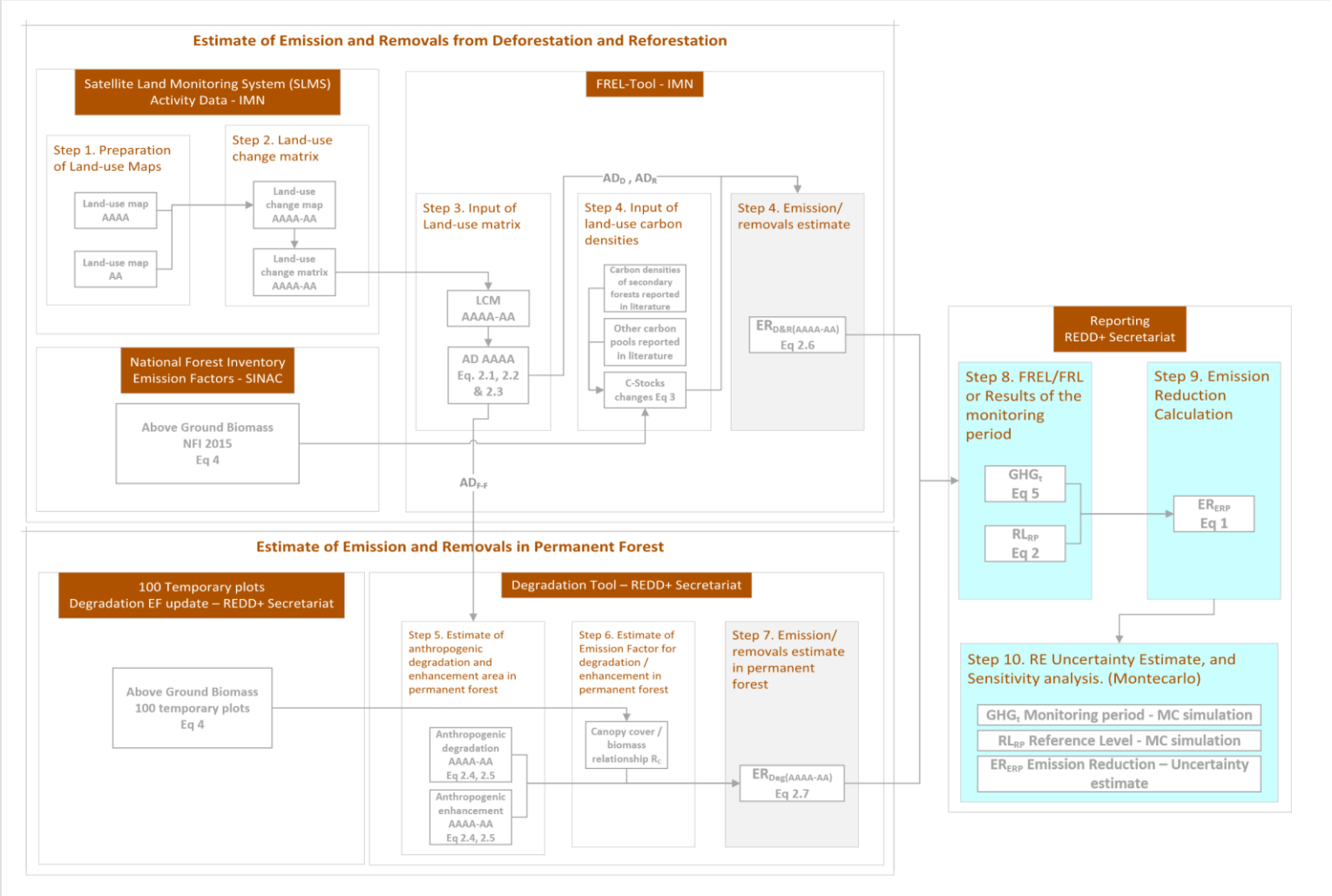


***Figure 4**:* Step-by-step description of the measurement and monitoring approach applied for establishment of the Reference Level and estimating Emissions and Emissions reductions during the Monitoring / Reporting Period for estimating the emissions and removals from the Sources/Sinks, Carbon Pools and greenhouse gases selected in the ER-PD of Costa Rica. In this 2018-2019 monitoring report Costa Rica includes the update of the emission factors for degradation for the main forest types in the country

(wet and rain forests, moist forests, dry forests, mangrove forests, and palm forests). This update is based on the 100 temporary plots sampled for aboveground biomass in 2018-2019. The details of this update are provided in the sections below.

2.2.2 Calculation

2.2.2.1 EMISSION REDUCTION CALCULATION

$$\mathrm{ER}_{\mathrm{ERP,t}} = \mathrm{RL}_{\mathrm{RP}} - \mathrm{GHG}_{\mathrm{t}} \qquad \textbf{Equation 1}$$

Where:

$\mathrm{ER}_{\mathrm{ERP}}$	Emission Reductions under the ER Program in year t; $tCO_2e*year^{-1}$.
$\mathrm{RL}_{\mathrm{RP}}$	Gross emissions of the RL from deforestation and degradation over the Reference Period; $tCO_2e*year^{-1}$. This is sourced from Annex 4 to the first ER Monitoring Report and equations are provided below.
$\mathrm{GHG}_{\mathrm{t}}$	Monitored gross emissions from deforestation at year t; $tCO_2e*year^{-1}$;
t	Number of years during the monitoring period; dimensionless.

2.2.2.1.1 Reference Level ($\mathbf{RL_t}$)

The RL estimation may be found in Annex 4 of the first ER-MR, yet a description of the equations is provided below. 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:

$$\mathrm{RL}_{\mathrm{RP}} = \frac{\sum_{t=1}^{\mathrm{RP}} \mathrm{ER}_{\mathrm{RA_t}}}{\mathrm{RP}} = \frac{\sum_{t=1}^{\mathrm{RP}} \sum_{i=1}^{\mathrm{I}} \left(\mathrm{AD}_{\mathrm{RA}i,t} * \mathrm{EF}_{\mathrm{RA}i,t} \right)}{\mathrm{RP}}$$

Equation 2

Where:

$\mathrm{ER}_{\mathrm{RAt}}$	=	Emissions or removals associated to REDD+ activity *RA* in year *t*; tCO_2-e yr^{-1}
$\mathrm{AD}_{\mathrm{RA}i,t}$	=	AD associated to REDD+ activity *RA* for the land use transition *i* in year *t*; ha yr^{-1}
$\mathrm{EF}_{\mathrm{RA}i,t}$	=	EF associated to REDD+ activity *RA* applicable to the land use transition *i* in year *t*; tCO_2-e ha^{-1}
RP	=	Reference Period in years
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

Deforestation and Reforestation Activity Data (**AD_D** and **AD_R**) are calculated differently from Degradation and Enhancement Activity Data (**AD_{Deg}** and **AD_E**). Deforestation and Reforestation ADs result from the cartographic comparison of land-use maps from the beginning and end of the monitoring period. The Degradation and Enhancement DAs result from the sample-based estimation of canopy change area in permanent forest lands. Below are the equations used to calculate these parameters:

Activity Data of Deforestation (AD_D)	$AD_{D_{i,t}} = \lvert D_{i,t} \rvert * 0.81$, **Equation 2.1**	Where $\lvert D_{i,t} \rvert$ is the count of pixels of the land-use transition *i* in year *t*, dimensionless; and 0.81 is the pixel size in Hectares (ha).
Activity Data of Reforestation (AD_R)	$AD_{R_{i,t}} = \lvert R_{i,t} \rvert * 0.81$, **Equation 2.2**	Where $\lvert R_{i,t} \rvert$ is the count of pixels of the land-use transition *i* in year *t*, dimensionless; and 0.81 is the pixel size in Hectares (ha).
Forest remaining forests ($AD_{F\text{-}F}$)	$AD_{F-F_{i,t}} = \lvert F - F_{i,t} \rvert * 0.81$, **Equation 2.3**	Where $\lvert F - F_{i,t} \rvert$ is the count of pixels of the land-use transition *i* in year *t*, dimensionless; and 0.81 is the pixel size in Hectares (ha).

Activity Data of Degradation (AD_{Deg})	$AD_{Deg_k} = \frac{\lvert Deg_k \rvert}{N} * AD_{F-F_t}$ **Equation 2.4**	Where $\lvert Deg_{i,t} \rvert$ is the count of sampling points where canopy change decrease (dimensionless) in forest type k, N is the total of sampling points (dimensionless), and AD_{F-F_t} is the total area of permanent forest (in hectares – ha) in the monitoring period.
Activity Data of Permanent Forest Regeneration (AD_E)	$AD_{E_k} = \frac{\lvert E_k \rvert}{N} * \sum_{i=1}^{I} AD_{F-F_{i,t}}$ **Equation 2.5**	Where $\lvert E_{k,} \rvert$ is the count of sampling points where canopy change increase (dimensionless) in forest type k, N is the total of sampling points (dimensionless), and AD_{F-F_t} is the total area of permanent forest (in hectares – ha) in the monitoring period.
Emissions from Deforestation & Removals $E_{D\&R(AAAA-AA)}$	$E_{D\&R(AAAA-AA)} = \sum_{k=1}^{I} AD_{D_{i,t}} * EF_{D_i} + \sum_{k=1}^{I} AD_{R_{i,t}} * EF_{R_i}$ **Equation 2.6**	Where i is a land-use transition represented in a cell of the land-use change matrix (dimensionless), EF_{D_i} is the deforestation emission factor for land-use transition i, EF_{R_i} is the removal factor for land-use transition i (when land-use transition i is forest loss, activity data and emission factor for forest recovery are cero and vice versa).
Emission & Removals from Degradation $E_{Deg(AAAA-AA)}$	$E_{Deg(AAAA-AA)} = \sum_{i=1}^{I} AD_{Deg_k} * EF_{Deg_k} + \sum_{i=1}^{I} AD_{E_k} * EF_{E_k}$ **Equation 2.7**	Where k is a forest type, EF_{Deg_k} is the degradation emission factor for forest type k, EF_{E_k} is the removal factor for forest type k.

Deforestation EFs were determined 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:

$$\Delta C = \frac{(C_{t2} - C_{t1})}{(t2 - t1)} * 44/12 \qquad \textbf{Equation 3}$$

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.
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[44] and 20[45] of the sheets "ER AAAA" (where "AAAA" stands for the year *t*) in the FREL TOOL.
t2-t1	=	In all cases the C stock changes were estimated annually, *i.e. t2-t1* = 1 year.
44/12	=	Conversion of C to CO_2

[44] The C stock values reported in line 19 represent total C stocks existing in secondary forest and tree plantation 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 and conversions of other land use categories to permanent crops.

[45] 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 and conversion of other land use categories to permanent crops.

Forest C is determined from the NFI biomass data, converted to carbon as follows:

$$C_t = \sum_{j,i} (B_{tot}) \times CF \qquad \textbf{Equation 4}$$

Where:

B_{tot} = Total biomass stock for the land use category *LU*; tCO_2-e ha^{-1}.
Total biomass is equivalent to the sum of all biomass pools: $B_{tot} = B_{AGB} + B_{BGB} + B_{DW} + B_L$
Where:
AGB is above-ground biomass for land use category *LU*; tCO_2-e ha^{-1}
BGB is below-ground biomass for land use category *LU*; tCO_2-e ha^{-1}
DW is dead wood biomass for land use category *LU*; tCO_2-e ha^{-1}
L is litter biomass for land use category *LU*; tCO_2-e ha^{-1}

CF = Carbon fraction of dry matter in tC per ton dry matter. The value used is:
0.47 is the default for (sub)tropical forest as per IPCC AFOLU guidelines 2006, Table 4.3.

Carbon stocks of non-Forest land uses are 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.

Additional details on AD, EF, and calculations in the reference level and monitoring period are available in Section 3 and Annex 4 of this monitoring report.

2.2.2.1.2 Monitored emissions ($\mathbf{GHG_t}$)

Annual gross GHG emissions over the monitoring period in the Accounting Area (GHG_t) are estimated as the sum of annual change in total biomass carbon stocks (ΔC_{Bt}).

$$GHG_t = \frac{\sum_t^{MP} ER_{RA_t}}{MP} = \frac{\sum_{t=1}^{MP} \sum_{i=1}^{I} \left(AD_{RA_{i,t}} * EF_{RA_{i,t}} \right)}{MP} \qquad \textbf{Equation 5}$$

Where:

ER_{RAt} = Emissions or removals associated to REDD+ activity RA in year t; tCO2-e yr-1
$AD_{RAi,t}$ = AD associated to REDD+ activity RA for the land use transition i in year t; ha yr-1
$EF_{RAi,t}$ = EF associated to REDD+ activity RA applicable to the land use transition i in year t; tCO2-e ha-1
MP = Monitoring Period in years
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

Deforestation and Reforestation Activity Data (**AD_D** and **AD_R**) are calculated differently from Degradation and Enhancement Activity Data (**AD_{Deg}** and **AD_E**). Deforestation and Reforestation ADs result from the cartographic comparison of land-use maps from the beginning and end of the monitoring period. The Degradation and Enhancement DAs result from the sample-based estimation of canopy change area in permanent forest lands. Below are the equations used to calculate these parameters:

Activity Data of Deforestation (AD_D)

$$AD_{D_{i,t}} = \left|D_{i,t}\right| * 0.81,$$ ***Equation 5.1***

Where $\left|D_{i,t}\right|$ is the count of pixels of the land-use transition *i* in year *t*, dimensionless; and 0.81 is the pixel size in Hectares (ha).

Activity Data of Reforestation (AD_R)

$$AD_{R_{i,t}} = \left|R_{i,t}\right| * 0.81,$$ **Equation 5.2**

Where $\left|R_{i,t}\right|$ is the count of pixels of the land-use transition *i* in year *t*, dimensionless; and 0.81 is the pixel size in Hectares (ha).

Forest remaining forests ($AD_{F\text{-}F}$)

$$AD_{F-F_{i,t}} = \left|F - F_{i,t}\right| * 0.81,$$ **Equation 5.3**

Where $\left|F - F_{i,t}\right|$ is the count of pixels of the land-use transition *i* in year *t*, dimensionless; and 0.81 is the pixel size in Hectares (ha).

Activity Data of Degradation (AD_{Deg})

$$AD_{Deg_k} = \frac{|Deg_k|}{N} * AD_{F-F_t}$$ **Equation 5.4**

Where $\left|Deg_{i,t}\right|$ is the count of sampling points where canopy change decrease (dimensionless) in forest type k, *N* is the total of sampling points (dimensionless), and AD_{F-F_t} is the total area of permanent forest (in hectares – ha) in the monitoring period.

Activity Data of Permanent Forest Regeneration (AD_E)

$$AD_{E_k} = \frac{|E_k|}{N} * \sum_{i=1}^{I} AD_{F-F_{i,t}}$$
Equation 5.5

Where $\left|E_{k,}\right|$ is the count of sampling points where canopy change increase (dimensionless) in forest type k, *N* is the total of sampling points (dimensionless), and AD_{F-F_t} is the total area of permanent forest (in hectares – ha) in the monitoring period.

Emissions & Removals from Deforestation $E_{D\&R(AAAA-AA)}$

$$E_{D\&R(AAAA-AA)} = \sum_{k=1}^{I} AD_{D_{i,t}} * EF_{D_i} + \sum_{k=1}^{I} AD_{R_{i,t}} * EF_{R_i}$$
Equation 5.6

Where i is a land-use transition represented in a cell of the land-use change matrix (dimensionless), EF_{D_i} is the deforestation emission factor for land-use transition i, EF_{R_i} is the removal factor for land-use transition i (when land-use transition i is forest loss, activity data and emission factor for forest recovery are cero and vice versa).

Emission & Removals from Degradation $E_{Deg(AAAA-AA)}$

$$E_{Deg(AAAA-AA)} = \sum_{i=1}^{I} AD_{Deg_k} * EF_{Deg_k} + \sum_{i=1}^{I} AD_{E_k} * EF_{E_k}$$
Equation 5.7

Where k is a forest type, EF_{Deg_k} is the degradation emission factor for forest type k, EF_{E_k} is the removal factor for forest type k.

Changes in total biomass carbon stocks are calculated following Equation 3 above.

3 DATA AND PARAMETERS

3.1 Fixed Data and Parameters

Table 2: Source of Activity Data and description of the methods for developing the data for estimate emissions from deforestation during the reference period[46].

Parameters:	**Activity Data of Deforestation (AD_D) Eq. 2.1** **Activity Data of Reforestation (AD_R) Eq. 2.2** **Forest remaining forests (AD_{F-F}) Eq. 2.3**
Description:	Deforestation: Hectares of forest that changed to non-forest land in a year summed each year (i) of the reference period. Reforestation: Hectares of non-forest that changed to forest land in a year, summed for each year (i) of the reference period. Forest remaining forests: Hectares of Forest remaining forests in a year, summed for each year (i) of the reference period
Data unit:	Hectares
Source of data	
Introduction	AD for land-use change activities was derived from map-algebra by analyzing all land cover maps created for 1998-2011 and estimating multi-temporal data for the areas that remained in the same category or converted to other land cover categories. Annual AD was interpolated for years in which maps were not produced. A time-series of land use maps was created for 1985/862012/13 in a Geographical Information System (GIS)[47] and then extracting the values of the areas that remained in the same category or converted to other land use categories from the combined set of multi-temporal data. The area covered by the land-use maps includes the country's continental territory (5,133,939.50 ha) but excludes Coco Island (238,500 ha). The land use maps were created using the methodology summarized here; further information may be found in separate reports [48, 49, 50]:
Data sources for estimating activity data:	The construction of the AD time series required the following sources of data: i. Remotely sensed data from four generations of the Landsat family (Landsat 4 TM, Landsat 5 TM, Landsat 7 ETM and Landsat 8 OLI/TIRS). ii. A "Life Zones" map according to the classification system of Holdridge (1966). This map was used to stratify "Forests" into the three sub-categories: "Wet and Rain Forests", "Moist Forests" and "Dry Forests". iii. Ancillary data 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. iv. The Global Forest Change project (Hansen et al., 2013) has been used to fill in pixels without information in the mosaic of classifications for each year of the series between 2000 and 2012.

[46] All AD parameters listed in table 2 sourced from the same survey.

[47] The geodatabase with the time-series of land use maps created for the reference period 1985/86-2012/13 can be accessed at the following link: https://drive.google.com/drive/folders/1XulVBwfZNam6acIksq-ZMQoK_ISqy0V2?usp=sharing

[48] Agresta, Dimap, Universidad de Costa Rica, Universidad Politécnica de Madrid. 2015. 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 pp.

[49] Ministry of the Environment and Natural Resources of Costa Rica. (2016). Modified REDD+ Forest reference emission level/forest reference level (FREL/FRL). COSTA RICA. SUBMISSION TO THE UNFCCC SECRETARIAT FOR TECHNICAL REVIEW ACCORDING TO DECISION 13/CP.19. Retrieved from https://redd.unfccc.int/files/2016_submission_frel_costa_rica.pdf

[50] Ministry of the Environment and Natural Resources of Costa Rica. (2018). Costa Rica Emission Reductions Program to the FCPF Carbon Fund (Second Revision). Retrieved from https://www.forestcarbonpartnership.org/system/files/documents/Costa Rica ERPD EN_Oct24-2018_clean.pdf

Methods for mapping land-use and land-use change	
Selection of images	Costa Rica prepared the FREL / FRL Costa Rica from a time series of satellite images for 19872013. The time series includes images from four generations of LANDSAT satellites: Landsat 4 TM, Landsat 5 TM, Landsat 7 ETM +, Landsat 8 OLI / TIRS. The analyst downloaded the satellite information through the USGS Earth Explorer server. It was necessary to work with seven LANDSAT scenes to cover the continental territory of Costa Rica in each of the years of the series: two scenes from path 14 (rows 53 and 54), three scenes from path 15 (rows 52, 53, and 54) and two scenes from path 16 (rows 52 and 53). Low cloud-coverage Landsat images were combined to minimize the area covered by clouds and cloud shadows. In most cases, the scenes were selected from the same year and season but, in some cases, it was necessary to choose scenes from different years within a 14-month timeframe.
Pre-processing and Geometric validation	All images were registered to a standard system of coordinates (CRTM05). The mean quadratic error in control points was less than one pixel (30 m). The maximum registration error was estimated at 2 pixels (60 m). The 2005 orthophotography generated with the IDB-Cadastral project's CARTA mission has been used to collect control points for the geometric validation of the reference runs. A mosaic of scenes is prepared for each path's available dates with the geometrically corrected images.
Radiometric normalization	All images were radiometrically normalized. This process is applied to reduce radiometric differences between images due to atmospheric conditions and the sensors' calibration at image acquisition dates. The radiometric normalization was done using the "Iteratively Reweighted Multivariate Alteration Detection" (IR-MAD), as described by Canty and Nielsen (2008)[51]. The normalization of the time series used as a reference the zenith angle 36.90° corresponding to February 17, 2013.
Random Forest classification	The classification of the images uses the Random Forest (RF) method. This methodology has 2 phases: (1) training or adjustment of the RF and (2) classification of the images using the generated RF classifier. Homogeneous regions of interest have been digitized according to the land cover classes between 2011 and 2014 (see Table 3 of Agresta, 2015) for the models' adjustment. The base information used for the digitization and photointerpretation of these regions has been i) the systematic grid of cover points taken on the RapidEye images by SINAC for the elaboration of the map of forest types of Costa Rica 2013 (10,000 points distributed in the national territory), ii) the RapidEye high spatial resolution images themselves, iii) both current and historical images available on Google Earth. Control points for RF training have been randomly generated from these regions of interest. In total, 20 predictor variables (also called covariates or auxiliary variables) were used for the adjustment of the RF models, divided into four groups: (1) Spectral information of the bands, (2) Indices of vegetation, (3) Variables related to the texture of the image, and (4) Variables derived from the Digital Elevation Model. The analyst applied the classifiers to all the images according to their path and sensor. The result is a classification file for each classified image.

[51] 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.

Postprocessing	Final maps are presented at 30 meters resolution. The preparation of the final maps from the classified images included the following tasks: i. Union of the mosaic for each date from the classified images using a pixel prioritization algorithm. The analyst merged all the different images' classifications for each of the dates and paths, eliminating the extreme strip of the paths overlapping. If the classifier predicts several classes for the same pixel, the most common category was selected, according to band 2 of the results. ii. Filling gaps with global products: The Global Forest Change project (Hansen et al., 2013) has been used to fill in pixels without information in the mosaic of classifications for each year of the series between 2000 and 2012. iii. Multi-temporal analysis: the multi-temporal analysis of the series allowed assigning the age class to each of the forest pixels, analyzing the years that have elapsed from the date of appearance of a new forest. The forest from 1987 has been considered a primary forest. Also, the multi-temporal analysis improved land-uses classification, especially when the land cover has similar spectral information. The classifier confused native forests with forest plantations. For this reason, the forest plantations were reclassified as forest. iv. Minimum mapping unit: The analyst replaced Forest Class groups of pixels smaller than 11 pixels with the LULC class of the largest neighboring group to comply with the minimum area threshold of the definition of "forest (1.00 ha) and setting the minimum mapping unit. Due to the pixels' dimensions in the Landsat images (30.00 m x 30.00 m), the minimum mapping area is 0.99 ha, equivalent to 11 pixels (11 x 30.00 m x 30.00 m). v. Manual editions: In order to improve land use mapping, several editions were made, largely aimed at decreasing high classification errors (for more detail please see section 4.3.3 in Ministry of the Environment and Natural Resources of Costa Rica, 2016[52]): a. "Forest Plantations" were merged with the "Forest land" category. 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". b. For estimating the area of "Coffee Plantations", the analyst used ancillary maps 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). c. Paramo, Mangroves and Palm forests are ecosystems restricted to particular elevation, edaphic, inundation, and salinity conditions; it is challenging for such ecosystems to exist in other locations. Therefore, these forests were re-classified using the map of Forest types (MTB), prepared by Agresta (2015). 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. d. 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 e. A map of potential forest types was created to assign secondary forests to a forest type (Wet and Rain Forests, Moist Forests, Dry Forests, Mangroves, Palm Forests). This map will also be used in future measurements for determining the forest type of secondary forests. The map of potential forest types was created by combining the life-zones and then overlapping the map of the masks of potential areas of "Mangroves", "Palm Forests", and "Paramo".

[52] Ministry of the Environment and Natural Resources of Costa Rica. (2016). Modified REDD+ Forest reference emission level/forest reference level (FREL/FRL). COSTA RICA. SUBMISSION TO THE UNFCCC SECRETARIAT FOR TECHNICAL REVIEW ACCORDING TO DECISION 13/CP.19. Retrieved from https://redd.unfccc.int/files/2016_submission_frel_costa_rica.pdf

Activity Data calculation	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[53]".
Value applied in reference period:	
	1998-2011: • Total anthropogenic deforestation: 30,439 ha yr^{-1} • Primary forest anthropogenic deforestation: 13,147 ha yr^{-1} • Secondary forest and tree plantation anthropogenic deforestation: 17,292 ha yr^{-1}
QA/QC procedures applied	
Introduction	The QA/QC procedures applied during the preparation of the land-use maps used to calculate AD for the reference period are summarized here, further information may be found in Agresta (2005), Sections 3, 4, and 7:
Download and satellite image preparation	1. Verification of file storage errors in digital media that could affect reading the data by the analyst responsible for download support images. 2. Previewing and verification of the satellite image quality and metadata by the analyst responsible for downloading support images. 3. Previewing and verification of the satellite image quality and metadata by the supervisor.
Image orthorectification	1. Analyst's exhaustive visual inspection to identify errors in the orthorectification process, such as duplicated areas, pixel stretching, or geometric errors related to the digital terrain model (DTM). 2. Geometric control of orthorectified images by taking checkpoints in each scene in a regularly distributed grid. 3. Validation of root mean square error (RMSE) of the control points, by the analyst responsible for the orthorectification. In no case, RMSE is above the pixel size of the image. The number of correct points after debugging should not be less than 20 ground control points in each reference path. The RMSE obtained in the checkpoints is less than 1 pixel (30 meters), and the maximum error in any of the points, 2 pixels (60 meters). 4. Preparation of a "georeferencing validation datasheet," including a general image view with the checkpoints marked on it and a list of the coordinates and RMS obtained for each point. Annex 5 of Agresta (2015) includes the lists of checkpoints and RMSE of the dates processed.
Radiometric normalization:	5. Radiometric normalization to reduce the differences between the time-series images.
Generation of cloud and shadow masks	6. Validation of cloud and shadow mask by visual verification of a systematic random grid of checkpoints identified as a cloud (n), shadow (s), or clear (d). The analyst visually checked the original image in RGB or false color if the classification matches the cloud and shadow mask. The analyst must pay special attention to the verification of cloud masks in urban areas and coastlines with a high reflectance, adjusting some of the cloud and shadow mask degeneration parameters during the verification process. 7. The validation includes a random sample in each path of an image from each time series (3 paths x 6 series = 18 images). Table 2 of Agresta (2015) includes a summary of the results of the validation of the cloud and shadow maps.
Land use classification:	8. Analysts perform an iterative process of classification, verification of results, error detection, and review of areas and training points.

[53] The FREL Tool can be accessed in the following link:
https://docs.google.com/spreadsheets/d/103jZDLVaK3bKC-OQwBV4CmSYj_sSZ5nh?rtpof=true&usp=drive_fs

	9. Progressive improvement of the areas and training points of the RF classifier before the final classification of the images. Review of the Random Forest classifiers' errors, identify classes that need improvement, and training points. 10. Visual verification and validation of classified images by comparing them with the available high-resolution image.
Preparation of land-use maps:	11. Visual check of mosaics and identify information gaps and sensor failures on each time series' images. 12. Visual verification of the maps generated after filling the gaps with global data. 13. Analysts implement an independent validation of the land-use change maps with ground validation points provided by the country's institutions not used in the classification phase. 14. Manual edition of the time-series classification to improve land use mapping, largely aimed at decreasing high classification errors.
Visual verification and validation of land-use change map:	15. Visual verification of the country's main deforestation and reforestation areas between consecutive years of the series to detect classification errors. 16. Validation of land-use changes between 2001 and 2011 based on photointerpretation of changes on a systematic random grid of points and using the Landsat, aerial orthophotography of the year 2005, and Rapid-eye images of the years 2011 and 2012.
Uncertainty associated with this parameter:	
Uncertainty associated with this parameter:	Uncertainties associated to AD are due to the production process of land use maps. The uncertainties of the AD for land use change activities (deforestation and reforestation) and forest remaining forest activities (degradation and enhancements in forest lands) come from the uncertainties (i.e. the margin of error for a 90% confidence level divided by the estimate) associated with the process creating land use change maps from which the activity data are obtained. The accuracy assessment of the land-use change map 2001/02 – 2011/12 was done following Olofsson et al.'s (2014)[54] guidelines. Due to a large number of land-use change transitions, they were aggregated into four categories: Deforestation (forest to non-forest), new forests (non-forest to forest), stable forest (forest remaining forest), and stable non-forest (nonforest to non-forest). The validation of land-use changes during the period 2000/2001 2010/2011 is based on the photointerpretation of orthophotography from 2005, Rapid eye imagery, and Landsat images, since they have higher quality and spatial resolution than the maps and are independent of the sample of land-use data used to produce the maps. For further detail please see section 12.2 in ERPD document (Ministry of the Environment and Natural Resources of Costa Rica, 2018)[55]. A total of 716 reference points were assessed in this study. Out of these, 312 were in stable forest areas (areas classified as forest in 2000/01 remaining forest in 2010/11), 228 were in stable non-forest areas (areas classified as non-forest in 2000/01 remaining non-forest in 2010/11), 55 were in afforestation/reforestation areas (areas classified as non-forest in 2000/01 classified as forest in 2010/11), and 44 were in deforested areas (areas classified as forest in 2000/01 classified as non-forest in 2010/11). A total of 77 points were excluded from consideration. Out of these, 60 points were excluded because of poor-quality land-use interpretation, 10 points had no land-use information available on the map, and 7 points were excluded because of the booth, lack of map information, and poor-quality interpretation. Finally, after the accuracy assessment analysis, a total of 639 points were considered.[56]. The activity data's uncertainty is the bias between the adjusted (reference data) and estimated (land use maps) areas. The uncertainty values are as follows (see cells F56-F59 of spreadsheet "2.4E Datos Actividad 2001-2011 in excel file CDI_CostaRicaREL_AnalisisExactitud_MCS2000-2001 vs MCS2010-2011): Uncertainty of hectares of deforestation from 1998-2011: 26% Uncertainty of hectares of non-forest that changed to forest land: 51% Uncertainty of hectares of forests remaining forests in 1998-2011: 7%

[54] Olofsson et al. (2014) Good practices for estimating area and assessing accuracy of land change. Remote Sensing of Environment 148, 42-57.
[55] Ministry of the Environment and Natural Resources of Costa Rica. (2018). Costa Rica Emission Reductions Program to the FCPF Carbon Fund (Second Revision). Retrieved from https://www.forestcarbonpartnership.org/system/files/documents/Costa Rica ERPD EN_Oct24-2018_clean.pdf
[56] Accuracy Assessment 2001-2011 analysis can be accessed in the following link (CDI_CostaRicaREL_AnalisisExactitud_MCS2000-2001 vs MCS2010-2011.xlsm excel file): https://drive.google.com/file/d/1wUfwkW4E74Y-AZHCesr4coNIs0e_SabC/view?usp=sharing

Table 3: Source of Activity Data and description of the methods for developing the data for estimate emission from degradation during the reference period.

Parameters:	**Activity Data of Degradation (AD_{Deg}) Eq. 2.4** **Activity Data of Permanent Forest Regeneration (AD_E) Eq. 2.5**
Description:	Degradation: Hectares of forest with a reduction of canopy cover during the reference period. Forest Enhancement: Hectares of forest with an increase of canopy cover during the reference period
Data unit:	Hectares
Source of data	
Introduction	The forest degradation assessment was made on forest lands that remain as forest lands. The analysis of degradation was only performed on the area of forest remaining forest according to the land-use MCS 2012/13 map to avoid double-counting of baseline emissions between deforestation and forest degradation. This procedure avoided any measurements of degradation that were also accounted for under deforestation. Reference data to estimate Degradation AD were collected by Ortiz-Malavassi, (2017)[57].
Type of sampling	A Systematic Sampling (SYS) over the Level 1 Systematic Grid of 10,242 points of the Monitoring system of land-use change and ecosystems (SIMOCUTE) was used. The original systematic grid is in the CRTM05 coordinate system of Costa Rica. However, it was re-projected to geographic coordinates in WGS84 to evaluate the sampling point with the Collect Earth Desktop tool. The SIMOCUTE sampling units are permanent, which facilitates reinterpretation through time and easy temporal tracking of LULC changes.
Sampling Unit	The Sampling Unit (SU) is a 90x90 meter plot whose central point coincides with the SIMOCUTE sampling points. The SU corresponds to 3x3 Landsat pixels and covers 0.98 ha. Inside SU, a 7x7 points sub-grid was created to estimate land cover percentage within each sampling unit.
Number of Sampling Units	The forest degradation assessment was made on forest lands that remain as forest lands during 1998-2016. A total of 4377 points were classified as permanent forest land according to the MCS 2012/13 map. These points are an extract from the Systematic Grid adopted in SIMOCUTE.
Classification scheme	Three classes of canopy cover were considered to estimate degradation/enhancement in permanent forest land: i. Intact forest (85-100% forest cover), ii. Degraded forest (60-85% forest cover), and iii. Very degraded forest (<60% forest cover). The following forest cover change classes were assessed by forest type and type of carbon fluxes (anthropogenic and natural): Degradation: a. Intact to Degraded forest. b. Intact to Very degraded forest. c. Degraded to Very degraded forest. Forest enhancement: d. Very degraded to intact forest. e. Very degraded to degraded forest. f. Degraded to Intact forest. No Condition changes: g. Stable intact forest h. Stable degraded forest i. Stable very degraded forest

[57] Ortiz-Malavassi, E. (2017). Evaluación Visual Multitemporal (EVM) del Uso de la tierra, Cambio en el Uso de la Tierra y Cobertura en Costa Rica Zonas A y B Tarea 1: Estimación del área de cambio de uso de la tierra durante el periodo 2014-2015. Retrieved from https://drive.google.com/file/d/1GXdN43f-DNKelkM8y7gBLrKou-f7LI-G/view?usp=sharing

Imagery Sources

The range of dates of the images presented in the table below was used. Priority was given to operating with the ortho-rectified photographs of the TERRA 1997 project to evaluate the canopy cover in 1998. Still, since TERRA 1997 covered less than 40% of the national territory, the second priority was to use high-resolution images in Google Earth before 2006. If these did not exist, the next priority was to use the ortho-rectified photos of the project Carta-2005 available on the SNIT server. For the other years, the repository of high-resolution images available in Google Earth and Earth Engine was used as a data source, giving priority to images from the years to be evaluated (2011 or 2016). However, in case of absence, the use was recorded in the year closest to monitoring dates. Data sources and imagery date range used in the canopy cover evaluation on permanent forest for the reference period 1998-2011 are the following:

Monitoring Year	Imagery date range	Data sources
1998	January 1997 – December 2005	• Orthophotos TERRA 1997. • Google Earth imagery repository • Mission CARTA 2005
2011	July 2011 – June 2012	• Google Earth imagery repository
2016	July 2015 – June 2016	• Google Earth imagery repository

Interpretation Key

The land cover class keys used to determine canopy cover for the years 1998, 2011, and 2016 are the following:

Code	Land cover class
1100	Trees
1200	Shrubs
1300	Herbaceous
1400	Palm
1500	Bromeliads
1600	Greenhouse
1700	Other vegetation
2000	No vegetation
3000	Water
4000	Clouds and shadows
5000	Not classifiable

Data collection

See QA/QC procedures.

Data analysis	The country developed a tool for calculating emissions and removals on permanent forest lands (¨Herramienta_degradación.xlsx¨ [58]). The database for the visual interpretation of canopy cover for the reference period 1998-2011 and period 2012-2016 are included in the sheet "Base_de_datos". The area of degraded and enhanced forest areas was extrapolated to the forest area in the entire country through proportional representation within the respective degradation classes (intact, degraded and very degraded) and forestry type. 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 between 30% and 59%. Forest areas that went from intact to degraded, intact to very degraded, or degraded to very degraded (in terms of their canopy cover) during the assessment period (1998-2011) were classified as degraded. Forest areas that went from very degraded to degraded, very degraded to intact, or degraded to intact were identified as forest enhancement areas. Carbon fluxes were estimated for anthropogenic and natural conditions. Fluxes from sampling points inside protected areas and farther than 500 meters from a road[59] were considered natural fluxes and removed from reference level accounting. The estimation of the areas of change of degradation and canopy enhancement, for both anthropic and natural carbon fluxes, can be found in the sheet ¨Resumen_de_puntos¨ of the Degradation tool, for the reference period 1998-2011 and period 2012-2016.
Value applied in reference period:	
	• **2,233,119** hectares of forests remaining forests in the reference period (1998-2011) • **145,556** hectares of anthropogenic degradation (1998-2011) • **157,739** hectares of anthropogenic forest enhancement (1998-2011)
QA/QC procedures applied	
	Ortiz-Malavassi (2017) prepared a land cover evaluation protocol to reduce the uncertainty of the land cover classification due to: a) the bias associated with the spatial registration of the reference image, b) the interpreter bias in the assignment of the land cover class; and c) interpreter variability. The protocol includes the operational definition of the canopy coverage with examples taken from high-resolution images and registration templates for Collect Earth Desktop. The following procedures were applied during the collection of reference data: **Data registry forms**: The canopy cover change information was recorded in standard Collect Earth Desktop forms. **Variability between interpreters**: The analysts recorded screenshots, plot numbers, and a brief description of the problem in case of doubts with the interpretation (land cover and land-use). Every two days, they sent the log to other analysts for feedback. This feedback was available to all team members. Meetings will be held at the end of the week to discuss complex cases to reduce interpreters' variability. **Validation of the coverage classification**: The supervisor validated land cover classification with National Forest Inventory land cover data. This information was available only for the supervisors. **Imagery co-registration:** Google Earth images can show displacements, which became evident when the interpreter compares the same area for different years. Potere (2008)[60] found that the average displacement in developing countries is 44.4 meters. When this problem occurred, the analyst noted the maximum displacement detected in meters in Collect Earth form. **Data consistency:** The supervisor reviewed the existence of discrepancies between cover class and land use.
Uncertainty associated with this parameter:	

[58] Degradation tool can be accessed in the following link:
https://docs.google.com/spreadsheets/d/11r7J0a6BHZx5aWyzC45UatWy3XAlnfp0?rtpof=true&usp=drive_fs

[59] 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

[60] Potere, D. (2008). Horizontal positional accuracy of Google Earth`s high-resolution imagery archive. In: Sensors, 8,12: 7973-7981 p. Retrieved from: http://www.mdpi.com/1424-8220/8/12/7973/htm

	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. Uncertainty of changes in canopy cover to identify areas of degradation and forest enhancement from 1998-2011 vary depending on the forest type and the conversion class. It is based on the sampling error.

Table 4: Source of Emission Factors and description of the methods for developing the emission factors for deforestation.

