Forest Carbon Partnership Facility (FCPF)
Carbon Fund

Caribbean Coast Emission Reduction Program Document (ER-PD)

ER Program Name and Country: Nicaragua

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Content

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Acronyms

AD	Activity data
AFOLU	Agriculture, forestry and other land use
AGB	Aboveground biomass
AGF	Agroforestry systems
AMASU	Awas Tingni Mayangnina Sauni Umani indigenous territory
ANACC	Nicaraguan Climate Change Alliance
APP	Public-private partnerships
BAU	Business as usual
BCN	Central Bank of Nicaragua
BECO	Ecological Battalion
BGG	Belowground biomass
BICU	Bluefields Indian and Caribbean University
C	Carbon
CADPI	Center for the Autonomy and Development of Indigenous Peoples
CANICARE	Nicaraguan Chamber of Meat Exporters
CANISLAC	Nicaraguan Dairy Sector Chamber
CCF-A	Forest and Environment Consultative Committee
CEDAW	Convention on the Elimination of all Forms of Discrimination Against Women
CITES	Convention on International Trade in Endangered Species
CNU	National University Council
CO_2	Carbon dioxide
$C0_2e$	Carbon dioxide equivalent
CODEFOR	Departmental Forestry Commission
COMUFOR	Municipal Forestry Commission
CONADETI	National Commission of Demarcation and Titling
CONAFOR	National Forestry Commission
CONAGAN	National Livestock Commission of Nicaragua
CONFOR	National Commission of Reforesters
COP	Committee of Parties
COP	Persistent organic contaminants
DFI	Direct foreign investment
d.m	Dry matter
EF	Emissions factor
EIE	Environmental Impact Evaluation
ENDE-REDD+	National REDD+ Strategy
ER	Emission reductions
ERP	Emission Reductions Program
ERPA	Emissions Reduction Payment Agreement
ERPD	Emissions Reduction Program Document
ER-PIN	Emission Reductions Program Idea Note
ESMF	Environmental and Social Management Framework
EU	European Union

FAO	Food and Agriculture Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
FGRM	Feedback and Grievance Redress Mechanism
FONADEFO	National Fund for Forest Development
FRL	Forest Reference Level
FUNDENIC	Nicaraguan Foundation for Sustainable Development
GDP	Gross Domestic Product
GEF	Global Environment Facility
GFOI	Global Forest Observations Initiative
GHG	Greenhouse gas
GIS	Geographic Information System
GIZ	German International Development Agency
GRACC	Autonomous Regional Government of the Caribbean Coast
GRACCN	Autonomous Regional Government of the North Caribbean Coast
GRACCS	Autonomous Regional Government of the South Caribbean Coast
ha	Hectare
IADB	Inter-American Development Bank
IED	Direct foreign investment
IFAD	International Fund for Agricultural Development
INAFOR	National Forestry Institute
INATEC	National Technological Institute
INETER	Nicaraguan Institute of Territorial Studies
INGEI	National Inventory of Greenhouse Gases
INIDE	National Institute of Development Information
INPESCA	Nicaraguan Institute of Fisheries and Aquaculture
INTA	Nicaraguan Institute of Agricultural and Livestock Technology
IPCC	International Panel on Climate Change
IPSA	Agricultural and Livestock Protection and Sanitation Institute
IT	Indigenous territory
ITG	Indigenous territorial government
IUCN	International Union for the Conservation of Nature
LULUCF	Land use, land use change, and forestry
M	Million
MAG	Ministry of Agriculture and Livestock
MARENA	Ministry of the Environment and Natural Resources
MEFCCA	Ministry of Family, Community, Cooperative, and Associative Economy
MHCP	Ministry of Hacienda and Public Credit
MIGA	Multilateral Investments Guarantee Agency, World Bank
MRV	Measurement, Verification (Monitoring), and Reporting
Mt	Million tons
MTR	Mid-term review
NB	Non-forest
NGO	Non-governmental organization

NICADAPTA	Adaptation to climate change and market changes project
NMRVS	National Monitoring, Reporting, and Validation System
OP	Operational policies
PA	Protected area
PAIPSAN	Support Project for the Increase of Productivity, Food and Nutrition Security in the Nicaraguan Caribbean Coast
PAMCC	Policy of Climate Change Adaptation and Mitigation
PES	Payments for environmental services
PIU	Program Implementation Unit
PNDH	National Human Development Plan
PNF	National Forestry Program
PP	Private property
PPP	Public-private partnerships
PROCACAO	Project for the improvement of organizational and productive capacities of cocoa producers in the Mining Triangle.
Produzcamos	Production Bank
	Nicaragua Investment Promotion Agency
PRONicaribe	Regional office of PRONicaragua on the Caribbean Coast
RACCN	Autonomous Region of the North Caribbean Coast
RACCS	Autonomous Region of the South North Caribbean Coast
RAMSAR	Convention on Wetlands
REDD+	Reduction of emissions from deforestation and forest degradation
REL	Reference emission level
R-PIN	Readiness Program Idea Note
R-PP	Readiness Program Proposal
RRNN	Natural resources
RSOP	Roundtable on Sustainable Oil Palm
SDC	Swiss Development Cooperation
SDCC	Secretary for Development of the Caribbean Coast
SEPLAN	Secretary of Planning
SEPROD	Secretary of Production
SERENA	Secretary of Natural Resources and the Environment
SESA	Strategic Environmental and Social Assessment
SICOR	Regional Cooperation Information System
SIGA	Environmental Management Information System
SIGC	Knowledge Management Information System
SIMEAR	Information, Monitoring, and Environmental Education Systems
SINAP	National System of Protected Areas
SINAPRED	National System for Disaster Prevention
SINIA	National System of Environmental Information
SIS	Safeguard Information System
SNMRV	National Monitoring, Reporting, and Validation System
SPPP	Secretary to the Presidency for Public Policies
tn	Tons

TA	Technical assistance
TAP	Technical advisory panel
UCA	Central American University
UNA	National Autonomous University
UNFCCC	United Nations Framework Convention on Climate Change
UNI	National Engineering University
URACCAN	University of the Autonomous Regions of the Nicaraguan Caribbean Coast
WB	World Bank

Executive Summary

The ER-P is expected to generate 13,69 Mt CO_2e of emission reductions and 1.56 Mt CO_2e removals, with a total balance of emission reduction/removals of 14.32 Mt CO_2e in the total carbon accounting area. Excluding the 4% calculated uncertainty factor and 22% buffer for reversal, the net *ex-ante* estimates of greenhouse gas (GHG) emission reductions would amount to 11 MT $C0_2e$ over a five (5) year period. This represents a mean emissions reduction of 14% compared to the net reference level associated with a mean deforestation of 90,844 ha/year and a mean rate of accumulation of new forests of 16,717 ha/year. Nicaragua is expected to transfer 11 MT CO_2e of these reductions to the Carbon Fund.

Emission reduction efforts will concentrate on the carbón accounting area composed of the Autonomous Regions of the North (RACCN) and South (RACCS) Caribbean Coast, as well as two highly biologically diverse reserves, the BOSAWAS Biosphere Reserve and the Indio Maíz Biological Reserve. All of this area has been mentioned as of high priority in Nicaragua´s National Human Development, given that it contains 54% of the national territory, 80% (3.16 million ha) of Nicaragua´s forestland, the majority of the nation´s indigenous populations, at the same time showing high poverty levels and accounting for the majority of the deforestation on the national level.

The ER Program is designed to combat the principal causes of deforestation (the expansion of the agricultural frontier driven by extensive crop and livestock management systems, which underlie institutional and productive barriers and weaknesses) by the implementation of a territorially based model of production-protection. This model is more intensive, more sustainable, more equitable, and less carbon-dependent.

Building upon the considerable socio-economic and legal achievements by Nicaragua in recent years, the model will combine in a synergetic manner forest conservation, silviculture, and sustainable agricultural production, as well as improvements in the underlying enabling productive and institutional/legal conditions, with the objective to reduce emissions, achieve a more sustainable land use, and improve food security and biodiversity conservation. At the same time, emphasis will be placed on the strengthening of family economies, the defense of nature, and adaptation to climate change, all based on inclusion, dialogue, partnerships, and consensus. In so doing, it is expected that the Program will have a positive impact on more than 3 million ha of the forest landscape and will benefit more than 1.1 million inhabitans in 26 municipalities and 23 indigenous and Afrodescendant territories found in the carbon accounting area.

The overall intervention strategy offers greater access to technical assistance, credit, markets, and investment from outside the region, to achieve more sustainable production systems that create incomes and employment while reducing emissions (community forests, reforestation, natural regeneration, agroforestry and silvopastoral systems based on an innovative trust agreement).

At the same time, it includes improved forestry governance, as well as incentives and control measures, such as great levels of local monitoring and the application of laws; early warning systems for deforestation; incentives base on deforestation avoidance results in the indigenous and Afro-descendant territories, with the objective to improve conservation, principally in the protected areas (PA) and the previously mentioned areas, in which most of the forests of the Caribbean Coast are found.