Parameters:	**Carbon density of aboveground tree or woody biomass (C_{AGB}) Eq. 4 Carbon density of belowground biomass (C_{BGB}). Eq. 4. Carbon density of dead wood biomass (C_{DWB}). Eq. 4 Carbon density of litter (C_L). Eq. 4**
Description:	• **C_{AGB}**: Amount of carbon (C) contained in aboveground biomass per forest hectare, converted to CO_2e multiplying by a factor of 44/12 (i.e., the molecular weight of a CO_2 molecule over the molecular weight of a C molecule). • **C_{BGB}**: Amount of C contained in belowground forest biomass per forest hectare, converted to CO_2e multiplying by a factor of 3.67 (i.e., the molecular weight of a CO_2 molecule over the molecular weight of a C molecule). • **C_{DWB}**: Amount of C contained in dead wood forest biomass (standing and lying) per forest hectare, converted to CO_2e multiplying by a factor of 3.67 (i.e., the molecular weight of a CO_2 molecule over the molecular weight of a C molecule). • **C_L**: Amount of CO_2e contained in litter forest biomass per forest hectare.
Data unit:	Tonnes of CO_{2e} per hectare
Source of Data	
Introduction	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), and models or average values of direct measurements reported in literature. • **Carbon pool of aboveground tree or woody biomass (C_{AGB}):** Carbon pool of aboveground tree or woody biomass for each Primary Forest type (C_{AGB}) is the area-weighted average of C_{AGB} stock value from 2015 field campaign performed for the National Forest Inventory. • **Carbon pool of belowground biomass (C_{BGB})**: Derived directly from C_{AGB} data following the Cairns et al., (1997) formula. • **Carbon pool of dead wood biomass (C_{DWB})**: Average values of direct measurements reported in literature. The value was used to develop a ratio of C_{DWB} over C_{AGB} used for AD_D, $AD_{F\text{-}F}$, and AD_R. The values obtained from the literature were used to develop an area-weighted average of DW:AGB ratios, assumed to be the same in primary and secondary forests. • **Carbon pool of litter (C_L):** Average values of direct measurements reported in literature. The value was used to develop a ratio of C_L over C_{AGB} used for AD_D, $AD_{F\text{-}F}$, and AD_R. The values obtained from the literature were used to develop an area-weighted average of L:AGB ratios, assumed to be the same in primary and secondary forests.
Source of Data of Above Ground Biomass for Primary Forest	**Type of sampling:** 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 (REDD/CCAD-GIZ-SINAC, 2015)[61] and plots were equidistantly allocated within each stratum. **Sampling Unit:** Rectangularly shaped plots with an area of 0.1 ha (20m x 50m) distributed on fixed sample intensities by forest class. The sampling unit design allows the measurements of the following (Ministerio de Ambiente y Energía, 2015)[62]: • Primary Sampling Unit (UMP for its acronym in Spanish) for measurement of live tree DBH and height of trees with DBH ≥ 10cm (light green area) • Secondary Sampling Unit (UMS for its acronym in Spanish) for measurement of saplings with 2cm ≤DBH<10cm, and height >1.5m. • Third-order Sampling Unit (UMT for its acronym in Spanish) for measurement 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) to measure the abundance of species. • Fifth-order Sampling Unit (UMH) to measure litter. • Lying deadwood sampling (UMM) to measure the lying deadwood's diameter in the 20m transects. Soil sampling of the first 30cm with cylinder method. **Number of Sampling Units:** The INF-CR installed a total of 286 single plots. Out of the 286 sampling units (SU), litter was sampled only in 54, and lying deadwood in 61 SUs. Because of inconsistent sampling of all carbon pools across all plots and lack of confidence in data where litter and deadwood, a decision to consider only aboveground biomass from INF-CR was made. Some SU presented zero as a result of litter and deadwood pools. It was not verified whether the SU represented the absence of litter and deadwood in the plots, or these carbon pools weren't sampled.
Source of Data of Above Ground Biomass for Secondary Forest	The AGB for secondary forest was 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)[63] 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. Wet and Rain Forests (Cifuentes, 2008, Table 2.5, p. 42, equation for "*Tropical Wet*"): $$TAGB_t = B_{max} * [1 - e_{(-0.0186*t)}]_1$$ Moist Forests (Cifuentes, 2008, Table 2.5, p. 42, equation for "*Tropical Moist*"): $$TAGB_t = B_{max} * [1 - e_{(-0.0348*t)}]_1$$ Dry Forests (Cifuentes, 2008,, Table 2.5, p. 42, equation for "*Tropical Dry*"): $$TAGB_t = B_{max} * [1 - e_{(-0.113*t)}]_{5.1411}$$ Mangroves and Palm Forest the following linear equation was applied: $= \frac{max}{100} * {}^{B}TAGB_t t$, when *t* <= 100 $TAGB_t = B_{max}$, when *t* > 100 It was assumed that the maximum biomass in secondary forests (B_{max}) equals the biomass estimated for primary forests.

[61] Sistema Nacional de Áreas de Conservación (SINAC) - Programa REDD-CCAD-GIZ. (2015). Cartografía base para el Inventario Forestal Nacional de Costa Rica 2013-2014. Retrieved from https://www.sirefor.go.cr/pdfs/Documento-cartografia-Imprenta.pdf

[62] Ministerio de Ambiente y Energía. (2015). Volumen 4 Marco conceptual y metodológico para la Inventario forestal nacional de Costa Rica. Retrieved from https://www.sirefor.go.cr/pdfs/Volumen4-MarcoC-Imprenta.pdf

[63] Cifuentes, M. (2008). Aboveground Biomass and Ecosystem Carbon stocks in Tropical Secondary Forests Growing in Six Life Zones of Costa Rica (Oregon State University). Retrieved from https://drive.google.com/file/d/1FsiTVc78EHcU0gQ4JfFJFSlPqesm3JFW/view?usp=sharing

Source of data of Litter and Deadwood in primary and secondary forest	The carbon stocks of litter and deadwood were estimated based on a compilation of values from published literature. 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, the allometric equation used, etc.,
	were also recorded. For full detail please check BaseDeDatos_v5[64] and C-STOCKS sheet of FREL TOOL[65]. 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
Source of data of carbon stocks of non-Forest land uses	C stocks in these non-forest land uses were estimated as the average values reported by the selected studies. For full detail please check BaseDeDatos_v5 and C-STOCKS sheet of FREL TOOL. • **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.

[64] BaseDeDatos_v5.xlsx can be accessed at the following link: https://drive.google.com/file/d/1d6QqYQci7_Qo7DJhS5eOKgCqLFDX-rFX/view?usp=sharing

[65] The FREL Tool can be accessed in the following link: https://docs.google.com/spreadsheets/d/103jZDLVaK3bKC-OQwBV4CmSYj_sSZ5nh/edit?usp=sharing&ouid=101528572552038951719&rtpof=true&sd=true

Methods for estimating C stocks and Emission Factors

• **Above ground biomass (AGB)**: Above ground of forest biomass is calculated as 47% of the biomass dry weight of standing trees in the forest, which is calculated using allometric equations. Aboveground biomass of each measured tree was estimated using Chave et al.,

(2005)[66] moist forests allometric equation as follows:

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

AGB: aboveground biomass (kg) ρ: wood specific gravity (g/cm³). 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 m²) that is occupied by the plot as follows:

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

Where:

10,000m²: Area of one hectare (m²)
1,000m²: Area of INF-CR rectangular plot (20m x 50m)

• **Below ground biomass (BGB)**: BGB is derived directly from Cairns et al., (1997).[67] equation, to estimate C_{BGB} from C_{AGB} data:

$$BGB = \exp(-1.085 + 0.9256 * \ln(AGB))$$ 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.

• **C stocks of forest** lands corresponds to the area-weighted average of C stocks by C pool and strata.

• **C stock changes** (ΔC) are estimated using the Stock-Difference Method by applying IPCC (2006) equation 2.5 (cf. Volume 2, Chapter 2, Section 2.2.1.).

Value applied in reference period:

Carbon stocks in Primary forest

Primary Forest type	Area-weighted average		
	t C_{AGB} ha^{-1}	t C_{DWB} ha^{-1}	t C_L ha^{-1}
Wet and Rain Forests	131.2	13.5	2.7
Moist Forests	92.7	13.2	2.2
Dry Forests	61.5	15.4	6.2
Mangroves	72.2	1.9	0.3
Palm Forests	51.7	1.6	0.3

[66] Chave J et al. (2005). Tree allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia 145: pp. 87-99.

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

Carbon stocks in Secondary Forest

The table below shows the Bmax values used in the equations above to calculate $TAGB_t$ from the secondary forest stand age.

Secondary Forest Type	B_{max} (t dry mass ha^{-1})
Wet and Rain Forests	445
Moist Forests	262
Dry Forests	155

Carbon stocks of non-Forest land uses

Non-forest land uses	Area-weighted average t C_{AGB} ha^{-1}
Permanent crop, wooded, cropland	16
Annual crop, wooded, cropland	0
Permanent crop, non-wooded, cropland	7
Annual crop, non-wooded, cropland	23
Grasslands, wooded	8
Grasslands, non-wooded	4
Paramos	35

QA/QC procedures applied

AGB in primary forest

SINAC implemented the following QA/QC procedures during the National Forest Inventory of Costa Rica (for further details please see Ministerio de Ambiente y Energía, 2015)[68]:

Fieldwork organization: SINAC organized the fieldwork by regions: North Pacific and Central Valley (PN-VC), Central Pacific and South Pacific (PS), North-Caribbean North Zone (ZN-CN), Central-South Caribbean (CC-CS), and complex sites (Talamanca mountain range). SINAC prepared terms of reference, describing each member of the field crew's roles and responsibilities. An experienced dendrologist was part of the work team, and a field manual was prepared for identifying, collecting, transport, and processing botanical samples. The Crew was trained before the start of fieldwork, and an Excel template was designed for data typing.

Fieldwork supervision: During the NFI implementation, the coordinator made field visits to supervise the crews' work. A photographic registry of each plot was made.

Registry of information: The field crew filed field forms and prepared reports of the activities. The crew chief and fieldwork director reviewed the field forms. The IFN steering committee did the final review. If the supervisor detected errors, omissions, or inconsistencies, the records were returned to the crew leader with observations for their correction or documenting the discrepancies; the dendrological inventory component coordinator reviewed questionable species identifications. Control procedures were applied to evaluate the coherence, integrity, and completeness of dasometric, dendrological, and positioning data.

Independent evaluation of forest inventory data quality: A separate crew evaluated the quality of forest inventory data. The independent team made field visits and re-measures 10% of the plots established by stratum, both in the pre-sampling and inventory phase.

[68] Ministerio de Ambiente y Energía. (2015). Volumen 4 Marco conceptual y metodológico para la Inventario forestal nacional de Costa Rica. Retrieved from https://www.sirefor.go.cr/pdfs/Volumen4-MarcoC-Imprenta.pdf

Uncertainty associated with this parameter:

AGB's uncertainty in primary forests is derived from NFI sampling errors. Since belowground biomass is a function of aboveground biomass, the belowground biomass values have the same level of uncertainty as the aboveground biomass. Uncertainty from values DWB and L is derived from values identified in the scientific literature. The statistical uncertainty reported in these documents takes into consideration the sampling error. Therefore, the current version of the reference level only considers this error source.

Primary Forest type	Uncertainty (%) of aboveground biomass
Wet and Rain Forests	150%
Moist Forests	152%
Dry Forests	152%
Mangroves	93%
Palm Forests	81%

Non-forest land uses	Area-weighted average t C_{AGB} ha^{-1}
Permanent crop, wooded, cropland	71%
Annual crop, wooded, cropland	0%
Permanent crop, non-wooded, cropland	68%
Annual crop, non-wooded, cropland	12%
Grasslands, wooded	0%
Grasslands, non-wooded	0%
Paramos	2%

Table 5: Source of Emission Factors and description of the methods for developing the emission factors for forest degradation.

<table>
<tr><td>Parameters:</td><td>Ratio AGB:Percent of canopy cover per forest type (R_C)</td></tr>
<tr><td>Description:</td><td>• Canopy cover and biomass relationship (R_C): For each forest type, a ratio was estimated of aboveground biomass (in t CO_2e) to percent canopy cover based on direct measurements in 100 permanent forest plots. These ratios were used to estimate degradation and forest regeneration in forests remaining forests.</td></tr>
<tr><td>Data unit:</td><td>Tonnes CO_2e ha^{-1} / % canopy cover</td></tr>
<tr><td colspan="2">Source of Data</td></tr>
<tr><td>Introduction</td><td>Costa Rica has updated the forest reference level by recalculating the forest degradation emissions. Additional temporal sampling plots were measured following the methodology used in the NFI to determine aboveground biomass. The number of field observations increased in 100 temporary degradation plots covering all forest types (i.e., wet and rain forests, moist forests, dry forests, mangroves, and palm forests). These new data were integrated into aboveground biomass vs. canopy cover models to develop new degradation emission factors. Degradation categories in the aboveground biomass vs. canopy cover models were updated as follows: intact forests have a cover of 85-100%, degraded forests have a canopy cover of 60-85%, and very degraded forests of 30-59%. Forest areas that went from intact to degraded, intact to very degraded, or degraded to very degraded (in terms of their canopy cover) during the reference period (1998-2011) were classified as degraded. In contrast, primary forest areas that went from very degraded to degraded, very degraded to intact, or degraded to intact were identified as forest enhancement areas.</td></tr>
<tr><td>Sampling Unit</td><td>As Sampling Unit, the Primary Sampling Unit (UMP) of the National Forest Inventory was used to generate complementary and comparable data of Aboveground biomass. The UMP has an area of 1000 m^2 on a rectangular plot of 20 x 50 meters.</td></tr>
<tr><td>Selection of Sampling Units</td><td>Rodriguez (2018)[69] and Coto (2018)[70] selected the points to visit for the assembly of the 100 temporary plots distributed by categories of canopy cover and forest type, using as input the canopy cover assessment over level 1 systematic grid of SIMOCUTE, generated by Ortiz-Malavassi (2017). It was considering that the changes in the canopy cover, can be classified into four types of degradation: 1. Degradation at the edge of the forest, 2. Degradation by elimination of isolated trees, 3. Degradation by elimination of trees in forest blocks, and 4. Degradation by eliminating trees in protection zones; Rodriguez and Coto avoided selecting sample points at sites with degradation at forest edges (types 1 and 4). Likewise, it was requested that the location of the plot reflect the corresponding canopy cover category. The following classes were identified in the first plot distribution exercise without sufficient sampling points: Dry Forest 20-40%, Mangrove 20-49% and 50-80%, and Palm forest 20-49% and 50-80%. Rodriguez and Coto used the level 2 systematic grid of SIMOCUTE to complete the plots' sample in these categories.</td></tr>
<tr><td>Number of Sampling Units</td><td>In total, 100 temporary plots were measured. Fifteen sampling plots were installed in Palm forests, 36 in Wet and Rain forests, 15 in Moist forests, 19 in Dry forests, and 15 in Mangroves. In total, 4,340 trees greater than 10 cm DBH were measured. The distribution of the 100 plots, according to the type of forest and canopy cover, is as follows:
<table>
<tr><td rowspan="2">Forest Type</td><td colspan="3">Canopy cover class</td><td rowspan="2">Total of SU – forest type</td></tr>
<tr><td>20-49%</td><td>50-79%</td><td>80-99%</td></tr>
<tr><td>Wet and Rain Forests</td><td>5</td><td>5</td><td>5</td><td>15</td></tr>
<tr><td>Moist Forests</td><td>12</td><td>14</td><td>10</td><td>36</td></tr>
</table>
</td></tr>
</table>

[69] Rodríguez, J. (2018). INFORME FINAL DE CONSULTORÍA Estudio de parcelas temporales para estimar el stock de carbono en bosques intactos, degradados y altamente degradados en zona A. (Contrato N°020-2018-REDD). Retrieved from https://drive.google.com/file/d/1dSyL8Dldwym5VN1jXpnAbmPovUW3AiTu/view?usp=sharing

[70] Coto, O. (2018). INFORME FINAL DE CONSULTORÍA. Estudio de parcelas temporales para estimar el stock de carbono en bosques intactos, degradados y altamente degradados en zona B. (Contrato N°019-2018-REDD). Retrieved from https://drive.google.com/file/d/1svYPJGEoBHpLn72sg4ejpf6uZkp6lllM/view?usp=sharing

	Dry Forests	8	6	5	19
	Mangroves	5	5	5	15
	Palm Forests	5	5	5	15
	Total SU-canopy cover class	35	35	30	100

Data collection

All trees, shrubs, palms, tree ferns, lianas, and vines with a Diameter at Breast High (DBH) > 10 cm were measured following the protocols of the National Forest Inventory (Ministerio de Ambiente y Recursos Naturales, 2017). The following data were collected:

Scientific Name: registry of the genus and species of each inventoried tree. Lianas and vines were identified at the level of life form, and no samples were collected.

Species Code: National Forest Inventory code of the scientific name (genus and species).

Diameter: registry of diameter in centimeters and at breast height (1.3 m).

Total height: registry of estimated total height for trees, shrubs, and palms; in the case of vines and lianas, it is not assessed. The crew member who estimated the heights performed periodic calibrations using the clinometer.

Specific Gravity: the GE values were obtained directly from the Biomass estimation tool developed by SINAC and specialized publications (IPCC, 2003[71]; Myers, 2013[72]; Tree Functional Attributes and Ecological Database, 2018[73]).

Data analysis

The biomass and carbon content were calculated with the equation of Chave et al. (2014) with the variables DBH, total height and Specific Gravity (GE) of each individual. An Excel sheet was prepared with the database and the estimated AGB/canopy cover ratio for forest type (Calculo_FE_041220.xlsx[74]). The AGB / canopy ratio was estimated, excluding outliers. Cook's Distance statistical approach (calculated in R) was used to identify the outliers. Two points out of the total number of observations were eliminated in BMHP and BS, whereas only one outlier was identified in BH, M, and P.

Value applied in reference period

Ratio AGB:Percent of canopy cover per forest type (R_C)

Forest type	**R_c - Ratio Aboveground biomass (t CO_2e ha^{-1})/ % canopy cover**
Wet and Rain Forests	5.03
Moist Forests	3.86
Dry Forests	3.47
Mangroves	3.19
Palm Forests	4.26

QA/QC procedures applied

The REDD+ Secretariat of Costa Rica implemented the following QA/QC procedures during the measurement of the 100 temporary plots (for further details please see Rodriguez, 2018, Coto, 2018 and Obando, 2019):

[71] IPCC. 2003. Good Practice Guidance for Land Use, Land-Use Change and Forestry. Intergovernmental Panel on Climate Change (IPCC). Edited by Jim Penman, J.; Gytarsky, M.; Hiraishi, T.; Krug, T.; Kruger, D.; Pipatti, R.; Buendia, L.; Miwa, K.; Ngara, T.; Tanabe K.; Wagner, F. IPCC National Greenhouse Gas Inventories Programme. Published by the Institute for Global Environmental Strategies (IGES) for the IPCC. 583 p.

[72] Myers, R. 2013. Fenología y crecimiento de Raphia taedigera (Arecaceae) en humedales del noreste de Costa Rica. En:Rev. Biol. Trop. (Int. J. Trop. Biol. ISSN-0034-7744) Vol. 61 (Suppl. 1): 35-45

[73] Tree Functional Attributes and Ecological Database. (2018). Wood Density. Recuperado el 10 de 12 de 2018, de http://db.worldagroforestry.org/.

[74] Calculo_FE_041220.xlsx can be accessed in the following link:
https://drive.google.com/file/d/1bqrLUfbUreR18MsNDHLWHRzZKEbF2RGr/view?usp=sharing

	Canopy cover assessments review: To reduce the error in the SU´s impairment category assignment, the imagen analyst reviewed Ortiz-Malavassi's (2017) database consulting additional image repositories available on e.g., SAS Planet and Global Mapper. **Review of selected sampling points:** the coordinator reviewed the selected sampling points to assure that SU corresponds to the degradation category. **Review of field information**: Once finished the field measurement work, the field crew chief verified that every tree, shrub, palm, etc., with DBH > 10 cm had been measured and had the paint mark. Also, the crew chief verified that the plot's central point was recorded in the GPS with the required precision and that the access track was recorded for its location. **Registry of information**: The field forms were reviewed and digitized daily to minimize errors during field measurements and errors during digitally recording data. The collection of all measured trees was managed in an MS Excel template. The data analyst daily reviewed the field forms to identify inconsistencies. If any error were detected, the data analyst requested the crew chief's clarifications. **Independent evaluation of forest inventory data quality:** A separate crew evaluated the quality of forest inventory data. The independent team made field visits and re-measures 5% of the plots (see Annex 1 in Obando, 2019)[75].
Uncertainty associated with this parameter:	
Uncertainty of R_c	The uncertainties were calculated from the standard deviations of the identified relationships.

Forest type	Uncertainty of R_c (%)
Wet and Rain Forests	16%
Moist Forests	22%
Dry Forests	24%
Mangroves	32%
Palm Forests	37%

[75] Obando, G. (2019). COORDINACIÓN GENERAL DE LA IMPLEMENTACIÓN DEL PLAN DE MEJORA DEL NIVEL DE REFERENCIA. Tercer Informe de Consultoría N ° 016-2018-REDD. Retrieved from https://drive.google.com/file/d/1MEHZ6dvQKY52X58UtlG02o4Uw9x1HV6v/view?usp=sharing

3.2 Monitored Data and Parameters

Table 6: Source of Activity Data and description of the methods for developing the data for estimate emissions from deforestation, degradation and carbon removals during the monitoring period.

Parameters:	**Activity Data of Deforestation (AD_D) Eq. 5.1** **Activity Data of Reforestation (AD_R) Eq. 5.2** **Forest remaining forests (AD_{F-F}) Eq. 5.3**
Description:	Deforestation: Hectares of forest that changed to non-forest land in a year summed each year (i) of the monitoring period. Reforestation: Hectares of non-forest that changed to forest land in a year, summed for each year (i) of the monitoring period. Forest remaining forests: Hectares of Forest remaining forests in a year, summed for each year (i) of the monitoring period
Data unit:	Hectares
Source of data	
Introduction	A unique and uniform methodology was used both for FREL / FRL and for the forest emission estimate to avoid that changes registered in the cartographic comparison of LULC maps were affected by the combination of different techniques and methods. Córdoba-Peraza, (2020b;2023[76]) prepared the LULC Maps 2019 and 2021 of Costa Rica (MCS 2019/20[77] and MCS 2021/22)[78], following the satellite land monitoring protocol (SLMP) developed by AGRESTA (2015) and the protocol for postprocessing developed by Carbon Decisions International (Ministry of the Environment and Natural Resources of Costa Rica, 2016). Also, the geodatabase's table of uses, types, and ages of the forest was updated. To automate the workflow, AGRESTA (2015) generated the toolkit ***REDD tools Costa Rica package***. This toolbox runs on the geographic information system QGIS for the Microsoft Windows operating system. The programs were compiled in the QGIS Processing framework [79] allowing to run geoprocessing algorithms implemented in software libraries external to QGIS. The following libraries are used: • GRASS GIS (https://grass.osgeo.org/) • Orfeo Toolbox (https://www.orfeo-toolbox.org/) • GDAL (https://gdal.org/) It was necessary to migrate the toolkit to updated versions of QGIS and update the libraries to 64-bit versions to be able to work with recent versions of Windows, QGIS, and IMN equipment. The updated guide for installing the software tools and the necessary programs to prepare Land-use maps can be consulted in Annex 1 of the Córdoba-Peraza (2019) report[80]. It is important to note that none of these

[76] Córdoba-Peraza, J. (2023). INFORME FINAL MAPA DE COBERTURA Y USO DE LA TIERRA 2021 DE LA SERIE HISTÓRICA DE COSTA RICA SECRETARIA REDD +. Retrieved from https://drive.google.com/file/d/14pihK3Lqt622Mziv1qF2qz-IB6Ta-RtG/view?usp=sharing

[77] LULC map 2019 (MCS 2019/20) can be accessed at the following link: https://drive.google.com/drive/folders/1NRxm3yRV6yT1NgLwhp_z00wxyA0fpMdx?usp=sharing

[78] LULC map 2021 (MCS 2020/21) can be accessed at the following link: https://drive.google.com/drive/folders/19nhF3IXjVpS6EEuGfhCnS-HiQdI4A5RB?usp=sharing

[79] https://docs.qgis.org/2.8/en/docs/user_manual/processing/

[80] Córdoba-Peraza, J. (2019). Informe final Elaboración del mapa de cobertura y uso de la tierra en Costa Rica 2015. Retrieved from https://drive.google.com/file/d/14rmbzUdfHL9Zw62PQtbVmbY6blbIm79U/view?usp=sharing

	updates results in a change in methodology. The land use maps were created using the methodology summarized here; further information may be found in separate reports [81,82,83,84] :
Data sources for estimating activity data:	The construction of the AD time series required the following sources of data: i. Remotely sensed data from Landsat 8 OLI/TIRS. ii. Mask of the country (in raster format) generated from map MCS 2013/14 iii. Land-use maps 2013 and 2015 (MCS 2013/14, MCS 2015/16[85]) and Forest's type map (MTB), prepared by AGRESTA (2015) 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. iv. The Global Forest Change project (Hansen et al., 2013) has been used to fill in pixels without information in the mosaic of classifications for land-use maps 2019 and 2021.
Methods for mapping land-use and land-use change	
Selection of images	To prepare the Land-use map 2019 and 2021 (MCS 2019/20 and MCS 2021/22, images from the LANDSAT 8 OLI / TIRS satellite were used for the period from June 2019 to June 2020 for the land-use map of 2019 and from June 2021 to June 2022 for land-use map of 2021. In both cases, to cover the continental territory of Costa Rica, it was necessary to work with two scenes of path 14 (rows 53 and 54), three scenes of path 15 (rows 52, 53, and 54), and two scenes of path 16 (rows 52 and 53). The following bands used were 2, 3, 4, 5, 6, and 7.
Pre-processing and Geometric validation	It was not necessary to rectify the Landsat8 images supplied by the USGS. These images have a 1T processing level (Terrain corrected), a systematic geometric correction using ground control points for image registration with a WGS84 map projection. These also include correction of relief changes. A mask of the country (in raster format) generated from map MCS 2013/14 of the geodatabase was used to ensure that the maps MCS 2019/20 and MCS 2021/22 are consistent in area, pixel resolution, and dimensions (same number of columns and rows X, Y) with the maps of the 1997-2013 time series. The MCS 2019/20 and MCS 2021/22 map has the same number of columns and rows (c 14554, r 14089) and a spatial resolution of pixels in XY (29.99951157, 29.9995115) to compare them geographically and to obtain the land-use change matrix. Also, a mask of clouds and shadows was prepared to improve the classification. According to the SLMP protocol in Agresta (2015), GRASS "r.mapcalculator" in QGIS 2.4 should have been used for cloud and shadow masking, as well as a SAGA majority filter. However, Fmask 4 (https://github.com/gersl/fmask) was used since this tool is an improved software for the generation of cloud and shadow masks in Landsat and Sentinel images. Finally, all those pixels that do not belong to the country's continental territory were included in the mask of clouds and shadows.

[81] Córdoba-Peraza, J. (2020). Informe final Elaboración del mapa de cobertura y uso de la tierra en Costa Rica 2019. Retrieved from https://drive.google.com/file/d/1WPr46RFOu_1Vr5rAYO_QDUlaL090zWd3/view?usp=sharing

[82] Córdoba-Peraza, J. (2023). Informe final Elaboración del mapa de cobertura y uso de la tierra en Costa Rica 2021. Retrieved from https://drive.google.com/file/d/14pihK3Lqt622Mziv1qF2qz-IB6Ta-RtG/view?usp=sharing

[83] Agresta, Dimap, Universidad de Costa Rica, Universidad Politécnica de Madrid. 2015. 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 pp. https://www.dropbox.com/s/ygjw6zq00a1qtbm/Informe_tecnico_feb_2015.pdf?dl=0

[84] Ministry of the Environment and Natural Resources of Costa Rica. (2016). Modified REDD+ Forest reference emission level/forest reference level (FREL/FRL). COSTA RICA. SUBMISSION TO THE UNFCCC SECRETARIAT FOR TECHNICAL REVIEW ACCORDING TO DECISION 13/CP.19. Retrieved from https://redd.unfccc.int/files/2016_submission_frel_costa_rica.pdf

[85] Córdoba-Peraza, J. (2019). Informe final Elaboración del mapa de cobertura y uso de la tierra en Costa Rica 2015. Retrieved from https://drive.google.com/file/d/15rAwOV9I8jRArkcDnVpkf0tyJyRNu69C/view?usp=sharing

Radiometric normalization	All images were radiometrically normalized. This process is applied to reduce radiometric differences between images due to atmospheric conditions and the sensors' calibration at image acquisition dates. The conversion of digital values (6-band images) to reflectance was made using "Obtain reflectance" tool included in REDD tools Costa Rica package. The time normalization of the images was performed using the zenithal reference angle with a value of 36.90°, corresponding to February 17, 2013. For this procedure, "time normalization" of REDD tools Costa Rica package was used. Finally, for the radiometric normalization of the images, the tool "Radiometric Normalization" of REDD tools Costa Rica was used.
Random Forest classification	The classification of the images uses the Random Forest (RF) method. This methodology has 2 phases: (1) training or adjustment of the RF and (2) classification of the images using the generated RF classifier. Random Forest classifier was trained using homogeneous regions of interest known as ROI's, that provided "ground truth" information. ROIs were prepared by the technical team of the National Meteorological Institute together with the consultant. The ROIs are consistent with the land cover classes established in the satellite land monitoring protocol of Agresta (2015). ROI s were not collected for the paramo class, since a mask developed by Agresta (2015) was used to exclude this type of coverage from the analysis. The information used to define the training zones was the following: i. Google Earth's high-resolution image dataset. ii. Landsat 8 images used in the preparation of the land use map for the year 2021 (MCS 2021/22) and iii. ROIs provided by AGRESTA were used as a guide to delimit the polygons with the coverage classes. In total, 20 predictor variables (also called covariates or auxiliary variables) were used for the adjustment of the RF models, divided into four groups: (1) Spectral information of the bands, (2) Indices of vegetation, (3) Variables related to the texture of the image, and (4) Variables derived from the Digital Elevation Model. The classification of the images was done with the module "Classification of land cover Costa Rica" of REDD Tools Costa Rica in QGIS 2.18, using a ROIs shape file containing the training regions with LULC classes and the image of 20 bands (predictor variables) to be classified.
Postprocessing	Final maps are presented at 30 meters resolution. The preparation of the final maps from the classified images included the following tasks: i. The classified images were merged into a mosaic using the classification prioritization algorithm of the "FusionClass" module of REDD tools Costa Rica. ii. Information gaps due to the presence of clouds and shadows, although small, were filled with global data from the Global Forest Change project[86]. iii. MCS 2019/20 and MCS 2021/22 maps were re-projected, using the GDALWARP tool, from the OSGeo4W Shell console. This tool was used considering the geographical properties of the MCS 2013/14 map (pixel resolution, image extension X1-X2, Y1 Y2) as well as the number of rows and columns. iv. Minimum mapping unit: The analyst replaced Forest Class groups of pixels smaller than 11 pixels with the LULC class of the largest neighboring group to comply with the minimum area threshold of the definition of "forest (1.00 ha), and setting the minimum mapping unit. Due to the pixels' dimensions in the Landsat images (30.00 m x 30.00 m), the minimum mapping area is 0.99 ha, equivalent to 11 pixels (11 x 30.00 m x 30.00 m). v. MCS 2019/20 and MCS 2021/22 maps were reclassified according to the Land-use categories of the MCS 2013/14 map. The forests were separated into primary and secondary forest and by life zone (wet and rainy, wet, dry, mangrove and palm forest); permanent and annual crops also were grouped.

[86] Hansen, M.C., Potapov, P.V., Moore, R., Hancher, M., Turubanova, A., Tyukavina, D., Thau, D., Stehman, S.J.m Goetz, T.R., Loveland, T.R., Egorov, A., Chini, L., Justice, C.O. & Townshend, J.R.G. 2013: High – Resolution Global Maps of 21st-Century Forest Cover Change http://science.sciencemag.org/content/342/6160/850.

Activity Data calculation	For calculating the activity data, a cartographic comparison of the wall-to-wall maps MCS 2019/20 and MCS 2021/22 was made to subsequently count the pixel change and stable pixels in the 2019-2021 transition matrix. It was assured that both maps, MCS 2019/20 and MCS 2021/22 map, met the following requirements: i. Both maps must be in raster format; ii. Both maps must have the same number of rows and columns and the exact pixel resolution; iii. They should be in the same geographical reference system and not being displaced, and the projection should be EPSG 102305 CRTM05; iv. Both maps must share the same classification LULC key used in REDD+ Time Series maps, and v. Both maps must cover the same area. Using the ArcGIS / Zonal / Tabulate Area tool, the landuse change was obtained. The stable and converted areas are reported in land-use change matrices in the sheet "LCM 2020-21" of the FREL TOOL CR developed by Carbon Decision International (CDI) to estimate forest emissions for the period.
Value applied in monitoring period	
	2020-2021: • Total anthropogenic deforestation: **9,305** ha • Primary forest anthropogenic deforestation: **799** ha • Secondary forest and tree plantation anthropogenic deforestation: **8,507** ha
QA/QC procedures applied	
Introduction	The QA/QC procedures applied during the preparation of the land-use maps used to calculate AD for the reference period are summarized here, further information may be found in Agresta (2005), Sections 3, 4, and 7:
Download and satellite image preparation	1. Verification of file storage errors in digital media that could affect reading the data by the analyst responsible for download support images. 2. Previewing and verification of the satellite image quality and metadata by the analyst responsible for downloading support images. 3. Previewing and verification of the satellite image quality and metadata by the supervisor (IMN specialist).
Image orthorectification	Landsat 8 images are already orthorectified, therefore it was not necessary to apply the QA / QC procedure.
Radiometric normalization*:*	4. Radiometric normalization to reduce the differences between the time-series images.
Generation of cloud and shadow masks	5. The cloud and shadows mask were not validated with checkpoints. Instead, the analysts performed an exhaustive visual inspection.
Land use classification*:*	6. Analysts perform an iterative process of classification, verification of results, error detection, and review of areas and training points. 7. Progressive improvement of the areas and training points of the RF classifier before the final classification of the images. Review of the Random Forest classifiers' errors, identify classes that need improvement, and training points. 8. Visual verification and validation of classified images by comparing them with the available high-resolution image.
Preparation and validation of land-use maps:	9. Visual check of mosaics and identify information gaps (sensor failures on each time series' images. It is essential to clarify that Landsat 8 does not present the banding problems of Landsat 7. Therefore, it was not necessary to check for sensor errors. 10. Visual verification of the maps generated after filling the gaps with global data. 11. Manual edition of the time-series classification to improve land use mapping, largely aimed at decreasing high classification errors.
Preparation and validation of land-use change map:	12. Visual verification of the country's main deforestation and reforestation areas between consecutive years of the series to detect classification errors. 13. Validation of land-use changes between 2019 and 2021 based on photointerpretation of changes on a systematic random grid of points with high-resolution images of the year 2019 and 2021.
Uncertainty associated with this parameter:	

	Uncertainties associated to AD are due to the production process of land-use maps. The uncertainties of the AD for land-use change activities (deforestation and reforestation) and forest remaining forest activities (degradation and enhancements in forest lands) come from the uncertainties associated with the process creating land use change maps from which the activity data are obtained. The accuracy assessment of the land-use change map 2019/20 – 2021/22 was done following Olofsson et al.'s (2014)[87] guidelines. Reference data were collected by Aguilar, L. (2023)[88]. The following is a summary of the sampling design for the collection of Refence Data: **Type of sampling:** Systematic Sampling **(**SYS) over the Level 1 Systematic Grid of 10,242 points of the Monitoring system of land use change and ecosystems (SIMOCUTE). The SIMOCUTE sampling units are permanent, which facilitates reinterpretation through time and easy temporal tracking of LULC changes. **Sampling Unit:** Multi-point Sampling Unit (SU). The SU is a 100x100 m square plot with 1 point. **Number of Sampling Units:** A total of 10,241 checkpoints were assessed in the country's territory (excluding Cocos's Island). **Classification scheme:** Due to a large number of land-use change transitions, they were aggregated into four categories: 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). **Data sources**: The reference data for the validation of land-use changes during the period 2019/2020 - 2021/2022 was collected from visual interpretation of high-resolution images, During the visual interpretation, priority was given to the high-resolution images available in Google Earth, for 2018 (July 1, 2019, to June 30, 2020) and 2019 (July 1, 2021 to June 30, 2022). In the absence of images of less than 4 m resolution, the Planet images available in the NICFI Program[89] were used, and in the second instance Sentinel-2 or Landsat 8 within the priority dates. **Interpretation Key**: A revised version of the SIMOCUTE key was used to interpret land-use, following specific rules and spatial contexts such as size and shape of forests and considerations regarding gallery forests, rivers, and lake protection zones (see Aguilar, 2023). **Data collection**: The following procedures were applied during the collection of reference data: i. Cold checks: During the data collection process, a certain percentage of randomly selected sample units called "cold checks" are reviewed by a coordinator and data collection operator or group of interpreters. If an interpreter's error is found, the interpreter is directly addressed, and the affected sample units are corrected. Typically, at least 5% of surveyed subplots are reviewed, but in this evaluation, the percentage was increased to 11.0% to improve the remote evaluation process.

	ii. Hot checks: the supervisor provided immediate feedback to the analysts to improve the interpretations through the weekly review of points. The "hot checks" also contemplate the revision of doubtful classification. **Data analysis**: The Stratified sampling tool for area estimation was used to calculate land-use change areas, developed by FAO Open Foris project and available at https://github.com/openforis/accuracy-assessment. The activity data's uncertainty is the bias between the adjusted and estimated areas. The uncertainty values for the monitoring period 2020-2021 are as follows[90]: Uncertainty of hectares of deforestation from 1998-2011: 8% Uncertainty of hectares of non-forest that changed to forest land: 1% Uncertainty of hectares of forests remaining forests in 1998-2011: 3%

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

[88] Aguilar, L. 2023. Evaluación Visual Multitemporal (EVM) para la determinación de la degradación forestal en los puntos de la malla sistemática de puntos del SIMOCUTE N1 correspondiente al bosque permanente para el periodo 2019-2021 y recolección de datos de cambio de uso de suelo con datos de referencia recolectados mediante EVM con la malla sistemática de puntos del SIMOCUTE N1 sobre imágenes de alta resolución. II Informe. Procedimiento Operativo Estándar. Retrieved from https://drive.google.com/drive/folders/1AA7GKA--SpT2hxbGMPCsg3QKYOSxVnYT?usp=sharing

[89] Norway's International Climate and Forests Initiative Imagery Program https://www.planet.com/nicfi/

[90] Reference data and uncertainty estimate excel file can be accessed at the following link: https://drive.google.com/drive/folders/19vN91oetoPetOxdetRiA0r6PtR-TDDiZ?usp=sharing

Table 7: Source of Activity Data and description of the methods for developing the data for estimate emissions from degradation during the monitoring period.

Parameters:	**Activity Data of Degradation (AD_{Deg}) Eq 5.4** **Activity Data of Permanent Forest Regeneration (AD_E) Eq. 5.5**
Description:	Degradation: Hectares of forest with a reduction of canopy cover during the monitoring period. Forest Enhancement: Hectares of forest with an increase of canopy cover during the monitoring period
Data unit:	Hectares
Source of data	
Introduction	The forest degradation assessment was made on forest lands that remain as forest lands. The analysis of degradation was only performed on the area of forest remaining forest according to the land-use MCS 2019/20 map to avoid double-counting of baseline emissions between deforestation and forest degradation. This procedure avoided any measurements of degradation that were also accounted for under deforestation. Reference data to estimate Degradation AD were collected by Aguilar (2023)[91].
Type of sampling	A Systematic Sampling (SYS) over the updated version of Level 1 Systematic Grid with 10,241 points of the Monitoring system of land-use change and ecosystems (SIMOCUTE) was used. The original systematic grid is in the CRTM05 coordinate system of Costa Rica. However, it was re-projected to geographic coordinates in WGS84 to evaluate the sampling point with the Collect Earth Desktop tool. The SIMOCUTE sampling units are permanent, which facilitates reinterpretation through time and easy temporal tracking of LULC changes.
Sampling Unit	The Sampling Unit (SU) is a 100x100 meter plot whose central point coincides with the SIMOCUTE sampling points. The SU corresponds to 3x3 Landsat pixels and covers 0.98 ha. Inside SU, a 7x7 points sub-grid was created to estimate land cover percentage within each sampling unit.
Number of Sampling Units	The forest degradation assessment was made on forest lands that remain as forest lands during 2019-2021. The 4377 points classified as permanent forest land according to the MCS 2012/13 map were assessed in this monitoring period. These points are an extract from the Systematic Grid adopted in SIMOCUTE.
Classification scheme	Three classes of canopy cover were considered to estimate degradation/enhancement in permanent forest land: i. Intact forest (85-100% forest cover), ii. Degraded forest (60-85% forest cover), and iii. Very degraded forest (<60% forest cover). The following forest cover change classes were assessed by forest type and type of carbon fluxes (anthropogenic and natural): Degradation: a. Intact to Degraded forest b. Intact to Very degraded forest c. Degraded to Very degraded forest Forest enhancement: d. Very degraded to intact forest e. Very degraded to degraded forest f. Degraded to Intact forest No Condition changes g. Stable intact forest h. Stable degraded forest i. Stable very degraded forest

[91] Aguilar, L. 2023. Evaluación Visual Multitemporal (EVM) para la determinación de la degradación forestal en los puntos de la malla sistemática de puntos del SIMOCUTE N1 correspondiente al bosque permanente para el periodo 2019-2021 y recolección de datos de cambio de uso de suelo con datos de referencia recolectados mediante EVM con la malla sistemática de puntos del SIMOCUTE N1 sobre imágenes de alta resolución. II Informe. Procedimiento Operativo Estándar. Retrieved from https://drive.google.com/drive/folders/1AA7GKA--SpT2hxbGMPCsg3QKYOSxVnYT?usp=sharing

Data Sources

The range of dates of the images presented in the table below was used. Priority was given to operating with high-resolution dated imagery available in Google Earth. The next priority was to use the dated Planet images available in the NICFI Program.

Table 8: Data sources and Imagery date range used in the canopy cover evaluation on permanent forest for the monitoring period 2018-2019

Monitoring Year	Imagery date range	Data sources
2019	July 2019 – June 2020	• Google Earth dated high-resolution imagery repository (CNES/Airbus, Maxar Technologies) • Planet dated imagery of NICFI Program • Other sources (Bing Map, Copernicus, Landsat 7, US Geological Survey)
2021	July 2021 – June 2022	

Interpretation Key

The Version 1.2. 2018. SIMOCUTE land cover class key was used to determine canopy cover:

Table 9: Land cover key used in the land cover evaluation protocol for the years 2018, and 2019.