These actions relieve pressure on forests by promoting investments to create off-farm employment that can absorb marginal farmers. Furthermore, this mix of interventions results in almost complete geographic coverage of the carbon accounting area and lessens the possibility that unattended areas will continue to contribute to forest-based emissions.

Although improved enabling conditions may not directly produce emissions reductions, they do play a role in the proposed Program, since they determine the long-term success of the conservation or sustainable production measures by ensuring that economic development does not continue being the cause of greater deforestation. Fundamental conditions include the improvement of institutional resources and capacities, inter-institutional coordination, greater access to and use of information, and in particular, land-use monitoring, control and application of laws. On the other hand, the conditions that promote investment and public education/promotion/awareness will enable the sustainable production mechanisms proposed in this document.

The planned interventions will address the Environmental and Social Standards defined by the World Bank (ESS 1: Risk and Environmental and Social Impact Evaluation and Management; ESS 2: Work and Workplace Conditions; ESS 3: Resource Use Efficiency and Pollution Prevention and Management; ESS 4: Community Safety and Security; ESS 5: Land Acquisition, Land-Use Restrictions, and Involuntary Resettlement; ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources; ESS 7: Indigenous Peoples/Local Traditional Communities Historically Disregarded in Subsaharan Africa; ESS 8: Cultural Heritage; ESS 9: Financial Intermediaries; and, ESS 10: Participation of Interested Parties and Disclosure of Information), which have been confirmed to be reflected in the national legal framework. The fulfillment of the designed Environmental and Social Monitoring Framework (ESMF) will contribute to the avoidance or mitigation of negative impacts of the interventions and will help to highlight the non-carbon related benefits.

In the ESS items, dialogue and broad participation of the actors, consultations and communication channels are included, utilizing established structures during the preparation process, as well as during the activation of a mechanism of Feedback and Reception and Resolution of Complaints.

The design of a benefit-sharing mechanism is still in a very preliminary stage. The goal is to integrate benefits, economic as well as non-economic (for example, cultural, social and environmental), under a just, equitable, and transparent approach. It is considered that the distribution scheme for benefits and ecosystem services and the existence of an established

legal framework for the distribution of funds originating from natural resource use will have a significant contribution in this aspect.

In this context, land use and carbon rights are clearly understood, since carbon rights pertain to the forest owners, and 98% of the lands in the carbon accounting area are titled as communal or private property, as a result of recent efforts by the Nicaraguan government to title indigenous lands (these reach 31.4% of the national territory and 53% of the carbon accounting area). Legal rights and procedures for settling land and resource rights are also clear, but need to be applied more agilely.

The proposed total budget for the ER Program is US $57.3 million for seven years (2 preparatory years and 5 intervention years), of which US $ 52.8 million are for operation and implementation costs. The majority of the program costs are associated with the enabling conditions (US $ 8.86 million), direct incentives (US $ 13.97 million), investment promotion (US $ 4.81 million), and credit lines and guarantees for silvopastoral trusts (US $ 17.26 million).

Revenues include US $10.76 million from public funds (including US $ 662,000 from additional funds for Readiness), US $ 21.96 million in loans, US $ 1,911,800 from the CONAGAN trust, and US $ 8.61 million from grants. The loans will be utilized mainly to establish the silvopastoral trusts. The government is contemplating closing US $ 3.84 financial gap, using the Readiness resources of the Green Climate Fund, which are destined for Nicaragua (US $ 1 million per year).

General ER Program coordination will be shared among MARENA, MHCP, MEFFCA, INETER, INAFOR, MAG, SDCC, and the regional and territorial governments. Based on their mandates and past experience, MARENA will be responsible for REDD+ and overall ER Program implementation; MHCP for finance; MEFCCA for the on-the-ground implementation of rural development activities in the Caribbean region; INETER for forest cover and land use monitoring; INAFOR for administration and supervision; SDCC for the coordination between the central government and the regional governments of the Caribbean Coast for governance at those levels. These institutions are considered key to governance and coordination of the Program, given that they maintain a balance between national and regional interests and contribute to the necessary capacities for Program planning, coordination, and implementation.

In general, the ER Program generates positive net financial and economic returns (US $ 33.94 million) and economic (US $ 120.9 million, respectively) with financial and economic net present worth of US $ 31.52 million and US $ 33.94 million, respectively, despite the relatively low early returns (within 5 years) generated from tree-based production systems.

1. Entities Responsible for the Management and Implementation of the Proposed ER Program

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

Name of entity	Ministry of the Environment and Natural Resources (MARENA) (Ministerio del Ambiente y de los Recursos Naturales)
Type and description of organization	National Government Ministry
Main contact person	Maria Jose Corea Perez
Title	Minister of the Environment and Natural Resources (Ministra del Ambiente y de los Recursos Naturales)
Address	Km 12.5 carretera norte, frente al Centro Industrial Zona Franca. Managua, Nicaragua
Telephone	(+505) 22632862
Email	
Website	www.marena.gob.ni

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

Same entity as ER Program Entity identified in 1.1 above?	Yes
If no, please provide details of the organizations(s) that will be managing the proposed ER Program	
Name of organization	
Type and description of organization	
Organizational or contractual relation between the organization and the ER Program Entity identified in 1.1 above	
Main contact person	
Title	
Address	
Telephone	
Email	
Website	

1.3 Partner agencies and organizations involved in the ER Program

Name of partner	Contact name, telephone and email	Core capacity and role in the ER Program
Ministry of Finance and Public Credit (MHCP)	**Tabla 1** Iván Acosta Montalván, Minister Tel (+505) 22227061 E-mail: Ivan.acosta@mhcp.gob.ni	Responsible for national fiscal policy and economic representative of the government of Nicaragua before financial organizations.
Private Secretary of the Presidency for Public Policies (SPPP)	Paul Oquist Kelly, Minister	Advises the President with respect to public policies. Overseas the alignment of national policies, especially the National Human Development Plan, with international commitments and the ER Program.
Ministry of Agriculture (MAG)	**Tabla 2** Edward Francisco Centeno, Minister Tel (+505) 22751441 E-mail: ministro@magfor.gob.ni	Responsible for formulating, executing, monitoring and evaluating policies for the agricultural sector. Coordinates forestry development and ecological protection programs.
Ministry of the Economy of Families, Communities, Cooperatives and Associations (MEFFCA)	Justa del Rosario Pérez Acuña, Minister Tel. (+505) 22706083 jperez@economiafamiliar.gob.ni	Will contribute to Program implementation via rural and agricultural development projects, and services such as technical assistance to farmers and local governments, the organization of producers, and training.
National Forestry Institute (INAFOR)	Fanny Sumaya Castillo Director Tel (+505) 22330013 **Tabla 3** E-mail: frueda@inafor.gob.ni	In charge of implementing the country's forest development policy, generates reference levels for the sector and has a presence throughout the country.
Nicaraguan Institute of Territorial Studies (INETER)	Vladimir Gutiérrez, Director Tel (+505) 22492757 E-mail: vladimir.gutierrez@ds.ineter.gob.ni	In charge of research, inventory and assessment of the country's physical resources. Executes territorial management studies as well as

		those of the effects of natural phenomena. Regulates and carries out cartographic and geodesic work. Establishes rules for, regulates, updates and executes national land registry.
South Caribbean Coast Autonomous Government (RACCS)	Shaira Down Morgan, Coordinator Tel (505) 88281765 **Tabla 4** E-mail: Doth56@yahoo.com.mx Judy Delcy Abraham Omier, President, Autonomous Regional Council of the South Caribbean Coast	Representative of the different indigenous and Afrodescendant communities. Participates in the development, planning, implementation and monitoring of policies, plans and economic, social and cultural programs that affect the region. Administers planning and information related to the execution and monitoring of economic, social, and cultural policies, plans, and programs that affect the region.
North Caribbean Coast Autonomous Government (RACCN)	Carlos Alemán Cuningham, President, Board of Directors **Tabla 5** Tel (+505) 88515623 E-mail: carlosalemancuningham3@gmail .com Debony McDavis, President, Autonomous Regional Council of the North Caribbean Coast	Representative of the different indigenous and Afrodescendant communities. Participates in the development, planning, implementation and monitoring of policies, plans and economic, social and cultural programs that affect the region. Administers planning and information related to the execution and monitoring of economic, social, and cultural policies, plans, and programs that affect the region.
Territorial Governments	25 territorial governments, 18 in the RACCN, 5 in the RACCS, and 2 in upper Wangki and Bocay	Responsible for the political administration of the indigenous and Afrodescendant territories, including education, health, economy, and sports. Democratically elected by territorial assemblies.

Secretary for Development of the Caribbean Coast (SDCC)	José Leon Avilés Lazo General Director **Tabla 6** Tel (505)89394778 Email: chepe_leon@hotmail.com	Government body charged with coordinating the development of the Caribbean Regions and linking the national and regional governments.
Municipalities	25 municipalities,	Basic political-administrative units within the country. Responsible for socioeconomic and environmental development of the municipalities and their inhabitants.
Universities	URACCAN, BICU	Educational institutions in the region with the necessary technical capacity to generate inputs related to the monitoring of indicators

2. Strategic Context and Rationale for the ER Program

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

Background

Nicaragua´s participation in REDD+ began in 2008 when an R-PIN was formulated and submitted to the FCPF, which was subsequently approved in June, 2012 and signed in December, 2013. Readiness began in January, 2014, with a budget of $3.6 million[1]. These funds were used to: (i) establish the Project Implementation Unit (PIU); (ii) procure technical and technological equipment in the two autonomous regions of the Caribbean coast, the RACCN and RACCS; (iii) provide training for institutions involved in the ENDE-REDD+ Readiness process such as MAG, INETER, INAFOR, MHCP and the Secretary for Public Policy of the Presidency; and (iv) hold dialogue and consultations with indigenous and Afrodescendant peoples, local organizations, productive sectors and associations (i.e. cattle-ranchers and reforestation companies).

Nicaragua´s development of an ERPD proposal to the Carbon Fund of the FCPF has evolved in parallel with the REDD+ Readiness process and has received considerable support from the World Bank (see Annex 1 for more detailed information on World Bank missions in support of the ERPD). During this process, four important milestones have been achieved: the ER-PIN was endorsed in 2015; the "*Letter of Intent for the Readiness of a Program focused on the Reduction of Emissions by Deforestation and Environmental Degradation*" was signed in January, 2016; the Mid-Term Report (MTR) on Readiness was presented in Augus,t 2016; and PC approval for the request for $5 million of additional funds to complete the Readiness process was obtained in September, 2017[2]. Implementation of the additional funds is expected to begin in mid 2018 and will run for a period of 24 months.

Current Status of Readiness

The Readiness Program self-evaluation was carried out in February, 2017 and included the participation of 80 stakeholders, especially those of the Caribbean Coast Autonomous Regions and representatives of the Indigenous and Afrodescendant Territorial Governments in the Caribbean, Pacific, Central and Northern regions. According to the evaluation by participants in the five working groups, of the 34 progress indicators, 1 was below 20% compliance, 4 were between 21% and 50% compliance meaning that they need more development; 24 were scored between 51% and 80% compliance, indicating that they are

[1] http://enderedd.sinia.net.ni/index.php/2015-06-04-16-17-46/2015-06-04-16-19-34

[2] https://www.forestcarbonpartnership.org/sites/fcp/files/2017/Sep/Final%20Resolution%205%20Endorsement%20of%20Nicaragua%27s%20Readiness%20Package.pdf

well-advanced but need more development, and 5 showed considerable progress or completion (Table. 1).

Comparison of the results of the self-evaluation with the mid-term evaluation show that progress was made in the following areas: multi-sector collaboration; participation, consultation, and communication; plans to address rights to natural resources and land tenure; the identification of the implications of interventions for sectorial policies; the design of the implementation framework including the implementation of laws and regulations; guidelines for a mechanism for benefit sharing; the REDD+ registry and monitoring system; social and environmental impacts and safeguards including the implementation of SESA and the design of the ESMF; the formulation of reference levels; and almost all aspects of the forest monitoring and reporting system, including the identification of non-carbon benefits[3,4].

Table. 1 Comparison of the mid-term and self-evaluation of the Readiness process.

Component	Sub-component	Status
1. Readiness Organization and Consultation	1a. National REDD+ management mechanisms	
	1b. Consultations, participation and outreach	
2. REDD+ Strategy Preparation	2a. Assessment of land use, drivers of land use changes, forestry law, policy and management	
	2b. REDD+ Strategy options	
	2c. Implementation framework	
	2d. Social and environmental impacts	
3. Forest Reference Emission Levels		
4. Measuring, Reporting, and Verification	4a. National forest monitoring system	
	4b. Information system for multiple benefits, other impacts, governance, and safeguards	

Key: Little progress Some progress Significant progress, but actions pending More or lesscomplete

On the other hand, greater efforts are needed with regards to the system for stakeholder feedback and the redress of grievances, the implications of the Strategy on forestry and other sectorial laws and policies, a benefit sharing mechanism, further development of the reference level, and consolidation of the MRV system.

[3] Please see the following link for information on the Readiness package: http://forestcarbonpartnership.org/sites/fcp/files/2017/Aug/1.%20PaqueteR%20%28R-Package%29%20%28English%29.pdf

[4] For information on the Readiness grant, see: https://www.forestcarbonpartnership.org/sites/fcp/files/2017/Sep/GRM_Nicaragua_20170630_Progress%20Report_20170921.pdf

According to the independent expert review of the self-assessment process of Nicaragua´s R-Package[5], the R-Package exhibits a successful and positive government attitude and participation in the ENDE-REDD+ process. Other relevant findings are:

a The Readiness Process has enabled the Nicaraguan society to mature its vision of development based on consultation, discussion and critical analysis by several sectorial institutions.
b The ENDE-REDD+ Program has been included in the national policy on forests and climate change.
c The REDD+ Readiness process and progress at the national level is the result of a participatory process that has included stakeholders from the Caribbean Coast, the Pacific-Central-North (PCN) Region, and the national levels.
d Self-evaluation of the readiness process was carried out in a noticeably participatory manner.
e As a result, there is a better understanding among Nicaraguans of the scope and challenges of REDD+ in the indigenous territories, and among the authorities of the GTIs and the autonomous regions. During the REDD+ Readiness process organizational and institutional structures have been strengthened, both on the Caribbean Coast and in the Pacific-Central-North Region.
f An unquestionable inference is that the ENDE-REDD+ process has broadened the country´s vision of REDD+ to 2040, and has helped to formulate a roadmap for the implementation of effective actions to reach the goals defined and to reduce the rate of deforestation.

In addition, the international expert review of the R-Package included the following recommendations:

- Reforestation-afforestation, in order to be consistent and sustainable, should be made with a “purpose” either for the production of non-wood services, such as soil conservation or soil recuperation, water provision or non-wood products, or commercial timber for the production of saw logs, pulp logs or firewood through dendroenergy plantations.
- Efforts should be made to incorporate oil palm, livestock, and other industrial crops, entrepreneurs, or landowners in the program.
- There is a challenge and felt need to strengthen inter-sectorial coordination in order to tackle the problems of deforestation and forest degradation, which are rooted in many different sectors, as well as implementing multi-sectoral coordination.
- Greater efforts should be made to obtain greater participation, cohesion and effectiveness in communication and liaison between public and private actors interested in supporting the design and implementation of ENDE-REDD+ in the territories.

5 https://www.forestcarbonpartnership.org/sites/fcp/files/2017/Sep/Nicaragua%20TAP%20Expert%20Review%20092117.pdf

- There is a need to continue to develop a robust benefit sharing mechanism that will inform the benefit sharing plan for the sub-national emission reductions program.
- The Program should continue deepening the analysis of the applicable legal framework and policies to identify opportunities to improve policies and management.

Based on these evaluations, the Program identified the following Readiness needs and activities (Table. 2). These activities will also contribute directly or indirectly to the preparation for the implementation of the ERPD. These activities will be financed by the $5 million of additional Readiness funds requested from the FCPF.

Table. 2 Proposed use of the additional Readiness funds requested by the government of Nicaragua.

Component	Principal Activities	Amount ($)
1. Organization and consultation at the national and regional levels	Strengthen management, communication, and information management and use by MARENA, the regional governments, and the Secretary for Development of the Caribbean Coast (SDCC).	1,889,174
	Carry out further consultations with the Caribbean, Pacific-Central-North Region and with the private sector. Hold consultations on the feedback mechanism and benefits sharing.	
2. Further development of the national ENDE-REDD+ Strategy	Establish the groundwork and coordination for ERPD implementation at the national and regional levels.	754,900
	Carry out legal and econometric studies regarding barriers and interventions.	
	Consultations by the communications, safeguards, MRV, and coordination working groups.	
	Establish a climate and natural resource working group and strengthen the capacities of MHCP to coordinate and manage climate finance.	
3. Emission Reference Levels	Strengthen and deepen existing capacities of MRV and improve the reference level, including further analysis of forest degradation, development of Tier 2 emission factors for agriculture and land use change (AFOLU) and wetlands. Acquire software.	803,800
	Develop the Third Climate Change Communication.	
4. National Forest Monitoring System	Technical and technological strengthening of INETER and INFOR including: updating of the national forest inventory, development of forest traceability, development of an early warning system for deforestation, development of indicators and registries for non-carbon benefits and safeguards, and implementation of the National Forestry Program.	1,474,888
5, Monitoring and Evaluation System	Develop the framework and implementation of the REDD+ Supervision and Control System as well as multi-annual external audits.	77,238
TOTAL		**5,000,000**

2.2 Ambition and strategic rationale for the ER Program

The ER Program is the principal component of Nicaragua´s national ENDE-REDD+ framework, which is being implemented in a stepwise fashion. The overall goal of the ENDE-REDD+ Strategy is to reduce emissions due to deforestation and degradation by 50% by the year 2040; conserve and improve forest carbon stocks; and contribute to the protection of Mother Earth in the face of climate change. At the same time, the Strategy is expected to help improve the quality of life of the Nicaraguan people and the resilience of ecosystems to climate change, and increase the flow of funds to the environmental and forest sectors in order to enhance their national as well as international positioning and competitiveness.