Code	Land cover class
1100	Trees
1200	Shrubs
1300	Herbaceous
1400	Palm
Not included	Bromeliads
1500-1600	Greenhouse
1700	Other vegetation
2000-2200	No vegetation
3000	Water
4000	Clouds and shadows
5000	Not classifiable

Data collection

See QA/QC procedures.

Data analysis	The country developed a tool for calculating emissions and removals on permanent forest lands (¨Herramienta_degradación.xlsx¨ [92]). The database for the visual interpretation of canopy cover for the periods 2016-2018, 2018-2019, 2019-2021 are included in the sheet "Base_de_datos". The area of degraded and enhanced forest areas was extrapolated to the forest area in the entire country through proportional representation within the respective degradation classes (intact, degraded and very degraded) and forestry type. 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 between 30% and 59%. Forest areas that went from intact to degraded, intact to very degraded, or degraded to very degraded (in terms of their canopy cover) during the assessment period were classified as degraded. Forest areas that went from very degraded to degraded, very degraded to intact, or degraded to intact were identified as forest enhancement areas. Carbon fluxes were estimated for anthropogenic and natural conditions. Fluxes from sampling points inside protected areas and farther than 500 meters from a road were considered natural fluxes and removed from reference level accounting. The estimation of the areas of change of degradation and canopy enhancement, for both anthropic and natural carbon fluxes, can be found in the sheet ¨Resumen_de_puntos¨ of the Degradation tool, for the monitoring period 2019-2021. It is important to indicate that it was unnecessary to update proximity analysis to roads and protected areas to estimate anthropogenic carbon flux since the 1: 5000 layer of roads and the layer of protected areas have not been updated.
Value applied in monitoring period:	
	• **2,193,917** hectares of forests remaining forests in the monitoring period (2019-2021) • **58,700** hectares of anthropogenic degradation (2019-2021) • **48,540** hectares of anthropogenic forest enhancement (2019-2021)
QA/QC procedures applied	
	Aguilar (2023) prepared a land cover evaluation protocol to reduce the uncertainty of the land cover classification due to: a) the bias associated with the spatial registration of the reference image, b) the interpreter bias in the assignment of the land cover class; and c) interpreter variability. The following procedures were applied during the collection of reference data: **Consideration of spatial and temporal context**: The protocol includes a procedure for canopy cover change interpretation considering the spatial and temporal context. **Reference order of the repositories of images**: The analyst gave priority to high-resolution images in Google Earth. In the second instance, on the Planet images available for the monitoring period. In case there are no high-resolution images for any sampling points, lower-resolution images available in the Collect Earth Desktop tool were used, if the monitoring period images are equal or better quality than the 2019 assessment. **Data registry forms**: The canopy cover change information was recorded in standard Collect Earth Desktop forms. **Training**: The supervisor trained the interpreters before starting the interpretation of plots to calibrate and leave clear procedures to collect the most accurate information possible. **Supervision of interpreters ("Hot Checks"):** The supervisor opened remote sessions between the coordinator and the interpreter; to oversee the evaluation process without intervening. The coordinator presented the results in periodic sessions with all interpreters to improve the group of interpreters' criteria. The supervisor resolved the consultations of the interpreters online. **Checking of interpretations by the supervisor, without interpreters' presence ("Cold Checks"):** During the data collection process, a certain percentage of randomly selected sample units called "cold checks" are reviewed by a coordinator and data collection operator or group of interpreters. If an interpreter's error is found, the interpreter is directly addressed, and the affected sample units are corrected. Typically, at least 5% of surveyed subplots are reviewed, but in this evaluation, the percentage was increased to 11.0% to improve the remote evaluation process. **Checking of interpreters' consistency ("Blind Checks"):** The analysts performed this procedure at the end of interpreting all the sampling plots. Each analyst evaluated at least 5% of the assessed plots by other interpreters, e.g., Interpreter 1 reviewed interpreters 2 and 3. The minimum level of consistency between evaluators was 90%. If not complying with the standard, the interpreter team should review the work until reaching the 90% threshold. **Consistency between reference and monitoring period data**: The analyst reviewed the consistency of 2021 canopy cover data with the 2019 evaluation.

[92] Degradation tool can be accessed in the following link:
https://docs.google.com/spreadsheets/d/11r7J0a6BHZx5aWyzC45UatWy3XAlnfp0?rtpof=true&usp=drive_fs

Uncertainty associated with this parameter:	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 above. Uncertainty of changes in canopy cover to identify areas of degradation and forest enhancement from 2019-2021 vary depending on the forest type and the conversion class. It is based on the sampling error. **Description of error found in degradation tool**: The estimate of degradation is made with 4377 sampling plots, as shown in column B of the "Degradation tool". The canopy cover change is collected with Collect Earth Desktop (CED) and imported to the Degradation tool for emission calculations. The information collected from CED and the quality control processes applied have been well maintained. However, an inconsistency was found in the canopy cover data loaded into the tool in Excel: "Degradation tool" for the periods 2016-2018, 2018-2019, and 2019-2021. This inconsistency was detected by an additional review that was carried out, given a considerable increase in the results of the degradation analysis in the period 2019-2021. The statistics of illegal logging events did not explain this increase in emissions from degradation, nor were there no changes in SINAC's budget for illegal logging control. The error occurred during importing canopy cover data from the files generated in CED to the "Degradation Tool". A human error was committed entering plot number **7948**, which is not part of the original 4377 plots to be evaluated. In addition, plot 14764 was omitted, even though it was collected in the CED form. This error generated the plot's order change for monitoring periods after the 2016 assessment. To fix this error, we entered the data corresponding to the omitted plot (14764), plot number 7948 was eliminated, and the information of all the plots for the 2 previous periods was ordered according to the plot number of column B of the "Degradation tool ". In addition, it was confirmed that the data collected from CED for the year 2021 was imported in the right order into the "Degradation Tool." The QA/QC procedures have been updated for collecting canopy cover changes in CED and the emissions calculation. To avoid this type of error, the Collect Earth Desktop form now includes the entire time series canopy cover data, and the dataset import is made including the complete time series instead of annexing the last period only. Furthermore, when a point of degradation is found, it will be discussed in a group and documented.

4 QUANTIFICATION OF EMISSION REDUCTIONS

4.1 ER Program Reference level for the Monitoring / Reporting Period covered in this report

Costa Rica made technical corrections to the Reference Level of the ER program. These corrections are not related to any change to policy and design decisions that could affect the Reference Level (carbon pools and gases, GHG sources, reference period, forest definition, REDD+ activities, Accounting Area, forest types, and REDD+ activities). The country has replaced emission/removal factors for degradation by higher precision EF based on additional sample plots and corrected an error in the canopy cover change database during the identification of very degraded forests. Paragraph 3 positive list of the Guideline on the application of Methodological Framework Number 2 includes these technical corrections. Costa Rica has updated the FREL/FRL by recalculating the forest degradation emissions, as follows:

a. Increasing the number of field observations, following the methodology used in the NFI to determine aboveground biomass in 100 temporary degradation plots covering all forest types (i.e., wet and rain forests, moist forests, dry forests, mangroves, and palm forests). These new data were integrated into aboveground biomass vs. canopy cover models used to develop new degradation emission factors.

b. Updating the degradation categories in the aboveground biomass vs. canopy cover models as: intact forests have a cover of 85-100%, degraded forests have a cover of 60-85%, and very degraded forests a cover of 30-59%. Forest areas that went from intact to degraded, intact to very degraded, or degraded to very degraded (in terms of their canopy cover) during the reference period (1998-2011) were classified as degraded, whereas primary forest areas that went from very degraded to degraded, very degraded to intact, or degraded to intact were identified as forest enhancement areas.

c. An error was corrected in the database identifying forests classified as previously degraded. Prior to this correction, forests with a canopy cover of between 0% and 59% were classified as very degraded. To account for the fact that areas with less than 30% canopy cover are identified as non-forests, this classification was corrected to only include forests with a canopy cover between 59% and 30%.

d. Further, the methodology to estimate total uncertainty was updated as the previous approach of estimating the final confidence interval of the final distribution of Monte Carlo simulations was deemed to have led to unrealistically low values.

Further detail about the adjustments made to the reference level compared to the estimates provided in the most recent ER Program Document is presented in detail in the first ER-MR Annex 4[93].

Year of Monitoring / Reporting period *t*	Average annual historical emissions from deforestation over the Reference Period (tCO_{2-e}/yr)	If applicable, average annual historical emissions from forest degradation over the Reference Period (tCO_{2-e}/yr)	If applicable, average annual historical removals by sinks over the Reference Period (tCO_{2-e}/yr)	Adjustment, if applicable (tCO_{2-e}/yr)	Reference level (tCO_{2-e}/yr)
2020	5,985,795	1,383,974	-4,784,051	NA	2,585,717
2021	5,985,795	1,383,974	-4,784,051	NA	2,585,717
Total	**11,971,589**	**2,767,948**	**-9,568,102**	**NA**	**5,171,435**

[93] The final version of Costa Rica First ER Monitoring Report can be Access at the following link: https://www.forestcarbonpartnership.org/system/files/documents/costa_rica_fcpf_er_monitoring_report_1st_rp_final_0.pdf

4.2 Estimation of emissions by sources and removals by sinks included in the ER Program's scope

The quantification of emissions and removals during the Reporting Period was done following the measurement and monitoring procedures described in section 2.2.1-Figure 2, the equations 2-5 described in section 2.2.2 of this Monitoring Report and applying the approaches to determine activity data and emission or removal factors included in the data and parameter tables on section 3 above. As in the Reference Level period, the total emissions or removals associated with each of the REDD+ activities were calculated as the Annual emissions or removals were estimated for all land transitions ¨*i*¨ by REDD+ activity, and then adding the results for all selected REDD+ activities for each year:

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

Equation 2

Where:

ER_{RAt}	=	Emissions or removals associated to REDD+ activity *RA* in year *t*; tCO_2-e yr^{-1}
$AD_{RAi,t}$	=	AD associated to REDD+ activity *RA* for the land use transition *i* in year *t*; ha yr^{-1}
$EF_{RAi,t}$	=	EF associated to REDD+ activity *RA* applicable to the land use transition *i* in year *t*; tCO_2-e ha^{-1}
RP	=	Reference Period in years
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

REDD+ Secretariat of Costa Rica estimated emissions by sources and removals by sinks included in the ER Program with two separate integration tools: deforestation and degradation[94]. The country also prepared an Emission Reduction Calculation Tool based on the FREL and Degradation tool results[95].

Year of Monitoring / Reporting Period	Emissions from deforestation (tCO_{2e}/yr)	If applicable, emissions from forest degradation (tCO_{2-e}/yr)*	If applicable, removals by sinks (tCO_{2-e}/yr)	Net emissions and removals (tCO_{2-e}/yr)	Net emissions and removals (tCO_{2-e}/yr) *Adjusted after correction in Degradation estimation
2020	542,797	2,764,822	-5,793,491	-2,485,873	-2,439,319
2021	574,858	2,764,822	-5,624,483	-2,284,803	-2,242,015
Total	**1,117,655**	**5,529,643**	**-11,417,974**	**-4,770,676**	**-4,681,334**

[94] FREL and Degradation TOOL can be accessed in the following links:
FREL: https://docs.google.com/spreadsheets/d/103jZDLVaK3bKC-OQwBV4CmSYj_sSZ5nh/edit?usp=sharing&ouid=101528572552038951719&rtpof=true&sd=true
Degradation:
https://docs.google.com/spreadsheets/d/11r7J0a6BHZx5aWyzC45UatWy3XAlnfp0/edit?usp=sharing&ouid=101528572552038951719&rtpof=true&sd=true

[95] Emission Reduction Calculation tool can be accessed in the following link:
https://docs.google.com/spreadsheets/d/17ivM7Lgv22C7myLo31gwlJSevKLYdtII/edit?usp=sharing&ouid=101528572552038951719&rtpof=true&sd=true

Note: While preparing the Second Monitoring Report (MR), Costa Rica found a calculation error in the forest degradation emission estimation tool. This error retroactively affected the emission of the First ER-MR. The issue was described in table 7 of Section 3.1 of this report. The remedial measure agreed with the FMT is to keep the number of ERs obtained in the first Monitoring Report (Value A in the table of section 8 of the First Monitoring Report) and adjust the ER estimate for the second MR to match the corrected accumulated ERs for 2018-2021. The adjustment procedure is described in Section 8 of this report.

4.3 Calculation of emission reductions

	Emission Reductions	**Emission Reductions Adjusted after correction in Degradation estimation**
Total Reference Level emissions during the Reporting Period (tCO_2-e)	5,171,435	5,171,435
Net emissions and removals under the ER Program during the Reporting Period (tCO_2-e)	-4,770,676	**-4,681,334**
Emission Reductions during the Reporting Period (tCO_2-e)	**9,942,111**	**9,852,768**

Note: While preparing the Second Monitoring Report (MR), Costa Rica found a calculation error in the forest degradation emission estimation tool. This error retroactively affected the emission of the First ER-MR. The issue was described in table 7 of Section 3.1 of this report. The remedial measure agreed with the FMT is to keep the number of ERs obtained in the first Monitoring Report (Value A in the table of section 8 of the First Monitoring Report) and adjust the ER estimate for the second MR to match the corrected accumulated ERs for 2018-2021. The adjustment procedure is described in Section 8 of this report.

5 UNCERTAINTY OF THE ESTIMATE OF EMISSION REDUCTIONS

5.1 Identification, assessment and addressing sources of uncertainty

Table 10: Sources of uncertainty to be considered under the FCPF MF

Sources of uncertainty	Systematic and/or random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
Activity Data					
Measurement	Systematic and random	**Land-use change areas (deforestation, reforestation and forest remaining forest areas)**: A unique and uniform methodology was used both for FREL / FRL and for the forest emission estimate to avoid that changes registered in the cartographic comparison of LULC maps were affected by the combination of different techniques and methods. This error represents the operator error during preparation and interpretation of LULCC maps. This error is reduced by the following QAQC procedures (see table 2 and 6). Quality control was first conducted during the download and image preparation phase by reviewing storage errors that affect the reading of the data, analyzing the image's metadata, and visually previewing the original image. The scenes of the reference period were analyzed by conducting the following image orthorectification procedures: i. Using control points, verify that the average square error never exceeds the pixel size of the image, ii. Visually inspect the image to ensure that there has been no defect in the orthorectification process (i.e., duplicate areas, pixel deformation, or geometry errors caused by errors in the digital terrain model), and iii. Using a regularly distributed grid, take checkpoints in each scene and perform geometric control of rectified images. For the scenes of monitoring period, it was not necessary to rectify the Landsat8 images supplied by the USGS. These images have a 1T processing level (Terrain corrected), a systematic geometric correction using ground control points for image registration with a WGS84 map projection. These also include correction of relief changes. A radiometric normalization was applied to reduce the differences between the time-series images. The cloud and shadow masks in all images were then checked by visually comparing them with the original image in RGB or false color. These masks were then validated in a sample of 18 images by visual verification of a systematic grid of checkpoints. Further quality control measures were taken through an iterative process of land use classification, verification of classification, error detection, and review of areas and training points. Errors from the Random Forest classifier were reviewed, classes and training points that needed to be improved were	High	Yes	No

Sources of uncertainty	Systematic and/or random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
		identified, and classifications were visually checked against high resolution images. The final maps were prepared after mosaiced images were visually checked and information gaps and sensor failures on each of the dates in the series were identified. The final maps were subject to a quality assurance (QA) process that was provided by institutions of the country not used in the classification phase. These reviewers validated the final maps on three of the dates in the time series.			
Measurement	Systematic and random	**Permanent forest degradation and regeneration**: The same methodology was used to estimate degradation and regeneration in permanent forest lands. A Systematic Sampling (SYS) over the Level 1 Systematic Grid of 10,242 points of the Monitoring system of land-use change and ecosystems (SIMOCUTE) was used. The analysis of degradation was only performed on the area of forest remaining forest according to the land-use MCS 2017/18 map to avoid double-counting of baseline emissions between deforestation and forest degradation. This procedure avoided any measurements of degradation that were also accounted for under deforestation. 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 above in tables 3 and 7. The following QA/QC procedures were applied during the interpretation of high-resolution imagery: i. **Consideration of spatial and temporal context**: The protocol includes a procedure for canopy cover change interpretation considering the spatial and temporal context (see section 1.6 in Aguilar, 2020). ii. **Reference order of the repositories of images**: The analyst gave priority to high-resolution images in Google Earth. In the second instance, on the Planet images available for the monitoring period. In case there are no high-resolution images for any sampling points, lower-resolution images available in the Collect Earth Desktop tool were used, if the monitoring period images are equal or better quality than the 2017 assessment. iii. **Data registry forms**: The canopy cover change information was recorded in standard Collect Earth Desktop forms (see section 1.7 in Aguilar, 2020). iv. **Training**: The supervisor trained the interpreters before starting the interpretation of plots to calibrate and leave clear procedures to collect the most accurate information possible. iv. **Supervision of interpreters ("Hot Checks"):** The supervisor opened remote sessions between the coordinator and the interpreter (due to the Covid); to oversee the evaluation process without intervening. The coordinator presented the results in periodic sessions with	Low	Yes	No

Sources of uncertainty	Systematic and/or random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
		all interpreters to improve the group of interpreters' criteria. The supervisor resolved the consultations of the interpreters online. v. **Checking of interpretations by the supervisor, without interpreters' presence ("Cold Checks"):** The supervisor reviewed at least 5% of the parcels evaluated. The points that do not coincide were reviewed together by the supervisor and all the interpreters. vi. **Checking of interpreters' consistency ("Blind Checks"):** The analysts performed this procedure at the end of interpreting all the sampling plots. Each analyst evaluated at least 5% of the assessed plots by other interpreters, e.g., Interpreter 1 reviewed interpreters 2 and 3. The minimum level of consistency between evaluators was 90%. If not complying with the standard, the interpreter team should review the work until reaching the 90% threshold. viii. **Consistency between reference and monitoring period data**: The analyst reviewed the consistency of 2018 canopy cover data with the 2016 evaluation performed by OrtizMalavassi (2017). vii. **Treatment of plots with forest cover less than 30%:** The analyst made the degradation analysis over the systematic grid points that falls on permanent forest lands during 19982011 in REDD time series maps. Thus, the 4,377 points of the original sampling implemented by Ortiz-Malavassi (2017) were re-visited in 2016, 2018, and 2020 evaluations. During the review of these points, some of them passed to non-forest conditions due to the loss of coverage and non-compliance with the minimum forest definition area (30% of canopy cover). Some of these points may have been declared deforestation or being part of the omission error in the land-use change's permanent forests for the periods 2012-13, 2014-15, 2016-17, 2018-19 and 2019-2021. Finally, uncertainty of changes in canopy cover to identify areas of degradation and forest enhancement from reference and monitoring periods vary depending on the forest type and the conversion class. It is based on the sampling error.			
Representative ness	Systematic	**Land-use change areas (deforestation, reforestation, and forest remaining forest areas)**: Land-use change areas (deforestation, reforestation and forest remaining forest areas): To prepare the LULCC maps for reference and monitoring periods, four generations of LANDSAT satellites were used: Landsat 4 TM, Landsat 5 TM, Landsat 7 ETM +, Landsat 8 OLI / TIRS. Scenes were selected from June (Year 1) to June (Year 2) for the period under monitoring. Monitoring occurs every two years, and the territorial forest area covered includes the country's continental territory but excludes the Coco Island due to its exclusion from anthropogenic intervention.	Low	Yes	No

Sources of uncertainty	Systematic and/or random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
		To ensure the representativeness of the LULCC maps, the Random Forest methodology is used for the reference and monitoring periods to train a forest classifier and then classify imagery. To train the forest classifier, regions of different land cover classes were digitized using (1) a systematic grid of 10,000 points from Rapideye images developed by SINAC, (2) high-resolution images from Rapideye, and (3) current and historical Google Earth images. This base data was then combined with 20 predictor variables to adjust the forest classifier models. To minimize the error (i.e. uncertainty) in these classifier models, the Random Forest R package generates an error and confusion matrix which allows for an initial quality control check based on a subset of checkpoints. To further minimize uncertainty, the random forest classifier was iteratively improved by analysts using the error and confusion matrix generated by the classifier, which identifies classes that need improved training data or predictor variables. Once the classifiers were trained, they were applied to all images to assess land use land cover for the given two-year period. The resulting land use land cover maps then underwent post processing to further reduce uncertainty in classification, through visual comparison of classified maps and high-resolution imagery, analysts performed manual edition of the time- series classification aimed at decreasing high classification errors. Analysts also performed visual verification of the country's main deforestation and reforestation areas to detect any classification errors to ensure an accurate assessment of land use-change. **Permanent forest degradation and regeneration**: High-resolution imagery used to estimate degradation and regeneration were selected from June to June for the year under monitoring.			
Sampling	Random	**Land-use change areas (deforestation, reforestation, and forest remaining forest areas)**: Uncertainties associated to AD are due to the production process of land use maps. The uncertainties of the AD for land use change activities (deforestation and reforestation) and forest remaining forest activities (degradation and enhancements in forest lands) come from the uncertainties associated with the process creating land use change maps from which the activity data are obtained. The accuracy assessment of the land-use changes map MCS 2001/02, MCS 2011/12, MCS 2017/18, MCS 2019/20, and MCS 2021/22 was done following Olofsson et al.'s (2014)[96] guidelines. Due to a large number of land use change transitions, they were aggregated into four categories: 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). For further detail of the accuracy assessment for the reference and monitoring periods please see the uncertainty section in tables 3 and 6.	Not apply	Not apply	Not apply

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

Sources of uncertainty	Systematic and/or random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
	Random	**Permanent forest degradation and regeneration**: The same methodology was used to estimate degradation and regeneration in permanent forest lands for reference and monitoring period. A Systematic Sampling (SYS) over the Level 1 Systematic Grid of 10,242 points of the Monitoring system of land-use change and ecosystems (SIMOCUTE) was used. Uncertainty of changes in canopy cover to identify areas of degradation and forest enhancement for reference and monitoring vary depending on the forest type and the conversion class. It is based on the sampling error.	Low	No	No
Extrapolation	NA	This source of uncertainty is not applicable. Costa Rica generates estimates of deforestation, regeneration, and permanent forest lands per forest type, where the total annual areas are the sum of each forest type for a given year.	NA	NA	NA
Approach 3	NA	This source of uncertainty is not applicable. Activity data were estimated conducting tracking of lands or IPCC Approach 3 for reference and monitoring periods.	NA	NA	NA
Emission Factor					
DBH measurement	Systematic and Random	Extensive quality control procedures were implemented prior to the start of field work during estimation of AGB in the National Forest Inventory and Canopy cover and biomass relationship with additional temporal sampling plots. Field crews were organized by region. Each field crew was trained and provided with manuals to assist with identification, collection, transport, and processing of botanical samples. A terms of reference document was also provided which explained specific roles and responsibilities of each crew member. Finally, an Excel template was created to control the quality of data collection. Quality assurance measures were then taken as supervisors visited field sites to oversee the field crews and take photographic records of each field plot (please see tables 4 and 5). The quality of forest inventory data then underwent an evaluation by an independent crew that visits and remeasures 10% of the plots established in the NFI and 5% of the 100 additional plots. Thanks to these QA/QC procedures implemented before, during, and after the field campaigns the potential biases in the measurement of DBH, H, and plot delineation have been minimized. The random error associated with the measurement of these parameters has therefore been considered to be low, and thus this source of error will not be propagated.	Low	Yes	No
H measurement					
Plot delineation					
Wood density estimation	Systematic and Random	The wood density values were obtained directly from specialized publications (Biomass estimation tool developed by SINAC, IPCC 2003[97]; Myers 2013[98]; Tree Functional Attributes and Ecological Database, 2018[99]). High-skilled specialists conducted the tree identification following specific protocols to mitigate the error when the wood density value was assigned to each tree.	Low	Yes	No

[97] IPCC. 2003. Good Practice Guidance for Land Use, Land-Use Change and Forestry. Intergovernmental Panel on Climate Change (IPCC). Edited by Jim Penman, J.; Gytarsky, M.; Hiraishi, T.; Krug, T.; Kruger, D.; Pipatti, R.; Buendia, L.; Miwa, K.; Ngara, T.; Tanabe K.; Wagner, F. IPCC National Greenhouse Gas Inventories Programme. Published by the Institute for Global Environmental Strategies (IGES) for the IPCC. 583 p.

[98] Myers, R. 2013. Fenología y crecimiento de Raphia taedigera (Arecaceae) en humedales del noreste de Costa Rica. En:Rev. Biol. Trop. (Int. J. Trop. Biol. ISSN-0034-7744) Vol. 61 (Suppl. 1): 35-45

[99] Tree Functional Attributes and Ecological Database. (2018). Wood Density. Recuperado el 10 de 12 de 2018, de http://db.worldagroforestry.org/.

Sources of uncertainty	Systematic and/or random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
Biomass allometric model	Systematic and Random	The biomass was calculated using Chave et al. (2005) for NFI inventory data, and Chave et al. (2014) for the 100 additional AGB plots. The propagation of error through MC simulation did not include this source of uncertainty due to the complexity of calculation, the lack of bias (given errors from allometric equations are not systematic), and the agreement of experts in the fields and of standards (cf. ART) that it is reasonable to exclude this form of error (Winrock International, personal communication, 2021).	Low	Yes	No
Sampling	Random	Sampling error is the statistical variance of the estimate of aboveground biomass, dead wood or litter. This source of error is random and is considered to be high and it has been propagated. In Costa Rica, sampling error was identified for aboveground biomass values in primary forests in its National Forest Inventory. In secondary forests and in other carbon pools, sampling error of biomass values was estimated from scientific literature. Sampling error was also identified when estimating the ratio between canopy cover and aboveground biomass based on plot data.	High	Yes	Yes
Other parameters (e.g. Carbon Fraction, root to-shoot ratios)	Systematic and Random	Below ground biomass (BGB) is derived directly from Cairns et al., (1997)[100]. The carbon fraction employed was PCC's default value (0.47). The propagation of error through MC simulation did not include either the uncertainty of the root-shoots rations or carbon fraction.	Low	No	Yes
Representative ness	NA	This source of uncertainty is not applicable. Costa Rica generates estimates of carbon stocks per forest type.	NA	NA	NA
Integration					
Model	Systematic	Manuals have been prepared for the correct use of FREL and Degradation tools[101], to avoid errors during the process of data preparation.	Low	Yes	No
Integration	Systematic	The Emission factors were calculated for each forest type according to AGB sampling plots' location to assure the comparability between transition classes of the Activity Data and those of the Emission Factors. This source of uncertainty is considered in the sampling error of the AGB inventory.	Low	Yes	No

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

[101] The manual of FREL Tool can be accessed in the following link: https://drive.google.com/file/d/1INuL5Jld7nlKVsAf7mRsEepm2n8WRVpT/view?usp=sharing

5.2 Uncertainty of the estimate of Emission Reductions

Parameters and assumptions used in the Monte Carlo method

Parameter included in the model	Parameter values	Error sources quantified in the model (e.g. measurement error, model error, etc.)	Probability distribution function	Assumptions
Area (hectares) of deforestation	9,305 ha in 2020 and 2021	Sampling error	Truncated normal	Minimum value assumed to be 0
Area (hectares) of forests remaining forests	2,194,364 ha in 2020 and 2,193,917 ha in 2021	Sampling error	Truncated normal	Minimum value assumed to be 0
Area (hectares) of new forests	918,763 ha in 2020 and 916,368 in 2021	Sampling error	Truncated normal	Minimum value assumed to be 0
Change in percent canopy cover in degraded and regenerated forests	Varies depending on the level of degradation and regeneration	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass for very moist and rain forests – primary	313.69	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass for moist forests - primary	203.99	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass for dry forests – primary	199.19	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass for mangroves – primary	253.74	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass for palm forest - primary	229.81	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass for secondary forests	Varies depending on age (1-400 years) and forest type	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass for annual cropland	83.57	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass for permanent cropland	Varies depending on age (1-400 years)	Sampling error	Truncated normal	Minimum value assumed to be 0

Parameter included in the model	Parameter values	Error sources quantified in the model (e.g. measurement error, model error, etc.)	Probability distribution function	Assumptions
Aboveground biomass for paramos	126.87	Sampling error	Truncated normal	Minimum value assumed to be 0
Belowground biomass for very moist and rain forests – primary	71.97	Sampling error	Truncated normal	Minimum value assumed to be 0
Belowground biomass for moist forests - primary	48.32	Sampling error	Truncated normal	Minimum value assumed to be 0
Belowground biomass for dry forests – primary	47.27	Sampling error	Truncated normal	Minimum value assumed to be 0
Belowground biomass for mangroves - primary	53.96	Sampling error	Truncated normal	Minimum value assumed to be 0
Belowground biomass for secondary forests	Varies depending on age (1-400 years) and forest type	Sampling error	Truncated normal	Minimum value assumed to be 0
Belowground biomass for annual cropland	21.16	Sampling error	Truncated normal	Minimum value assumed to be 0
Belowground biomass for permanent cropland	Varies depending on age (1-400 years)	Sampling error	Truncated normal	Minimum value assumed to be 0
Belowground biomass for paramos	31.13	Sampling error	Truncated normal	Minimum value assumed to be 0
Deadwood for very moist and rain forests – primary	49.5	Sampling error	Truncated normal	Minimum value assumed to be 0
Deadwood for moist forests - primary	48.27	Sampling error	Truncated normal	Minimum value assumed to be 0
Deadwood for dry forests – primary	56.47	Sampling error	Truncated normal	Minimum value assumed to be 0
Deadwood for mangroves - primary	6.95	Sampling error	Truncated normal	Minimum value assumed to be 0
Deadwood for palm forest - primary	5.97	Sampling error	Truncated normal	Minimum value assumed to be 0
Deadwood for secondary forests	Varies depending on	Sampling error	Truncated normal	Minimum value assumed to be 0

Parameter included in the model	Parameter values	Error sources quantified in the model (e.g. measurement error, model error, etc.)	Probability distribution function	Assumptions
	age (1-400 years) and forest type			
Deadwood for grassland	8.28	Sampling error	Truncated normal	Minimum value assumed to be 0
Litter for very moist and rain forests – primary	10.05	Sampling error	Truncated normal	Minimum value assumed to be 0
Litter for moist forests - primary	8.01	Sampling error	Truncated normal	Minimum value assumed to be 0
Litter for dry forests – primary	22.73	Sampling error	Truncated normal	Minimum value assumed to be 0
Litter for mangroves - primary	0.97	Sampling error	Truncated normal	Minimum value assumed to be 0
Litter for palm forest - primary	0.96	Sampling error	Truncated normal	Minimum value assumed to be 0
Litter for secondary forests	Varies depending on age (1-400 years) and forest type	Sampling error	Truncated normal	Minimum value assumed to be 0
Litter for permanent cropland	Varies depending on age (1-400 years)	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass-canopy cover ratio in very moist and rain forests	5.03	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass-canopy cover ratio in moist forests	3.86	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass-canopy cover ratio in dry forests	3.47	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass-canopy cover ratio in mangroves	3.19	Sampling error	Truncated normal	Minimum value assumed to be 0
Aboveground biomass-canopy cover ratio in palm forests	4.26	Sampling error	Truncated normal	Minimum value assumed to be 0

Quantification of the uncertainty of the estimate of Emission Reductions

The country estimated the uncertainty of aggregated Emission Reductions based on Monte Carlo analysis. A total of 10,000 iterations were calculated for the cumulative emissions of reference and monitoring period[102].

		Reporting Period	Crediting Period
		Total Emission Reductions*	**Total Emission Reductions***
A	**Median**	9,312,211	19,112,161
B	**Upper bound 90% CI** (Percentile 0.95)	15,853,036	31,680,042
C	**Lower bound 90% CI** (Percentile 0.05)	3,399,246	7,824,276
D	**Half Width Confidence Interval at 90% (B – C / 2)**	6,226,895	11,927,883
E	**Relative margin (D / A)**	66.9%	62.41%
F	**Uncertainty discount**	12%	12%

*Remove forest degradation if forest degradation has been estimated with proxy data.

5.3 Sensitivity analysis and identification of areas of improvement of MRV system

In order to identify the relative contribution of each parameter to overall uncertainty, a sensitivity analysis was conducted in which the uncertainty of each parameter was selectively removed prior to running Monte Carlo simulations and combining uncertainties. As shown in the table below, the carbon stocks used to estimate emission factors for deforestation were by far the largest source of uncertainty. When this uncertainty source was removed, total uncertainty decreased by over 54%. The mapping error of new forests during the reference period, the error of the ratio of aboveground biomass to percent canopy cover, and changes in canopy cover in forests remaining forests during the monitoring period also had sizable impacts on uncertainty. When the uncertainty for each of these was removed, uncertainty decreased by 6.9%, 6.8%, and 6.2% respectively[103].

For certain sources of uncertainty, when selectively removed, the overall uncertainty of the emission reductions increased, albeit minimally. This can be explained by the fact that, when Monte Carlo simulations of multiple error sources are combined (say through multiplication), depending on the spread and distributions of the different sources of error, the final distribution may end up being narrower than when there are fewer sources combined. For example, when values at one end of the distribution are multiplied by values at the other end of another distribution, the resulting final values may end up nearer to the average.

Sensitivity analysis results

Error source selectively removed from uncertainty analyses	Final % uncertainty of ERs	% change in total uncertainty of ERs
Mapping error (AD) of deforestation in the reference period	63.3%	0.6% decrease
Mapping error (AD) of deforestation in the monitoring period	63.6%	0.1% increase
Carbon stocks used to estimate deforestation emission factors	29.2%	54.2% decrease
Mapping error (AD) of new forests in the reference period	59.3%	6.9% decrease

[102] MC propagation analyses to estimate uncertainty of Emission Reductions can be found in the following link: https://docs.google.com/spreadsheets/d/12NZpIs3Rl4UrTydeOMTZkVg3ao38IFg7/edit?usp=sharing&ouid=101528572552038951719&rtpof=true&sd=true

[103] Sensitivity analyses of the uncertainty estimate for Emission Reductions can be found in the following link: https://drive.google.com/drive/folders/1sPjBD5kjd8JN6vXvLb6LaaTUjdRh8VtT?usp=sharing

Mapping error (AD) of new forests in the monitoring period	64.0%	0.5% increase
Carbon stocks used to estimate enhancements in new forests	62.3%	2.1% decrease
Mapping error (AD) of forests remaining forests in the reference period	63.7%	0.2% increase
Mapping error (AD) of forests remaining forests in the monitoring period	63.9%	0.4% increase
Changes in canopy cover in forests remaining forests in the reference period	63.2%	0.6% decrease
Changes in canopy cover in forests remaining forests in the monitoring period	59.7%	6.2% decrease
Ratio of aboveground biomass (in t CO2e) to % canopy cover	59.3%	6.8% decrease
Carbon stocks used to estimate enhancements in forests remaining forests	63.7%	0.2% increase

6 TRANSFER OF TITLE TO ERS

6.1 Ability to transfer title.

According to the Benefit Sharing Plan, FONAFIFO will distribute direct payments or monetary benefits from the Emissions Rection Purchase Agreements (ERPA) to forest landowners. REDD+ Secretary has designed a Standards and Procedure Manual for the Emissions Reduction Payment Program, setting the technical and legal requirements to enter the ER Program and sign a CREF[104]. The landowners need a Forest Emissions Reduction Agreement (its acronym in Spanish is CREF) duly signed with FONAFIFO to participate in the ER-Program. The compensation for forest owners is fixed and will depend on forest area contribution to forest emissions reduction. Figure 5 outlines the process for transferring the title to Emission Reductions. Regarding the ability to transfer titles to ERs, Executive Decree No. 40464-MINAE[105] specifies the following land tenure types that generate ER titles.

I. **Indigenous Territories**. Indigenous territories are privately owned, registered in the name of the Association for Integral Indigenous Development (ADII), which exercises collective ownership. To be eligible for the Emission Reduction Program and receive payment for emission reductions, the ADII must submit an application to the program. This application should include a document called "informed consent," proof of having an accountant, an exclusive bank account for resource management, and a cadastral plan of the territory or decree of creation of the Indigenous Territory. The REDD+ Secretariat will then conduct a technical and legal analysis of the land submitted by the ADII to confirm ownership/possession and check geographical overlaps that may indicate a dispute over ownership. This analysis helps determine the eligible areas that can benefit from the ER Program. In addition, the ADII must also prepare and approve a Territorial Forest Environmental Plan (PAFT) by the Indigenous Territory community. This plan includes an investment or resource distribution plan. Before signing a Contract of Emissions Reductions from Forest (CREF), the PAFT and the act of creating an Internal Committee for the Supervision of Indigenous Territorial Investment Plan must be presented. Finally, to transfer the title to ERs, the ADII President will sign the CREF contract, transferring the title of ERs to FONAFIFO.

II. **Lands included in the Payment for Environmental Services (PES) Program**. These lands are included in the PES Program. The forest owners have signed a PES contract that transfers the title to ERs to the National Forest Financing Fund (FONAFIFO). Before signing the PES contract, FONAFIFO checks the beneficiary´s ownership of the land to determine the area eligible for benefits from the ER Program.

III. **State Natural Heritage owned by other State Institutions**: These lands are part of the Patrimony of other state institutions. REDD+ Secretariat checks geographical overlaps that indicate any disputes over the ownership of the land in SNH to determine the area eligible to receive benefits from the ER Program. The transfer of the title to ERs is made by signing a contract in which the institution's representative transfers the title to ERs to FONAFIFO (CREF contract).

IV. **Privately Owned Lands with Contracts of Emissions Reductions from Forest (CREF)**. These lands are privately owned and registered in the National Registry. For land rights that are not registered in the National Registry, Executive Decree No. 43649-MINAE and Law No. 8640 provide the possibility to include such land in the Emission Reduction Program (see Manual of Requirements and Procedures for the Emission Reduction Payment Program, article 15). To prove their right of possession, possessors need to fulfill a series of requirements, including the cadastral plan, affidavits of the possessor, witnesses, and adjoining landowners. All these requirements must be valued to prove the right. The REDD+ Secretariat checks geographical overlaps, suggesting land ownership disputes. This helps determine the eligible area that can benefit from the ER Program. Once the legal requirements are met and the eligible area is

[104] Manual of Requirements and Procedures for the Emissions Reduction Program can be accessed at the following link https://www.imprentanacional.go.cr/pub/2022/09/16/ALCA197_16_09_2022.pdf (Page 14)

[105] Decree 40464-MINAE is accessible at the following link: http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=84456&nValor3=108959&strTipM=TC

determined, a CREF contract is signed with the landowner to transfer the title of emission reductions to FONAFIFO.

V. **State Natural Heritage (SNH):** The State holds title to the land or verifies the existence of regulations indicating that it is part of the Protected Wild Areas. The REDD+ Secretariat checks geographical overlaps that indicate any disputes over the ownership of the land in SNH to determine the area eligible to receive benefits from the ER Program. Transferring the title to ERs does not require signing a specific contract, as the State owns the land.

Calculation of the Percentage of ERs able to transfer the Title to the ERs

To determine the percentage of eligible Emission Reductions (ERs) that can transfer their title, it is necessary to calculate the proportion of the total forest area they occupy. This can be achieved by dividing the documented ER-owned area participating in the Emission Reduction Program (See Table 12) by the total forest area during the monitoring period, including primary and secondary forests [106].

Table 11 presents a summary of the number of contracts signed for the transfer of emission reduction titles under the ER Program. It is important to note that State Natural Heritage Forest lands, being state-owned, do not require a transfer of carbon title contract. Table 12 displays the corresponding area of the contract and state-owned lands based on the ER-Program Data Management System (DMS).

Please be advised that the areas under legal and technical analysis and the geo-referencing process did not have a signed contract at the time of preparing this report. However, they have a formal request for inclusion in the RE program, duly signed by the forest owner. Furthermore, it is crucial to clarify that the Indigenous Territories have submitted a Letter of Interest to the REDD+ Secretariat for participation in the ER Program. FONAFIFO will sign a CREF contract with each territory once they prepare the Forest and Environmental Territorial Plans (PAFT).

The percentage of eligible Emission Reductions (ERs) that can transfer their title is calculated annually. The total area covered by active PES and Biodiversity contracts changes yearly due to contract expiration, so the percentage of ERs that can be transferred varies between years. Table 12, Row E displays the percentage of ERs that can transfer their title annually, which was 42.6% for 2018, 43.0% for 2019, 43.5% for 2020, and 42.1% for 2020. Rows F and G show the total transferrable ERs in the first ER-MR and total transferrable ERs after retroactive correction. The accumulated ERs for the first and second reporting periods are 6,896,942 tCO2e, with 3,555,294 tCO2e for the first reporting period and 3,341,648 tCO2e for the second.

Table 11. Landowner types and their number of contracts for transferring emission reduction titles under the ER Program.