Within that context, the ER Program is key to carrying out the Strategy. The ER Program incorporates all six strategic pillars, as well as various of the 37 strategic actions of the Strategy.

Likewise, it focuses on the geographic area of highest priority for the reduction of greenhouse gas emissions in Nicaragua, that is, the Caribbean Coast. The Caribbean Coast includes the Autonomous Region of the North Caribbean Coast (RACCN) and the Autonomous Region of the South Caribbean Coast (RACCS), the BOSAWAS Biosphere Reserve, located in the RACCN, as well as the Indio Maiz Biological Reserve in the RACCS. The two autonomous regions comprise 90% of the accounting area, while the remaining 10% is distributed in the municipalities of: San José de Bocay, El Cua, Wiwilí Nueva Segovia, Wiwilí Jinotega, El Castillo and San Juan de Nicaragua, found in the departments of Nueva Segovia, Jinotega, and the Rio San Juan.

The strategic importance of the Caribbean Coast for reducing deforestation and emissions, and therefore as the focal point of the ER Program, is evident. According to INETER, approximately 80% (3.16 million ha) of Nicaragua´s 3.94 million ha of forest are found in the accounting area (ENDE-REDD+, 2017). The area has also been a major source of deforestation, since it accounts for almost 65% (2.8 million ha) of the 4.32 million ha of forests lost at the national level between 1983 and 2015 (Table. 3).

With time, the importance of the Caribbean as a source of deforestation has increased as the deforestation front has advanced from the Pacific coast to the country’s Central Region and then to the Caribbean Coast. Being that the largest percentage of Nicaragua's forests are in the Caribbean, deforestation in the region represented half of the national deforestation between 1983 and 2000, 70% in the 2000-2005 period, 85% between 2005 and 2010, and almost 100% of national deforestation between 2010 and 2015 (Table. 3).

Table. 3 Forest cover and changes in forest cover in Nicaragua, 1983-2015.

Variable	1983	2000	2005	2010	2015
			National level		
Forest cover (ha)	8,255,861	5,449,384	4,545,859	4,049,257	3,938,669
Change in forest cover (ha)		-2,806,476	-903,525	-496,602	-110,588
Caribbean Coast					
Forest cover (ha)	6,013,844	4,552,479	3,913,874	3,491,224	3,188,867
Change in forest cover (ha)		-1,461,365	-638,605	-422,649	-302,357

Beside deforestation, the ER Program and its accounting area are also important from the perspectives of national goals and policies. The area contains 54% of the national territory and a large share of the national indigenous and Afrodescendant populations and has been singled out within the National Human Development Plan as a high priority area, due to the high poverty levels, vulnerable populations, and natural resource and forest wealth. The high biological value and richness of the BOSAWAS Biosphere Reserve in the RACCN and the Indio Maíz Biological Reserve in the RACCS have also been recognized internationally.

Apart from its overwhelming importance for reducing the effects of forest degradation, activities in the accounting area are also expected to contribute to regional and national objectives. At the regional level, the ER Program is aligned with the Strategy and Development Plan of the Caribbean Coast and will contribute to the process of updating both strategic instruments, whose main objectives are: i) to increase the socioeconomic wellbeing of the population; ii) achieve an equitable and sustainable transformation, in harmony with nature; and iii) strengthen the capacities of autonomous institutions in the Caribbean Coast to contribute to human development. The Program will also contribute to Nicaragua´s model of development for the Caribbean coast based on inclusion, the restitution of the rights of indigenous peoples and people of African descent, respect for the autonomy of the Caribbean Coast and the protection of the environment.

At the national level, the ER Program is aligned with the country's overall development strategy - the National Human Development Plan (PNDH) - and its goals related to poverty reduction, improved human development, and sustainable natural resources on the Caribbean Coast (PNDH 2012, paragraphs 283 and 284). It also contributes to one of the PNDH´s principal pillars, the Climate Change Adaptation and Mitigation Policy (PAMCC), especially the strategic guidelines related to climate change mitigation, adaptation and risk management, as well as to national policies and plans focusing on the environment and production, including the National Environmental and Climate Change Strategy (ENACC) and the Production, Consumption and Commerce System.

In addition, the ER Program will also contribute to Nicaragua´s compliance with its international commitments such as the Bonn Challenge, the 20 x 20 Initiative, and the Central American Regional Climate Change Agreement, as well as a host of international legal instruments and conventions ratified by Nicaragua and incorporated into its legal framework related to forests, biodiversity, climate change, desertification, indigenous people, and protection of the ozone layer.

As the centerpiece and initial implementation of the ENDE-REDD+, the ER Program represents a unique opportunity to strengthen the overall forest, conservation, and agricultural sectors in Nicaragua. It is expected that the enabling of the forest sector and increased sustainability of the agricultural sector will contribute to greater human and economic development, especially that of the indigenous and Afrodescendant inhabitants of these forests. At the same time, the experience gained during the ER Program is expected to have important positive impacts on other jurisdictions targeted by ENDE-REDD+.

In the forestry sector, forests cover about a quarter of the national territory, but contribute to less than 1% of the national economy (Nicaragua Central Bank, 2015). The ER Program is expected to improve forestry management via activities related to the implementation of the National Policy for Sustainable Forest Sector Development (Decree No. 69-2008), the National Forestry Development Fund (FONADEFO), the National Forestry Program (PNF), the National Reforestation Plan, the National Forest Fire Prevention and Control Plan, and the National Firewood and Charcoal Strategy (2011-2021).

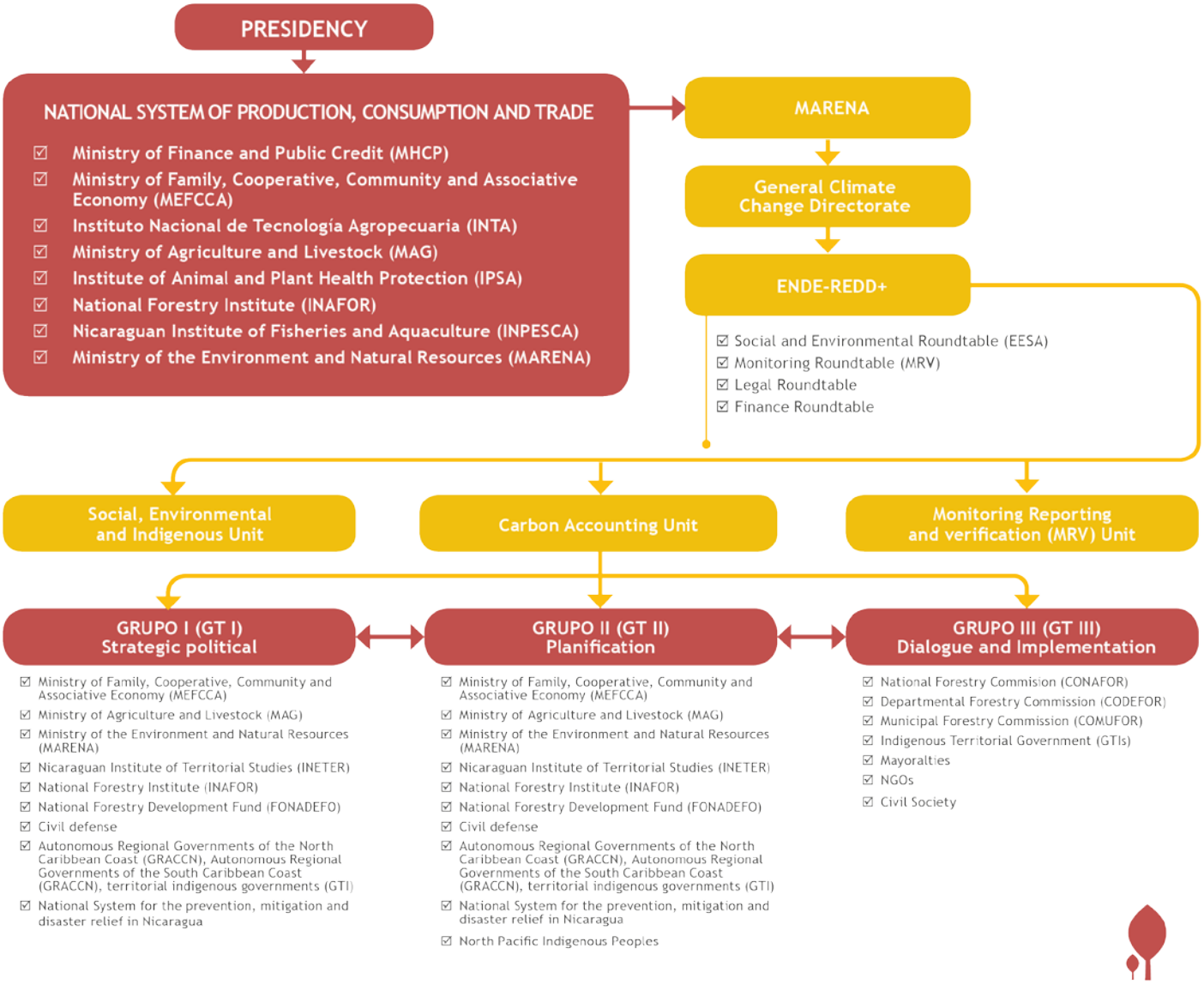
In the agricultural sector, the ER Program will contribute to the reduction of deforestation caused by extensive agricultural and livestock productions systems via its alignment with the implementation of the national policy and program on the reconversion of livestock ranching, and the promotion of sustainable and environmentally friendly farming systems that preserve forests, make rational use of water, reduce inputs, fertilizers and pesticides, and protect biodiversity (Plan for Production, Consumption and Commerce 2016-2017, Law of Ecological Agriculture). In addition, it will strengthen the institutions that e at promoting investments dedicated to productive and sustainable use of natural resources of the Caribbean Coast.

2.3 Political commitment

The global orientation of the ER Program stems fromthe National Human Development Plan (PNDH), which is based on consensus, dialogue and partnership. This orientation is reflected in production, consumption and trade policies in the accounting area. The political commitment to the PRE is aligned with and is derived from the Plan at the highest political level. The Program has the support of the National System of Production, Consumption and Trade, the Private Secretariat for Public Policies of the Presidency (SPPP) and the Secretary of Development of the Caribbean Coast (SDCC), all of which respond directly to the President of the Republic, as well as numerous ministries and various institutions, all of which have been active in setting policies and making high-level decisions in the ENDE-REDD

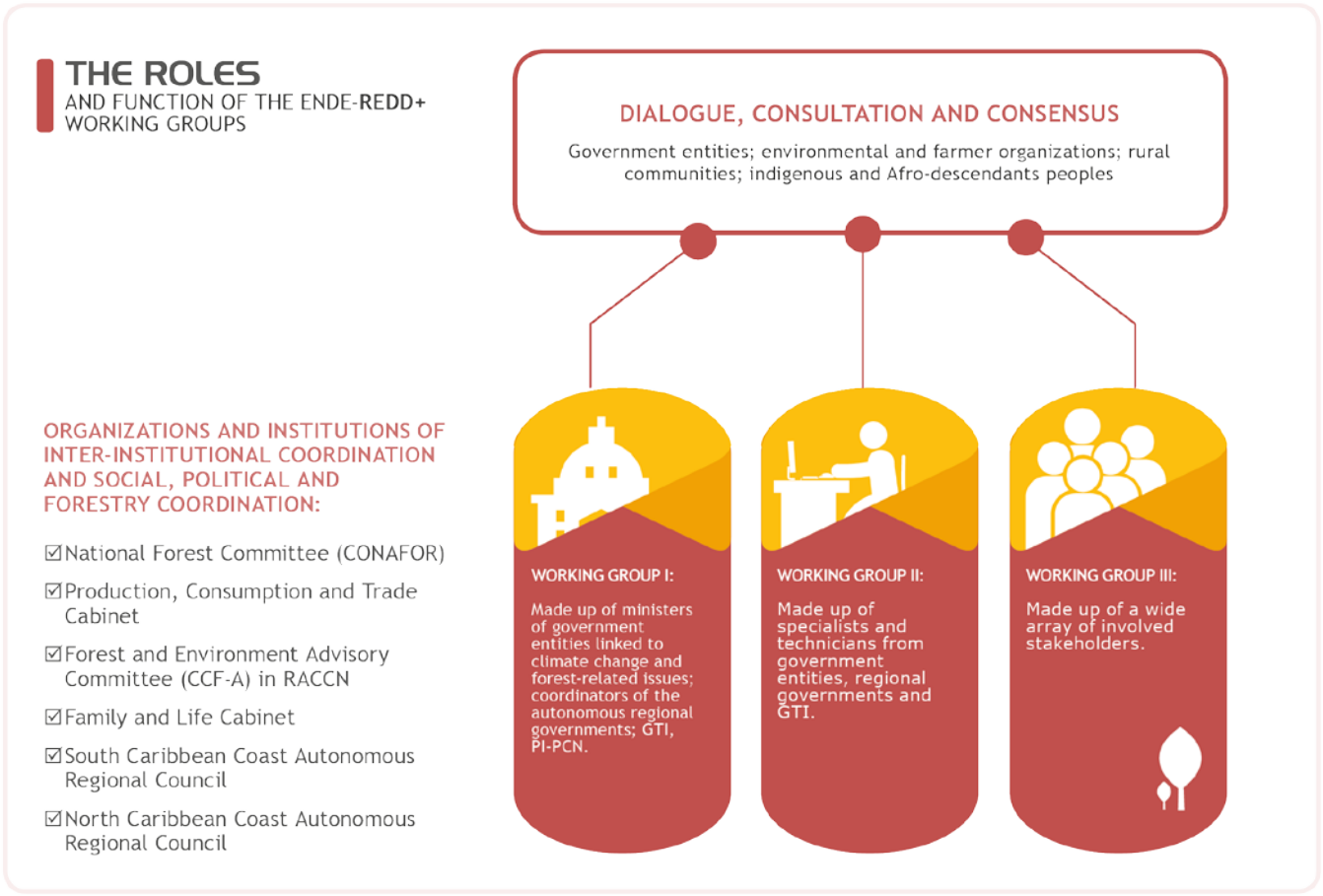
+ and the structures of the RE Program Working Group I (Figure. 1 and Figure. 2)-. In this context, the participation of the MHCP, the SPPP and the SDCC is particularly important for the strengthening of vertical and horizontal coordination and collaboration between the participating entities in Working Groups I and II of the ENDE-REDD+.

Figure. 1 Governance structure of ENDE-REDD+.



Besides the high level political support and coordination afforded by Working Group I, multi-sectorial and multi-level support at the national and regional levels is also assured by Working Groups II (Planning and Technical Support) and III (Grassroots Dialogue and Participation) that represent a broad cross-sectorial commitment by both public and private actors to the ER Program and REDD+ in general (Figure. 2).

Figure. 2 The roles and function of the ENDE-REDD+ Working Groups.



3. ER Program Location

3.1 Accounting Area of the ER Program

The accounting area includes the North Caribbean Coast Autonomous Region (RACCN) and the South Caribbean Coast Autonomous Region (RACCS), the Special Development Regime of the territories located in the upper Wangki and Bocay watershed, the BOSAWAS Biosphere Reserve in the north and Indio Maiz Biological Reserve in the south. The BOSAWAS Reserve lies within the RACCN and the departments of Jinotega and Nueva Segovia, while the Indio Maiz Reserve is found partly in the Rama y Kriol territory located in the RACCS and partly in the department of Rio San Juan. The two Autonomous Regions and the upper Wangki and Bocay watershed make up 49% of the national territory and 83% of the accounting area, while the two Reserves make up 10% of the national territory and 17% of the accounting areas.

The total carbon accounting area covers 26 municipalities: 12 in the RACCS, 8 in the RACCN, 4 in BOSAWAS (3 in Jinotega and 1 in Nueva Segovia) and 2 in the Indio-Maíz Reserve (Figure. 3 and Table. 4). It also includes 23 territories of indigenous and Afrodescendant peoples: 16 in the RACCN, 4 in the RACCS and 3 in Jinotega (Figure 4), as well as 23 protected areas (AP), including the BOSAWAS and Indian-Maíz Reserves. The carbon accounting areas are 98% titled: 53% is communal property and belongs to indigenous and Afrodescendant peoples (representing 31.4% of the national territory); 45% is private property and 2% is not titled. Protected areas (PA) include both private and communal lands[6].

The total carbon accounting area consists of 7,023,717 ha, of which 3,188,867 are covered by forests. The RACCN, the special development regime of Alto Wanki and Bocay, as well as BOSAWAS represent an area of 4,008,037 ha, of which 2,054,573 ha (51%) are forests, and the RACCS and the Indio-Maíz Reserve represent an area of 3,015,680 ha, of which 1,134,293 ha (37%) are forests.