Forest Cover Owner Type			Contracts transfer title to ERs			
			2018[1]	2019[2]	2020[3]	2021[4]
1	CREF beneficiaries who have either registered or non-registered properties	With signed contracts or have been approved for signing.	280	280	281	278
		Legal and technical analysis in process	N.A.	N.A.	N.A.	N.A.
		Geo-referencing process of the beneficiary's property	N.A.	N.A.	N.A.	N.A.
2	Indigenous Territories		2	2	2	2
3	Biodiversity Fund		1	1	1	1
	FONAFIFO PES Program		5,012	5,181	5,582	5,012

[106] Forest remaining as forest values reported in the FREL tool, obtained with the land use and land use change maps. The FREL Tool can be accessed at the following link: https://docs.google.com/spreadsheets/d/103jZDLVaK3bKC-OQwBV4CmSYj_sSZ5nh?rtpof=true&authuser=mrvreddcr%40gmail.com&usp=drive_fs

4	State Natural Heritage- SINAC	N.A.	N.A.	N.A.	N.A.
	SNH-Other State Institutions	3	3	3	3

[1] List of contracts signed for the 2018 ERs can be accessed at the following link (see worksheet "Lista de Contratos":
https://docs.google.com/spreadsheets/d/1SU4Gy-fxbLAyoGrQJLQRTn2_InkM4WiY?rtpof=true&usp=drive_fs
[2] List of contracts signed for the 2019 ERs can be accessed at the following link (see worksheet "Lista de Contratos":
https://docs.google.com/spreadsheets/d/1SHmADAfJv5NgOjV4zZTbxvw0gBt_16Wj?rtpof=true&usp=drive_fs
[4] List of contracts signed for the 2020 ERs can be accessed at the following link (see worksheet "Lista de Contratos":
https://docs.google.com/spreadsheets/d/1SV8x1pyUwS3ZpdjKHXgwFszKDnOOF-uj?rtpof=true&usp=drive_fs
[5] List of contracts signed for the 2021 ERs can be accessed at the following link (see worksheet "Lista de Contratos":
https://docs.google.com/spreadsheets/d/1ScP9MW9BR00nKdzEyIOTB05eOThGkYtq?rtpof=true&usp=drive_fs

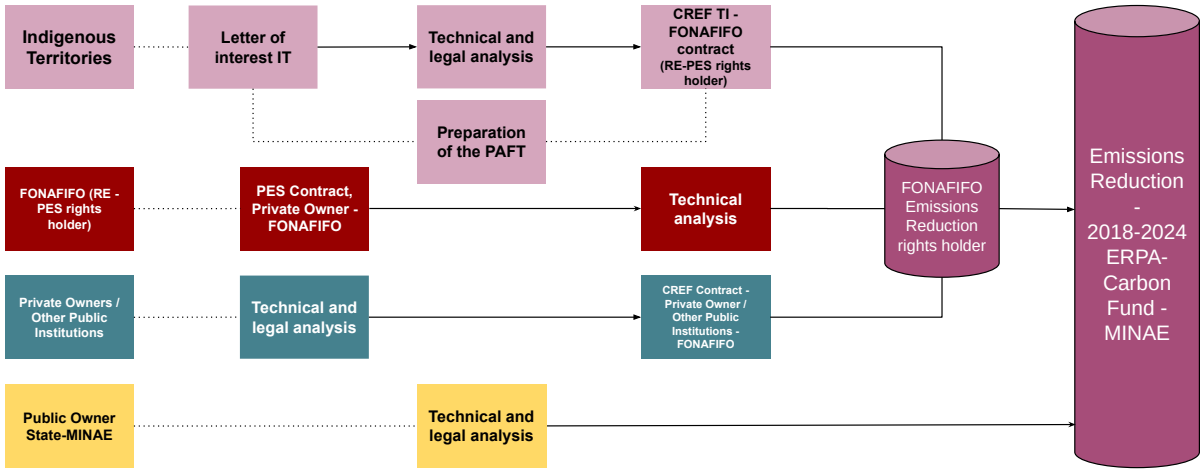


Figure 5: Process for transferring title to Emission Reductions ERPA - Carbon Fund - MINAE 2018-2024

Challenges in documenting ownership of Emissions Reduction

The ER-Program has encountered significant hurdles in documenting ownership of emissions reduction. These challenges are crucial to understand as they directly impact the potential participants' interest and the overall success of the program. During the initial phase of field visits for property geolocation, the potential participants showed little interest due to the initial possible payment (US$7/ha per year). This first estimate of emission reduction compensation was unattractive for the landowners compared with the current PES amount (US$64/ha per year).

The CREF payment has been increased to US$18 per hectare per year in order to tackle this issue. The Ministry has allowed the use of US$38.8 million from the REDD+ result-based payment granted to the country by the Green Climate Fund. This payment is a compensation for the reduction of 14.08 million tons of carbon dioxide equivalent ($MtCO_2eq$) in emissions during 2014-2015, which has led to an increase in the CREF payment. FONAFIFO has added these resources to the funds obtained from the Emission Reduction Purchase Agreement (ER-PA). With this combination of resources, the ER-Program is now able to pay US$18 per hectare per year for a period of seven years under the project.

Also is essential to note that the unregistered farms have the most significant potential to enter the ER Program due to the impossibility of participating in PPES. However, unregistered farms lack several legal requirements that are difficult to obtain. The REDD+ Secretariat sought ways to involve unregistered farms, which comprise a significant portion of ownership and farm size. In August 2022, Executive Decree N 43649-MINAE was released[107], allowing

[107] Executive Decree N 43649-MINAE can be accessed at following link
https://onfcr.org/wp-content/uploads/MODIF-PSA-publicado-en-La-Gaceta-165-31-Ago-22.pdf (Page 11)

forest holders in Protected Areas to join the ER Program (CREF) and the Payment for Environmental Services Program. This positively affected the RE Program's recruitment level and increased the volume of work to review legal and technical requirements. The unregistered farms are the ones that generate the greatest volume of work, given the number of requirements established in the procedure's manual and in the Eco-Markets law (8640) that establishes the legal conditions for holders.

The REDD+ Secretary implemented three additional measures to recruit the largest number of ER Program beneficiaries while ensuring that at least 55% of the country's forest land is protected.

i. **Recruitment of former PES beneficiaries/applicants**: FONAFIFO's historic PES database consultation to identify potential beneficiaries who are no longer receiving PES or were not suitable to participate because they did not meet the priorities of the PPES. REDD Secretariat will contact the potential beneficiaries by phone calls or email to inform the ER Program and their participation.
ii. **Engagement of Forestry Organizations**: The principal forest owner organizations were contacted, seeking their partners' involvement.
iii. **Open call for participation**: In August 2021, a new call was made to explain the ER Program and invite forest owners to participate. This call will be open until the end of the crediting period.

Table 12. Forest area identified until December 31, 2023 as eligible to participate in the Emission Reduction Program of Costa Rica.

	Forest Cover Owner Type			2018 (ha)	2019 (ha)	2020 (ha)	2021 (ha)
Reported on Substantial Volume of ER	1	CREF beneficiaries who have either registered or non-registered properties	With signed contracts or have been approved for signing.	38,624	37,826	37,776	37,391
			Legal and technical analysis in process	21,839	22,685	22,787	23,425
			Geo-referencing process of the beneficiary's property	20,454	22,331	22,210	22,574
	2	Indigenous Territories		179,531	179,753	175,617	175,417
	3	FONAFIFO PES Program		394,459	402,957	420,515	374,589
		Biodiversity Fund		6,292	7,539	8,661	9,207
	4	State Natural Heritage-SINAC		664,394	664,115	663,978	663,956
		SNH-Other State Institutions		2,867	2,865	2,867	2,867
Subtotal				1,328,460	1,340,072	1,354,410	1,309,425
Non-reported areas on Substantial Volume of ER. Areas under legal	4	SNH-Other State Institutions		67,569	66,762	66,617	67,062
	5	Forest cover in inalienable areas		42,146	42,967	41,764	42,229
	6	Forest cover in Protected Wilderness Areas (outside National Parks, Biological Reserves, and National Monuments)		318,396	314,257	311,971	326,357
	7	Forest Cover in Overlay Analysis		1,679	1,534	1,873	1,773
	8	Forest owners NOT ELIGIBLE for the RE program		4,375	4,367	4,355	4,330
Subtotal				434,165	429,887	426,579	441,750
Total				1,762,625	1,769,959	1,780,989	1,751,176
A. Forest Cover Area with documented ownership (ha):				1,328,460	1,340,072	1,354,410	1,309,425
B. Forest Cover Area without documented ownership (ha):				434,165	429,887	426,579	441,750
C. Forest Cover Area not considered in the ER-P (C=D-A-B) (ha)				1,354,210	1,346,876	1,329,296	1,359,109
D. Total area of forest cover (ha):				3,116,835	3,116,835	3,110,285	3,110,285
E. Percentage of ERs able to transfer the Title to the ERs (E=A/D) [1]:				42.6%	43.0%	43.5%	42.1%
F. Total Transferrable ER reported in first ER-MR (TCO2eq) [2]:				1,641,512	1,641,512	-	-
G. Total Transferrable ER retroactively corrected (TCO2eq) [3]:				1,777,647	1,777,647	1,670,824	1,670,824
H. Additional ERs to be registered for the First ER-MR (H=G-F) (TCO2eq):				136,136	136,136	-	-
I. Minimum number of ERs contracted for the reporting period (TCO2eq):				1,700,000	1,700,000	1,700,000	1,700,000
J. ER payment (J=G*5) (US$)				8,888,236	8,888,236	8,354,120	8,354,120
K. ER payments made in 2018-2019 (K=F*5) (US$)				8,207,558	8,207,558	-	-
L. ER payment for 2020-2021 (L=J-K) (US$)				680,679	680,679	8,354,120	8,354,120

Notes:

[1] A geospatial overlay analysis of ER title owners determines the percentage of ERs able to transfer the Title to the ERs. This analysis considers the following geo-databases: (i) forest land in the State Natural Heritage, (ii) private forest owners with CREF contracts, (iii) private forest owners with active PES contracts during the monitoring period, (iv) private forest owners with active Biodiversity

contracts, and (v) Indigenous Territories. The geospatial overlay analysis is conducted annually, and only active PES and Biodiversity contracts are considered. As the total area of active PES and Biodiversity contracts changes yearly due to contract expiration, the percentage of ERs that can be transferred varies between years.

Private voluntary projects are not included in the REs able to transfer the Title to the REs since they do not receive PSA, CREF, or form part of State Natural Heritage; therefore, they are not registered in the Data Management System of the ER-Program. The table below contains information on the two private voluntary projects that have been identified in the ER-Program accounting area.

Year	BaunInvest Reforestation Project (1795)	VisionForest (530)	Total
2017	4882	664	5546
2018	5271	664	5935
2019	6510	664	7174
2020	7136	664	7800
2021	0	664	664

https://registry.goldstandard.org/projects/details/1795

https://registry.goldstandard.org/projects/details/530

[2] The number of FCPF ERs on the front page of Costa Rica's first ER-MR is divided by two.

[3] ERs are calculated according to the Carbon Pools and the Reference Level described in Annex 4 of the ER Monitoring Report submitted to the Carbon Fund of the FCPF. (https://www.forestcarbonpartnership.org/system/files/documents/costa_rica_fcpf_er_monitoring_report_1st_rp_final_0.pdf). ER's volume was calculated by applying the updated % of ER able to transfer the title and retroactively corrected ER volumes.

Source: You can access annual summaries (2018, 2019, 2020, 2021) of eligible areas in both geo-database and Excel file formats by clicking on the link below: https://fonafifo-my.sharepoint.com/:f:/g/personal/redd_fonafifo_go_cr/Ej0dcqWiJ4dOqWz2G90V51kBcxPNA1GjUkz5Y9me-G1A9A?e=7eJOqA . Furthermore, the worksheet with the calculation of the percentage of transferrable ERs can be accessed at the following link: https://docs.google.com/spreadsheets/d/17ivM7Lgv22C7myLo31gwlJSevKLYdtII?rtpof=true&usp=drive_fs

6.2 Implementation and operation of Program and Projects Data Management System

The country has decided to maintain its own comprehensive national REDD+ Program and Projects Data Management System (MF I.37.1). Costa Rica Emission Reduction Program´s data management system is part of the National System of Climate Change Metrics of Costa Rica (SINAMECC). SINAMEC is Costa Rica's official platform to coordinate climate information in the country (Figure 3). The system serves to track national climate change policy progress, enable data-driven decision-making, and facilitate reporting under national and international commitments. SINAMECC was officially established in 2018 by Executive Decree No. 41127-MINAE[108]. The system operates as a sub-module of the National Environmental Information System (SINIA), linked to the National Statistical System (SINIA). Climate Change Directorate (DCC) of the Ministry of Environment and Energy (MINAE) coordinates SINAMECC[109]. This system also has the SINAMECC Committee made up of the National Meteorological Institute (IMN), the Secretariat for Sector Planning for the Environment, Energy, Seas and Territorial Planning (SEPLASA), the National Center for Geo-environmental Information (CENIGA), and the National Institute of Statistics and Censuses (INEC)[90].

[108] Decree 41127-MINAE can be accessed at the following link http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?nValor1=1&nValor2=86584

[109] Decree 35669-MINAE can be accessed at the following link http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?nValor1=1&nValor2=66973 [90] http://sinamecc.go.cr/acerca-de

SIMAMECC has three modules: i. Mitigation, ii. Adaptation, and iii. Climate Finance. The mitigation module aims to register and measure climate change mitigation actions in Costa Rica with transparency. A mitigation action is an initiative that reduces greenhouse gas emissions or increases carbon dioxide removals, such as sector initiatives - NAMAs. Also, it includes private projects within the Country Program for C-neutrality and actions derived from public policy associated with sectoral development plans. For transparency purposes, as far as possible, all actions - small or large in scale and impact - must be part of SINAMECC, which seeks to ensure that the effects of the mitigation action are reflected in the national inventory of greenhouse gases.

The country is implementing the Mitigation Action Registry. Mitigation actions in Costa Rica have multiple metrics and different baselines; this prevents aggregation and definition of collective progress on reducing emissions at the national level. Therefore, the Mitigation Action Registry will document the initiatives together with a procedure for harmonization with the National Greenhouse gas inventory. A preliminary design of the Mitigation Action Registry has been prepared [110].

The REDD+ Secretariat has completed the documentation forms required by the SINAMECC Mitigation Actions Registry for the Costa Rica Emission Reduction Program (PRE)[111]. This template includes the following information, among others (MF I.37.2): i. Initiative Name, ii. Entity promoting the initiative (name, business name, representative, and information contact.), iii. The scale of the mitigation action, iv. Description, REDD + type activity, and carbon pools considered, v. Methodological framework or Standard, vi. Project Life Cycle (Credit Period), vii. Reference Level used; viii. Existence of a purchase-sale contract for Reduction of emissions, and ix. Ex Ante Estimation of Emissions Reduction. The REDD+ Secretariat will document in the Costa Rica Emission Reduction Program´s data management system the title-right owner and beneficiaries' information, geographic limits of the properties and forest area included in the PRE.

In 2023, the REDD+ Secretariat, the National Meteorological Institute, and the UNDP Result-Based Program began collaborating to evaluate two options for implementing the Mitigation Action Registry. A specialized company is expected to start construction of the Registry System in 2024.

Figure 4 shows the line diagram for the operation of the ER-Program Data Management System. Table 12 provides details on the users, analysts, reviewers, and approvals functions of the ER-Program Data Management System. The REDD+ Secretariat, together with the FONAFIFO Legal Department, has prepared a manual of requirements and procedures for the Emissions Reduction Program. The manual details the beneficiary's approval procedures in PRE, including decision rules for overlap cases between landowners and the legal requirements, both for private owners and the natural heritage of the state and indigenous territories. Finally, it indicates the general terms of the session of the rights and the payment of the RE[112].

The REDD+ Secretariat is implementing the ER-Program Data Management System (DMS). The ER Program´s DMS includes i. The entity that has Title to ERs produced; ii. Geographical boundaries of the State Natural Heritage (National Parks, National Monuments and Biological Reverses, inalienable areas), Indigenous Territories, and Private Owned Forest Properties; iii. Scope of REDD+ activities. The DMS system produces the input information included in Table 11, with ERs produced by owner type and year according to the Carbon Pools and the Reference Level described in Annex 4 of the ER Monitoring Report submitted to the Carbon Fund of the FCPF.

[110] Concept note of Design and testing of a cross-sectorial Measurement, Reporting, Verification and Registry framework for Costa Rica's National Climate Change Metrics System
http://sinamecc.go.cr/biblioteca-sinamecc/conceptoSinamecc

[111] The documentation form completed for the ER-P can be accessed at the following link
https://docs.google.com/spreadsheets/d/1ltS_8NvZeF79ZfqAVrTVcltq2_UB88GB/edit?usp=sharing&ouid=101528572552038951719&rtpof=tru

[112] A Draft of the Manual of Requirements and Procedures for the Emissions Reduction Program can be accessed at the following link
https://docs.google.com/document/d/1ckHxhAomfagRVMfN9OH_86nOcx06VElE/edit?usp=sharing&ouid=101528572552038951719&rtpof=true&sd=true

The following tasks have been completed or are in progress:

- *Calls for CREF beneficiaries*: The REDD+ Secretary of Costa Rica and FONAFIFO have made two calls for participating in the Emissions Reduction Program (PRE) and later to sign Emissions Reduction Contracts (CREF). The first was in October 2020, and the second was in August 2021. The REDD+ Secretary of Costa Rica and FONAFIFO called for the first time. FONAFIFO invited forest owners to express their interest in participating and learn about the Program by filling out a form[113] on FONAFIFO's website[114]. Farm owners with forests, natural regeneration, forest management (primary or secondary), or forest plantations can participate in the CREF mechanism. FONAFIFO promoted the campaign in different media such as national circulation newspapers, Facebook, website, and individual invitations to several organizations or relevant stakeholders. REDD+ Secretariat is building a database with all the applications.
- *Analysis of ER owners*: As part of the ER Program's entry process and to demonstrate ownership of emission reductions, REDD Secretariat built a geospatial database with the potential ER Program beneficiaries, including private forest owners, Indigenous peoples, SINAC, FONAFIFO, and other institutions administering State Natural Heritage.
- *Property geolocation analysis*: The database allows REDD+ Secretariat to locate overlayed areas between private owners. Also, to determine if the overlaying is due to location errors in the cadastre plan. The Geospatial Analyst of The REDD Secretariat is preparing CREF non-overlapped maps for each application received during the calls. The procedure for the overlay analysis is in the manual of requirements and procedures for the Emissions Reduction Program[115].
- *Field visits*: The Field Analyst of the REDD+ Secretary visits the properties of the potential beneficiaries to identify and resolve any location issue. The Secretary has visited more than 150 locations with applications to the ER Program. Property accessibility has resulted in a problem. Remote properties usually do not maintain clear boundaries, complicating the cadastre plan's verification and increasing recruitment costs.
- *Legal analysis*: After the overlay issues have been solved, the REDD Secretary does a legal analysis and then proceeds with the signature of the CREF.

The REDD+ Secretariat, with the support of the World Bank, built a repository system for Costa Rica REDD+ information. This repository is hosted in the servers of FONAFIFO and will include the publication of the Database of the Project Data Management System. In this way, the REDD+ Programs and Projects Data Management System will be available to the public via the internet in the Spanish language.

[113] Application to Join the CREF Project
https://forms.office.com/Pages/ResponsePage.aspx?id=ytnVe7YiPUK3Aloh1bsHR3mtNt1gTYhOgux9YcGhPN9UNkRVT1NFMDZES0FMR0dEVTRXSTMwQ0kzWC4u

[114] www.ganacontubosque.com

[115] A Draft of the Manual of Requirements and Procedures for the Emissions Reduction Program can be accessed at the following link
https://docs.google.com/document/d/1ckHxhAomfagRVMfN9OH_86nOcx06VElE/edit?usp=sharing&ouid=101528572552038951719&rtpof=tru

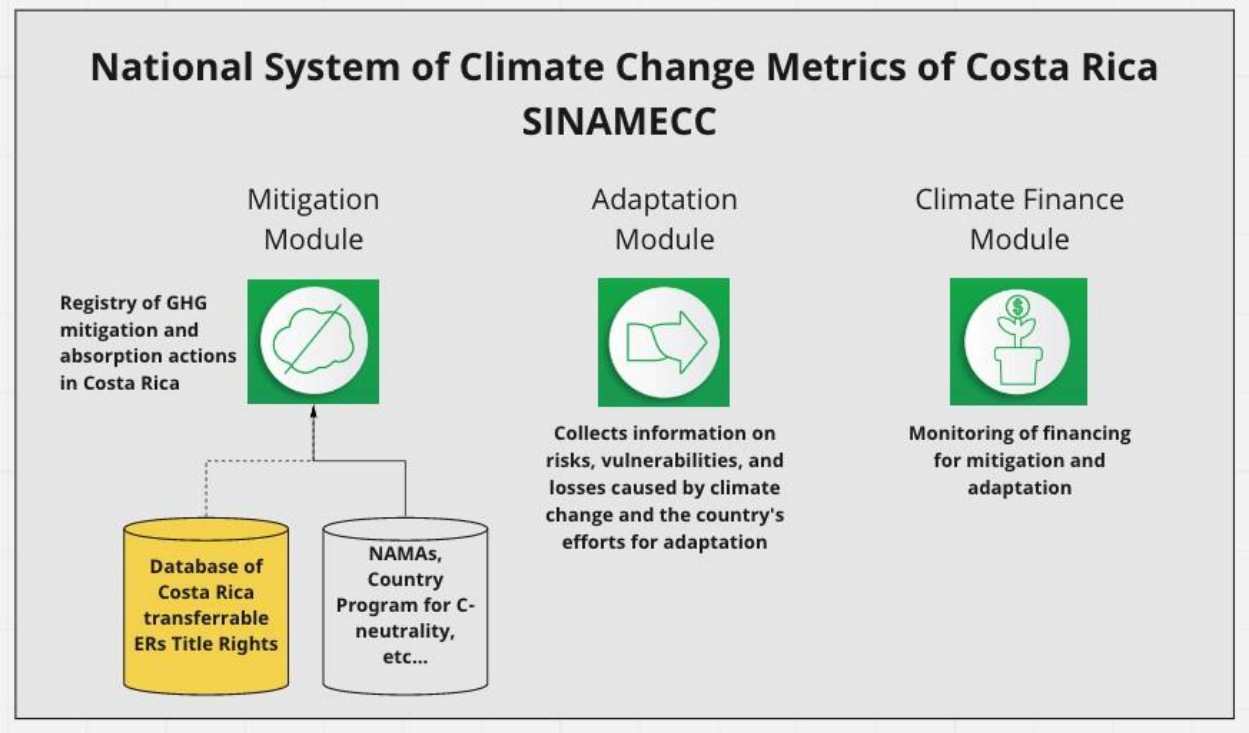


Figure 3: National System of Climate Change Metrics of Costa Rica (SINAMECC). Costa Rica Emission Reduction Program´s data management system is part of the SINAMEC. This system is Costa Rica's official platform to coordinate climate information in the country.

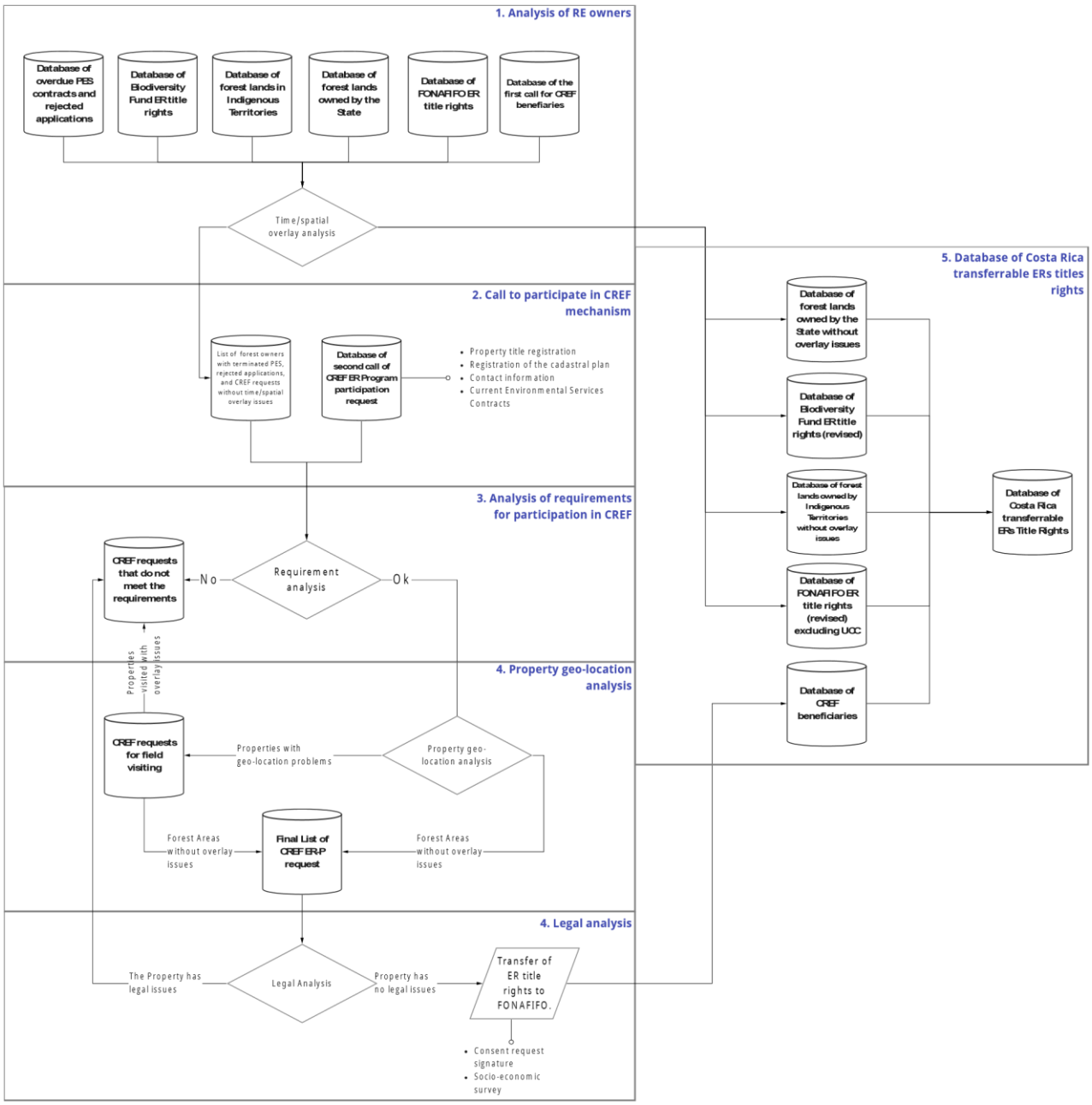


Figure 6: Line diagram for the building process of Costa Rica ER-Program Data Management System.

Table 13: Functions of the ER-Program Data Management System

Registration process phases	User / Analyst	Reviewer	Approval	Issuance of Opinion
Receipt of CREF requests	Landowner with forest cover	CREF recruitment officer (REDD+ Secretariat)	Head of REDD + Secretariat	Approval of the closing report for the receipt of CREF applications
Receipt Payment for Environmental Services Program geodatabase.	FONAFIFO	CREF recruitment officer (REDD+ Secretariat)	Head of REDD + Secretariat	Approval of database reception report
Receipt of the State Natural Heritage geodatabase	SINAC	CREF recruitment officer (REDD+ Secretariat)	Head of REDD + Secretariat	Approval of database reception report
Receipt of Biodiversity Fund geodatabase	FUNBAN	CREF recruitment officer (REDD+ Secretariat)	Head of REDD + Secretariat	Approval of database reception report
Preparation of the Indigenous Territories geodatabase	Geospatial Analyst (REDD+ Secretariat)	CREF recruitment officer (REDD+ Secretariat)	Head of REDD + Secretariat	Approval of database reception report
CREF Requirements Analysis	Requirements Analyst (REDD+ Secretariat)	CREF recruitment officer (REDD+ Secretariat)	Head of REDD + Secretariat	Requirements review report approval
Spatial overlap analysis between ER´s owners	Geospatial Analyst (REDD+ Secretariat)	CREF recruitment officer (REDD+ Secretariat)	Head of REDD + Secretariat	CREF effective area maps
Geolocation field review of properties.	Field Analyst (Forestry Engineer - REDD+ Secretariat)	CREF recruitment officer (REDD+ Secretariat)	Head of REDD + Secretariat	Corrected CREF effective area map
Legal Analysis	CREF recruitment officer (REDD+ Secretariat)	Legal Analyst (FONAFIFO)	Head of FONAFIFO´s Legal Department	RE title-right contract
Registry ER title-rights	Geospatial Analyst (REDD+ Secretariat)	CREF recruitment officer (REDD+ Secretariat)	Head of REDD + Secretariat	Record ID of the property in the database.

6.3 Implementation and operation of ER transaction registry

The Government of Costa Rica has decided to use the FCPF ER Transaction Registry in conjunction with its own national registry, which is currently being developed as part of the National Climate Change Metrics System (Sistema Nacional de Métrica de Cambio Climático, SINAMECC). As part of the measures to avoid double counting of ERs generated from Costa Rica FCPF ER Program in the national transaction registry and the FCPF ER Transaction Registry, once the national registry is operational the Government of Costa Rica will only recognize, including for purposes of reporting to the Trustee, authorization and/or corresponding adjustments units that are duly registered in the Costa Rican national registry. Both Parties will take all reasonable efforts to ensure that the Costa Rican national registry component of SINAMECC and the FCPF ER Transaction Registry will incorporate all features necessary to enable communication and operational compatibility between the systems.

6.4 ERs transferred to other entities or other schemes

There are four Afforestation and Reforestation (AR) projects in Costa Rica that are listed in the Gold Standard Registry. These projects are Reforestation Project in Costa Rica 01 (GS11708), BaumInvest Forest Landscape Restoration Programme (GS11707), BaumInvest Reforestation Project (GS2913) and VisionsWald - VisionForest (GS3264).

To avoid double counting of Emission Reductions (ERs) generated from the Costa Rica Forest Carbon Partnership Facility (FCPF) ER Program with these specific initiatives, the Private Voluntary Projects have not been included in the ERs that can transfer the Title to the ERs. It is also important to note that these Private Voluntary Projects do not receive PSA, CREF, or form part of State Natural Heritage. As a result, they are not registered in the Data Management System of the ER-Program.

7 REVERSALS

7.1 Occurrence of major events or changes in ER Program circumstances that might have led to the Reversals during the Reporting Period compared to the previous Reporting Period(s)

Costa Rica uses the Reversal Risk assessment tool to determine the Reversal Risk Set-Aside Percentages for each of them. These risk factors, as specified in the ER-PD, are:

1. Default risk set by the FCPF (10%)
2. Lack of broad and sustained stakeholder support (low, 0%)
3. Lack of institutional capacities and/or ineffective vertical/cross sectoral coordination (low, 0%)
4. Lack of long-term effectiveness in addressing underlying drivers (low, 0%)
5. Exposure and vulnerability to natural disturbances (low, 0%)

This analysis revealed that the overall risk of reversals in the country is 10%. Costa Rica's circumstances have not changed and thus this risk of reversals is maintained during the monitoring period (see section 7.3 below). Costa Rica manages Reversal Risks through the use of an ER Program CF Buffer; a buffer reserve account has been established for this purpose in an appropriate ER Transaction Registry, following FCPF's registry conditions.

As shown in section 4, there have not been reversals during the first and second reporting period, and Costa Rica reduced net emissions by 19,112,161 t CO_2e during the crediting period (see table in section 5.2).

7.2 Quantification of Reversals during the Reporting Period

Intentionally left blank. No reversals occurred during the reporting period.

A.	**ER Program Reference level for this Reporting Period (tCO_2-e)**	*from section 4.1*		
B.		*from previous ER Monitoring Reports*		**+**

	ER Program Reference level for all previous Reporting Periods in the ERPA (tCO2-e).		
C.	**Cumulative Reference Level Emissions for all Reporting Periods [A + B]**		
D.	**Estimation of emissions by sources and removals by sinks for this Reporting Period (tCO_2-e)**	*from section 4.2*	
E.	**Estimation of emissions by sources and removals by sinks for all previous Reporting Periods in the ERPA (tCO_2-e)**	*from previous ER Monitoring Reports*	
F.	**Cumulative emissions by sources and removals by sinks including the current reporting period (as an aggregate accumulated since beginning of the ERPA) [D + E]**		–
G.	**Cumulative quantity of Total ERs estimated including the current reporting period (as an aggregate of ERs accumulated since beginning of the ERPA) [C – F]**		
H.	**Cumulative quantity of Total ERs estimated for prior reporting periods (as an aggregate of ERs accumulated since beginning of the ERPA)**	*from previous ER Monitoring Reports*	–
I.	**[G – H], negative number indicates Reversals**		

If I. above is negative and reversals have occurred complete the following:

J.	**Amount of ERs that have been previously transferred to the Carbon Fund, as Contract ERs and Additional ERs**	
H.	**Quantity of Buffer ERs to be canceled from the Reversal Buffer account [J / H × (H – G)]**	

7.3 Reversal risk assessment

Risk Factor	Risk indicators	Default Reversal Risk Set-Aside Percentage	Discount	Resulting reversal risk setaside percentage
Default risk	*N/A*	**10%**	*N/A*	*10%*
Lack of broad and sustained stakeholder support	**Land tenure conflicts, carbon rights conflicts, insufficient stakeholder consultation.** • **REDD+ governance structures**. 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. These activities entail adopting improved governance structures and processes[116] that aim to eliminate the conflict and abate the risk it poses, thereby enhancing the long-term effectiveness of the REDD+ program. The REDD+ governance structure and the roles and responsibilities of each institution are detailed, both in the ER Program and in the Benefit Sharing Plan. • **Mechanism to resolve disputes related to carbon rights.** 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. The mechanism to resolve carbon rights disputes is defined in the REDD+ Decree No. 40464, which states the mechanisms of carbon trading and REDD+ Strategy financing. REDD+ Secretary is taking action to minimize the probability of a reversal due to overlay issues. The selection process of CREF beneficiaries' applications is based on an overlay analysis of a global geodatabase of ER's owners. CREF mechanism will include only non-overlapped forest land (See section 6.2). • **Additional consultation processes** In 2020-2021, Costa Rica was approved for a project by the Green Climate Fund, and for their emission reductions in 2014-2015, they were granted acknowledgment worth US$54 million. The United Nations Development Programme (UNDP) is responsible for implementing this initiative as a financial intermediary, through the Results Based Payment (PBR) Project. FONAFIFO and the PBR project are currently overseeing the development of Territorial Forest Environmental Plans (PAFT) in indigenous territories. It is mandatory for the Indigenous Territory to fulfill the PAFT requirement to receive the CREF payment. The PAFTs are prepared through a voluntary consultation process, in compliance with UNFCCC safeguards and World Bank social and environmental safeguards. Moreover, 24 indigenous territories have expressed their interest in participating in the PAFT creation processes.	**10%**	*Reversal Risk is considered low: 10% discount*	*0%*

[116] 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.

Lack of institutional capacities and/or ineffective vertical/cross sectorial coordination	**Insufficient experience implementing programs and policies, lack of cross-sectoral cooperation and between gov. levels.** **REDD+ focal point institution** FONAFIFO is the focal point for the REDD+ program in Costa 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. In addition to PES Program, according to Benefit Sharing Plan, FONAFIFO implemented the Emissions Reduction Agreement (its acronym in Spanish is CREF) as the mechanism to distribute direct payments or monetary benefits from the Emissions Rection Purchase Agreements (ERPA) to forest landowners. REDD+ Secretary has designed Standards and Procedure Manual for CREF Program, setting the technical and legal requirements to enter the ER Program.	**10%**	*Reversal Risk is considered low: 10% discount*	*0%*
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**. **Costa Rica REDD+ results.** Costa Rica decoupled agricultural production from deforestation by implementing solid legal frameworks, innovative agricultural and environmental policies, and Payment for Environmental Services schemes (REDD+ financial mechanisms), which together generated agricultural and livestock intensification, plus the growing development of Ecotourism. AFOLU emissions have decreased from 11.4 in 1998 to 0.7 million tCO2-e yr-1 in2021 (See Figure 1 in Section 1.2). Costa Rica has demonstrated that emissions can be reduced effectively, as planned in the ER Program. Deforestation in Costa Rica has historically been driven by the lack of ecosystem service value that incentivizes converting forest land to agriculture and pasture. During this monitoring period 2012-2021, the government of Costa Rica signed 448,407 ha of PES contracts with private forest owners under the activities of Protection, Reforestation, Regeneration, and Forest Management. There have not been any new deforestation drivers identified and those listed in ER-PD. In addition, the Intensification of agriculture and livestock helped to produce a positive balance of mature forests loss and forest regeneration, improving the agriculture sector's added value and exports (see Figure 1). Between 2012 and 2021, the loss of mature forest was 37,285 hectares (61% for grasslands), while 194,914 hectares of forest were regenerated mainly from pasture lands (51%). Finally, Ecotourism facilitated the Internalization of the benefits of biodiversity conservation. Ecotourism in Costa Rica has become an effective forest conservation strategy. An explicit conservation mechanism, a local economic benefit, and strict monitoring and application of environmental regulations have accompanied ecotourism.	**5%**	*Reversal Risk is consider ed low: 5% discount*	*0%*
Exposure and vulnerability to natural disturbances	**Exposure and vulnerability to natural disturbances and disasters, limited capacity and/or experience in preventing them.**	**5%**	*Reversal Risk is considered low: 5% discount*	*0%*

	Costa Rica considers the following natural risks affecting its forest lands: • Low-intensity natural disturbances are frequent and cause small and diffuse impacts that cannot be easily differentiated from those caused by anthropogenic factors. The emissions caused by these disturbances are measured through the degradation accounting approach but excluded from the degradation reference level. They will be excluded in future measurement reports of the Program results, posing no risk of reversals. • High-intensity natural disturbances are not a cause of deforestation and degradation. The high-intensity natural disturbances occasionally result in significant impacts occurring at a lower frequency. These disturbances include 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 been excluded from the reference level, 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.			
		Total reversal risk set-aside percentage		*10%*
		Total reversal risk set-aside percentage from ER-PD or previous monitoring report (whichever is more recent)		*10%*

The assessment of reversal risk is determined by the following set of indicators that are used to evaluate the level of risk associated with each factor. Based on these evaluations, the risk is categorized as low, medium, or high, and a corresponding percentage discount is assigned for each type of risk that determines the set-aside amount.

Risk Factor	Low Risk Indicator	Medium Risk Indicator	High Risk Indicator
Lack of broad and sustained stakeholder support	There are REDD+ governance structures. There is a mechanism in place to resolve disputes related to carbon rights.	REDD+ governance structures are not clearly defined. The mechanism for carbon rights disputes is not clearly defined.	There are no REDD+ governance structures. There is no established process to settle disagreements that may arise concerning carbon rights.
	Discount 10%	**Discount 5%**	**Discount 0%**
Lack of institutional capacities and/or ineffective vertical/cross sectorial coordination	There is a focal point institution, government resourced, responsible for the implementation of the ERPA, and other REDD+ related programs.	There is a focal point institution, government resourced, responsible for the implementation of the ERPA, dedicated to the forest administration.	There is a focal point institution, government resourced, responsible for the implementation of the ERPA. With no experience in forest administration.
	Discount 10%	**Discount 5%**	**Discount 0%**
Lack of long-term effectiveness in addressing underlying drivers	More than 20 years of positive results have been achieved in reducing emissions from deforestation and degradation.	More than 10 years of positive results reducing emission from deforestation and degradation.	No progress yet in reducing deforestation and degradation emissions.
	Discount 5%	**Discount 3%**	**Discount 0%**
Exposure and vulnerability to natural disturbances	High-intensity natural disturbances are not a cause of deforestation and degradation.	High-intensity natural disturbances have been identified as a driver of deforestation and degradation.	The primary cause of deforestation and degradation is high-intensity natural disturbances.
	Discount 5%	**Discount 3%**	**Discount 0%**

8 EMISSION REDUCTIONS AVAILABLE FOR TRANSFER TO THE CARBON FUND

While preparing the Second Monitoring Report (MR), Costa Rica found a calculation error in the forest degradation emission estimation tool. This error retroactively affected the emission of the First ER-MR. The issue was described in table 7 of Section 3.1 of this report.

The remedial measure agreed with the FMT is to keep the number of ERs obtained in the first Monitoring Report (Value A in the table of section 8 of the First Monitoring Report) and adjust the ER estimate for the second MR to match the corrected accumulated ERs for 2018-2021, as follows.

		Emission Reductions during the Reporting period (tCO_2-e)	
First Monitoring Report	Value with material error	10,486,289	S
	Corrected Value	10,396,947	T
Second Monitoring Report	Reported Value	9,942,111	U
	Adjusted Value	9,852,768	V=(T+U)-S
Accumulated Ers 2018-2021	Sum of corrected values	20,339,057	X=T+V
	Sum of value with error and adjusted value	20,339,057	Y=S+V
	Difference	0	Z=X-Y

The table below displays the FCPF ERs for the Second Monitoring Report. Transferrable ER volumes are calculated based on the latest percentage of ERs that can transfer the title to the ERs and the retroactively corrected value for the Second Monitoring Report (Value V in the table).