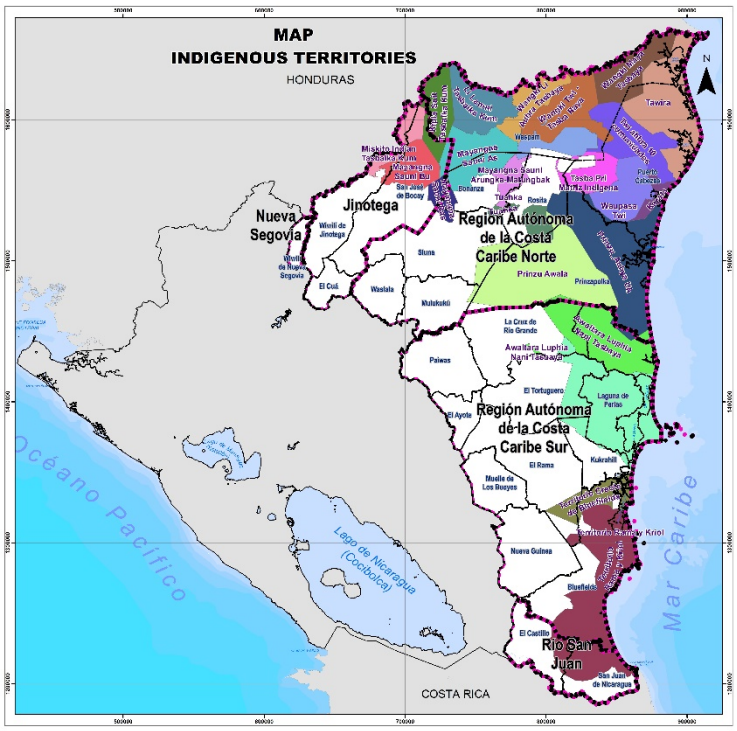
Table. 4 Characteristics of the accounting area in 2015.

Category	Total Area (ha)	Forests (ha)	Municipalities	Indigenous Territories	Population
RACCN + BOSAWAS	4,008,037	2,054,573	12	19	About half of the total
RACCS + Indio Maiz	3,015,680	1,134,293	14	4	About half of the total
Total	**7,023,717**	**3,188,867**	**26**	**23**	**1,107,342 (2013)**

[6] See Table 5, figure 27

Figure. 3 Political jurisdictions of accounting areas.

Figure. 4 Map of the indigenous and Afrodescendant territories within the accounting area.



3.2 Conditions in the Accounting Area

Biophysical Characteristics

The accounting area constitutes about 59% of Nicaragua´s national territory. Most of the accounting area is comprised of hot, humid tropical lowlands that include the coastal plains of the Caribbean and the lower portion of the Rio San Juan basin, but also the eastern spurs of the central highlands and an area of hills on the western edge of the Indio Maiz Reserve in the south. The low plains of the Caribbean Coast are 97 km wide in some areas.

The Caribbean lowlands receive between 2,500 and 5000 mm of rainfall annually. During the rainy season, eastern Nicaragua is subject to heavy flooding along the upper and middle reaches of all the major rivers. Near the coast, where river courses widen and river banks and natural levees are low, floodwaters spill over onto the floodplains until large sections of the lowlands become continuous sheets of water, damaging river bank agricultural plots.

The coast is also subject to destructive tropical storms and hurricanes, particularly from July through October. The high winds and floods, accompanying these storms often cause considerable destruction of property. In addition, heavy rains (called *papagayo* storms) accompanying the passage of a cold front or a low-pressure area may sweep from the north from November through March.

Soils are generally leached and infertile. Fertile soils are found only along the natural levees and narrow floodplains of the numerous rivers, including the Escondido, the Río Grande de Matagalpa, the Prinzapolka and the Coco rivers, and along the many lesser streams that rise in the central highlands and cross the region en route to the complex of shallow bays, lagoons, and salt marshes of the Caribbean coast. Soils are predominantly silt loams, but are sandier in the area around Prinzapolka.

Pine and palm savannas are found near the Honduran border and along the coast as far south as the Laguna de Perlas. Broadleaved tropical rain forests are characteristic from the Laguna de Perlas to the Río San Juan, in the interior west of the savannas, and along rivers through the savannas. This large rainforest region is drained by several large rivers and is sparsely populated. It has been exploited, but much natural diversity remains. This biome contains the greatest biodiversity in the country and is largely protected by the Indio Maiz Biological Reserve in the south (RACCS) and the BOSAWAS Biosphere Reserve in the north (RACCN).

At approximately 20,000 km² (2 million hectares) in size, the BOSAWAS Reserve (i.e. nucleus plus buffer zone) comprises about 15% of the nation's total land area making it the second largest rainforest in the western hemisphere, after the Amazon. BOSAWAS is largely unexplored, and is extremely rich in biodiversity, although deforestation in the buffer zone is significant. The Indio Maíz Biological Reserve measures about 4,500 square kilometers and is situated on the southeastern corner of Nicaragua bordering the San Juan River. It is the second largest expanse of lowland rainforest reserve in Nicaragua and is referred to as

"the gem of Central American nature reserves" by UCLA biologists. Indio Maíz is rich in biodiversity, and contains a higher number of tree, bird, and insect species than all of Europe. Taken together, these areas are home to some seventy ecosystems, thirteen of the nation's 21 most important watersheds, and close to one million inhabitants. The livelihoods of these residents depend upon the forest, and they are highly vulnerable to impacts driven by climate change.

Socioeconomic Characteristics

Nicaragua´s development is characterized by two different historical social, cultural, and economic processes that today shape the current reality of indigenous peoples in the country. In the Pacific-Central-North region of Nicaragua, Spanish conquest and colonization resulted in the near extermination and forced acculturation of the ancestral peoples. On the Caribbean Coast, however, indigenous peoples resisted the advance of Spanish colonization, and were joined during the colonial period by groups of Afrodescendants that today form part of the multiethnic and multicultural reality of the Caribbean coast.

The population of Nicaragua exceeds 6 million (2012), is young (more than half is under 24), urban (58%), and is growing at approximately 1% per year (2016). In the accounting area the population was estimated at 1,107,342 inhabitants (INIDE, 2013), with approximately 400,000 inhabitants in each of the Autonomous Regions of the Caribbean Coast. The rest is distributed in those parts of the BOSAWAS and Indio-Maíz Reserves that are found in 6 municipalities in the departments of Río San Juan, Jinotega and Nueva Segovia.

The Caribbean Coast is characterized by its multi-ethnic population represented by native and Afrodescendant peoples: Miskitos (120,817), Ramas (4,184), Mayangnas (9,756) and Ulwas. Other peoples include Afrodescendant Garifunas and Creoles. The population of the RACCS is mostly mestizo (81%), and Creole (8.5%); the population of the RACCN, on the other hand, is predominantly Miskito (72%) and mestizo (22%). The Caribbean Coast is therefore multicultural and multilingual, with Miskito, Creole and Spanish being the most widely used languages, while the Mayangna, Ulwa, Garífuna and Rama languages are used in smaller geographical areas.

Politically, in 1987 and in 2002, laws (Law 28 - Statute of Autonomy of the Caribbean Coast and Law 445 - Law of Communal Property of the Native Peoples and Ethnic Communities of the Autonomous Regions of the Caribbean Coast of Nicaragua and of the Bocay, Coco, Indio and Maíz Rivers) were passed regulating the autonomy of the Caribbean Coast, communal property and the administration of natural resources (see Section 4.5) Law 445 assigns responsibility for the titling and demarcation of indigenous and Afro-descendent communities to the State and strengthens the exercise of rights of use, enjoyment and enjoyment of natural resources included in the territories of the original peoples as well as the traditional forms of self-government.

In 2003, the regulations of Law 28 were approved, which deepened the process of regionalization by enabling the autonomy of the public administration and recognizing the rights of the Caribbean peoples. Between 2007 and 2016, the GRUN has demarcated and titled the 23 territories of the indigenous and Afrodescendant peoples, which together comprise 31.4% of the national territory.

Within this framework, the territorial administration of the accounting area of the ER Program is divided into two Autonomous Regions and a Special Development Zone, divided into municipalities, territories and communities of indigenous and Afrodescendant peoples. These last two divisions - municipal and territorial governments - present physical-geographic and administrative overlaps (see section 4.4).

Nicaragua's economy is characterized by employment growth, price stability, fiscal sustainability and a healthy financial system with a good credit rating. The year 2016 was the sixth consecutive year of robust economic growth, based on the service sectors, mainly commerce, financial intermediation, public administration and defense, followed by agriculture and manufacturing. Between 2011 and 2015, GDP grew at an average annual rate of 5.2% as a result of a good business climate enabling constant growth of exports and foreign direct investment, thanks to the opening of the private sector, as well as alliances between the government and businesses and workers that has been decisive in maintaining social and national stability and fighting poverty.

While it is true that both poverty and extreme poverty have been halved since 2005, Nicaragua is the second poorest country in the Western Hemisphere, and the RACCS, RACCN and Río San Juan department have the lowest human development indices (0.50-0.55) of Nicaragua.

In the accounting area, the main economic activities are subsistence agriculture, livestock, coffee, cocoa, African palm, bamboo and fishing (including shrimp and lobster), logging, tourism and mining. Bluefields is the main economic center and port of the RACCS, while Siuna, Rosita and Bonanza, known as "the mining triangle", as well as Bilwi (Puerto Cabezas), are important cities of the RAACN. Bonanza still has an active gold mine, but those of Siuna and Rosita no longer operate. However, gold washing is still very common in the region. In relative terms, logging is more important in the RACCN than in the RACCS, and the extraction of resin and other products is important in the northern pine forests of the RACCN.

4. Description of Actions and Interventions to be Implemented Under the Proposed ER Program

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

This section discusses deforestation tendencies and the direct and indirect drivers of deforestation and is largely based on recent information and analyses performed subsequent to the submission of the ER-PIN and incorporates responses to comments by the TAP and donors.

Deforestation Tendencies

In 2015, standing forests covered 2.05 million ha in the RACCN and 1.13 million ha in the RACCS and are mostly broadleafs and found in indigenous and Afrodescendant (I&A) territories (Table. 5). Current forest cover has been reduced by half from historical levels as the agricultural frontier has advanced in an eastward direction from central Nicaragua towards the Caribbean coast (Figure 5 and Annex 2).

The annual deforestation rate in the accounting area between 2005 and 2015 is 90,854 ha/yr (see also Section 8, (Figure. 6)[7], equivalent to emissions of 14.17 Mt CO2e/yr. Additionally, anthropic forest degradatation is about 16% of total emissions and contributes on average 2.43 Mt CO2e/yr (see Section 8).

An annual average deforestation rate of 16,667 ha/yr in the BOSAWAS Biosphere Reserve contributed to about 40% of the deforestation in the north and 7,640 ha deforested yearly in the Indio Maiz Biological Reserve contributed to about a quarter of the deforestation in the south. In both Reserves, the majority of the deforestation occurred in buffer zones. In Indio Maiz, the deforestation rate in the buffer zone was about 7,100 ha/yr (a relative annual rate of 5.99%), compared to about 500 ha/yr (a relative rate of 0.17%) in the nucleus of the Reserve. In the case of BOSAWAS, deforestation in the nucleus of the Reserve averaged about 4,671 ha/yr (0.87% annually), but was much greater in the buffer zone, about 11,990 ha/yr (2.88% annually).

[7] This discussion is based on non-adjusted estimates derived from land cover maps. The numbers thus differ slightly from the adjusted estimates for deforestation for the period 2005-2015 based on the sampling of 1309 points (see Sections 7-9).

Figure. 5 Advances in the agricultural frontier and deforestation, 1983-2010.

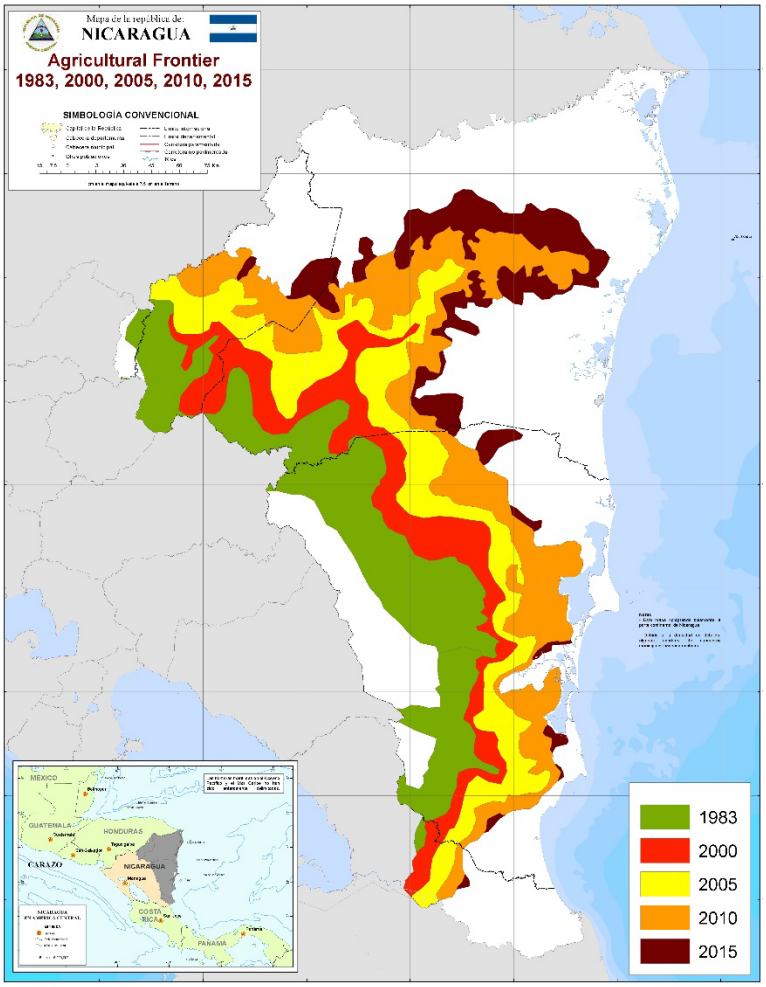


Figure. 6 Loss of forest cover in the Autonomous Regions, 1983 - 2015.

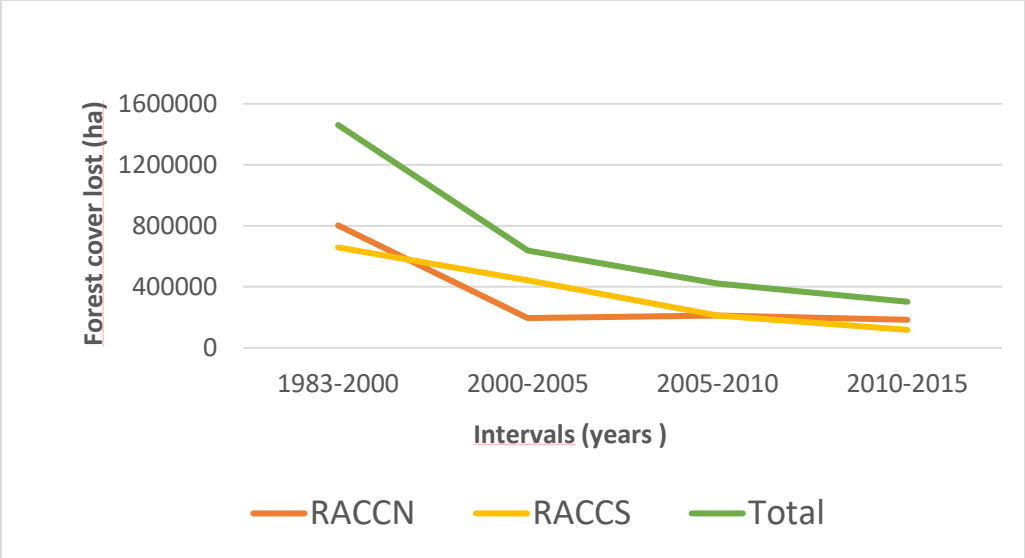


Table. 5 Characteristics of forest cover and loss in the accounting area, 2005 – 2015.

Use	Forest cover in 2015 (ha)	Average annual deforestation rate (%) 2005 - 2015	Average annual forest loss (ha/yr) 2005 - 2015[8]	Estimated emissions (Mt CO_2e/yr)
Land tenure				
I&A territories within PAs	1 056 235	1.07	12 729	2.4
I&A territories outside PAs	1 260 892	1.61	24 300	4.5
Private property within PAs	353 304	2.26	10 345	1.9
Private property outside PAs	518 435	3.26	25 126	4.7
Total	**3,188,866**	**2.11**	**72,500**	**13.5**
Forest type (adjusted values)				
Conifers	175,604	0.40	1,547	0.1
Broadleaf	1,989,098	2.29	73,109	13.7
Total	**3,158,868**		**74,656**	**13.8**
Fate of forests lost				
Principal fates of cleared forests (in communal and private property)	**Forest loss, 2005-2015 (ha)**	**Average annual deforestation rate (%) 2005 - 2015**	**Average annual net loss (ha/yr) 2005 - 2015**	**Estimated emissions (Mt CO_2e/yr)**
Pastures	522,133	1.52	52,213	10.8
Annual crops	86,825	0.25	8,682	1.8
Perennial crops	20,847	0.06	2,085	0.4