Notably, the number of FCPF ERs corresponds to the volume of clear and uncontested ERs recorded until the end of January 2024.

Furthermore, it's crucial to mention that the transferrable ER volume for the First ER-MR has been updated based on the latest percentage of ERs that can transfer the title to the ERs. A total of 272,272 tCO2e of additional ERs have been submitted to the registry, including 41,254 tCO2e for the Uncertainty Reversal buffer, 15,126 tCO2e for the Reversal buffer, and 15,126 tCO2e for the Pooled Reversal Buffer.

The worksheet with the calculation of the percentage of transferrable ERs and retroactively corrected ERs values can be accessed at the following link; note that the Excel file need to be downloaded and opened in the computer to avoid the error message shown in the Google Drive:
https://docs.google.com/spreadsheets/d/17ivM7Lgv22C7myLo31gwlJSevKLYdtII?rtpof=true&usp=drive_fs

A.	**Emission Reductions during the Reporting period (tCO_2-e)**	*from section 4.3*	**9,852,768**
B.	**If applicable, number of Emission Reductions from reducing forest degradation that have been estimated using proxy-based estimation approaches (use zero if not applicable)**		0
C.	**Number of Emission Reductions estimated using measurement approaches (A-B)**		**9,852,768**
D.	**Percentage of ERs (A) for which the ability to transfer Title to ERs is clear or uncontested**	*from section 6.1*	42.82%
E.	**ERs sold, assigned or otherwise used by any other entity for sale, public relations, compliance or any other purpose including ERs accounted separately under other GHG accounting schemes or ERs that have been set-aside to meet Reversal management requirements under other GHG accounting schemes**	*from section 6.4*	0
F.	**Total ERs (B+C)*D-E**		4,218,955
G.	**Conservativeness Factor to reflect the level of uncertainty from non-proxy based approaches associated with the estimation of ERs during the Crediting Period**	*from section 5.2*	12%
H.	**Quantity of ERs to be allocated to the Uncertainty Reversal Buffer (0.15*B/A*F)+(G*C/A*F)**		506,274
I.		*from section*	10%

	Total reversal risk set-aside percentage applied to the ER program	*7.3*	
J.	**Quantity of ERs to allocated to the Reversal Buffer (F-H)*(I-5%)**		185,634
K.	**Quantity of ERs to be allocated to the Pooled Reversal Buffer (F-H)*5%**		185,634
L.	**Number of FCPF ERs (F- H – J – K)**		3,341,413

ANNEX 1: INFORMATION ON THE IMPLEMENTATION OF THE SAFEGUARDS PLANS

I. FCPF requisites for managing the environmental and social aspects of ER Programs

This annex is a description based on summarized information on safeguarding implementation for the Safeguarding Follow-Up Report for the 2020-2021 period. The report's goal is to identify and define if the following Emission Reduction (ER) Program measures and actions were executed in conformity with national environmental and social laws, institutional guidelines and procedures contained in the Environmental and Social Management Framework (ESMF) for the 2020-2021 evaluation period.

- 2.1.1 Fostering the creation and implementation of wildfire prevention campaigns
- 2.1.2. Following-up and promoting volunteer wildfire firefighting forces
- 2.1.3. Strengthening the Wildfire Control Program
- 2.2.1. Strengthening the Illegal Logging Control Program
- 2.2.2. Reactivating Natural Resources Monitoring Committees (COVIRENAS, for its acronym in Spanish)
- 2.3.1. Administrating and managing Protected Wilderness Areas (PWAs)
- 3.1.2. Expanding and improving financial mechanisms for natural regeneration

Given that the annex refers to the period ranging from January 2020 to December 2021, some of the template's sections do not fully apply to this period, the reason being that the RE Program was in its initial stages and the ESMF had just ended. Nonetheless, the sections have been completed as they should.

Actions for the reporting period were implemented with the country's own resources, based on national laws and strategies that aim to conserve and protect forests through State institutions in charge of fulfilling the national regulations' mandates. Strategies and mechanisms to strengthen and create better opportunities for forest owners to care for them in an environmentally-friendly way were used to this effect. ER Program's resources for launching the REED+ Strategy have not reached the country yet.

FCPF requisites for managing the environmental and social aspects of ER Programs

The implementation of safeguarding into the Emission Reduction (ER) Program's scope complies with the World Bank's social and environmental safeguards, which are aligned with the UNFCCC's guidance on REDD+.

ER Program design and implementation have been developed according to the ESMF, which was created based on the applicable national environmental and social legislation, as well as national and institutional procedures, in conformity with the World Bank's environmental and social operative policies. The ESMF identifies and evaluates the potential environmental and social risks and impacts of the proposed measures, incorporating the results of the Strategic Environmental and Social Assessment (SESA), which was carried out in the initial preparation phases. This 2021-2022 period report considers the following Operational Policies (OP) and their fulfillment within the ER Program's framework in the aforementioned activities: Environmental Assessment (OP 4.01), Natural Habitats (OP 4.04), Pest Control (OP 4.09), Indigenous People (OP 4.10), Involuntary Resettlement (OP 4.12) and Forests (OP 4.36).

The Emission Reductions Payment Agreement (ERPA) contains a set of regulatory measures for implemented program activities in conformity with the ESMF and the national legislation of Costa Rica. Section 2.1 of this annex only focuses on the environmental and social risks and in the main mitigation measures identified in the report.

Feedback and Grievance Mechanisms (FGRM) are a way to prevent and solve interested parties' concerns in advance, according to each case. This promotes risk-reduction and supports processes that lead to the creation of positive social spaces. The country has effectively handled complaints and suggestions from the various social actors involved in the project's activities. This has been possible due to relevant legislation that allows it and because there are national structures within ER Program's connected institutions that allow tending transparently to emerging processes and situations. To the effects of the Program, feedback and grievances are processed through the Information, Feedback and Nonconformity Mechanism (MIRI, for its acronym in Spanish). For doing so, Costa Rica has Executive Order N° 40464-MINAE, which created the REDD+ National Strategy, made up by SINAC and FONAFIFO, institutions that have proposed using their service comptrollers for tending to MIRI's needs, while building a comprehensive system (software) that systematizes specific activities related to REDD+. This is detailed in Section 2.4 of this annex.

MIRI relies on Service Procurement Law No. 9158, whose goal is to guarantee the rights of those who use services provided by public organizations and private companies which are registered in the System, in accordance with this law. In this way, it

contributes to service comptrollers' efficacy, continuous improvement, and innovation. It is important because it states the minimum procedures for managing service users before the comptroller's offices.

According to the previous monitoring report (2018-2019), Costa Rica has a General Consultation Mechanism for Indigenous Peoples. This mechanism is used rigorously in implementation of the ER Program's Benefit Distribution Plan's information and consultation process. An information and consultation process was carried out with the advanced version of the BSP during that period in the 24 indigenous territories. The following undertaken actions stand out:

As mentioned in the 2018-2019 Retroactive Report, Indigenous People considerations had an important place in each one of the activities and their corresponding measures of compliance. Within the framework of the REDD+ National Strategy development, the Government of Costa Rica proposed holding a national dialogue, which started in 2012 with the SESA workshop, in which the 24 indigenous territories of the country participated. They presented a joint agenda to the Government, which included topics of interest for REDD+ Strategy indigenous territory work. A national dialogue was held through three national encounters,[117] with the participation of 19 indigenous territories. This culminated in the approval of the Indigenous Consultation National Plan and the appointment of delegates to the REDD+'s Executive Committee. The plan developed a methodology for implementing consultancy in indigenous territories in three phases: information, pre-consultation, and consultation. The indigenous territories prioritized five key consultation themes: (i) Land reclamation, (ii) Payment for Environmental Services (PES) on indigenous territories, (iii) Forests and worldview, (iv) Indigenous territories and Protected Wilderness Areas (PWA), and (v) Monitoring and participation. In the year 2020 and within the framework of the General Consultation Mechanism, REDD+ Secretariat requested, via official letter REDD-OF-0219-2020 to the Unit for Indigenous Consultation of the Ministry of Justice and Peace, technical criteria for defining a roadmap to an internationally valid agreement on how participation processes should be in indigenous territories for acknowledging results-based payments, given the possibility of receiving additional and more community-inclusive financial resources with more robust follow-up mechanisms and transparency.

This methodology's implementation acknowledges the Indigenous Consultation Unit of the Ministry of Justice and Peace (MJP, for its acronym in Spanish) through official letter DNRAC-UTCI02-2021, which states that "the process carried out by REDD+ Secretariat with indigenous territories since 2008 has complied with the General Consultation Mechanism for Indigenous People's (MGCPI, for its acronym in Spanish) standards (such as principles, criteria and procedures), by having extensive Indigenous People participation in a free, preliminary and informed manner, through the corresponding procedures and their representative institutions (Article 1, Executive Order 40932-MP-MJP)". Also, REDD+ Secretariat respected and promoted taking steps to ensure participation of Indigenous People in accordance with the Planning Framework for Indigenous People (MPPI, for its acronym in Spanish), which is included in the ESMF. Indigenous People activity procedures must keep complying with the General Mechanism for Consultation with Indigenous Peoples (MGCPI, for its acronym in Spanish), formalized by the government of Costa Rica, so that Territorial Forest Environmental Plan (PAFT, for its acronym in Spanish) development processes factor in existent community-acknowledged internal structures, as well as the topics and concepts approached in the REDD+ National Strategy consultation with the goal of complying with agreements and respecting their safeguards.

For the following 2020-2021 report, Costa Rica got the Green Climate Fund's project approval, and emission reductions for years 2014-2015 got acknowledged at a US$ 54 million-dollar amount. This initiative is implemented through financial intermediaries. Costa Rica also has the Payment by Results (PBR) Project, led by the United Nations Development Programme (UNDP), with whom it coordinated to carry out processes with this government's funds for managing, facilitating, monitoring and launching the Territorial Forest Environmental Plans (PAFT, for its acronym in Spanish) in indigenous territories, respecting the voluntary aspect of consultation process participation, in alignment with UNFCCC safeguards and World Bank social and environmental safeguards. To such effect, there are interest letters by the 24 indigenous territories in which they express desire to participate in the PAFT creation processes.

Besides that, SINAC got a Forest Carbon Partnership Facility (FCPF) grant and, in 2019, it developed the Indigenous People Chapter, the goal of which was to update the National Forestry Development Plan (Indigenous Chapter of the National Forestry Development Plan). With the participation of 114 indigenous leaders in nine workshops, strategic axes were defined for program implementation. Working with the indigenous communities led to acknowledging traditional uses of ecosystems through a process of free, prior and informed consent (FPIC), helped strengthen and/or create the necessary alliances for working together, and allowed for identifying social and economic bonds. All of this resulted in culturally appropriate and inclusive benefits for the local indigenous communities.

As mentioned, the new Plan incorporates the vision of indigenous peoples for the forestry sector through extensive consultation and participation of indigenous peoples for the implementation of the Indigenous Forest Chapter (IFC). In Annex 1: Participants, you can see detailed information on the number of people, place, date and indigenous territories that participated.

[117] The first workshop took place on May, 2012, and SESA's analysis in December 18, 2012, where the final proposal was approved.

Implementation of the Gender Action Plan activities continued. The Gender Equality Award for Productive Units (GIGUP) was created in 2020 with GIZ support. This award was created to promote a fairer and more inclusive and equitable sustainable development that would guarantee gender equality, as well as young and adult women autonomy, by understanding gender gaps and implementing actions to narrow them. Resources were used in 2021 to develop a technological platform to manage information from all women's productive units in the country.

This award was developed through a participatory methodological consultation process with rural and indigenous women, accompanied by national and international experts. These are some of the actions that were carried out:

- Research and analysis of two national certifications/seals, two international certifications/seals that operate in Costa Rica and 10 of the most relevant agricultural, environmental, and social certifications in the international market
- Meetings with national organizations in charge of seals/certifications to identify possible points for collaboration and synergies
- National diagnostics, reports, and research:
  - REDD+ Strategy's Gender Action Plan (2019):
  - National Institute for Women (INAMU) reports for the Committee on the Elimination of Discrimination Against Women (2015-2017):
  - Various studies by the National Institute of Statistics and Census (INEC) and the Ministry of Agriculture and Livestock (MAG) on women's situation in the Costa Rican agricultural sector (2015-2018):
  - Estado de la Nación 2020
- A gender equality participatory indicator construction process with diverse populations from 150 Latin American and African projects was carried out by the International Union for Conservation of Nature (IUCN) from 2000 to 2018.

There is an implementation procedure manual, and a Technical Committee made up by related institutions, the academy and non-governmental organisms was appointed to provide implementation guidance.

The Benefit Sharing Plan set itself to create the Inclusive Sustainable Development Fund (FOINDES, for its acronym in Spanish) with seed capital corresponding to 10% of the resources that FONAFIFO gets from the Emission Reduction Program (ERP), which come from the PES Program's emission reduction acknowledgments. Once these funds are available, the expectation is to define its operational technical and governance rules once Costa Rica starts claiming emission reduction corresponding resources.

It is worth noting that the Safeguard Information System (SIS) is located at the National Center for Geoenvironmental Information (CENIGA, for its acronym in Spanish), in an advance stage of construction, but that it hasn't been operating during this period, given that final indicators are being defined and technological improvements for its full implementation are being worked on.

II. Monitoring and reporting requisites

The entities in charge of implementing Safeguarding Plans have adequate resources for carrying out their duties and responsibilities, assigned according to Safeguarding Plans statements.

1.1 Summarize key institutional arrangements, such as the decision's procedures, institutional responsibilities, budgets, and monitoring arrangements required by the Safeguarding Plans.

ESMF implementation and capacity strengthening for developing the REDD+ National Strategy are primarily coordinated by the National Forestry Financing Fund (FONAFIFO) and the National System of Conservation Areas (SINAC) through REDD+ Executive Secretariat, as stated in Executive Order N° 40464- MINAE. A detailed analysis of the involved institutions and their respective functions, technical abilities, responsibilities and human and financial resources is available in the Safeguarding Report for the 2020-2021 period.

It is worth mentioning that for the period of 2020 and 2021, the REDD+ Secretariat staff designated by the institutions for the implementation of the Strategy include 3 professionals in forest engineering and one professional in biology, because there was no specific budget for the hiring of new personnel for the implementation and monitoring of safeguard measures, the professionals mentioned above were in charge of promoting said processes.

In total for the monitoring period, there are approximately 15 people in SINAC and FONAFIFO who are institutionally in charge of the safeguards process for the Emissions Reduction Program.

To the effect of this annex, it is summarized as follows:

The main institutions in charge of implementing the ESMF, decision-making procedures and identified environmental and social management instruments, within the framework of the REDD+ National Strategy, are the following:

REDD+ Directive Committee: It is represented by the Executive Director of the National System of Conservation Areas, the Executive Director of the National Forestry Financing Fund, and the Vice-Minister in charge of the Environment sector. Its role is to supervise and provide political direction for this Executive Secretariat, negotiate reductions, and oversee REDD+ Strategy compliance in Costa Rica. (Executive Order N° 40464).

REED+ Executive Secretariat: It is the entity in charge of organizing, directing, and monitoring the REED+ Strategy process in Costa Rica; ensuring the continued application of socio-environmental management instruments according to national legislation; and ensuring compliance with the Social and Environmental Safeguards, as well as with the World Bank Operational Policies. Likewise, this Secretariat must oversee involved institutions to make sure they execute the Strategy as it corresponds in terms of responsibilities, follow-up, coordination, commitment planning and defined activities.

In regard to the ESMF, the REDD+ Secretariat is the main one in charge of ensuring compliance with the Political Framework for Involuntary Resettlement, Indigenous People Planning Framework, Procedural Framework, environmental and social risk and impact mechanisms and mitigation measures, MIRI follow-up, national and international reports on safeguarding and operational policy compliance, Safeguarding Information System operations and ESMF disposition follow-up in coordination with the main executive entities, and elaborating frequent follow-up and evaluation reports.

EMSF and Safeguarding Unit: This unit depends on the REDD+ Executive Secretariat and it is in charge of reviewing, circulating and presenting annual follow-up reports to validate and manage every process, information and document related to the National REDD+ Strategy, in order to comply with the ESMF requisites and the responsibilities set forth in the Emission Reductions Payment Agreements (ERPAs). Besides that, it is in charge of reporting to the World Bank team, as part of compliance with the defined commitments.

Monitoring and Reporting Unit: It is in charge of coordinating environmental service control and follow-up activities, emission reduction accounting and non-carbon benefits. This Unit defines mechanisms needed to monitor and support following-up with ESMF and all its components, to make sure that instruments used in the Unit promote more robust and transparent information.

Ministry of Environment and Energy (MINAE): It is the governing entity in environmental matters. Therefore, it has the political responsibility to supervise and comply with every agreement taken on by the country. In that sense, it looks after adequate participation by all MINAE administrative units involved and coordinates actions with other ministries, autonomous institutions, and any other governmental entity beyond its field.

1.2 Confirm if previously resumed institutional arrangements have been implemented.

For the 2020-2021 period, the REDD+ Secretariat has participated in and assisted every process and action it is responsible for, according to the ESMF stipulated procedures and regulations, and under FONAFIFO and SINAC supervision. Furthermore, both institutions supported and participated in the 2020-2021 Retroactive Report creation by providing data on activities carried out within the ESMF framework for that period. The following Table A1.1 lists the institutions, and their respective internal departments, in charge of each measure's implementation and reporting.

Table A1.1 Institutions and departments in charge of each ER Program measure and action.

Implemented action	Institution in charge	Institutional area connected with the implemented action
2.1.1. Fostering the creation and implementation of wildfire prevention campaigns	National System of Conservation Areas (SINAC)	Department of Protection, Prevention and Control (PPC)
2.1.2. Following-up and promoting volunteer wildfire firefighting forces	National System of Conservation Areas (SINAC)	Department of Protection, Prevention and Control (PPC)
2.1.3. Strengthening the Wildfire Control Program	National System of Conservation Areas (SINAC)	Protection, Prevention and Control (PPC) Department

2.2.1. Strengthening the Illegal Logging Control Program	National System of Conservation Areas (SINAC)	Protection, Prevention and Control (PPC) Department
2.2.2. Reactivating Natural Resources Monitoring Committees (COVIRENAS)	National System of Conservation Areas (SINAC)	Department of Citizen Participation and Governance (CPG)
2.3.1. PWA administration and management	National System of Conservation Areas (SINAC)	Department of Conservation and Sustainable Use of Biodiversity and Ecosystem Services (CUSBSE)
3.1.2. Expanding and improving financial mechanisms for natural regeneration	National Forestry Financing Fund (FONAFIFO)	Directorate of Environmental Services Control and Monitoring Department PES Management Department

For the 2020-2021 period and with Green Climate Fund resources approval, the REDD+ Secretariat has relied on the Payment by Results Project's operations to comply with the Benefit Sharing Plan's processes, particularly to promote the Contract for the Reduction of Forest Emissions (CREF). It has also relied on the project's social area staff, who have supported the territories by contracting and carrying out Territorial Forest Environmental Plans (PAFT) development activities in indigenous territories. This document will allow them to define the activities that will be funded by CREF resources.

1.3 Confirm that the executive entities and the interested parties understand their respective roles, have the technical capacity to execute their responsibilities, and have adequate human and financial resources available.

REDD+ Secretariat: Within the framework of the REED+ Strategy, FONAFIFO and SINAC, as the ones in charge of implementing the ESMF, have been clear and transparent when executing the roles above-mentioned, in Table A1. Each institution managed the Emission Reduction Program activities in their records administration units, according to the specific measures they are in charge of. FONAFIFO keeps exhaustive records of PES files, as well as documented evidence of due diligence analyses, consultation processes and selection processes undertaken within the framework of REDD+. SINAC has been keeping administrative records for a long time under powers granted by Forestry Act N° 7575, on fire-control measure-related permits and authorizations, protected wildlife areas and illegal logging.

In regard to both institutions' budget for setting the hereby reported political actions in motion, along with ESMF implementation actions, it is worth noting there was no specific budget for the 2020-2021 period. Instead, their ordinary budgets were affected by the effects of the Pandemic. Corresponding measures were implemented within the framework of FONAFIFO and SINAC general projects and duties. Therefore, these institutions have had fewer financial resources available for developing activities, as they have had to prioritize attention to actions and aspects of the ESMF's approach under the current legislation and regulations, and with the committed staff.

Professionals from both institutions have received continuous training through events that provide and reinforce technical abilities to fulfill their commitments within the framework of policies to report. However, for the 2020-2021 Retroactive Report, it is worth mentioning the pandemic's impact on the global economy, and even more so on national economies.

That said, this second report must highlight the importance of strengthening the technical aspects of the REDD+ Secretariat because, even though it advanced Strategy's implementation processes with existing staff, appointed by Executive Order N° 40464, and with support of institutions' staff, there is a clear need to make up a necessary team for the REDD+ Secretariat's Safeguarding Unit, so they can support the processes.

For implementing actions within the framework of the National Strategy, the REDD+ Secretariat has relied on technical cooperations from various donors. This is how international cooperation activities with GIZ, the Green Climate Fund and others have been handled.

SINAC: The SINAC institution was created by MINAE via Article 22 of the 1998 Biodiversity Law N° 7788. This is the governing body on forest management, illegal logging control, wildfire control, COVIRENAS coordination and forest inventories. Measure 3.1.2 is an exception to this. Expanding and improving financial mechanisms for natural regeneration is related to PES and, therefore, is FONAFIFO's responsibility. The six remaining measures of the ER Program, to be implemented during the reporting period, are under SINAC's responsibility. SINAC is organized by a regional system of Conservation Areas throughout the national territory. It has administrative, human, and financial resources at the regional and local level, with more than 1200 permanent employees. Each Conservation Area has professional, technical, and administrative staff to carry out its responsibilities. Also, the Regional Councils of Conservation Areas (CORACs, for its acronym in Spanish) are made up by government and civil society representatives that facilitate the political coordination and direction of work plans at the regional level. In conformity with Biodiversity Law N° 7788, Regional Councils of Conservation Areas have been created for each of the 11

Conservation Areas. They are made up by regional public institutions and society representatives. Local Councils of Conservation Areas (COLACs) have also been created for supporting and participating in specific processes related to PWAs, silviculture, etc.

As a result of this decentralized structure, SINAC has sufficient capacity to guarantee the relevant ESMF guideline implementation and to comply with the World Bank's environmental and social operational policies, at both central and regional levels, during the retroactive period.

SINAC's monitoring capacity is also reflected in its existent platforms that generate and process complementary information to reports within the ESFM. Likewise, SINAC has been keeping administrative records for a long time under powers granted by Forestry Act N° 7575, on fire-control measure-related permits and authorizations, protected wildlife areas and illegal logging. The platforms include the System of Forest Resources (SIREFOR), which was legally established by Executive Order N° 33826-MINAE with the objective of periodically gathering, processing, analyzing, systematizing, and publishing official records and updated information about the status of forestry activities and resources in Costa Rica". They also include the National Ecological Monitoring Program (PRONAMEC), created by Executive Order N° 39747/MINAE, whose "objective is to create and disseminate reliable scientific information about the status of biodiversity conservation in the country and its trends on the ground and in continental and marine waters, something that is useful for local and national level decision-making". CUSBSE is in charge of the following programs and systems:

FONAFIFO: FONAFIFO is a government entity associated with MINAE and created by Article 46 of Forestry Act N° 7565. It has legal faculties and responsibilities in terms of environmental services for implementing avoided deforestation projects and ER initiatives, and it is in charge of developing the PES Program. FONAFIFO keeps exhaustive records of PES files, as well as documented evidence of due diligence analyses, consultation processes and selection processes undertaken within the framework of REDD+. The safeguarding implementation and follow-up roles of FONAFIFO's Directorate of Environmental Services, Department of Control and Monitoring and PES Management Department are reflected in their respective responsibilities and contributions to the 2018-2019 Retroactive Report. The Directorate of Environmental Services is in charge of directing, coordinating, executing, and supervising environmental service affairs. It supported the report's framework by providing geospatial data of areas under PES contracts, as well as statistics on complementary topics related to Program budgets, amounts and modalities. FONAFIFO has eight regional offices across the nation with a PES Manager (a Forestry Engineer) and an assistant. The regional offices supported the set-up of PES areas under different modalities and monitored property contracts annually in conjunction with the Department of Control and Monitoring.

1.4 Until what point have these measures been carried out in situations where the RE Program or Safeguarding Plans have needed specific capacity building measures (such as training and professional development)?

As previously mentioned, the professionals participated in various training events during that retroactive period. However, the officials' capacities did not increase as expected, and the hope for the following report is for more motivating conditions.

During this reporting period, the ESMF implementation and follow-up functions were taken on as part of department-level general activities. The ESMF was posted on the country's REDD+ website and circulated by the REDD+ Secretariat to the corresponding institutions. There were also virtual meetings for officials to socialize it and training on safeguarding in order to respond to international commitments.

2. RE Program activity implementation is alignment with the specific Safeguarding Plans' management and mitigation measures.

2.1 Confirm that the environmental and social documents created during the Program's implementation are based on the Safeguarding Plans. Provide information about its scope, main mitigation measures (as specified in the plans), whether plans are prepared in a timely manner, and if plan dissemination and consultancy follow the agreed-on measures.

As previously mentioned in Section I, the activity attention and regulation measures for implementing the Program that are executed in SINAC and FONAFIFO, according to legislation, are stated in the regulations that apply to the ESMF activities. These are described in detail in Table A1.2, which lists executed measures during the reporting period, with their applicable management instruments, and provides the most relevant aspects of identified risks and adopted mitigation measures.

According to ESMF and the 2020-2021 Retroactive Report, only activities 2.1.2., Following-up and promoting volunteer wildfire firefighting forces, and 3.1.2., Expanding and improving financial mechanisms for natural regeneration, implied risks and

impacts, given that the remaining activities mostly involved construction/training actions that did not result in environmental risks or impacts that would trigger the operational policies' requisites. Addendum 2.3. 1. PWA administration and management unleashed social risks related to OP 4.10, Indigenous People. This distinction is clarified in the Table, which separates activities with environmental and social risks (E&S) from activities without E&S risks.

Table A1.2 RE Program Management Instruments and Mitigation Measures.

Activities with environmental and social risks		
Activity description	**RE Program measures**	**Mitigation risks and measures**
The activities focused on: Official launching (February, 2020) of the Forest Fire Early Warning System (SATIF), to evaluate the various elements that influence possible fire occurrence and behavioral potential at the national level. This was based on calculating variables such as temperature, relative humidity, wind speed and rain. This index points out the potential fire danger class, which allows predicting characteristics such as progression speed, flame height and caloric intensity, among others. Another action worth highlighting was the acquisition of four rapid intervention vehicles (RIV) for wildfire suppression. Planning, budgeting, and maintenance activities by the SINAC for equipping institutional and volunteer firefighting forces and hiring back-up brigades, as well as for firebreak maintenance work in identified high-incidence areas. As part of the joint work with SINAC, Indigenous People representatives expressed the need to define clear protocols and strategic points to effectively control wildfires. It is worth noting that there is a SINAC gender integration action plan for female volunteer firefighters.	2.1.3. Strengthening the Wildfire Control Program Applicable Management Instruments: • National Strategy for Fire Management 2012-2021 National Action Plan for Fire Management. (page 41). • Contract proposal for firebreak maintenance work. There is also a need for incident and accident report. • With the creation of the National Commission of Forest Fires (CONIFOR), which is associated with the Ministry of Environment and Energy (MINAE) through the National System of Conservation Areas (SINAC), since 1997 it has been in charge of formulating, managing, supporting, following-up and evaluating the inter-institutional guidelines and actions stated in the National Strategy, as well as the activities described in the Fire Management Action Plan.	Identified risks: OP 4.01, Environmental assessment - The only identified risk for this measure is that of potential accidents/incidents that could result from field activities, firebreak maintenance or firefighting. Identified risk mitigation measures: - Building and maintaining fire mitigation structures are in charge of third-party services hired by SINAC. The terms of reference (ToF) clauses clearly state the required security measures for staff hired by the selected company. These measures include social security and work risk insurance policies. Other mitigation measures: - Fire mitigation structures do not displace forest-covered areas, for there are spaces defined to that end in the Conservation Areas. - Indigenous People have participated in fire program strengthening actions, which respect the guidelines set forth in the MGCPI, the Environmental and Social Management Framework (ESMF) and free, prior, and informed consent (FPIC), as well as the worldview and organizational and governance (both legal and traditional) structures of the indigenous territories. The Indigenous Territories' contribution is essential, as most of them are adjacent to PWA lands, particularly the ones located in higher fire incident areas. Corrective Recommendations/Actions: - There are no records of reported incidents during firebreak maintenance and construction, but the recommendation for future contracts is to ask the final TDR third-party to submit a registry of accidents/incidents that take place during the corresponding work.

- Activity description: This measure involves forest conservation and protection area promotion and management, as well as acknowledging environmental services provided by small and medium producers, Indigenous People and women, in accordance with the ESMF. The new mixed PES modality addresses small properties with agricultural zoning permits that would otherwise not be able to enter the PES Program. - The 2020 reform to improve the PES Program's procedure manual includes the following innovations: a. legislation (contracting) changes, b. computing platform, c. information access, d. digital era, e. technological tool implementation, f. new PES sub-activities (including mixed systems), and g. process and procedure adjustments. - PES regeneration management showed important improvements in 2020 by increasing the mixed PES, which was created to boost the inclusion of micro-producers in regeneration, forest protection and AFS activities in properties less than 15 hectares in size (backed by Resolution 010-2019, Appendix 4.x, and Agreement N° 8 of FONAFIFO's 2018 Board of Directors). - In addition, 98 women joined in 2020 and 51 in 2021 who made PES contracts official by representing 16% and 30% (which were 13% and 14% in previous reporting years), respectively, of the total of new PES contracts. As part of the Gender Action Plan's implementation, affirmative actions were promoted. - In 2021, as part of the strategy to distribute financial benefits from the Emission Reduction Program (ERP), FONAFIFO launched a recruitment process for owners of registered and non-registered properties who wanted to participate in the program and sign a Contract for the Reduction of Forest Emissions (CREF). That strategy started with a first call in October 2020, when forest owners were invited to express their desire to participate by filing out the online request. - Later, in August 2021, there was a second call with an advertising campaign which presented the new forest incentive scheme based on forest Emissions Reduction Contracts (CREF) through FONAFIFO, with the slogan "each forest has its history". The Program's Data Management System has been defined. The system in itself will include the participant location geobase and a digital file with the minimum required	3.1.2. Expanding and improving financial mechanisms for natural regeneration Applicable Management Instruments: • Executive Order N° 39871-MINAE, Amendment to the Forestry Act Regulations, Executive Order N° 25721-MINAE of October 17, 1996. Article 4, Section e. Supports the State Forest Administration's decisions under the principles of Organic Law for the Environment N° 7554 y Forestry Act N° 7575. • Reach N° 87 to the Gaceta 80 MINAE – FONAFIFO Regulations on the PES Program's Manual. • Executive Order N° 40932 on the General Consultation Mechanism for Indigenous Peoples. • Law N° 7788, Biodiversity Law. • DNRAC – UTCI 02-2021 Official Recommendations for the results based payment phase in relation to the General Mechanism for Indigenous People Consultation Law Nº 8839. Law for Comprehensive Waste Management Executive Order 41 931.Occupational Health Regulations for the Handling and Use of Agrochemicals	**Identified risk mitigation measures:** The PES Program's PES Procedure Manual contains a series of duties and requisites for technical studies under the various modalities, in order to prevent related environmental risks: - Unmaterialized changes in building/land use permits: This risk applies to when land use is not allowed, and its use is penalized. The forest manager holds public trust, and there are no reforestations or agroforestry systems (AFS) in areas that can be deforested to such effect. Forestry Act Nº 7575 and its regulations. - Use of invasive species: No forest species that has been declared or categorized as invasive in the country is used in the PES Program. The use of autochthonous species and most widely used exotic species is promoted. Health and security risks caused by inadequate use of agrochemicals: There is a legal order called Occupational Health Regulations for the Use of Agrochemicals, and there is no data on health risks or accidents resulting from the use of agrochemicals in the program for the reporting period. - Degradation of protected natural areas. **Identified risk mitigation measures:** The PES Program's PES Procedure Manual contains a series of duties and requisites for technical studies under the various modalities, in order to prevent related environmental risks: - Unmaterialized changes in building/land use permits: This risk applies to when land use is not allowed, and its use is penalized. The forest manager holds public trust, and there are no reforestations or agroforestry systems (AFS) in areas that can be deforested to such effect. Forestry Act Nº 7575 and its regulations. - Use of invasive species: No forest species that has been declared or categorized as invasive in the country is used in the PES Program. Promotion of the use of autochthonous or most used exotic species in the country. Health and security risks caused by inadequate use of agrochemicals: There is a legal order called Occupational Health Regulations for the Use of Agrochemicals, and there is no data on health risks or accidents resulting from the use of agrochemicals in the program for the reporting period. - Environmental pollution and health and security issues caused by inadequate agrochemical use. The country has Law Nº

information for creating the CREF contract, such as: copy of the cadastral plan of the property, registry studies, individual shapefile with the property's location and the CREF area map with the forest area that gets incorporated into the CREF, legal authorization and the contract duly signed by the parties. This process starts when the CREF request is submitted and ends when participation is approved or denied. The implementation of participation mechanisms that respect people's rights, the creation of additional sources of work in rural areas and better access to resources in conformity with local population traditional uses, particularly indigenous territories is continued. Identified risks: OP 4.01, Environmental assessment, OP 4.04, Natural habitats, OP 4.26, Forests - Changes to zoning permits that result in deforestation. - Use of invasive species in the PES program. - Environmental pollution or health and security problems related to inadequate use of agrochemicals. - Degradation of protected natural areas.		8839, the Law for Comprehensive Waste Management, whose goal is to regulate comprehensive waste management and efficient use of resources. Also, Article 14 of the occupational health regulations for agrochemical management and use mentions using adequate clothing and personal protection equipment in accordance with Comprehensive Waste Management. There are no registries for the period that indicate pollution events related to inadequate of agrochemicals as part of the PES Program. - In the case of critical natural habitats, no plantations or agricultural forest systems are allowed in national parks or biological reserves. Species planting is only allowed if the property is clearly registered and if the area's zoning permits allow it. Expanding and improving the PES Program, as well as incorporating natural regeneration, supposes improvements to the country's natural capital. **Other mitigation measures:** - Transparency processes that allow implementing a scheme that respects Indigenous People's autonomy and worldview continue. The REDD+ Secretariat continues with processes under the principle of respect, in order to ensure Indigenous People participation and compliance with FPIC and the GCPI procedures, which are based on the Indigenous People's applicable regulations in the MPPI, which is included in the ESMF. Requires: a) definition of "Indigenous People," b) preliminary social studies, c) regulation of consultation procedures (dialogues, negotiations, and agreements), d) agreement compliance and follow-up, e) definition of "impact," f) respect for representative organizations and g) culturally appropriate procedures. **Corrective Recommendations/Actions:** Lines of work with indigenous territories must be defined within the PAFT framework and during its implementation.

Activity description: The activities' objective is to improve processes and ensure adequate PWA implementation in Costa Rica. The ESMF did not identify any negative environmental impact, given that the measure mostly focuses on PES-strengthening activities by developing management plans to promote climate change mitigation and adaptation activities. This includes administrative activities and processes to guarantee ecosystemic service provisions for the general society. Protected wildlife areas are expanded. As part of these, the management category modification is highlighted. For example: San Lucas Island National Park, which used to be a Wildlife National Refuge, takes a step towards becoming a National Park. A second participatory conservation strategy gets promoted, Biological Corridors (BC), through the National Biological Corridor Program (NBCP). The NBCP is backed by Executive Order N° 33106-MINAE and Executive Order N° 40043. They present this model as a primary tool for biodiversity conservation and the fight against climate change. The actions can be found in the National Biological Corridors Plan. Protected Wildlife Area Management General Plan guidance and methodological guides for the creation of Prevention, Protection and Control (PPC) Plans: Based on these instruments, 12 new general management plans were approved. Final adjustments were made to the Land Ownership Management system in PWAs and State's Natural Heritage lands. It set itself to implement the tool with a pilot conservation area, with the goal of compensating for computing and technical aspects. The decision to work on the Central Conservation Area (CCA) was taken in 2021 to the effects of this process. For serving and managing PWAs, SINAC had human resources made up by 469 park rangers (2020), where only 13.5% of the staff devoted to this activity were women. They are currently allied to the Rural Development Institute (INDER, for its acronym in Spanish) and some Comprehensive Development Associations (ADIs, for its acronym in Spanish) in indigenous territories promote the Resource Keeper program with PES funds. In 2020 and with REDD+'s financial	2.3.1. PWA administration and management Applicable Management Instruments: Organic Law for the Environment N° 7554. • Forestry Act Nº 7575 and its regulations. • Biodiversity Law N° 7788 and its Executive Order Regulations N° 25721 – MINAE. • Wildlife Conservation Law N° 7317 and its amendments: Law N° 9106, Wildlife Conservation Law Reform Act and its Regulations. • National Parks Law N° 6084. • Executive Order N° 39519-MINAE. It recognizes governance models in Costa Rica's PWAs. • Executive Order No. 40932-MP-MJP National Consultation Mechanism for Indigenous People. Executive Order N° 33106-MINAE and Executive Order 40043. 2018-2025 Strategic Plan of the National Biological Corridor Program. Strategy and Action Plan for the Participatory Strengthening La Amistad Caribe World Heritage Site.	**Identified risks:** OP 4.10 Indigenous People The measure activated OP 4.10 Indigenous People and the procedures identified in the ESMF thanks to Indigenous People's participation in natural resource safeguarding and sacred area management. **Identified risk mitigation measures:** Includes assisting the PWAs, National Forestry Development Plan and MGCPI on Indigenous People consultations through the corresponding procedures and representative institutions. Follow-up, evaluation, and analysis mechanisms of the social, economic, and environmental contexts have been developed. They are currently allies of the Rural Development Institute (INDER, for its acronym in Spanish). Also, some Comprehensive Development Associations (ADIs, for its acronym in Spanish) in indigenous territories promote the Resource Keeper program with PES funds. 2020 started with the implementation of the "Strategy and Action Plan for the Participatory Strengthening of La Amistad Caribe World Heritage Site", whose objective was to carry out a diagnostic based on the inter-relations of populations linked to SPMH-LAC. This took into account the territories' own dynamics, their coexistence models, care and use of nature, and their culture of conservation, in order to come up with a satisfactory governance structure. The strategy has five axes, where the following is taken into account: creating ancestral traditional system promotion for zoning permits and strengthening natural resource protection and management (which translates into better work conditions and better financial conditions in the communities that make up its area of influence). A map of threats to natural resources was also developed in indigenous territories. This was done so in a participatory manner and resulted in greater indigenous population awareness about problems in their territories. **Corrective Recommendations/Actions:** It is important to visualize indigenous communities in PWA management, in order to avoid invalidating management processes within the PWAs and conflicts with indigenous communities. Lines of work with indigenous territories must be defined within the PAFT framework during its implementation. The PAFT formulation takes PWAs into account, as one of the five special themes

resources, SINAC coordinated and created the updated Guide to create the Costa Rican Protected Wildlife Area Climate Change Mitigation and Adaptation Plan.[118] Four specific Climate Change plans were created during this process, three of which were for National Parks and one for a Wildlife National Refuge.		defined by the territories. Therefore, this approach is included in the PAFT implementation management work by the indigenous territories according to their needs and priorities.
This measure promotes deforestation and degradation reduction in the PWAs through planning, generating, and implementing wildfire prevention campaigns throughout the country. The ESMF did not identify any negative environmental impacts. Communication processes were carried out at the national level, but these didn't generate field actions that could pose any risk to the environment. During the report's years, wildfire prevention promotion and implementation campaigns were carried out, one per year in both 2020 and 2021. They had national, regional, and local coverage. It is worth noting that both campaigns were influenced by the global SARS CoV2 virus pandemics, source of COVID-19. OP 4.10 Indigenous People was not activated, but the consultation mechanism's ruling body, the MJP, acknowledged that the REDD+ Secretariat respected and promoted taking steps to ensure Indigenous People participation in conformity with the MPPI and ESMF. The wildfire prevention campaigns got connected with the forest and worldview themes as a result of the consultation processes. The need to work on this was identified in the Indigenous Peoples Charter of the National Forestry Development Plan; therefore, priority was given to this activity. The regional SINAC offices worked with Indigenous Territories by coordinating	2.1.1 Fostering the creation and implementation of wildfire prevention campaigns Applicable Management Instruments: National Strategy for Fire Management 2012-2021	While conducting communication activities in indigenous communities had been contemplated, these were not carried out due to COVID-19 pandemic restrictions. Only general communication activities of national scope were carried out. The indigenous communication activities will take into account this community's cultural and linguistic characteristics, in such a way that guarantees including the entire population, from children to adults. The consultation process will assist with PAFT preparations, within the framework defined by indigenous territories, based on five special themes and territoriality, which consists on adapting their needs to each territory's characteristics and environmental and territorial priorities.

[118] National System of Conservation Areas (SINAC). 2021. Updated guide for the creation of the Costa Rican Protected Wildlife Area Climate Change Mitigation and Adaptation Plan. (2nd Edition). San José- Costa Rica. 60 pages. Link: http://www.sinac.go.cr/ES/docu/Cambio%20Climtico/Guia%20PlanEspecificoCambioClimaticoASP%202021.pdf

actions to approach preventative activity implementation with neighboring PWA territories. The needs that were identified by the territories during the Strategy's development were the following:		
This activity promotes positive effects on forests and other ecosystems based on institutional and volunteer forest firefighting forces that tend to incidents that arise in and beyond the PWAs. The ESMF did not identify negative aspects in this measure, as it comprises soft activities related to training, awareness-raising and strategy development.	2.1.2. Following-up and promoting volunteer wildfire firefighting forces Applicable Management Instruments: National Strategy for Fire Management 2012-2021. National Action Plan for Fire Management. (page 41). Contract proposal for firebreak maintenance work National Guide for Training and Certifying Staff on Comprehensive Fire Management Procedures and Guidelines for Managing Warehouses, Vehicles, Tools, and Others	Costa Rica has a National Guide for Training and Certifying Staff on Comprehensive Fire Management, which sets the bases for fire management training. There were 27 training sessions in 2020 and 2020 (five in 2020, due to the pandemic, and 22 in 2021, until November 15) with participation of 475 forest firefighters (341 men and 134 women, both staff and trained volunteers), with a 93% approval percentage. It is worth mentioning that during the reporting period, 2020 and 2021, the Fire Management Program had three forest firefighting brigades in indigenous territories. For 2020-2021, these brigades were made up by 41 men and 8 women in the Ujarrás, Salitre and Cabagra territories. Another activity that included this measure was women's presence in firefighting brigades, with the participation of 165 forest firefighting women in 2020 and 157 in 2021. The Conservation Areas' staff is covered by a **labor risk insurance policy**, and volunteer forest firefighting forces are covered by an accident insurance policy that includes medical attention and compensations for permanent disability or death while on activities related to wildfire prevention and control.

Attention was given to key deforestation and forest degradation engines by strengthening zoning permit change prevention and control programs. These allowed fighting against the deforestation-degradation dynamics. Work was also done to overcome detected gaps in forest governance that enabled illegal logging.	2.2.1. Strengthening the Illegal Logging Control Program Applicable Management Instruments: Illegal Logging Control Strategy. Forestry Regulations of the Agronomist Engineers Association. Procedure for Supervising Stationary Industries. Sustainable Forest Management (SFM) Principles, Criteria and Practice Codes for Primary Forests. Sustainable Forest Management Principles, Criteria and Practice Codes for Primary Forests. Behavioral Procedures for Portable Industry Control. Procedure for Confiscating Wood, Goods and Equipment used in the Commission of Illegal Acts as set forth in Forestry Act N° 7575 and its Regulations. Procedure for Donating, Returning and Destroying Confiscated Goods and Other Goods in SINAC's Possession. Methodological Guide Creating Prevention, Protection and Control Action Plans in Protected Areas and Sub-Regional SINAC Offices. Interviews with the Climate Change Coordinator and the Incentive Program Coordinator, CUSBSE. Electronic communications with the Director of SINAC's Department of Prevention, Protection and Control (PPC). 2.2.2. COVIRENAS Reactivation Applicable Management Instruments: • Executive Order N° 39833-MINAE, COVIRENAS Regulations Asides from Executive Order N° 39833 - MINAE, Executive Order N° 40357-MINAE makes the COVIRENAS and ad honorem environmental inspector registration forms official.	The approach to this measure's identified risks was through institutional procedures designed to work on the natural resource protection and control aspects of the activities. It is worth mentioning that such procedures were identified in the ESMF and are congruent with the institutional lines of work. Illegal logging control and follow-up processes got stronger when paperwork procedures that were making the activity more expensive were simplified. Also, more expedited, and efficient institutional systems were promoted. Adjustments and maintenance took place during the reporting period with the goal of improving information system control, both for receiving grievances and for permit paperwork processing. This resulted in the creation of digital files that sped up permit processes. These improvements also implied linking existent systems in order to achieve a more agile and transparent management. The indigenous territories play a buffering role for PWAs and protection of their natural resources. Indigenous dialogue is necessary for defining the use of natural resources in the PWAs and indigenous territories in order to define clear use and access guidelines. The figure of the resource keeper has been promoted in various indigenous territories and has allowed taking early actions related to natural resource protection. Lines of work with indigenous territories must be defined within the PAFT framework during its implementation. The creation of COVIRENAS does not activate OP 4.10 Indigenous People. Spaces for their free and volunteer participation were defined according to the requisites of the Executive Order through which COVIRENAS was created. The first committees were established, and there are currently four COVIRENAS in indigenous territories. Lines of work with indigenous territories must be defined within the PAFT framework during its implementation.

2.2. Confirm if the entities in charge of implementing the Safeguarding Plans keep coherent and complete records of the ER Program's activities, such as administrative approval records, licenses, permits, public consultation documentation, documentation of agreements reached with the communities, selection process records, due diligence assessments, and complaint and feedback management under the Feedback and Grievance Mechanism (FGRM).

These entities are in charge of implemented policies, actions and measures within the ER Program and their corresponding follow-up instruments. Based on the report, Table A1.3 lists the entities in charge of keeping coherent and complete records of the ER Program activities and their corresponding follow-up instruments that were used during the reporting period.

Table A1.3 ER Program institutions/departments in charge and monitoring instruments.

RE Program measures	Institution/department in charge	Monitoring instruments
2.1.1 Fostering the creation and implementation of wildfire prevention campaigns Prevention campaigns	SINAC, PPC, National Program for Wildfire Management	Annual report of actions carried out by the Comprehensive Wildfire Management Program (SINAP, PPC). - 2020-2021 wildfire prevention campaign reports. - Diffusion and communication activity systematization carried out by conservation areas. Interviews with the SINAC-MINAE Wildfire Management National Program Coordinator. Annexes included in the 2020-2021 Retroactive Report for the various activities performed during the 2020-2021 campaigns. National Strategy for Wildfire Prevention and Combat
2.1.2. Following-up and promoting volunteer wildfire firefighting forces	SINAC, PPC, National Program for Wildfire Management	Annual report on the Comprehensive Fire Management Program (SINAC, PPC) on diffusion and communication activities in conservation areas. Contracts for forest firefighters. Interviews with the SINAC-MINAE Wildfire Management National Program Coordinator. National Strategy for Wildfire Prevention and Combat.
2.1.3. Strengthening the Wildfire Control Program	SINAC, PPC, National Program for Wildfire Management	Annual report on the Integrative Fire Management Program (SINAC, PPC) on diffusion and communication activities carried out by conservation areas. Contingency plans. Forest Fire Early Warning System (SATIF) telephone implementation. Consultation report for the creation of the Indigenous Chapter for updating the National Forestry Development Plan. Interviews with the SINAC-MINAE Wildfire Management National Program Coordinator. National Strategy for Wildfire Prevention and Combat.
2.2.1. Strengthening the Illegal Logging Control Program	SINAC, PPC, Development Management Department, CUSBSE	CUSBSE's annual prevention, protection, and control labor report. SIREFOR information. SINAC, PPC annual report on the Illegal Logging Strategy implementation. SINAC granted a series of zoning permits processed through online information systems, the Management Plan System (SIPLAMA) for forest management plans and the Information System for Forest Use Control (SICAF, for its acronym in Spanish) for non-forest agricultural lands. In regard to illegal forest activity control, the SINAC has the following mechanisms to disincentivize the resource's degradation: • Illegal Logging Control Strategy.

		MFS principles, criteria, and practice codes for primary and secondary forests. c. • Executive Order N° 39833-MINAE. • Executive Order N° 40357-MINAE • COVIRENAS Regulations. • Procedure for supervising stationary industries. • Behavioral procedures for portable industry control. • Procedure for confiscating wood, goods and equipment used and listed as illegal in Forestry Act N° 7575 and its Regulations. • Procedure for confiscating wood, goods and equipment used and listed as illegal in in Forestry Act N° 7575 and its Regulations. • Procedure for donating, returning, and destroying confiscated goods and other goods in SINAC's possession.
2.2.2. COVIRENAS reactivation	SINAC, PPC	Interviews with the Climate Change Coordinator and the Incentive Program Coordinator, CUSBSE Electronic communications with SINAC, PPC Directors. Executive Order N° 39833-MINAE COVIRENAS Regulations. Asides from Executive Order N° 39833–MINAE, Executive Order N° 40357-MINAE makes the COVIRENAS and ad honorem environmental inspector registration forms official. Annual report by SINAC's Protection, Prevention and Control Department on Executive Order implementation.
2.3.1. PWA administration and management	SINAC, CUSBSE, PCG	Interviews and electronic communications with: Jenny Ash, PWA Program Coordinator; Mauricio Arias, National Coordinator of the Costa Rica Por Siempre Program; and CUBSBE. Protocols and guidelines for developing actions in the PWAs. Reports of Conservation Area actions with managed PWAs. System for Land Ownership Management in State's Natural Heritage Lands and PWAs, web platform for SINAC officials that administrates certifications, visas, purchases, donations, and empty lot registrations, with their respective revision processes.
3.1.2. Expanding and improving financial mechanisms for natural regeneration.	FONAFIFO, Directorate of Environmental Services.	Annual Reports on PES Program execution. Interviews and electronic communications with the Environmental Services Director. Procedures Manual for PES Program operation. Property records with their respective contracts and back-up documentation. PES Promotion and Follow-Up Strategy consolidated reports.

		Procedure Manual for creating and implementing the emission reduction instrument for results-based payments. The REDD+ Secretariat carries out the annual CREF contract report.

Complaint and feedback handling records under MIRI are summarized in Section 2.4 of this annex and are detailed in Section 5 of the 2020-2021 Retroactive Report.

2.3 Summarize until what point are the environmental and social management measures stated in the Safeguarding Plan implemented, as well as any subsequent plan prepared during the Program's implementation, the quality of the interested parties' participation and if field monitoring and supervision arrangements have been implemented.

While Table A1.2, above, summarizes the environmental and social management measures that were taken during the implementation, the following additional details describe the degree to which these measures were implemented *de facto* to mitigate risks. This section of the annex focuses on the specific measures and actions that unleashed environmental and social risks, but Section VII of the 2020-2021 Report describes all policies, actions and measures that were implemented in the ER Program during the reporting period, along with their corresponding risks and impacts.

2.1.3. Strengthening the Wildfire Control Program

In the 2020-2021 retroactive period, in spite of the health crisis that the world experienced due to COVID-19, the institutional budget aspect was severely affected. However, SINAC was able to do the work needed to comply with and ensure all mitigation guidelines and actions set forth in the ESMF as part of the National Fire Management Program, which means keeping firebreak patrols in areas that have been identified as high-incidence, equipping institutional and volunteer forest firefighters and hiring back-up brigades. Table A1.4 details the scope of the fire mitigation infrastructure that was built during the retroactive period:

Table A1.4 Fire mitigation infrastructure built in Conservation Areas during the retroactive period.

Conservation areas	Road maintenance (2020)	Firebreak maintenance (2020)	Maintenance (2020)	Firebreak building/maintenance (2021)	Total retroactive period
	Length (km)	Length (km)	Length (km)	Length (km)	
Arenal Tempisque	50	199	50	211	510
Tempisque	49	60	17	69	195
La Amistad Pacífico	-	108	-	108	216
Guanacaste	163	108	153	177	601
Central Pacific	-	13	4	18	35
Central	-	-	-	-	-
	262	488	244	583	1577

Note: National Guide for Training and Certifying Staff on Fire Management Procedures and Guidelines for Managing Warehouses, Vehicles, Tools and Others

SINAC hires physical or legal third-parties for these road maintenance and firebreak construction works. Within the contracting framework and as part of the Terms of Reference (TOR), they are asked to have their collaborators' labor conditions in force, according to the Ministry of Work and Social Security (social insurance and accident risk policies).

In regard to the personal protection equipment that was acquired during the retroactive period, the following items were purchased: helmets, anti-smoke glasses, long-sleeve shirts, short-sleeve t-shirts, leather gloves, pants, tall boots, back canteens, helmet flashlights, face protection, anti-smoke masks, belts and special forest firefighter backpacks. There was also tool and equipment acquisition for effective use of water due to the institution-identified interest to provide the necessary resources for safeguarding the staff and volunteers' life and health when fighting wildfires.

This aspect created a work opportunity for the Fire Management and Control Program that allowed training the brigades on fire prevention, use, control, and management, as well as strengthening exchange networks with other indigenous territories. Indigenous People representatives indicated that one thing they could work on with SINAC was the creation of regulations for

fire management in high-fire incidence territories neighboring areas. To such effect, the National Wildfire Program must define clear protocols and strategic points to control wildfires effectively.

3.1.2. Expanding and improving financial mechanisms for natural regeneration

The incentives policy for forest conservation and management demonstrated important execution accomplishments as part of the expansion and improvement of its financial mechanisms for regeneration. Thanks to the management and proactive work of FONAFIFO's Directors Board, which eliminated administrative and requisite obstacles for small producer modalities, expanding coverage to traditionally unfavored populations has been possible. Likewise, these changes are already backed-up in management procedures such as the Operations Manual, thus ensuring their continuity.

Through the expansion of the mixed PES in 2020, inclusion of micro-producers in regeneration, forest protection and AFS activities in properties less than 15 hectares in size has been promoted. This financial mechanism seeks to lower transactional costs for property owners and motivate them, forest professionals and producer organizations to have a better access to the program. The mixed PES acknowledges multiple forestry activities (Regeneration, Protection and AFS) under just one contract modality and with more expedite requisites. In consequence, the PES Procedure Manual was modified to define access to this sub-activity.

Also, through FONAFIFO Director's Board, for the 2020-2021 period the PES fund distribution changed to provide more resources for natural forest conservation actions. Besides that, the challenge of implementing the Contract for the Reduction of Forest Emissions (CREF) scheme was taken on. It allows participation of forest owners to increase.

Table A1.5 lists the obligations set forth in the Operations Manual for environmental matters that must be tended to for each PES modality. The additional environmental risk mitigations that have been implemented are described in Table A1.2, in the above annex.

Table A1.5 Obligations set forth in the Operations Manual for each PES modality.

PES modality	PES activity	Obligations set forth in the Operations Manual
Keeping forest cover	Protection Water resource protection Post-harvest protection	The Program's activities, particularly forest protection, were strengthened by integrating criteria into the PES Program property assessment matrix, which allows identifying conservation needs at the national level, as well as specific protection measures, such as forests located in properties identified by technical studies as conservation lagoons and properties inside biological corridors. Article 21: Protection obligations 21.1. Not performing activities related to logging, extraction or use that alter, damage, or undermine the forest's natural behavior. 21.2. Carrying out actions for protection against third-party harm. As a minimum: delimiting the forest area, the existence of tracks or fences, and area vigilance and periodic follow-up at least once every three months. 21.3. In the case of logging or forest alteration by third-parties, hunting or any other kind of activity that may damage the forest, the beneficiary should file a legal claim before the Public Ministry and an administrative claim before the SINAC within 15 calendar days of knowing about the fact. Copies of these claims must be sent to the regional FONAFIFO office within 30 natural days post-submission, along with the forestry regency report that quantifies the caused damages and impacts.

Recovering Forest Cover	Natural regeneration	Article 5. Prioritization criteria 5.4 Bare areas, areas without forest cover, areas with nearby nurseries, areas in recovery and properties without livestock will be given priority. Article 24. Obligations 24.1. Protecting vegetable cover in areas where regeneration processes are taking place, not cutting trees or any other type of vegetation, and protecting from damage caused by livestock or other animals. 24.2. Not doing any activity that would alter the natural behavior of the protected area. 24.3. Describe the resource, for example, sprouts and commercial pastures, presence of remaining trees, nearby seed sources or other relevant ecological aspects for secondary succession, bare areas, areas without forest cover in regeneration process and that do not comply with the definition of forest and that are free from livestock. 24.4. Carrying out necessary actions for protecting the area in regeneration from third-party damage and livestock, such as: area delimitation, track presence and cleaning, firebreaks in high fire incidence areas and project supervision and follow-up every three months.
	Reforestation	Article 5. Prioritization criteria 5.3 Areas without forest with productive potential. Just as Executive Order N° 25663-MINAE regulates almendro tree logging or harvesting, Executive Order N° 25700- MINAE completely forbids using endangered trees. Article 22. Obligations 22.2. Sustaining forest plantation during the contract's validity by executing every silvicolous maintenance and management technical action according to science. 22.4. Carrying out necessary actions for protecting the area in regeneration from third-party damage, such as: area delimitation, track presence and cleaning, firebreaks in high fire incidence areas and project supervision and follow-up every three months. 22.5. Not conducting any incompatible agricultural activity in the plantation area. If the property has an area devoted to these ends, it must be fenced or delimited so that these actions do not damage plantation-occurring processes. This incompatibility of agricultural activity must be included in the technical study and be approved by FONAFIFO. 22.6. If non-authorized logging or forest alteration on behalf of third-parties, hunting or any other activity that may damage the forest takes place, the beneficiary must present a legal claim before the Public Ministry and an administrative claim before the SINAC within 15 natural days after knowing about the fact. Copies of these claims must be sent to the regional FONAFIFO office within 30 natural days after they take place, along with the forestry regency report that quantifies the caused damages and impacts. 22.9 In short rotation, fast or medium-growth reforestation projects, only projects that use reproductive material with genetic improvement, pest tolerance, and seed or clone availability certified by the National Seed Office will be allowed.

		The regent must certify the improved growing material, when applicable, or, in its defect, the origin of the selected material for planting. 22.10 Documenting the incidence of plague or disease attacks (estimating the impact degree and the surface or affected tree amount) by sending information to FONAFIFO on the status of the plantation during the contract's validity. Manual Guideline Annex for creating technical reforestation studies and AFSs 1.6. It must show the zoning permit analysis interpretation and indicate the corresponding recommendations for soil prepping, acidity correction, fertilization, and other required actions according to the analysis' results. 2.7. Conducting an assessment of the physical-environmental, ecologic, and silvicolous factors, recommended species, planting sites and species management. 3.8. Including the common and scientific names of the species that will be planted and clearly indicating each species in each line, for each real folio, as well as each species' plantation density, duly justified. Priority must be given to species with National Seed Office (ONS, for its acronym in Spanish) genetic improvement certification. 4.9. For every case, include recommendations for proper land preparation before and after planting, along with a silvicolous maintenance and management activity program during the project's life.
	Agroforestry Systems (AFS)	23.2. Protecting trees from animal grazing in forest shepherding systems and other kinds of AFSs. 23.3. Carrying out necessary actions for protecting the area in regeneration from third-party damage. These protection actions will include, as a minimum: planting area delimitation, track presence and cleaning, firebreaks in high fire incidence areas, and project supervision and follow-up at least every three months. 23.5. For PES projects, only those that use genetically improved material, with plague and disease tolerance, with clone or certified seed availability, and whose origin is certified by the National Seed Bank will be accepted. The regent must certify the improved growing material, when applicable, or, in its defect, the origin of the selected material for planting. 23.8. Existent trees of timber-yielding or multiple-purpose species will be accepted in the AFS mixed system, regardless of their age. 23.9. Documenting the incidence of plague or disease attacks (estimating impact degree and amount of affected surface or trees) by sending information to FONAFIFO on the status of the plantation during the contract's validity. Manual Guideline Annex for creating technical reforestation studies and PES 5.6. It must show the zoning permit analysis interpretation and indicate the corresponding recommendations for soil prepping, acidity correction, fertilization, and other required actions according to the analysis' results. 6.7. Conducting an assessment of the physical-environmental, ecologic, and silvicolous factors, recommending species, planting sites and species management. 7.8. Including the common and scientific names of the species that will be planted and clearly indicating each species in each line, for each real folio, as

		well as each species' plantation density, duly justified. Priority must be given to species with National Seed Office (ONS) genetic improvement certification. 9. For every case, detail the recommendations for a proper land preparation before and after planting, along with a silvicolous maintenance and management activity program during the project's life.

2.3.1. PWA administration and management

For serving and managing PWAs, SINAC has a human resource made up by 469 park rangers (2020), where only 13.5% of the staff devoted to this activity were women. They are currently allied to the Rural Development Institute (INDER, for its acronym in Spanish), and some of the Comprehensive Development Associations (ADIs, for its acronym in Spanish) in indigenous territories promote the Resource Keeper program with PES funds. This consists on indigenous community staff that carries out park ranger roles in indigenous territories and, therefore, in PWA areas adjacent to their territories. It currently operates in territories adjacent to the International Park La Amistad, Hitoy Cerere Biological Reserve and Barbilla National Park, in close cooperation with La Amistad Caribe Conservation Area.

In 2020, implementation of the "Strategy and Action Plan for the Participatory Strengthening of the World Heritage Site La Amistad Caribe" (SPMH-ACLAC, for its acronym in Spanish) started. Its objective was to diagnose populations linked to SPMH-ACLAC, particularly in 7 of the 8 indigenous territories (2 Bribri and 5 Cabécar) of the Caribbean coast and the ACLAC, taking the territories' own dynamics into account, as well as their coexistence models, care and use of nature and conservation culture, in order to ensure satisfactory governance.

In regard to the tools and guidelines to manage the Land Ownership Management system of the State's Natural Heritage lands and PWAs, which had been funded by REDD+ resources, which is a website platform for SINAC officials that manages certifications, endorsements, purchases, donations, and uncultivated lands, with their respective revision processes. This platform stopped adapting its digital platform and work guidelines in 2020. On the other hand, it set itself to launch the pilot conservation area tool's implementation, with the goal of correcting aspects from the computing perspective. To this effect, it set itself to start working on the Central Conservation Area (CCA) in 2021.

SINAC promotes a second participatory conservation strategy, the National Biological Corridor National Program (NBCP), which currently covers 38% of national territory (including natural and inter-urban biological corridors).

This program, which is part of SINAC's structure, is located in the Department of Citizen Participation and Governance (CPG). Its main objective is to promote conservation and sustainable use of biodiversity in Costa Rica from a functional and structural ecosystem connectivity between the PWAs and landscapes, ecosystems and (natural, urban, or modified) habitats.

SINAC has procedures in place for the creation, expansion, modification, and management of Protected Wildlife Areas. These are detailed in various documents, such as the Protected Wildlife Area General Management Plan's formulation and design guide, as well as the methodological guides, such as the one for the creation of Prevention, Protection and Control (PPC) Plans, sustainable tourism, waste management, research, natural resource management and ecological integrity.

2.4 Confirm that the FGRM is functional, along with evidence that it follows-up, documents and responds to grievances and concerns.

The Information, Feedback and Nonconformity Mechanism (MIRI), which was validated by the relevant interested parties and set in motion by institutions, presented the first results of its implementation. However, MIRI must be strengthened in both institutions, in such a way that it captures the processes these two carry out in a more comprehensive way, in order to work efficiently as the communication channel for Strategy, Government and relevant interested parties.

It is worth mentioning that for 2020-2021 there were no funds to develop a (software) management system that would centralize information of both service comptrollers (SINAC-FONAFIFO), as well as SITADA's links with MINAE, data management staff training on both procurements and budget for operations, promotion and informative approaches to all interested parties.

To strengthen communications, the MIRI has implemented a legal framework to regulate, organize and operate the Service Procurement system as a mechanism to guarantee the rights of users of public services (Regulatory Law of the National

System of Service Comptrollers N° 9158). Since Executive Order N° 4064-MINAE creates the REDD+ Executive Secretariat, made up by SINAC and FONAFIFO, these two institutions have offered their service comptrollers to assist with MIRI's needs. Based on its broad experience and capacities, FONAFIFO's Service Comptroller takes on the responsibility of comprehensively managing the mechanism, accounting, and report submission. A wide range of communications for guaranteeing inclusion is made available, including through SITADA, if MINAE's Environmental Comptroller redirects and applicable claim, such as the ones that correspond to SINAC's Conservation Areas. Table A1.6 details tickets received by the MIRI for the reporting period through the communication channel.

Table A1.6 shows details of MIRI's reception mechanism for the years 2020 and 2021. This mechanism reflects the importance of electronic means for ticket reception, which may be owed to the extensive coverage in the country, which among the top Latin American countries on the Broadband Development Index (IDBA)119.

Table A1.6 Breakdown of tickets received by MIRI according to their reception mechanism, FONAFIFO, years 2020 and 2021.

Reception mechanism	Year 2020.	Year 2021.
Website	0	0
E-mail	344	372
Online chat	0	0
Telephone	57	57
Citizen participation events	0	0
In-person	4	1
SITADA	4	1
Suggestion box	0	0
FONAFIFO social media	53	44
WhatsApp	5	0
Web platform	14	1

Table A1.7 shows that tickets have increased during the reporting period because of this, due to the health restrictions and population isolation, given that digital mechanisms are the tools available for processing tickets. 2020 shows 481 registered tickets, and 2021 shows 447 registered tickets, a similar amount for both years. A small decrease of 0.83% can be seen. It is due to the fact that, in the face of the COVID-19 health crisis, clients and citizens in general adapted to the use of technological mechanisms for requesting information for services and paperwork processing, as well as for public information requirements about services offered by the institution.

Table A1.7 Tickets received by MIRI in 2020 and 2021, classified according to their processing category.

Ticket category	**2020**	**2021**
Consultation	459	477
Disapproval	11	3
Legal claim	4	2
Suggestion	7	0
Compliment	0	1

A total of 3 grievances were registered for 2021, showing an important 72% decrease in this kind of tickets compared to 2020. These are related to aspects such as: Archived PES onboarding request processes and paperwork overlapping of PES property paperwork and website information quality issues were solved in the time granted by Law N° 9158. In most cases, there was a lack of justification or evidence on behalf of the one who was handling them.
In regard to the two legal claims filed, one was received via e-mail to the Service Comptroller. It was related to a supposed contract breach. The Eastern San José Regional Office Directorate processed it. The other one came in through the Integrated System of Processes and Attention to Environmental Complaints (SITADA) of the Ministry of Environment and Energy. It corresponded to supposed actions that were affecting a PES sub-area. It was processed by a Nicoya Regional Office colleague. Findings from an inspection that was previously coordinated with the project's leader indicated that those areas were not part of the PES program.

It is worth noting that, since the PES Program is one of the Emission Reduction Program activities and includes tending to safeguards, the motive of tickets received in 2021 at FONAFIFO's Comptroller came from the PES Program (60% of the user-submitted tickets). They were related to onboarding requirements, appointment dates, means for making appointments, contract payment status, PES onboarding request paperwork, PES request records, payment amounts, general or technical information about the program and statistics, among others.
An aspect worth highlighting from this retroactive report is that, in 2021, FONAFIFO's Service Comptroller, as the MIRI coordination entity, got 14 tickets related to REDD+, mostly focused on clearing doubts about the Contract for the Reduction of Forest Emissions (CREF).

It is worth mentioning that all the requests received in 2020 and 2021 by the FONAFIFO Services Comptroller's Office were resolved within the period stipulated by Law No. 9158 and most of the cases lacked justification or evidence from the manager.

For SINAC's case, the number of registered tickets for the 2020-2021 period is detailed in Table A1.8.

Table A1.8. Annual number of tickets registered by the Institutional Service Comptroller. SINAC. Years 2020-2021.

Concrete ticket detail	**Total received**
Information	24
User support	16
Process paperwork and management	20
Inadequate use of resources	07
Facilities	06
Others	77
Total received	150

Source: Institutional Service Comptroller - SINAC 2020-2021

The Comptroller is a consolidated mechanism that slowly gains relevance among its users, due to its paperwork processing efficiency and being strictly monitored by the institution's authorities, such as the external auditing bodies (MIDEPLAN), to verify compliance with defined times, regulations safeguarding and accomplishment of its objective as a continuous institutional improvement facilitator and promoter.

3. The Safeguarding Plans' expected objectives and results have been attained.

3.1 Evaluate the general efficiency of management and mitigation measures set forth in the Safeguarding Plans.

The implemented ESMF management and mitigation measures were effective during the reporting period, as details from Sections 2.2.3. and 2.2.4. show.

3.2 Are the quality assuring arrangements, and monitoring and supervision for identifying and correcting deficiencies for cases where ER Program activities are not implemented according to the Safeguarding Plan efficient?

These arrangements' efficiency is evidenced by details provided in Sections 2.2.3. and 2.2.4. The expected objectives and results have been attained. There are no identified cases of ESMF-based unimplemented ER Program activities.

3.3 Describe the supervision and monitoring arrangements to ensure Safeguarding Plans are implemented and, when applicable, environmental, and social documents created during the Program. Are these supervision and monitoring arrangements effective (do they provide a relevant feedback mechanism for implementer entities to enable corrective actions)?

Section 2.1.1. summarizes supervision and monitoring arrangements in force for the ER Program, while Section 2.2.2. details the institution and department in charge of following-up with each measure. These arrangements efficiency is evidenced by details provided in Sections 2.2.3. and 2.2.4.

4. The program activities present environmental and social risks and impacts that are not identified or foreseen in the safeguarding plans prepared before signing the ERPA.

4.1 Is the scope of potential risks and impacts that were identified during SESA's process still relevant for the ER Program activities?

The Environmental and Social Management Framework (ESMF) identifies and evaluates the potential environmental and social risks and impacts of the proposed measures, incorporating the results of the Strategic Environmental and Social Assessment (SESA), which was carried out in the initial preparation phases.

These risks have been identified with a reasonable degree of certainty and can be approached through best practices, mitigation measures, project-level grievance complaints, solid commitment based on interested party participation, capacity development, and impact assessment and monitoring. The ESMF was also created based on the applicable national environmental and social legislation, as well as national and institutional procedures, in conformity with the World Bank's environmental and social operative policies. ESMF allows ERP-derived action implementation to the FCPF to be carried out with absolute compliance with the World Bank Operational Policies and applicable safeguards.

4.2 Did any of the ER Program activities generate not previously identified risks or impacts (according to the Safeguarding Program, defined before signing the ERPA) during implementation? If so, what are the proposed actions to manage such risks and impacts that were not previously foreseen?

There were no identified risks or impacts for that 2020-2021 Retroactive Report that had not been foreseen in the Safeguarding Plans, prepared before signing the ERPA.

It is worth mentioning that, in spite of the risks that the COVID-19 global pandemic introduced, it was possible to tend to the Emission Reduction Program's policies, actions and measures. The identified forest deforestation and degradation motors, as well as the efficiency of all management and mitigation measures defined by the institutions for its operation, contributed to complying with the ER Program.

In turn, it is always possible for not previously identified environmental and social risks to emerge during the REED+ Strategy's implementation. If that were to happen, the country's legal regulations, institutionality and development objectives in force would be respected and used. Also, necessary measures would be adopted so that the Strategy's implementation does not have any negative impact on the country's populations or the environment.

5. Necessary corrective actions and improvements to increase the efficiency of the Safeguarding Plans.

5.1 Provide self-evaluation of the general Safeguarding Plans' implementation.

In general, and in spite of the situation resulting from the COVID-19 Pandemic, it was possible to comply with the Emission Reduction Program's policies, actions, and measures. In spite of the population's isolation for lowering transmission rates, institutional work contributed to the mitigation of risks related to promoting the participation of actors in deforestation and its underlaying causes.

5.2 List corrective actions and aspects to improve. Make sure to distinguish between: (i) corrective actions to ensure compliance with the Safeguarding Plans, and (ii) necessary improvements in response to unforeseen risks and impacts.

The measures and actions carried out within the 2020-2021 reporting period have been executed in conformity with the associated institutions' guidelines and operational regulations. This has allowed monitoring compliance with the Program's Environmental and Social Management Framework, as well as tending to the Operational Policies. However, to the extent that more Program activities are implemented with the Results Based Payment recognition, environmental and social risks and impacts that had not been identified or foreseen before signing ERPA could emerge, which could result in ESMF improvements or updates.

Up next, improvement recommendations and opportunities are listed. There will be information about these in next period's Safeguarding Report.

a. Accident Report

In spite of improvements to the Final TOR for third-party contracting as part of the Fire Management Program, third-parties have not been asked to submit registry of accidents/incidents that take place during the corresponding labors.

b. Institutional Strengthening for ESMF Implementation and Follow-Up

REDD+ Secretariat's work is strongly backed-up by the 2017 Executive Order on its creation and implementation processes. It guaranteed FONAFIFO and SINAC's guidance and follow-up of work done. Both institutions involved in the implementation had clear roles within this project's framework. However, more awareness is required for the ones in charge of each measure, in such a way that ensures generating timely information.

While there have been improvements, the recommendation is the same: to promote an agreement through the Directive Committee (Vice-Minister of Environment, SINAC and FONAFIFO) in order to foster more accurate action monitoring, complete information for these submission dates, submission mechanism and the person in charge.

There is still the need to create the team needed for the Safeguarding Unit of the REDD+ Secretariat in order to support processes and accompany professionals in charge of information gathering, analysis, processing, and follow-up, as well as field work with citizens and sectors involved.

In terms of the involved institutions' human resource, there is constant capacity building, particularly in the traditional competences of the natural and forest resources field. Building capacities on the operational policies and the Environmental and Social Framework of the World Bank, and the REDD+ safeguards, is recommended for all staff involved in field implementation. Capacity-building could be combined with the technical abilities of future-programmed natural resources, in such a way that officials can start generating comprehensive criteria of the various fields, such as forest, environmental, social and gender; educational methods, such as "knowledge bubbles" and small cards to submit in technical events, all of which can provide a way to continually add other less traditional themes for technicians, which require training to successfully implement the hereby reported actions.

c. MIRI recommendations

In regard to MIRI, the recommendation is to centralize all the information in one system, with details and characteristics to consider, with the goal of creating just one report, regardless of the institutional source of the information.

Also, in regard to its registry, the recommendation for comptrollers is to filter MIRI processes in such a way that process sub-categories can be distinguished, given that next year the report will be done by CREF and other activities that currently depend on economic resources from Results Based Payments' acknowledgment to be set in motion. In this way, sub-categories for smaller or form-based processes can be differentiated, such as complaints about website access, or similar, versus more important affairs (such as a Relevant Interested Party, or RIP, complaint about lack of participation).

There are active internal processes to integrate the SITADA platform to MIRI, a work in progress, in such a way that includes REDD+'s corresponding sections and the link under SINAC and FONAFIFO's comptrollers. This is done in a disaggregate manner, as the goal is to integrate it, so that all the information will be in just one system.

SINAC will define a plan of activities to tend to information, feedback, and grievance processes in a more expedited and robust manner, as part of internal improvements to integrate to the MIRI reports.

5.3 Describe the timeline to carry out the previously described corrective actions and identified improvements.

A 1.9. List of activities carried out during the period with the topics addressed and their respective verifiers

Date	Activity	Group of interested parties	Details/Recommendations
October 27, 2020	Virtual workshop with organizations invited by the ONF	Cantonal agricultural centers, cooperatives, and livestock chambers. 22 representative individuals participated.	• Flexibility in the conditions for REDD+ ownership information versus environmental service payments. • They proposed a fund to compensate for the small and medium producer land problem, leveraging PES. • Direct funds to the organization so it can help with owner promotion.
November 11, 2020.	Virtual workshop with ONF-invited organizations.	Codeforsa, UNAFOR, ASIREA, CAC, Fundecongo, Coopeagri, Coopepuriscal, ONF, Asmeverde. 26 representative individuals participated.	• Make sure those who take care of resources receive due benefits. • Benefits for small or medium private owners. Increasing BSP payment and complementing with PES, acknowledging other benefits, lakes, wetlands, scenic landscapes, and others. • Promoting trust in these programs and fostering spaces for mostly small and medium owners. • Generating more attraction for small and medium owners that have not been able to invest in legal affairs in regard to their lands.

			• Others.
November 02, 2020.	Virtual workshop with the Monitoring Committee	Members of the Monitoring Committee	• The Monitoring Committee agrees to ask the Secretariat to reach the necessary agreements with SINAC so that landowners in disputes, with indigenous or non-indigenous agreements, can be favored by benefit sharing. It is a form of acknowledgment. • The Committee requests analyzing the possibility of shortening product delivery times to the owners, as 7 years is a long term, because the 7.42 Fund has been questioned heavily. Therefore, if we are able to shorten the contract terms, hopefully there would be a maximum of two or three disbursements. The times would be shorted knowing that it keeps being a 7-year contract. • Changing the concept in page 10, paragraph 3 of the BSP, paragraphs 3 and 4. • The Committee requests following-up with the letter sent to the Directive Committee on clarifying the use of SINAC Funds in regard to the Strengthening Plan.
November 5, 2020.	Virtual workshop with FONAFIFO's employees	17 FONAFIFO employees	• Allocate funds to invest in FONAFIFO at administrative levels. • One recommendation is for the CREF to become a more efficient mechanism. • Leverage the experience of the Green Business Fund.
November 17, 2020.	Virtual workshop with public institutions	11 employees of various public institutions	• Interested in knowing about the funds that a public institution can receive under the emission control contract. • Interested in benefiting Indigenous People and women groups through the social inclusion funds.
November 24, 2020.	Virtual workshop with municipalities	7 municipality representatives, mostly from Environmental Management departments	• They talk about the importance of creating a map of social actors, to know the interested parties and thus start developing agreements. • They express the importance of including the most vulnerable populations in the distribution of these funds. • Looking to improve these sectors' participation and access. Also, coordinating and creating institutional plans to maximize obtainable benefits.
November 12, 2020.	Virtual workshop with municipalities	8 municipality representatives, mostly from Environmental Management departments	• They propose using funds to promote research and tourism in protected forest areas.
November 16, 2020.	Virtual workshop with municipalities	5 municipality representatives, mostly from Environmental Management departments	• Accompanying and advising on municipality's access to the proposed funds. • Coordinating meetings with the country's rural aqueduct associations.
December 02, 2020	In-person workshop with the Monitoring Committee	19 participants	• Verifying inclusive funds. • Allocating 15% of the PNDF to funding individual forest owner project promotion through organizations. • Fund a technical and forest policy congress every 2 years instead of the National Forestry Development Plan. • Allocating budget for the Monitoring Committee. • Reducing administrative costs and unifying criteria. • Working with forest owners to protect forest and incorporate them into CREF through the ONF. • Accountability mechanisms for analyzing forest policies. • With the goal of valuing and monitoring for accountability, $500,000 for organizations and represented entities.

			• Redistributing SINAC allocated funds to small individual forests and private reserves (CREF). • Managing urban forest cover in municipal lands with the goal of promoting carbon emission reductions that urban forests provide. • Managing the forest keeper implementation in SINAC for conservation area protection. • Securing funds for strengthening the various local action organizations linked to the REDD+.
November 23, 2020.	Reserve Network Workshop	21 participants	• They believe the current monetary distribution is not ideal because most funds are allocated to public institutions. • They request improving resource distribution to the private sector. • They complain about lack of private sector participation and representation in fund management. • They would like to promote a protection law for private conservation areas.
November 24, 2020.	UCIFOR workshop	8 participants	• UCIFOR's Board of Directors participated and questioned the women fund. • They believe regents are not participating in order to propose or promote actions. • No money is considered for the organizations, something important to be aware of. • They propose there being just one fund instead of two, as part of the plan's mechanisms.
February 05, 2021	BSP Virtual feedback workshop	SINAC employees	• None
February 18-19, 2021	BSP feedback workshop	RIBCA	• Talk to them about the PAFT and Benefit Sharing Plan building processes
July 08, 2021	Meeting with Telire	4 participants, ADI representatives	• Monitoring of the participation process in the REDD+
July 13, 2021	Meeting with Alto Chirripó	5 participants, ADI representatives	• Monitoring of the participation process in the REDD+
July 24, 2021	Meeting REDD+ Results-Based Payment Project and REDD+ Secretaria	7 participants	• Roadmap of the Indigenous Peoples' Plans.
July 30, 2021	Meeting with Térraba's indigenous territory	ADI representatives	• They are urged to keep working on REDD+ and told about the Benefit Sharing Plan
August 10, 2021.	Meeting with the Telire indigenous territory	ADI representatives	• ADI request to reincorporate into the REDD+ process. The Benefit Sharing Plan is presented to them.
September 28, 2021.	Meeting with the Bribri-Cabécar indigenous network	ADIS RIBCA representatives	• Talk to them about the PAFT and Benefit Sharing Plan building processes
September 28, 2021.	Meeting with the Bribri indigenous	ADI representatives	• Talk to them about the PAFT and Benefit Sharing Plan building processes
October 05, 2021.	Meeting with the Ngäbe block	10 participants, Ngäbe ADIS representatives	• Talk to them about the PAFT and Benefit Sharing Plan building processes
October 06, 2021	Meeting with the Central Pacific block	10 participants, ADI representatives	• Talk to them about the PAFT and Benefit Sharing Plan building processes

October 07, 2021	Meeting with Boruca	4 participants, ADI representatives	• The PAFT and Benefit Sharing Plan building processes were presented to them
October 12, 2021	Meeting with Alto Chirripó	10 participants, ADI representatives	• Talk to them about the PAFT and Benefit Sharing Plan building processes
October 20, 2021	Meeting with Monitoring committee	12 participants	•Meeting about monitoring of the process.
October 21, 2021.	Meeting with the Central North territories	12 participants, ADI representatives	• The PAFT and Benefit Sharing Plan building processes were presented to them
November 06, 2021.	Meeting with Térraba	4 participants, ADI representatives	• Talk to them about the PAFT and Benefit Sharing Plan building processes
November 8, 2021.	Meeting with the Bribri indigenous territory	ADI representatives	• ADI request to reincorporate into the REDD+ process. The Benefit Sharing Plan is presented to them.
November 17, 2021.	Meeting with the Ujarrás indigenous territory	ADI representatives	• Talk to them about the PAFT and Benefit Sharing Plan building processes
December 09, 2021.	Rey Curré indigenous territory	ADI representatives	• Presentation of the Benefit Sharing Plan

ANNEX 2: INFORMATION ON THE IMPLEMENTATION OF THE BENEFITSHARING PLAN

This annex is a description based on the Benefit Sharing Plan's (BSP) advancement and on the Costa Rica's Government contributions during the 2020-2021 period. Since the annex does not refer to that period, some of the report sections do not fully apply to this retroactive period, given that the Emission Reduction Program (ERP) was still in preparation stages, the ERPA was signed in December, 2020, and the BSP had not been implemented yet. Nonetheless, the sections have been completed as they should.

They take the following criteria into account for the implementation plan:

- Effective, intergenerational participation.
- Reflects relevant actor-expressed opinions and incites broad support to the affected indigenous communities.
- This plan is made publicly known in one format, one form and a language that can be understood by ER Program affected actors.
- The Benefit Sharing Plan's design and implementation adapts to applicable laws, including that of the national scope, and legally binding stipulations from international legislation.

1. FCPF requirements for the Benefit Sharing Plan

During the reporting period, which ranges from January 01, 2020, to December 31, 2021, the BSP found itself in an advanced draft stage and in the process of informing the relevant involved parties. During the year 2020, due to pandemic-related themes, these actions got interrupted, mainly by the Indigenous People. That is why the BSP advanced draft got picked back up and circulated among the relevant involved parties in 2021. For the most part, retaking this process with the Indigenous People set the official conclusion of the BSP for the year 2022.

The BSP was designed by the REDD+ Secretariat of Costa Rica, based on an extensive legal framework, to propose the REED+ Strategy implementation of the resulting benefit sharing, particularly the ER Program. The BSP complies with the main elements and requisites set forth in the FCPF's Methodological Framework criteria and indicators in regard to "Benefit Distribution" (No. 5.2), which demands ER Programs to use clear, effective and transparent benefit sharing mechanisms with extensive community and relevant actor support, as well as to ensure benefit sharing takes place under respect of the importance of guaranteeing legitimacy in the decision-making process; respecting customary land and territory rights; and complying with efficacy, efficiency and equality objectives. The BSP embodies the principles of legality, efficacy, efficiency, equality, transparency, citizen participation and intercultural sensitivity.

The BSP's goal is to guide the distribution of benefits derived from commercialization and sale of the country's greenhouse effect gas emission reductions that have been duly incorporated into the emission reduction registry, designed to such effect, and about which there is an agreement of right cessation or an commercialization authorization on behalf of their owners (be them public or private), particularly for resources from the ER Program execution that was signed with the Carbon Fund.

Article 15 of Executive Order REDD+ N° 40 464-MINAE states that ER commercialization resources will be distributed according to the contribution percentage of each of the ER public or private owner entities. The Executive Order was shared with the relevant interested parties and the feedback was duly processed. The initial ER payment assignment is based on the total forest land area, with carbon ownership evidence, that is then channeled through four benefit sharing mechanisms: i) SINAC strengthening plan, ii) Contract for the Reduction of Forest Emissions (CREF), iii) Green Business Fund and iv) Inclusive Sustainable Development Fund.

The monetary benefits will be properly distributed among the various actors involved in executing local-level REDD+ actions. Also, national mechanisms have been created within the framework of REDD+ to demonstrate monetary benefit distribution transparency, with follow-up mechanisms, accountability and means to access information. Every environmental and social management guideline and procedure within the Environmental and Social Management Framework (ESMF) of the ER Program apply to the BSP's implementation. Potentially adverse environmental and social risks and impacts (and their corresponding mitigation measures) from implementing the ER Program and this BSP have been duly analyzed and communicated to the interested parties during the ESMF development.

2. Monitoring and Reporting Requirements

2.1 Benefit Sharing Plan preparation

2.2. Confirm that the BSP has been completed and approved by all relevant parties. Are there any unclear aspects of the BSP or that require approval by the beneficiaries or other interested parties? Has the BSP been made available to the public?

The BSP comment diffusion and summarizing process started with the "Workshop for identifying elements of REDD+'s Benefit Sharing Plan," in April 2016. It is worth noting a high percentage women participation in BSP workshop (65% of participants) and in the process of creating the National REDD+ Strategy, SESA and ESMF. After consulting relevant actors from non-governmental organizations (ONF, FUNDECOR and UCIFOR, among others), Indigenous People (Indigenous BriBri-Cabecar Network, RIBCA), indigenous territories, indigenous women group (ACOMUITA) and government institutions (Climate Change Directorate, DCC, SINAC, Municipalities, CENIGA, IMN and others), the Government of Costa Rica published Executive Order N° 40 464-MINAE in July 2017. Article 15 of the Executive Order defines the general guidelines for the REDD+ Benefit Sharing System (BSP).

During the reported period (2020-2021), the following information and consultancy activities were carried out. These were directly related to the BSP via different ER owner interest groups. Representatives appointed by Indigenous People's institutions, community leaders and Director Boards participated.

Table A1.1 BSO consultation activities.

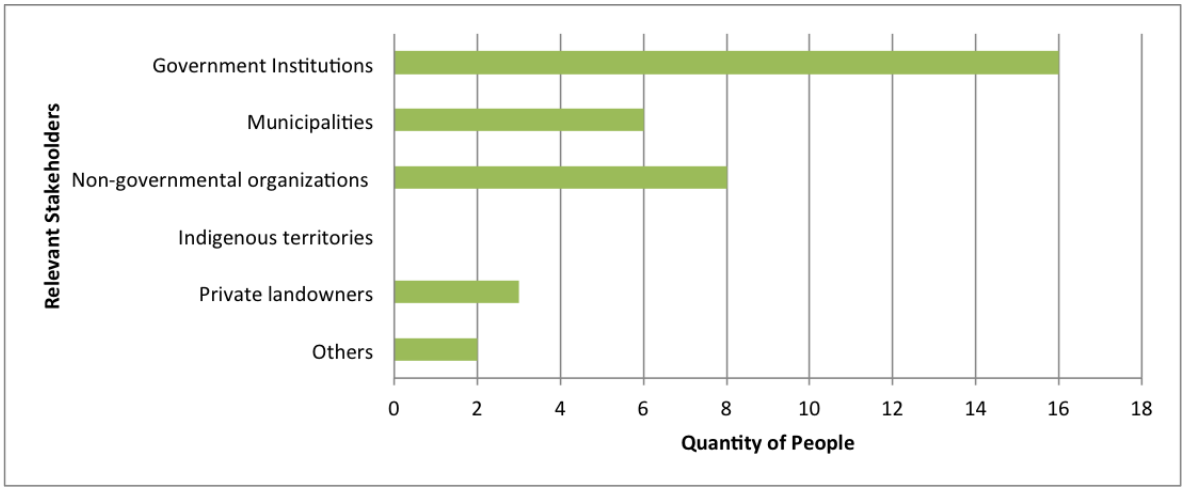
Date	Activity	Group of interested parties	Details
October 27, 2020	Virtual workshop with organizations invited by the ONF	Cantonal agricultural centers, cooperatives, and livestock chambers. 22 representative individuals participated.	• Flexibility in the conditions for REDD+ ownership information versus environmental service payments. • They proposed a fund to compensate for the small and medium producer land problem, leveraging PES. • Direct funds to the organization so it can help with owner promotion.
November 11, 2020.	Virtual workshop with ONF-invited organizations.	Codeforsa, UNAFOR, ASIREA, CAC, Fundecongo, Coopeagri, Coopepuriscal, ONF, Asmeverde. 26 representative individuals participated.	• Make sure those who take care of resources receive due benefits. • Benefits for small or medium private owners. Increasing BSP payment and complementing with PES, acknowledging other benefits, lakes, wetlands, scenic landscapes, and others. • Promoting trust in these programs and fostering spaces for mostly small and medium owners. • Generating more attraction for small and medium owners that have not been able to invest in legal affairs in regard to their lands. • Others.
November 02, 2020.	Virtual workshop with the Monitoring Committee	Members of the Monitoring Committee	• The Monitoring Committee agrees to ask the Secretariat to reach the necessary agreements with SINAC so that landowners in disputes, with indigenous or non-indigenous agreements, can be favored by benefit sharing. It is a form of acknowledgment. • The Committee requests analyzing the possibility of shortening product delivery times to the owners, as 7 years is a long term, and we know the 7.42 Fund has been questioned heavily. Therefore, if we are able to shorten the contract terms, hopefully there would be a maximum of two or three disbursements. The times would be shorted knowing that it keeps being a 7-year contract. • Changing the concept in page 10, paragraph 3 of the BSP, paragraphs 3 and 4.

			• The Committee requests following-up with the letter sent to the Directive Committee on clarifying the use of SINAC Funds in regard to the Strengthening Plan.
November 5, 2020.	Virtual workshop with FONAFIFO's employees	17 FONAFIFO employees	• Allocate funds to invest in FONAFIFO at administrative levels. • One recommendation is for the CREF to become a more efficient mechanism. • Leverage the experience of the Green Business Fund.
November 17, 2020.	Virtual workshop with public institutions	11 employees of various public institutions	• Interested in knowing about the funds that a public institution can receive under the emission control contract. • Interested in benefiting Indigenous People and women groups through the social inclusion funds.
November 24, 2020.	Virtual workshop with municipalities	7 municipality representatives, mostly from Environmental Management departments	• They talk about the importance of creating a map of social actors, to know the interested parties and thus start developing agreements. • They express the importance of including the most vulnerable populations in the distribution of these funds. • Looking to improve these sectors' participation and access. Also, coordinating and creating institutional plans to maximize obtainable benefits.
November 12, 2020.	Virtual workshop with municipalities	8 municipality representatives, mostly from Environmental Management departments	• They propose using funds to promote research and tourism in protected forest areas.
November 16, 2020.	Virtual workshop with municipalities	5 municipality representatives, mostly from Environmental Management departments	• Accompanying and advising on municipality's access to the proposed funds. • Coordinating meetings with the country's rural aqueduct associations.
December 02, 2020	In-person workshop with the Monitoring Committee	19 participants	• Verifying inclusive funds. • Allocating 15% of the PNDF to funding individual forest owner project promotion through organizations. • Fund a technical and forest policy congress every 2 years instead of the National Forestry Development Plan. • Allocating budget for the Monitoring Committee. • Reducing administrative costs and unifying criteria. • Working with forest owners to protect forest and incorporate them into CREF through the ONF. • Accountability mechanisms for analyzing forest policies. • With the goal of valuing and monitoring for accountability, $500,000 for organizations and represented entities. • Redistributing SINAC allocated funds to small individual forests and private reserves (CREF). • Managing urban forest cover in municipal lands with the goal of promoting carbon emission reductions that urban forests provide.

			• Managing the forest keeper implementation in SINAC for conservation area protection. • Securing funds for strengthening the various local action organizations linked to the REDD+.
November 23, 2020.	Reserve Network Workshop	21 participants	• They believe the current monetary distribution is not ideal because most funds are allocated to public institutions. • They request improving resource distribution to the private sector. • They complain about lack of private sector participation and representation in fund management. • They would like to promote a protection law for private conservation areas.
November 24, 2020.	UCIFOR workshop	8 participants	• UCIFOR's Board of Directors participated and questioned the women fund. • They believe regents are not participating in order to propose or promote actions. • No money is considered for the organizations, something important to be aware of. • They propose there being just one fund instead of two, as part of the plan's mechanisms.

Source: "Technical support for implementing the Environmental and Social Management Framework for the GCF and the FC". Report

Figure A1.1 Institutions and organizations that participated in the preparation of the BSP survey Advanced Draft.



As the previous figure reveals, shown data corresponds to one of the posterior stages for reinforcing BSP consultation with relevant actors, which did not include indigenous territories; these did participate in the following stage of the BSP consultation, in 2021. Later, territories' participation is shown in the additional consultation of the Benefit Sharing Plan.

The workshops with indigenous leaders approached the subject of income from ER sale, who benefits from it, what kind of benefits there are, benefit sharing proposal, importance of completing the territorial Forest Environmental Plans and actions to be carried out by public institutions with recovered resources.

Table A1.2 Detail of activities carried out with indigenous territories for expanding the Benefit Sharing Plan's information processes

Date	Activity	Group of actors	Recommendations	Type of invitation to participate
October 27, 2020	BSP presentation	ONF		Virtual

November 02, 2020	BSP presentation	Monitoring Committee		Virutal
November 05, 2020	BSP presentation	FONAFIFO		Virtual
November 11, 2020	BSP presentation	GM1		Virtual
November 12, 2020	BSP presentation	GM3 y GM4		Virtual
November 16, 2020	BSP presentation	Eenvironmental focal points - municipalities		Virtual
December 02, 2020	BSP presentation	Monitoring Committee		In person
February 05, 2021	BSP feedback workshop	SINAC employees	None	Virtual
February 18-19, 2021	BSP feedback workshop	RIBCA	Talk to them about the PAFT and Benefit Sharing Plan building processes	In-person
July 30, 2021	Meeting with Térraba's indigenous territory	ADI representatives	They are urged to keep working on REDD+ and told about the Benefit Sharing Plan.	In-person
August 10, 2021.	Meeting with the Telire indigenous territory	ADI representatives	ADI request to reincorporate into the REDD+ process. The Benefit Sharing Plan is presented to them.	In-person
September 29, 2021.	Meeting with the Bribri-Cabécar indigenous network	ADIS RIBCA representatives	Talk to them about the PAFT and Benefit Sharing Plan building processes	In-person
October 05, 2021.	Meeting with the Ngäbe block	Ngäbe ADIS representatives	Talk to them about the PAFT and Benefit Sharing Plan building processes	In-person
October 06, 2021	Meeting with the Central Pacific block	ADI representatives	Talk to them about the PAFT and Benefit Sharing Plan building processes	In-person
October 07, 2021	Meeting with Boruca and Térraba	ADI representatives	The PAFT and Benefit Sharing Plan building processes were presented to them	In-person
October 26, 2021.	Meeting with the Central North territories	ADI representatives	The PAFT and Benefit Sharing Plan building processes were presented to them	In-person
November 08, 2021.	Meeting with the Bribri indigenous territory	ADI representatives	ADI request to reincorporate into the REDD+ process. The Benefit Sharing Plan is presented to them.	In-person
December 09, 2021.	Rey Curré indigenous territory	ADI representatives	Presentation of the Benefit Sharing Plan	In-person

These meetings and workshops lead to an approval of indigenous territories through a note , with their willingness to continue the PAFT development process, knowing the scope of BSP. Evidence report of conducted workshops.

The consultations with other interested parties' results and observations have already been discussed by REDD+'s Directive Committee. Once indigenous consultations concluded and got systematized, REDD+'s Directive Committee analyzed

changing the Green Business Fund's percentage. This change was suggested by the consultation workshop's participants, so that both public institutions would allocate equal amounts for creating the Funds. This is why Green Business Fund allocated percentage was to be raised from 5% to 10%, directly favoring women, men and youth with entrepreneurial projects that carry out productive actions in harmony with the environment and, by doing so, contributing with decrease of climate change side-effects.

2.3 In the cases that have included capacity-building initiatives as part of the BSP, confirm if the program's entity has completed the required capacity-building measures to guarantee the system's efficiency. What other measures are pending?

In February, 2020, the World Bank completed FUNBAM's Financial Management (FM) Assessment, which is in charge of fiduciary aspects of the Carbon Fund's payment system operations. The World Bank reached the conclusion that FUNBAM had limited arrangements, which could cause delays in the implementation. Fiduciary risk rating was also considered substantial given the lack of previous FUNBAM experience in projects funded by the World Bank, the complex arrangements of BSP implementation and the lack of an operational manual to operate the BSP.

Since then, FUNBAM has successfully implemented a series of mitigation measures, suggested by the Bank, to improve its financial and administrative capacity to manage its responsibilities effectively. FUNBAM's financial supervision functions for receiving and administering ERPA payments have been strengthened. An administrative and financial unit has been created in FUNBAM for developing its respective capacity, with professional staff and hired support for managing projects, acquisitions, finances, and contracts, in order to manage ERPA income effectively. An operational manual that details the procedures has been developed and approved. An automatic accounting system has also been set in place. However, an additional administrative force is still needed, and the World Bank will train FUNBAM on FM. In the next years (2022).

In the Table A1.1 BSO consultation activities, you can find the detail of the Benefit Sharing Plan presentation activities for more relevant stakeholders

2.4 When applicable, confirm if agreed-on changes have been completed in the agreement for distributing the benefits identified during the previous reporting period.

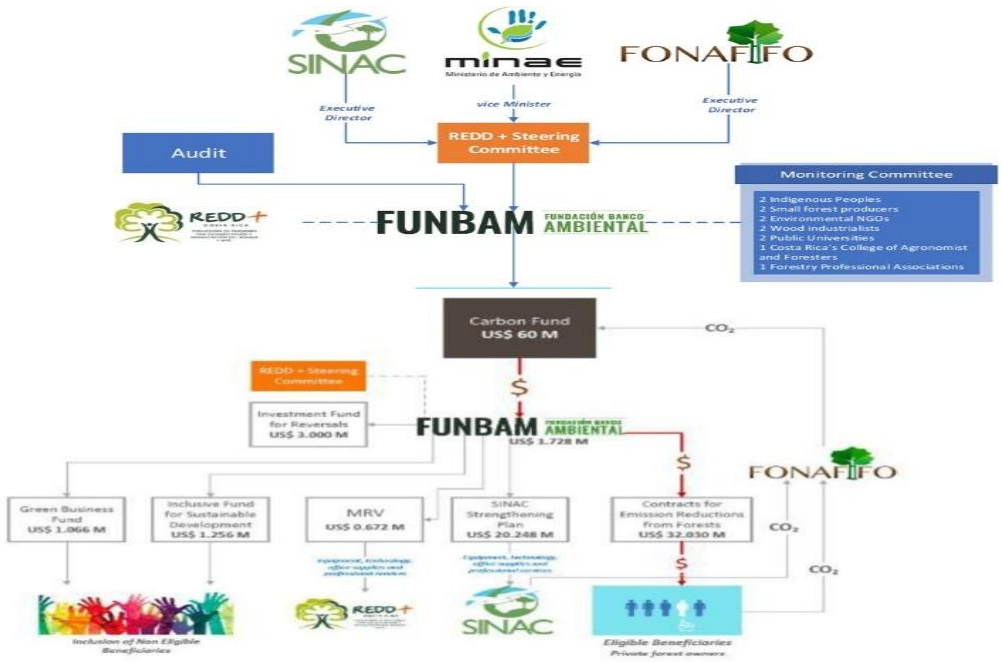
Not applicable, no changes were made to the BSP because this is the second period of the reportthe RBB and resources for implementation were not received during this period.

3. Institutional arrangements

3.1 Confirm that institutional arrangements agreed-on under the BSP are in force and that the executing entities have the adequate resources to carry out their respective responsibilities.

The institutional arrangements agreed-on under BSP have been kept and are in force for the 2020-2021 reporting period. Figure A2.2 shows the national level governance structure for BSP implementation and follow-up. Figure A2.3 illustrates the fund flow to guarantee that executing entities have the adequate resources to carry out their respective responsibilities. The executing entities' roles and responsibilities are briefly described as follows.

Figure 2.2 BSP governance



Directive Committee

REDD+ Directive Committee was created by Executive Order N° 40464-MINAE and is made up by SINAC's Executive Director, FONAFIFO's Executive Director and MINAE's Vice-Minister. It is role is to supervise and provide political direction to REDD+ Secretariat, negotiate reductions and look after compliance with the REDD+ Strategy in Costa Rica. It will instruct FUNBAM about the amount of funds that will be transferred to each Sub-Project's Entity after receiving ERPA's funds. In turn, FUNBAM will make such payments in conformity with instructions given to it through the MINAE-FUNBAM Covenant.

MINAE is a Program Entity that has signed the ERPA with the World Bank. The Republic of Costa Rica authorized MINAE's Minister through Executive Order N° 35669, MINAE's Organic Regulations, Article 7 of the Ministry's Official Letter, to represent the country legally.

FUNBAM

ERPA's income will be received and administrated by FUNBAM. FUNBAM was created by Law N° 8640 of 2008 with the objective of supporting Costa Rica in biodiversity conservation and ensuring the long-term sustainability of its PES Program. One way in which FUNBAM does this is by managing the Sustainable Biodiversity Fund (SBF), created with support by the World Bank and the Global Environment Fund (GEF) within the framework of Market-Based Instruments for Environmental Management Project (P093384). FUNBAM's Administrative Council is integrated by five members: i) MINAE's Minister or representative, ii) Ministry of Agriculture Minister or representative, iii) FONAFIFO's Director or representative, iv) SINAC's Director or representative, and iv) National Bank of Costa Rica's representative as an FBS representative.

Monitoring Committee

The main role of the Monitoring Committee is to make sure the various actors comply with REED+ Strategy, as long as there are resources available to such end. The Monitoring Committee was created by Article 18 of Executive Order N° 40464-MINAE and is integrated by: two Indigenous People representatives who are stationed in Costa Rica; two small forest producers, defined in Article 2, Section "and" of Forestry Act Regulation, Executive Order N° 25721-MINAE and its amendments; two environmental non-for profit, non-governmental organizations; two national timber primary industries' owner representatives; two Forestry Science teaching public universities' representatives; a representative of the Agricultural Engineer Association; and a representative of the country's forestry professional associations. The Monitoring Committee has been operating since January 2019 and gets together regularly, even to talk about the BSP Advanced Draft, which has already been consulted.

During the 2020-2021 period, the representatives of the Follow-up Committee have been informed of the progress in compliance with the Strategy and the actions carried out by the REDD+ Secretariat. Likewise, of the consultations that have been carried out to address issues of the Benefit Sharing Plan, which were exposed in table A.1.1 in this annex.

There is an agreement between MINAE and FUNBAM for the implementation of PDB resources, which establishes the functions of each actor for the execution of the ERPA. Costa Rica also has Executive Decree 40.464 - MINAE for the implementation of the National REDD+ Strategy and it has articles related to the implementation of the PDB.

3.2 Confirm having obtained the regulatory or administrative approvals for implementing the BSP.

Work on fiduciary aspects has been done in the defined period, and adequate arrangements are in place. As reported in the previous Program's Entity report, MINAE signed a Subsidiary Agreement with FUNBAM (the entity that receives ER payments), satisfactory to the World Bank as a Condition of Effectiveness to which ERPA refers for establishing FUNBAM's responsibilities in regard to financial supervision of Periodic Payment reception and issuing.

There is a regulation on the Endorsement of Public Administration Contracting, which indicates that the endorsement is a requirement for the effectiveness of the administrative contract and not a means by which the Comptroller General of the Republic can indirectly annul the awarding act or the administrative contract.

By means of the endorsement, the Comptroller General of the Republic examines and verifies that the clauses of the administrative contract are substantially in accordance with the legal system. This is why FONAFIFO carried out the respective procedure before the Office of the Comptroller of the Republic. Once the procedure was completed, it was indicated to us that the endorsement is not required for its implementation.

3.3 Evaluate if all BSP interested parties (beneficiaries and administrators) clearly understand their BSP-related obligations, functions, and responsibilities. This evaluation could be based on, for instance, findings and feedback received during field implementation support missions, interviews with beneficiaries, issues presented in public consultancy meetings, beneficiary follow-up or grievance submission mechanisms.

The relevant interested parties clearly understand their BSP-related obligations, roles, and responsibilities. The consultancies described in Section 1.1 have been useful for sharing the BSP and for communicating all interested party's roles and responsibilities. To this clear understanding, we add the fact that Costa Rican institutions have broad experience on forest-related benefit distribution. The country has had the Payment for Environmental Services Program, which addresses private forest owners, since 1997. It has created a governance structure in which institutions, private forest owners and other relevant actors are very clear about their responsibilities.

Also, the Benefit Sharing Plan has been socialized in Costa Rica with the relevant interested parties. It has clearly presented who has carbon rights. This has been reinforced with indigenous territories and has allowed an approach to inclusion, participation, and transparency in the Territorial Forest Environmental Plans' (PAFT) development processes.

3.4 Confirm there is a system for registering benefit distribution and obligations associated with eligible beneficiaries. For example: Are payment information systems, follow-up and monitoring systems, bank accounts, accounting and financial control mechanisms and payment modalities being implemented, and are they functional?

Section 1.2 describes FUNBAM measures for strengthening its financial management capacities as a result of the World Bank's FM assessment. These include: i) creating a financial management administrative unit within FUNBAM, ii) creating an accounting system to manage ERPA funds, and iii) developing a BSP operational manual to guarantee adequate fund management and monitoring mechanisms.

When a payment under ERPA expires (after successful result verification), the World Bank (will receive a MINAE Transference Form (as a Program Entity), which would request depositing those payments in the U.S. Dollar Operational Account, under World Bank acceptable conditions. FUNBAM will receive and manage every ERPA-related fund and would pay them out to the Sub-Project's Entities, in conformity with the BSP. FUNBAM opened the corresponding accounts for managing emission reduction payments, which for 2022 are distributed in the following way:

Table A1.3 FUNBAM accounts.

FUNBAM ERP accounts	
I	General
II	Reversions Fund
III	REDD+ Secretariat
IV	SINAC
V	CREF
VI	Inclusive Fund
VII	Green Business Fund

The transactions will be registered according to institutional accounting policies. FUNBAM will prepare and present biannual BSP financial reports in USD to the World Bank. FUNBAM will annually prepare BSP financial statements that would include explanatory notes of administered resources, which will be audited and submitted to the World Bank.

3.5 Confirm that the agreed-on accountability mechanisms are implemented and working properly (for example, interested party participation arrangements; agreed-on public information dissemination procedures; independent third-party monitoring or performance auditing mechanisms; conflict resolution and complaint reparation mechanisms).

The following accountability mechanisms are operational and working properly for the period: feedback and complain reparation mechanism through FONAFIFO and SINAC's Service Comptrollers, which work as MIRIs; independent third-party monitoring in process; and third-party financial auditing mechanism.

3.6 Confirm that Feedback and Grievance Mechanism (FGRM) work properly for recording and approaching complaints and suggestions about the BSP implementation. Confirm the amount and type of grievance received and submitted to the FGRM, as well as how and if they were tended to.

MIRI, the FGRM, is functional and capable of registering and approaching suggestions and complaints, including those related to BSP implementation. MIRI continues working through FONAFIFO and SINAC's Service Comptrollers. The Service Comptrollers are entities created by Costa Rican legislation as a mechanism for guaranteeing the rights of the users of services provided by public organisms and private utility companies. Section X of the 2020-2021 Retroactive Report provides a detailed description and analysis of the MIRI based on FONAFIFO and SINAC comptrollers' reports.

The Information, Feedback and Complaints Mechanism's (MIRI) goal is to work as a communication channel between the Government and the Relevant Interested Parties (RIPs) through the Service Comptroller as a neutral and independent entity. This mechanism allows social actors to clarify their information requests, manifest their nonconformities and provide feedback on the REED+ Strategy's implementation. To do so, they have a wide range of means of communications available, in such a way that inclusion is guaranteed and the particularities of the various RIPs are tended to.

Table A1.4 Breakdown of MIRI-received complains according to their reception mechanism, years 2020 and 2021

Reception mechanism	Year 2020.	Year 2021.
Website	0	0
E-mail	344	372
Online chat	0	0
Telephone	57	57
Citizen participation events	0	0
In-person	4	1
SITADA	4	1
Suggestion box	0	0
Social media	53	44
WhatsApp	5	0
Web platform	14	1

Source: Institutional Service Comptroller - FONAFIFO. 2020-2021

2020 registers 481complains tickets, and 2021 447 complains; a similar amount for both years. A brief decrease of 0.83% can be seen. It is due to the fact that, in the face of the COVID-19 health crisis, users clients and citizens in general adapted to the use of technological mechanisms for requesting information for services and paperwork processing, as well as for public information requirements about services offered by the institution.

Table A1.5 Tickets Complians received by MIRI in 2020 and 2021, classified according to their processing category.

Ticket category	2020	2021
Consultation	459	477
Disapproval	11	3
Legal claim	4	2
Suggestion	7	0
Compliment	0	1

Source: Institutional Service Comptroller - FONAFIFO. 2020-2021

Up next, information on received and served tickets from 2020 to 2021 is presented in detail. According to this information, 559 questions were received, of which 431 (71.95%) were solved.

Table A1.6 Annual number of tickets registered by the Institutional Service Comptroller. SINAC. Years 2020-2021.

Concrete ticket detail	Total received
Information	24
User support	16
Process paperwork and management	20
Inadequate use of resources	07
Facilities	06
Others	77
Total received	150

Source: Institutional Service Comptroller - SINAC 2020-2021

3.7 Confirm that the adequate human or financial resources for BSP implementation have been assigned or kept.

Before the first ER payment, the BSP budget will be integrated into FUNDAM's budget, based on input provided by the National REDD+ Secretariat. FUNBAM keeps employees with a financial/accounting specialist, a treasury assistant and an internal auditor with adequate abilities and experience for efficacy (see Section 1.2).

4. Benefit distribution status

4.1 Summarize all monetary and non-monetary benefit distribution during the reporting period.

The section is intentionally left in blank because monetary and non-monetary benefits are not distributed for the 2020-2021 period.

4.2 Indicate (in table format) the amount and type of beneficiaries that got benefits during the reporting period (examples of tables to use and expand follow). The tables must include information about:

The section is intentionally left in blank because no beneficiary got benefits during the 2020-2021 period.

4.3 Are the beneficiaries getting adequate implementation support to help manage and use the shared benefits?

The section was intentionally left in blank because none of the beneficiaries received benefits during the 2020-2021 period. In regard to support for resource use management, technical support for indigenous territories will be provided once PAFT building starts, for its incorporation into the CREF. In addition, for the funds' resource distribution, guidelines in the operational manuals are under creation. These will be formulated to implement such funds; this is pending definition.

4.4 Describe and evaluate the effectiveness of the mechanisms for ensuring transparency and accountability during BSP implementation, such as the participatory follow-up of the beneficiaries.

In regard to the effectiveness of mechanisms for guaranteeing transparency and accountability during the BSP's implementation, MIRI has been designed as an FGRM to receive and approach questions by the relevant interested parties. A series of information and training sessions with indigenous communities, small and medium agricultural-forest producers, forestry organizations and other actors generated valuable input for the mechanism's final design, to guarantee the promotion of dialogue in the case of disagreements.

There is a wide range of communication channels for making the instrument universally accessible: website, e-mail, online chat, telephone, participation events, in-person, SITADA and suggestion box. SIS was not operational yet, but will provide information to the public about how safeguards will be dealt with and respected during the ER Program's implementation. Given that REDD+ Secretariat and FUNBAM's Administrative Board are completely governmental, the inclusion of non-governmental actors in the benefit sharing decision-making processes takes place through the Monitoring Committee. This is so in order to promote transparency and credibility, and to reduce BSP implementation social risk reduction. The Monitoring Committee includes representation of Indigenous People, small forest producers, environmental NGOs, timber industries, public universities, the academia, and forest professionals associations.

The National REDD+ Strategy has a Monitoring Committee which, as part of its roles, contributes to program implementation transparency. Those functions are stated in Executive Order N° 40464- MINAE; they are the following:

- Promote and monitor that the various actors comply with the REED+ Strategy as far as there are resources for doing so.
- Request information deemed necessary from public entities.
- Create grievance notes as appropriate whenever the Strategy is not being executed.

4.5 Evaluate if the Benefit Sharing Program's distributions are still relevant to the main objectives and legitimacy of the ER Program objectives (for example, benefit distribution is considered equitable and effective; beneficiaries' active participation is sought after; it is respecting customary territorial rights; enjoys wide support from the Indigenous People community in regard to benefit distribution, emission reduction measure adoption, etc.).

The section was intentionally left in blank because there was no distribution of benefits for the 2020-2021 period.

4.6 Describe the existent mechanism to verify how benefits are used and if those payments offer enough incentives and compensations for participating in the program's activities, changing zoning permits or reducing carbon emissions. To what extent do beneficiaries consider the distribution mechanisms credible and trustworthy?

There will be various monitoring channels to verify how benefits are used and if payments provide enough incentives or compensations for participating in the program's activities, changing zoning permits or reducing carbon emissions. The results of a technical assessment of adapting incentives for the retroactive period will be ready at the end of September, 2021. Distribution mechanisms have been designed with feedback from the relevant interested parties and under supervision of a diverse Follow-Up Committee, in order to guarantee the transparency and inclusion needed for beneficiaries to consider it credible and trustworthy.

REDD+ Secretariat has implemented internal arrangements for monitoring each project. SINAC will make a Fund Implementation Plan, as well as periodic reports about its use. The Indigenous Territory will create a Territorial Forest Environmental Plan as a planning instrument for a transparent execution of resources that enter the territory. Approved by ADI's Assembly, as well as execution reports. The REDD+ Secretariat monitors Contracts for the Reduction of Forest Emissions (CREF) through a geo-spatial database and the development of a payment management system that guarantees transparency and payment tracking. REDD+ Secretariat will the in charge of gathering all the information and submitting the ER Monitoring Report for each monitoring event. MINAE, the Program's Entity, will first monitor and inform about the BSP six months after receiving the first Periodic Payment and, afterwards, annually. Provisional progress reports will describe the progress of the BSP operation at least once a year. Supervision will also include regular missions to support World Bank's implementation (includes virtual missions).

4.7 Do beneficiaries understand their continuous obligations once benefit sharing has taken place? Is there any evidence of there being an imbalance of expectations between granted benefits in term of their nature and their value? What mechanisms are there to manage such risks?

There was no benefit participation distribution in the 2020-2021 period. However, the BSP has been designed and disseminated through a participatory process to diverse groups of interested parties to make sure beneficiaries understand their continuous obligations one benefits have been distributed and once there are no discrepancies among the beneficiaries in terms of expectations of the nature and value of the benefits that correspond to them. Every BSP and ER Program related information and consultancy activity has been carried out in comprehensible ways and simple language for the ER Program's relevant interested parties, and in convenient public locations and through accessible means. Announcements are communicated on the website, as well as on social media and platforms, as a way to keep interested parties informed.

The Government acknowledges that the expectations are particularly financial. In order to manage the risk of the current incentive not being enough, the Government unified all Green Climate Fund's (CFG) resources with the Carbon Fund's, in order to attain a greater compensation per hectare. This fusion takes place for this reporting period by growing from 10 dollars per hectare to 17 dollars per hectare, per year, for private owners, which include indigenous territories.

5. Implementation of Environmental and Social Management Measures for the BSP

5.1 Evaluate to what extent the BSP activities' environmental and social management measures have been implemented. Consult the corresponding sections in the Safeguarding Plans, when appropriate.

Safeguarding instrument application mitigates the social and environmental risks of the ER Program. The safeguarding instruments will be applied to activities implemented with ER payments. The existent FGRM, MIRI, will also be used by individuals and communities that believe are being negatively affected by the initiatives. REDD+ Secretariat will be in charge of guaranteeing compliance with the World Bank's safeguarding requisites for initiatives implemented with emission reduction payments under the Program. As part of PAFT development, a Monitoring Committee will be created to process PAFT implementation-related grievances.

6. Recommendations for BSO improvements or modifications.

6.1 Based on the current report's experience and recipient feedback, identify any specific recommendation to modify substantial content or BSP procedure, if necessary. Substantial changes may include eligible beneficiary modifications, justification for benefit distribution, benefit distribution form or modality, defined structure for funds devoted to benefit distribution and beneficiary obligations, among others

The BSP has been adapted based on consultation results and local and national level discussions, in spite of not having been implemented in the MR ER period. The approved for change is the above-mentioned proposal to combine the GCF and the Carbon Fund to increase compensation per hectare, thus creating a greater incentive for the beneficiaries.

6.2 Are there administrative or procedural obstacles for a timely distribution of benefits (such as financial channel suitability and fund use capacity)? Are benefits distributed in a timely manner?

The section is purposely on blank because the BSP had not been implemented for the 2020-2021 period.

6.3 Is there evidence of other emergent risks that could affect the BSP sustainability or efficiency?

Given that the BSP is an adaptive instrument that relies on every safeguarding instrument in place, conditions are created for applying any measure that could reduce or eliminate any potential emergent risk. FONAFIFO will develop a System to implement emission reduction contracts and a property geo-reference data base. These would allow carrying a control of private individuals that access the emission reductions recognition under the REED+ Strategy.

6.4 Provide a suggested timeline and summary of administrative arrangements for introducing any recommended change.

No changes to the Benefit Sharing Plan were required during this period. However, Section 1.1 shows the chart of actions carried out with indigenous territories for strengthening consultation processes with them.

There has not been additional activity scheduling, as no BSP resources have yet been received for implementation.

ANNEX 3: INFORMATION ON THE GENERATION AND/OR ENHANCEMENT OF PRIORITY NON-CARBON BENEFITS

Costa Rica's National REDD+ Strategy aims to address the drivers of deforestation and forest degradation, improve forest management, and conserve forest carbon stocks, thus contributing to climate change mitigation while achieving multiple other environmental and social non-carbon benefits, consistent with the REDD+ safeguards agreed under the UNFCCC.

Priority Non-Carbon benefits

1. List the **identified set of priority Non-Carbon benefits** and provide necessary details on activities for the generation and enhancement of these Non-Carbon benefits. (See questions in sections 2 and 3 below for examples of details on potential specific non-carbon benefits identified).

Table 1 includes the list of indicators, based on available data in the short to medium term, to measure the generation or enhancement of the priority co-benefits identified in the Emission Reduction Program Document (ER-PD). Table 2 describes the REDD+ benefits included in the Convergence Maps, which estimate the non-carbon benefits generation.

Table 1: List of Identified Non-Carbon Benefits

Benefits of REDD+	Map of Convergence of multiple benefits		Indicators Details on activities for generation and enhancement
	Forest conservation	Landscape Restoration	
Climate change mitigation	✓	✓	Number of hectares with REDD+ activities. Estimated above-and below-ground biomass carbon (tons C/ha) of all primary forests, including very wet and rainforests, humid forests, dry forests, mangroves, and palm forests. Total carbon density equal to or greater than 50 tons C/ha (For climate change mitigation through conservation). Total carbon density equal to or greater than 70 tons C/ha for climate change mitigation by restoration.
Natural scenic beauty for tourism purposes	✓		Number of hectares with REDD+ activities in districts with areas of importance for tourism.
Biodiversity Conservation	✓	✓	Number of hectares with REDD+ activities in biological corridors Key Biodiversity Areas (KBA) to identify areas most susceptible to land use change. Richness species weighted index by rarity representing species richness and endemism for amphibians, birds, mammals, and reptiles. Additionally, the richness index weighted by rarity of threatened forest species.
Support to communities vulnerable to water stress	✓	✓	Number of hectares with REDD+ activities in areas vulnerable to water stress.
Potential for socioeconomic improvement	✓	✓	Number of hectares with REDD+ activities in areas with low Social Development Index (less than 40 percent) The socioeconomic index (IDS) by district (MIDEPLAN).
Control of soil loss by water erosion	✓	✓	Number of hectares with REDD+ activities in areas at erosion risk.

Potential for improving governance	✓	✓	The SITADA website was used to map the number of environmental violations recorded between 2013 and 2023 by administrative regions, which threaten the forest and biodiversity throughout the country.

Table 2: Description of benefits of REDD+ included in the Convergence Maps

Benefits of REDD+	Description of benefits included in the Convergence Maps	
	Forest conservation	**Landscape Restoration**
Climate change mitigation	Tropical forests make up one of the largest reserves of forest carbon in the world. Its deforestation and degradation cause its release and its restoration as a sink. The density of carbon in biomass by land cover class is used as an indicator variable.	
Natural scenic beauty for tourism purposes	Nature-based tourism has the potential to generate income that promotes its conservation and improves local living conditions. The scenic beauty can encourage the flow of visitors to areas dedicated to this activity. The distribution of floors of international tourist demand is used as an indicator variable.	
Biodiversity Conservation	Tropical forests are the terrestrial ecosystems with the highest species richness, so their conservation would contribute to ensuring the protection of biodiversity in the long term. The richness of threatened forest species is used as an indicator variable. Additionally, areas based on species richness, including amphibians, birds, mammals, and reptiles, as well as threatened forest species richness.	
Support to communities vulnerable to water stress	Under certain conditions, tree cover contributes to maintaining a positive water balance, so increasing it through forest conservation, restoration and agroforestry practices could support communities living in areas vulnerable to water stress. The estimate of water production due to the increase in tree cover in areas vulnerable to water stress is used as the indicator variable.	
Potential for socioeconomic improvement	Forest conservation, restoration, and agroforestry have the potential to support local livelihoods and serve as an instrument to alleviate poverty since it can favor the provision of goods and services that contribute to family income and improve the quality of life in neighboring communities. The Social Development Index is used as an indicator variable.	
Control of soil loss by water erosion	The tree cover can retain the soil and protect land at risk from water erosion. The introduction and strengthening of agroforestry practices in agricultural areas could contribute to the provision of this benefit. The relative risk of water erosion is used as an indicator variable.	
Potential for improving governance	The implementation of REDD+ can promote improvements in the decision-making processes associated with the protection of tree cover since it brings with it a framework of safeguards that must be addressed and respected to reduce social and environmental risks that may arise from putting them into practice. The SITADA website was used to map the number of environmental violations recorded between 2013 and 2023 by administrative regions, which threaten the forest and biodiversity throughout the country. (MINAE, s.f.).	

Monitoring generation of priority non-carbon benefits:

Costa Rica's National REDD+ Secretariat, with the support of the UN-REDD Programme, carried out in 2017 an analysis to evaluate the spatial convergence of multiple non-carbon benefits that could potentially be generated by the policies,

actions, and measures (PAMs) included in the National REDD+ Strategy[120]. The result of this analysis was the identification of critical areas where REDD+ PAMs could contribute to maintaining and generating the benefits prioritized in the Forest Law (N° 7575, 1996), the Law of Land Use, Management and Conservation (N° 7779, 1998), as well as during the consultation process for the preparation of the National REDD+ Strategy.

The results of this analysis were presented in the first monitoring report that covered the years 2018 and 2019.
For the Second Monitoring Report 2020-2021, the National REDD+ Secretariat of Costa Rica, with the support of the UN-REDD Programme, updated the analysis to evaluate the spatial convergence of multiple non-carbon benefits that could potentially generate measures (PAMs) included in the National REDD+ Strategy. The second monitoring report consists of the results for 2020-2021 and updated information from 2018 and 2019. The updated analysis highlights differences in outcomes for 2018-2019 between the first and second reports. These differences are a result of improved assessment methods for benefit mapping, such as biodiversity conservation benefits, and the use of updated information sources and databases (for further details, see Multiple benefits REDD+ Costa Rica 2023_description of layers (2023.08.15).pdf).

Also, it is essential to clarify that the first monitoring report included three convergence maps: A. Map of convergence of multiple benefits from low-carbon agricultural production systems, B. Map of convergence of multiple benefits from conservation incentives and sustainable management of forests, and C. Map of convergence of multiple benefits from forest landscape and ecosystem restoration actions. However, the emission reductions from low-carbon systems (such as Agroforestry Systems) are not included in the ER-Program's carbon accounting. As a result, the Payment for Environmental Services in Agroforestry Systems was excluded from the non-carbon benefit analysis. Therefore, the updated analysis is only based on Maps B and C.

The following two multiple benefit convergence maps were updated to show the analysis results for the second monitoring report.

CMB2: Map of convergence of multiple benefits that could be obtained by introducing incentives to strengthen forest conservation and sustainable management.
Map CMB2 (Figure 1, Map A) illustrates the convergence of priority benefits that could be obtained by introducing incentives to strengthen conservation and sustainable management in Costa Rican forests, including the following benefits: 1) Greenhouse gas mitigation, 2) Natural scenic beauty for tourism purposes, 3) Conservation of biodiversity, 4) Support for communities vulnerable to water stress, 5) Potential for socioeconomic improvement, 6) Control of soil loss due to water erosion and 7) Potential for the improvement of governance. This analysis is limited to the benefits considered priorities and the availability of spatially explicit information used to indicate these benefits and their underlying limitations, as highlighted in the report. Due to data limitations, areas where benefits have yet to be identified could still provide the prioritized benefits or others not included in the analysis.

CMB3: Map of convergence of priority benefits that could be improved by developing a program to restore landscapes and forest ecosystems.
This CMB3 map (Figure 1, Map B) shows the potential convergence of prioritized benefits that could be obtained through forest restoration in Costa Rica. The non-carbon benefits included in this analysis are 1) climate change mitigation, 2) biodiversity conservation, 3) support for communities vulnerable to water stress, 4) potential for socioeconomic improvement, 5) control of water erosion, and 6) potential to improve governance. This analysis is limited to the benefits considered priority and the availability of spatially explicit information used to indicate these

[120] García-Rangel, Shaenandhoa; Walcott, Judith; de Lamo, Xavier; Epple, Cordula; Miles; Lera; Kapos, Valerie; UN Environment World Conservation Monitoring Centre. (2017). Beneficios Múltiples De REDD+ en Costa Rica: Análisis Espaciales para apoyar la Toma de Decisiones. Costa Rica: ONU-REDD+, accessible at https://www.researchgate.net/publication/322697821_Beneficios_multiples_de_REDD_en_Costa_Rica_analisis_espaciales_par a_apoyar_la_toma_de_decisiones.

benefits and their underlying limitations, as highlighted in the report. Due to data limitations, areas where benefits have yet to be identified could still provide the prioritized benefits or others not included in the analysis.

The non-carbon benefit analysis for the second report was conducted using data from the Spatial Data Management System[121]. By overlaying vector layers and convergence maps, we identified the landowners participating in the Emissions Reduction Program and their extent, coverage, and amount of non-carbon benefits from conservation and restoration every year.

The country estimated the proportion of area under the ER Program for the years between 2018 and 2021 (i.e., private and public lands) that overlaps with the potential convergence of prioritized non-carbon benefits represented in each of the maps mentioned above. This proportion was calculated separately for each class/number of non-carbon benefits (1 to 6) for all areas that could provide at least one non-carbon benefit[122]. Figures 1 and 2 and Tables 3-6 show the results for conservation, while Figures 5 and 6 and Table 7 show the results for restoration. We also determined changes in coverage linked to the entry and termination of PSA contracts within the monitoring period (2018-2021).

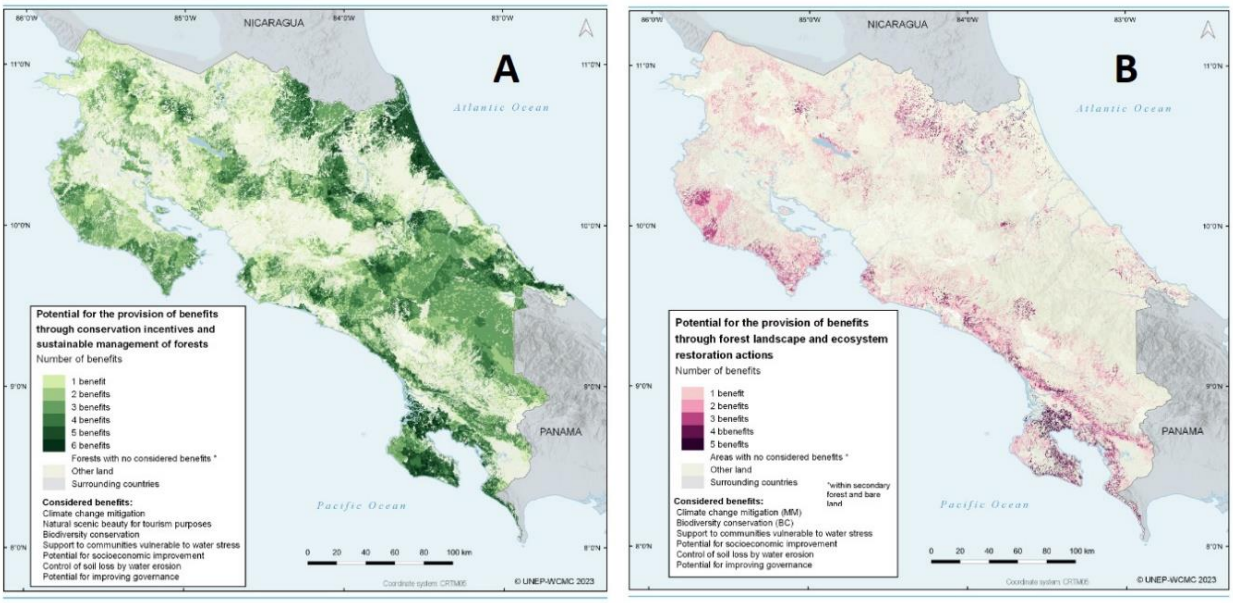


Figure 6: Map CMB2: Map of convergence of multiple benefits that could be obtained by introducing incentives to strengthen forest conservation and sustainable management. Map B CMB3: Map of convergence of priority benefits that could be improved through the development of a program for the restoration of landscapes and forest ecosystems.

Generation of priority non-carbon benefits during the 2018-2021 period:

Tables 3, 4, 5, and 6 show the estimate of the generation of priority non-carbon benefits in each potential production area (i.e., total pixels/area producing at least one REDD+ benefit) between 2018 and 2021. It is important to remember that in

[121] The REDD+ Secretariat built a geospatial database called Spatial Data Management System (for further detail, see Section 6 of ER-MR). This database contains information on the beneficiaries of the ER Program, including private forest owners, indigenous peoples, FONAFIFO, State Natural Heritage administered by SINAC, and other administering institutions.

[122] To carry out this analysis, each polygon was overlaid with the corresponding map to estimate the non-carbon benefits generated on each property or public land. Subsequently, the number of pixels from each benefit convergence level was extracted to calculate the ER-P coverage ratio.

the last monitoring report, the CREF beneficiaries were not included in the analysis. The CREF beneficiaries were included in the study after the contracts were finalized. The results obtained for each type of REDD+ action are summarized below:

Forest conservation actions: During 2018-2021, Costa Rica made outstanding progress in prioritizing the implementation of conservation actions in areas with the potential to generate non-carbon benefits. The country successfully focused conservation actions on potential multiple-benefit production areas, prioritizing strata with greater benefits. Costa Rica implemented forest conservation actions in a percentage coverage of 37.37% (2018), 37.68% (2019), 38.0% (2020) and 36.54% (2021) (Figure 3) of the forest lands that potentially produce at least one priority non-carbon benefit (Tables 3-6).

Areas with the potential to provide the highest number of benefits unrelated to carbon emissions reductions tended to have more of their land area included in conservation efforts. The State Natural Heritage was the most significant contributor to generating multiple benefits, with a consistently high coverage of 19.26% (in 2018) and 19.28% (from 2019 to 2021). Following them was the Payment for Environmental Services Program, which saw changing coverage percentages of 10.81% (in 2018), 11.09% (in 2019), 11.57% (in 2020), and 10.10% (in 2021) (as shown in Figures 2 and 3). The variation in PESP coverage is due to the start and end of PSA contracts, particularly in 2021 (as seen in Tables 3-6). Overall, these results suggest that various forest conservation efforts and protected area designs between 2018 and 2021 aimed to maximize the production of multiple benefits (Figure 3).

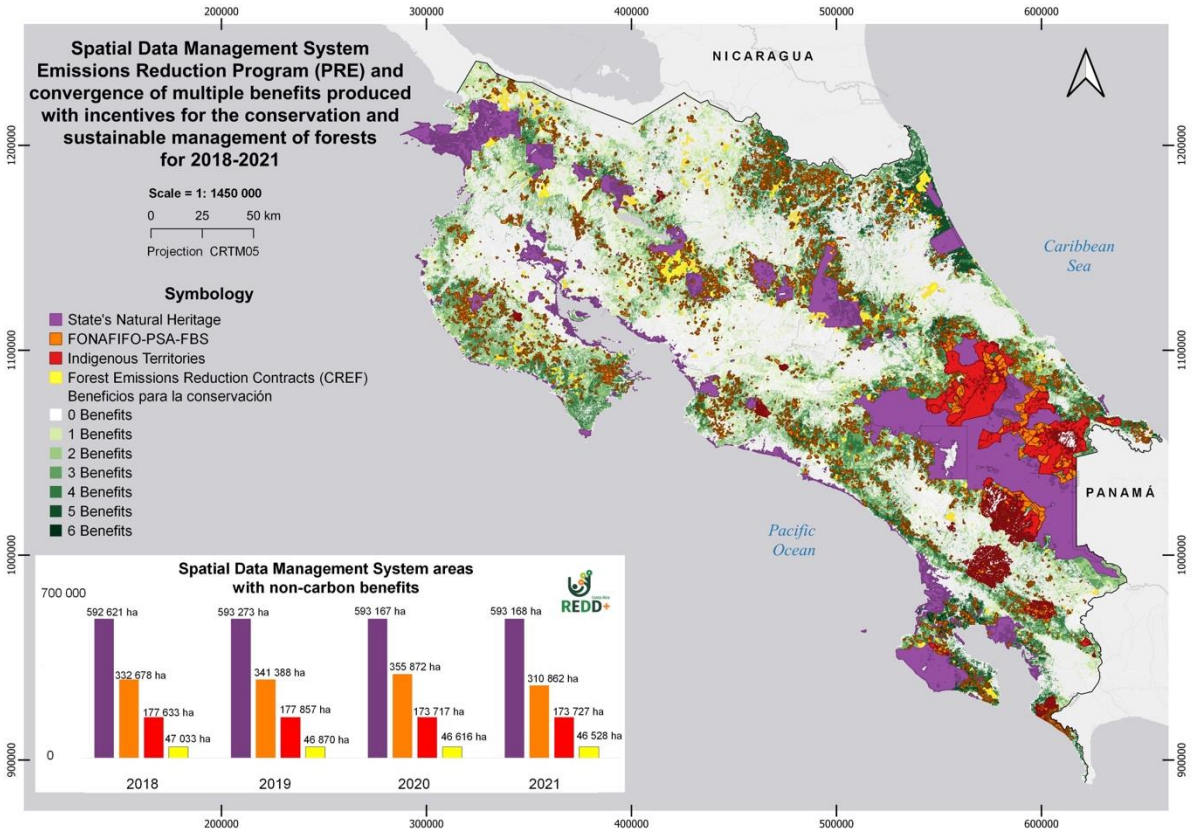


Figure 7: Spatial Data Management System Emissions Reduction Program (PRE) and convergence of multiple benefits produced with incentives for the conservation and sustainable management of forests for 2018-2021. The purple polygons represent the State's Natural Heritage, the orange color represents FONAFIFO-PSA-FBS, the red color represents Indigenous Territories, and the yellow color Forest Emissions Reduction Contracts (CREF) (registered and non-registered farms, approved, signed, and technical evaluation). Green colors represent the convergence of benefits from strengthening the conservation and sustainable management of forests, and dark green colors represent a greater number of benefits in convergence.

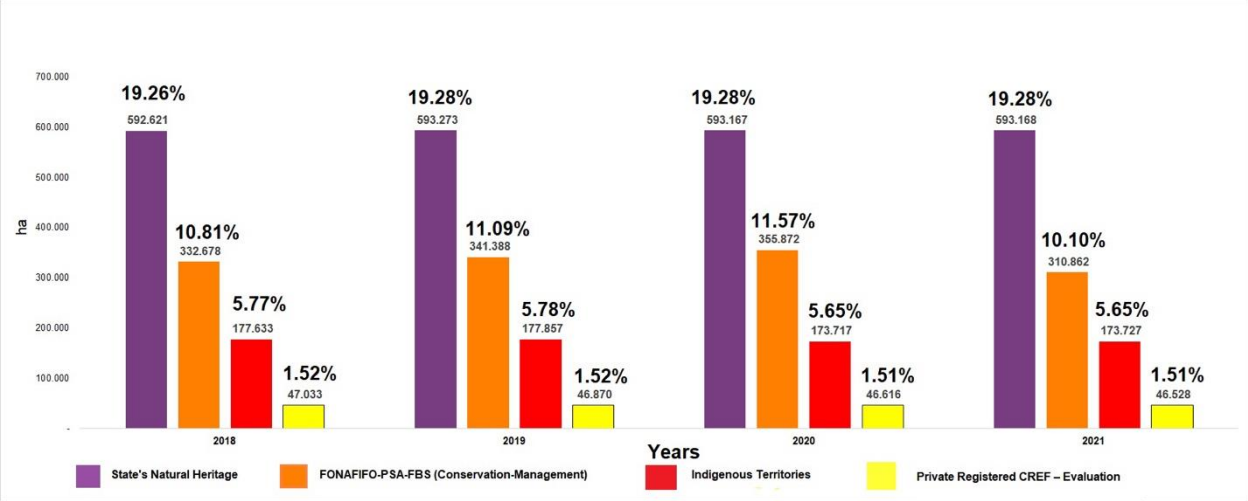


Figure 8: Percentages of coverage by owners that show the generation of non-carbon benefits from forest conservation actions included in the Costa Rica ER Program from 2018-2021.

Table 3: Generation of priority non-carbon benefits from forest conservation actions included in the Costa Rica ER Program during 2018.

Number of priority non-carbon benefits from forest conservation	CREF (%)	Territorios Indígenas (%)	FONAFIFO PSA – FBS (%)	Patrimonio Natural del Estado (%)	TOTALES
Non-critical forest lands for non-carbon benefit production	0.07%	0.02%	0.15%	0.59%	**0.84%**
One non-carbon benefit	0.21%	0.28%	0.78%	1.77%	**3.04%**
Two non-carbon benefit	0.31%	1.12%	2.32%	4.27%	**8.03%**
Three non-carbon benefit	0.39%	2.87%	4.09%	7.72%	**15.07%**
Four non-carbon benefit	0.36%	1.29%	2.56%	3.33%	**7.54%**
Five non-carbon benefit	0.23%	0.21%	0.96%	1.89%	**3.28%**
Six non-carbon benefit	0.02%	0.01%	0.10%	0.28%	**0.41%**
Forest land protected for production of at least one non carbon benefit. (%) Total	**1,529%**	**5,77%**	**10,81%**	**19,26%**	**37.37%**
Forest land protected for production of at least one non carbon benefit. (ha) Total	**47.033,46**	**177.632,62**	**332.678,13**	**592.621,25**	**1.149.965,45**

Table 4: Generation of priority non-carbon benefits from forest conservation actions included in the Costa Rica ER Program during 2019.

Number of priority non-carbon benefits from forest conservation	CREF (%)	Territorios Indígenas (%)	FONAFIFO PSA – FBS (%)	Patrimonio Natural del Estado (%)	TOTALES
Non-critical forest lands for non-carbon benefit production	0.07%	0.02%	0.15%	0.59%	**0.84%**
One non-carbon benefit	0.21%	0.28%	0.84%	1.76%	**3.10%**
Two non-carbon benefit	0.31%	1.13%	2.40%	4.27%	**8.12%**
Three non-carbon benefit	0.39%	2.87%	4.14%	7.75%	**15.15%**

Four non-carbon benefit	0.36%	1.29%	2.66%	3.33%	**7.64%**
Five non-carbon benefit	0.23%	0.20%	0.95%	1.89%	**3.27%**
Six non-carbon benefit	0.02%	0.01%	0.10%	0.28%	**0.41%**
Forest land protected for production of at least one non carbon benefit (%) Total	**1,523%**	**5,78%**	**11,09%**	**19,28%**	**37.68%**
Forest land protected for production of at least one non carbon benefit (ha) Total	**46.869,84**	**177.856,98**	**341.388,22**	**593.272,65**	**1.159.387,70**

Table 5: Generation of priority non-carbon benefits from forest conservation actions included in the Costa Rica ER Program during 2020.

Number of priority non-carbon benefits from forest conservation	CREF (%)	Territorios Indígenas (%)	FONAFIFO PSA – FBS (%)	Patrimonio Natural del Estado (%)	TOTALES
Non-critical forest lands for non-carbon benefit production	0.07%	0.02%	0.16%	0.59%	**0.85%**
One non-carbon benefit	0.21%	0.27%	0.86%	1.76%	**3.11%**
Two non-carbon benefit	0.31%	1.08%	2.51%	4.28%	**8.17%**
Three non-carbon benefit	0.39%	2.82%	4.32%	7.74%	**15.28%**
Four non-carbon benefit	0.35%	1.28%	2.75%	3.33%	**7.71%**
Five non-carbon benefit	0.23%	0.19%	1.01%	1.89%	**3.32%**
Six non-carbon benefit	0.02%	0.01%	0.11%	0.28%	**0.42%**
Forest land protected for production of at least one non carbon benefit. (%) Total	**1,51%**	**5,65%**	**11,57%**	**19,28%**	**38.00%**
Forest land protected for production of at least one non carbon benefit. (ha) Total	**46.616,14**	**173.717,02**	**355.872,35**	**593.167,26**	**1.169.372,78**

Table 6: Generation of priority non-carbon benefits from forest conservation actions included in the Costa Rica ER Program during 2021.

Number of priority non-carbon benefits from forest conservation	CREF (%)	Territorios Indígenas (%)	FONAFIFO PSA – FBS (%)	Patrimonio Natural del Estado (%)	TOTALES
Non-critical forest lands for non-carbon benefit production	0.07%	0.02%	0.13%	0.59%	**0.82%**
One non-carbon benefit	0.21%	0.27%	0.75%	1.76%	**2.99%**
Two non-carbon benefit	0.31%	1.08%	2.18%	4.27%	**7.85%**
Three non-carbon benefit	0.39%	2.82%	3.81%	7.75%	**14.76%**
Four non-carbon benefit	0.35%	1.28%	2.39%	3.33%	**7.35%**
Five non-carbon benefit	0.23%	0.19%	0.88%	1.89%	**3.20%**
Six non-carbon benefit	0.02%	0.01%	0.09%	0.28%	**0.39%**
Forest land protected for production of at least one non carbon benefit. (%) Total	**1,51%**	**5,65%**	**10,10%**	**19,28%**	**36.54%**

Forest land protected for production of at least one non carbon benefit. (ha) Total	**46.528,21**	**173.726,83**	**310.861,85**	**593.168,43**	**1.124.285,33**

Forest restoration actions: During 2018-2021 (Table 7), Costa Rica needed to significantly incentivize the generation of multiple benefits from forest restoration actions. REDD+ efforts focused on forest restoration were implemented in only 2.18% (Table 7) of areas with the potential to generate or improve at least one non-carbon benefit and distributed as follows: 0.88% (2018), 0.41% (2020), 0.42% (2021), 0.42% (2021) (Figures 4 and 5). The main contributor to forest restoration is the Payment for Environmental Services Program. Restoration actions implemented between 2018 and 2021 were mainly concentrated on the locations with the potential to deliver fewer non-carbon benefits (1-3). Additional analysis is required to determine why it has not been possible to focus restoration on strata with the highest number of non-carbon benefits.

It is important to note that the analysis results presented above are highly dependent on the quality of the data and the assumptions used to generate the information. As such, they are best used as relative indications of progress or challenges faced toward achieving the goals set by Costa Rica under REDD+ rather than absolute values.

Table 7: Generation of priority non-carbon benefits from forest restoration actions included in the ER Costa Rica Program from 2018-2021.

Number of priority non-carbon benefits from forest conservation	2018 FONAFIFO PSA (forest restoration actions)	2019 FONAFIFO PSA (forest restoration actions)	2020 FONAFIFO PSA (forest restoration actions)	2021 FONAFIFO PSA (forest restoration actions)	TOTALES
Non-critical forest lands for non-carbon benefit production	0.07%	0.04%	0.04%	0.02%	**0.171%**
One non-carbon benefit	0.29%	0.10%	0.13%	0.12%	**0.63%**
Two non-carbon benefit	0.33%	0.22%	0.25%	0.23%	**1.02%**
Three non-carbon benefit	0.16%	0.04%	0.05%	0.04%	**0.28%**
Four non-carbon benefit	0.04%	1.28%	2.39%	3.33%	**7.35%**
Five non-carbon benefit	0.01%	0%	0%	0%	**0.07%**
Forest land protected for production of at least one non carbon benefit (%) Total	**0.88%**	**0.41%**	**0.47%**	**0.42%**	**2.18%**
Forest land protected for production of at least one non carbon benefit (ha) Total	**7.979,05**	**3.610,50**	**4.261,99**	**4.134,83**	**19.986,37**

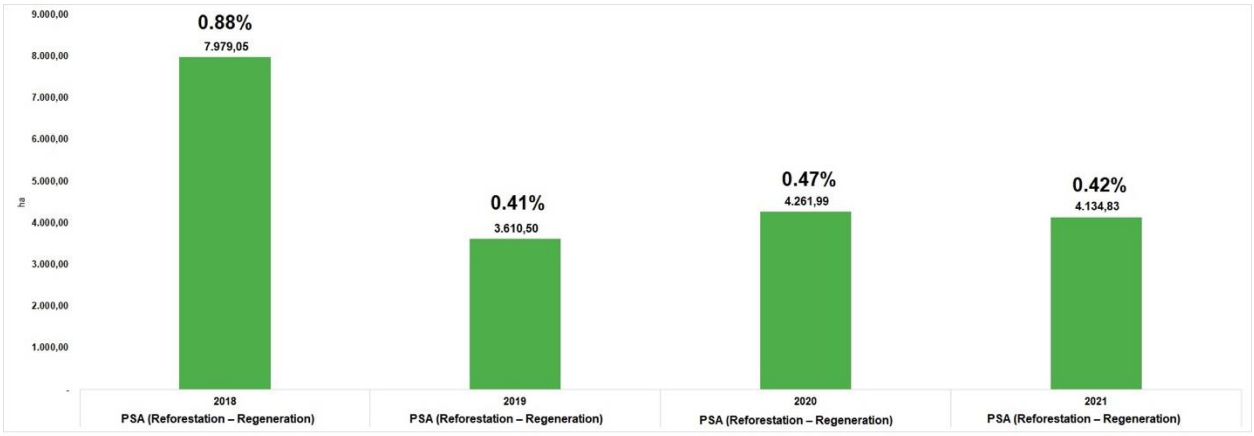


Figure 9: Percentages of coverage by PES for regeneration and reforestation that show the generation of non-carbon benefits from forest restoration actions included in the Costa Rica ER Program from 2018-2021.

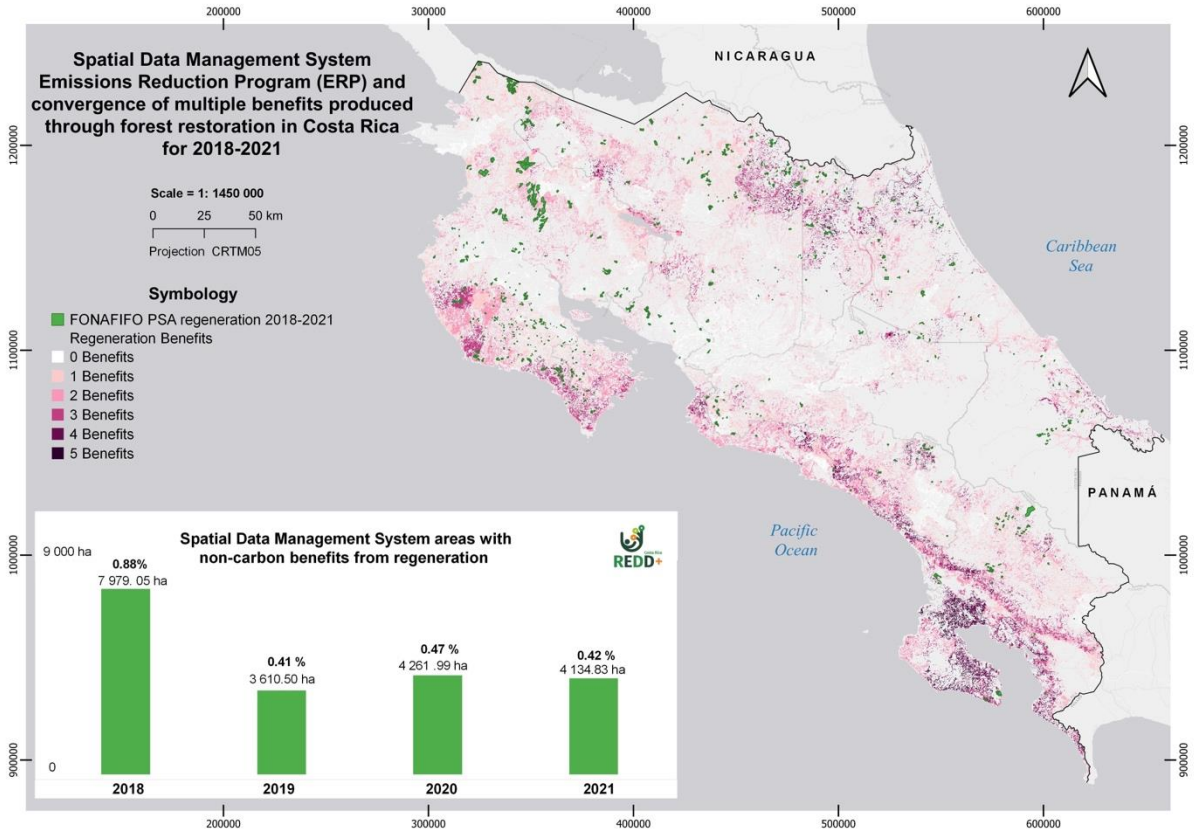


Figure 10: Spatial Data Management System Emissions Reduction Program (ERP) and convergence of multiple benefits produced through forest restoration in Costa Rica for 2018-2021. The green polygons represent the PES for restoration and regeneration. Dark pink colors represent a greater number of benefits in convergence.

Other Non-Carbon benefits and additional information as linked to Monitoring and Evaluation Framework

2. If applicable linked to **any other (non-priority identified) Non-Carbon benefits**, or if not already covered above linked to Priority Non-Carbon benefits, provide the following additional details:

Livelihood enhancement and sustainability

2.1. Is your CF program testing ways to sustain and enhance livelihoods (e.g. one of your program objective/s is explicitly targeted at livelihoods; your approach to non-carbon benefits explicitly incorporates livelihoods)?

The ER Program will improve beneficiaries' livelihoods by reducing soil erosion, increasing timber and non-timber products, improving hydrological services, strengthening adaptation to climate change, and improving family finances and well-being. The National REDD+ Strategy supports improvements in forest cover and forest health, which, in turn, will generate associated co-benefits not only as a sink for carbon but also for watershed protection, provision of essential habitats (biodiversity), provision of sustainable sources of timber forest products, and support of other forest-based livelihoods that are critical components of landscape resilience in the face of climate change (see section 1, table 1).

2.2. Is your CF program testing ways to conserve biodiversity (e.g. one of your program objective/s is explicitly targeted at biodiversity conservation; your approach to non-carbon benefits explicitly incorporates biodiversity conservation)?

The ER Program seeks to strengthen the Protected Wild Areas (ASPs), which are strategically located to create biological corridors, protect high-conservation value forests, and avoid the loss of key species to guarantee the conservation of critical biodiversity. The ASPs are distributed in different management categories based on their natural, cultural, and/or socioeconomic importance. Additionally, SINAC promotes a second participatory conservation strategy, which is the Biological Corridors (CB), through the National Program of Biological Corridors (PNCB), which currently covers 38% of the national territory (between the Natural Biological Corridors and the Interurban Corridors). This model is established as a tool for the conservation of biodiversity and the fight against climate change. Biodiversity maintenance has also been strengthened by improved forest fire management and increasing incentives for forest conservation and sustainable forest management by developing a more inclusive Environmental Services Payment Program.

Protected/conserved areas

2.3. What amount (in ha) of protected or conserved areas are included in your CF program area? Has this amount increased or decreased in the last year? If so, by how much?

The ER Program is implemented in the continental territory of the country. Costa Rica has 1,303,094.8 hectares under protection distributed in various management categories (Table 8), corresponding to 25.5% of the island's territory. The area has stayed the same during this 2020-2021 monitoring period; what has changed is that it has moved from one management category to another (for example, from a wildlife refuge, it was declared a National Park).

Table 8: Protected Areas in Costa Rica during the 2018-2021 period

Management category	ASP quantity	Surface (ha)
Wetlands	**12**	**36 610,0**
National Monuments	**1**	**229,7**
National Parks	**30**	**637 875,7**
National Wildlife Refuge	**51**	**234 552,2**
Biological Reserve	**9**	**27 599,4**
Forest reserve	**9**	**215 286,3**
Absolute Nature Reserve	**2**	**1 445,3**

Protective Zone	**33**	**149 496,2**
Total area	**151**	**1 303 094,8**

Source: SINAC. These data correspond to the continental and island area. Source: https://www.sinac.go.cr/ES/asp/Paginas/default.aspx .

Re/afforestation and restoration

2.4. Total forest area re/afforested or restored through the program.
The total area reforested and restored for the reporting period is 5,907 hectares (ha).

Table 9: Summary of the reforested and restored area during the 2018-2021 period.

Period reported	Área (ha)*
2018-2019	4 174
2020-2021	5 907

Source: Data from the MC2019 and MC2021 Land Cover and Use Map.

Finance and Private Sector partnerships

2.5. Update on CF program budget (as originally presented in ERPD), with updated detail on secured (i.e. fully committed) finance, in US$

The program budget has not changed. The budget initially presented in the ER-PD to finance the Payment for Environmental Services and cover the operating costs of SINAC during the 2020-2021 period was US$121,593,952.

2.5.1. Detail the amount of finance received (including ER payments) in support of development and delivery of your CF program. Figures should only include secured finance (i.e. fully committed): ex-ante (unconfirmed) finance or in-kind contributions should not be included

Costa Rica spent US$ 170,792,958.86 during the 2020-2021 period in implementing the ER Program. The primary funding source is the Public (national budget, fossil fuel tax, and water-canon). The country complemented the ER-Ps budget with private funding from conservation initiatives such as BN Servibanca Green Card and EcoMarchamo. Table 10 details the financing received. The figures are in dollars, calculated with the Central Bank of Costa Rica's average dollar price for the 2020-2021 period.

Table 10. Amount of finance received in support of the development and delivery of the ER Program.

Amount (US$)	**Source** (e.g. FCPF, FIP, name of gov't department)	**Date committed** (MM/YY)	**Public or private finance?**	**ERP, grant, loan, equity or other?**
$121.593.951,86	SINAC / National budget	Jan/2020-Dec/2021	Public	Other
$43,452,604	FONAFIFO/ Fossil Fuel Tax	Jan/2020-Dec/2021	Public	Other
$4,358,053	FONAFIFO / Water-canon	Jan/2020-Dec/2021	Public	Other
$883,645	FONAFIFO / Other sources	Jan/2020-Dec/2021	Public	Grant
$504,705	FONAFIFO / Costa Rican carbon units program	Jan/2020-Dec/2021	Private	Other

$1,060,052.36	FUNBAM / Trust Fund for Sustainable Biodversity - BN Servibanca Green card	Jan/2020-Dec/2021	Private	Other
$26,055	FUNBAM / Trust Fund for Sustainable Biodversity - EcoMarchamo	Jan/220-Dec/2021	Private	Other

Note: In 2021, FONAFIFO's budget was affected by the COVID-19 pandemic and the new regulations of Law Nº 9524 of March 7, 2018, on the Reduction in the collection of the fuel tax for the year 2020.

2.5.2. Not including ER payments from the FCPF Carbon Fund, what is the value of REDD+ ER payments that your CF projects have received, and that your country has received overall?

In November 2020, the Green Climate Fund approved a $54.1 million payment-for-results project for Costa Rica for emission reductions for 2014-2015[123]. In September 2021, the country delivered the first indicator compliance report for the Green Climate Fund. In December of that same year, the first disbursement of the payment-by-results project was received for $21,126,762.64. These resources complement the $18 paid-for forest emissions reduction contracts under the PR.

	Total REDD+ ER payments received to date ($US)
ER payments from sources other than the Carbon Fund	$ 21,126,762.64
All other national REDD+ projects	$ 0

2.5.3. How many formal partnerships have been established between your CF program and private sector entities?
Formal partnerships are defined as:

- The partnership is based on a written MoU (or equivalent), and/or
- The partnership involves tangible financial exchange/s and/or
- The partnership involves tangible non-financial exchange/s (e.g. in-kind contributions)

No formal partnerships were established between the CF program and private sector entities in the reporting period.

	Established in the last year (Jul-Jun)	**Total to date**
Number of private sector partnerships involving financial exchange	NA	NA
Number of private sector partnerships involving non-financial exchange	NA	NA

3. Other Non-Carbon benefits and additional information

Policy development

3.1. Is your CF program involved in the development, reform and/or implementation of policies to help institutions/people/systems/sectors? Please provide information on the approach and any other relevant or related indicators/results.

The ER Program is focused on increasing the impact of public policies that have successfully implemented the national Forestry Law in the last 20 years. The ER Program heavily relies on the prohibition of converting forests to other land uses but also seeks to strengthen the Protected Wildlife Areas System to guarantee the conservation of critical biodiversity and the PES Program as a policy instrument to guarantee forest conservation and carbon stock enhancement through

[123] FP144 Costa Rica REDD-plus Results-Based Payments for 2014 and 2015 https://www.greenclimate.fund/project/fp144

reforestation, tree plantations, agroforestry, and silvopastoral systems. Enhancement of the PES Program supports the active participation of forest organizations, Indigenous communities, and small agroforestry producers, along with promoting productive activities in the sector and work opportunities in rural areas.

In the 2020 period, a reform was established to the procedure manual of the PSA Program. The innovations shown in this improved manual are A. changes in legislation (contracts), B. computing platform, C. access to information, D. digital age, E. implementation of technological tools, F. new PSA sub-activities (including mixed systems), and G. adjustments in processes and procedures. The management of the PSA for regeneration had essential improvements in 2020 with the growth of the mixed PSA, which was created to promote the inclusion of micro-producers in regeneration activities, forest protection, and SAF on farms smaller than 15 hectares.

Additionally, in 2020, the country updated Costa Rica's Nationally Determined Contribution (NDC); the process was carried out by combining quantitative elements of climate action models and qualitative elements developed through a planning process based on exploratory future scenarios. The NDC has 13 areas of action that comprehensively integrate work on adaptation and mitigation. The REDD+ Strategy is immersed in thematic area number 8, corresponding to Forest and Terrestrial biodiversity.

There have been policy developments during the reporting period. In May 2021, the publication of the decree "Creation and operation of the National System for Monitoring Coverage and Use of Land and Ecosystems (SIMOCUTE)" N°. 42886-MINAE-MAG-JP was achieved under the responsibility of the Ministry of Environment and Energy (MINAE), in coordination with the Ministry of Agriculture and Livestock (MAG), and with the Ministry of Justice and Peace (MJP). SIMOCUTE is led by the National Center for Geoenvironmental Information (CENIGA) of MINAE and is part of Costa Rica's efforts to promote the use of information technologies and digital information, including spatially explicit data, as mechanisms to generate and increase knowledge, improve the management of the country's resources, and promote equal opportunities for the population, within the framework of the National REDD+ Strategy. This milestone marked the transition from the design stage to the implementation stage of SIMOCUTE and achieving its consolidation at the institutional level.

Capacity building

1.1. Is your CF program involved in training, education, or provision of capacity-building opportunities to increase the capacity of institutions/people/systems? Please provide information on the approach and any other relevant or related indicators/results.

For the reporting period, within the framework of the technical assistance of the Support Program for the National Decarbonization Plan of Costa Rica (2018-2050) and with the support of the French Agency for Development (AFD), there was a collaboration between the Center of International Cooperation in Agronomic Research for Development (CIRAD) and the Tropical Agronomic Center for Research and Teaching (CATIE) in projects aimed at developing the technical capacities of the institutions that make up SIMOCUTE.

The training received was the following:

- ✓ In-person training: "Opportunities for the quantification and monitoring of soil carbon in Costa Rica", November 23 to 25, 2021.
- ✓ Virtual training: "Web applications with R/Shiny to visualize geographic information," December 7, 2021.
- ✓ Virtual training: "Tools for analyzing data from remote sensors, practical application in Costa Rica," December 2 and 3, 2021.

Also, with the support of the SilvaCarbon program, within the framework of SIMOCUTE, a practical exercise was developed to generate national capacities in the application of the Multitemporal Visual Assessment methodology. The training was carried out between October 2020 and July 2021. It included the participation of 26 government and academic institutions representatives, who received more than 50 hours of technical training from national and international experts. Photointerpretation was carried out using the Collect Earth Online (CEO) tool, and for data analysis, the FIESTA package, developed for use in "R," was used.

The training received was:

- ✓ Workshop: Use and Coverage Classification System, Oct 30, 2020.
- ✓ Workshop: training in Collect Earth Online - First Session. Thursday, November 12, 2020.
- ✓ Workshops to complete interpretation of assigned plots in the study area, December 4, 2020.
- ✓ Virtual workshop: on the statistical analysis process, April 27, 2021.
- ✓ In-person workshop: Results of practical methodological exercise Monitoring by Points, July 6 and 7, 2021.

In addition, the National REDD+ Secretariat and the Results-Based Payments Project organized the following training activities:

- ✓ Virtual workshop: Environmental and Social Safeguards Training: A Protective Framework for People and the Environment; October 27, 2021.
- ✓ In-person workshop: Strategic communication to develop or reinforce skills in constructing audiovisual materials, dissemination, and critical messages to strengthen activities linked to REDD+, November 17, 2021.

Other

3.2. Is your CF program involved in the generation or enhancement of any non-carbon benefits not already covered in this annex? Please provide information on the approach and any other relevant or related indicators/results.

Costa Rica's CF program is not involved in the generation or enhancement of any non-carbon benefit already covered in this annex.