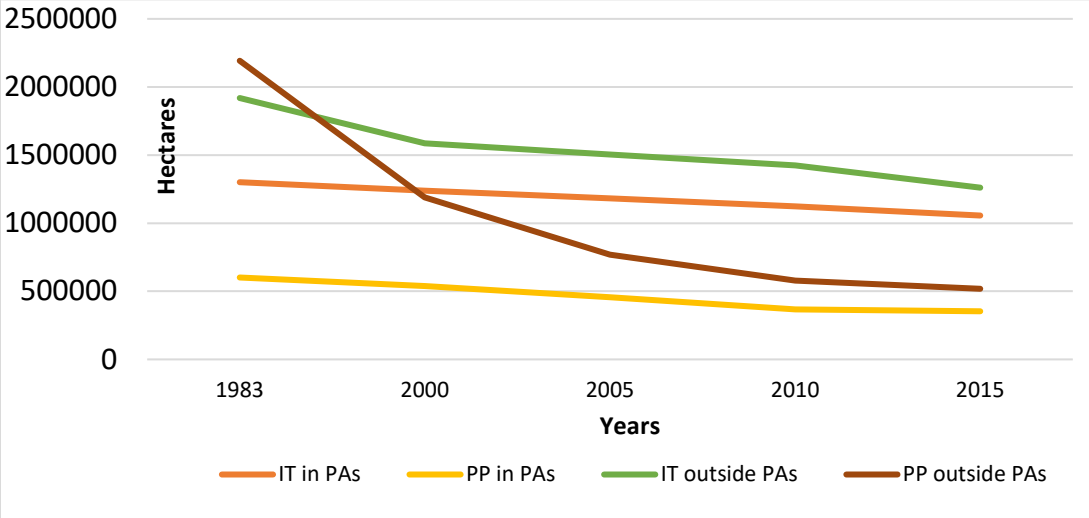
Most forest loss is associated with broadleaf forests rather than coniferous forests (Table. 5). Figure 7 suggests that forests historically found in private property outside protected areas (PAs) have been more deforested (solid blue line in Figure. 7, than forests found in indigenous and Afrodescendant communal territory (IT) inside (dashed grey line) or outside (dashed blue line) the PAs, or on private property (PP) within the PAs (solid grey line). During 2005 – 2015, annual deforestation rates in private and communal property were similar whether within PAs or outside of PAs, but rates within PAs were about half of those found outside of PAs, presumably due to greater control associated with PAs (Table. 5).

Table. 5 also underscores the importance of indigenous and Afrodescendant territories and PAs as forest reservoirs, since they contain about 85% of the forests (2.67 million ha

[8] The quantity of forests in 2005 was 3,421,985 ha, based on maps of forest cover.

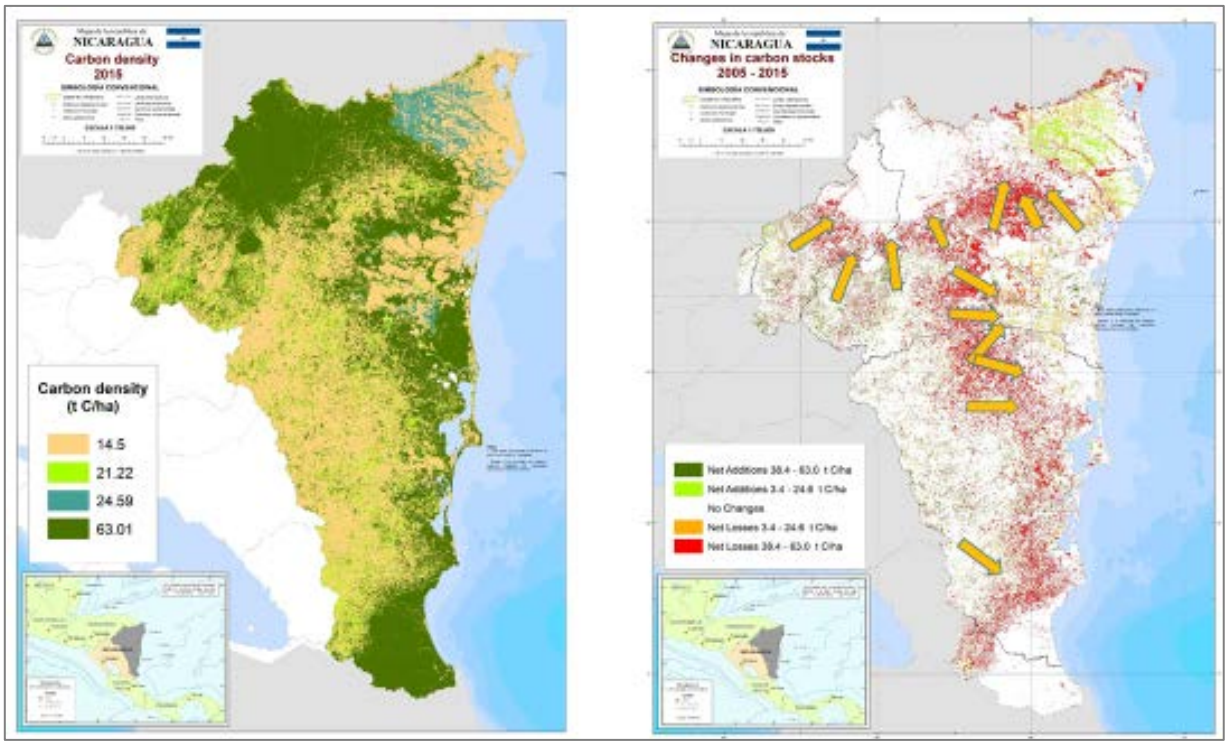
compared to 0.52 million ha found on private property outside of PAs) still found on the Caribbean Coast.

Figure. 7 Forest cover by land tenure category, 1983 al 2015.



At a more local level, recent deforestation is located in 6 areas or fronts where the risk of future carbon loss is high, due to the proximity of recent deforestation to areas of high carbon density with road access (Figure. 8). Consequently, these areas merit greater attention and concern. Four are found in the RACCN and two in the RACCS and are located on the margins of the territories of indigenous and Afrodescendant peoples and PAs. In the RACCS, deforestation is advancing towards the Indio-Maíz Reserve, especially towards the northern and western limits of the Reserve, and between the municipalities of La Cruz de Río Grande and Laguna de Perlas (Wawashan and Karawala). In the RACCN, the south-west (Jinotega) and south-east (Mining Triangle area) boundaries of the BOSAWAS Reserve, the road to Bilwi, and the forest ring in the Prinzapolka sector, are most affected.

Figure. 8 Carbon density in 2015 and changes in carbon density 2005-2015 (arrows indicate access routes).



Forest Degradation

Losses of forest biomass associated with forest degradation within 1 km of roads and rivers (assumed to be anthropic degradation) accounts for about 16% (an average of 2.4 Mt C/yr) of total annual emissions (see Section 7).

The principal candidate causes of degradation are firewood harvests, legal and illegal logging, and fires. In relation to logging, limited data from INAFOR suggests that the amount of legal timber transported to sawmills in 2013 was 77,000 m^3. Assuming that actual legal extraction levels are four times greater (the Production, Consumption, and Commerce cabinet plans about 278,000 m3 of timber production in 2017-2018[9]) and that illegal logging is similar to legal extraction[10], implies that legal and illegal logging are responsible for the extraction of about 0.6 million m^3 of wood/yr, equivalent to about 0.17 Mt C annually (less than 20% of estimated anthropic degradation).

Historically, firewood and charcoal produced from biomass have been the principal energy sources used in Nicaragua, but in recent years their importance has declined. According to the 2006-2007 National Firewood Survey, average firewood consumption is 1.81

[9] http://www.inta.gob.ni/index.php/noticias/485-presentan-plan-de-produccion-consumo-y-comercio-2017-2018
[10] Studies carried out in 2000 and 2003 indicate that illegal logging is equivalent to 60% of the timber volumes authorized and registered by INAFOR. However, other, more recent studies by the World Bank indicate that illegal logging is in the range of 150,000 – 200,000 m^3/yr).

kg/person/day (ENI, 2006-2007). If the population of the Caribbean Coast is 1,107,342 inhabitants (INIDE, http://www.unfpa.org.ni/wp-ontent/uploads/2013/02/Proyeccion-cPoblacion-Nic-2007.pdf), firewood consumption is estimated to produce about 0.34 Mt C emissions annually. However, it should be noted that 70% of the firewood come from branches, dead wood, or fallows, whereas only 9% (equivalent to 0.03 Mt C) comes from tree felling or pruning associated with forest loss.

The extent of fires is very variable from year to year. The national median value is about 20,000 ha/yr (MARENA, 2016), of which it is estimated that about 20% occurs in the Caribbean region, due to moist conditions in the region, and that fires consume 50% of the biomass. Therefore, fires are estimated to contribute about 0.13 Mt C/yr, which may be an overestimate, due to the difficulty in distinguishing between fires in forests and fires used to clear forest for agriculture (which is deforestation, not degradation).

The sum of these potential contributions to forest degradation only account for about one-to two-thirds of the estimated emissions based on biomass estimations. It is suspected that this difference is due to the sub-estimation of illegal logging. Clearly, more work is needed in order to estimate forest degradation more accurately (see section 8).

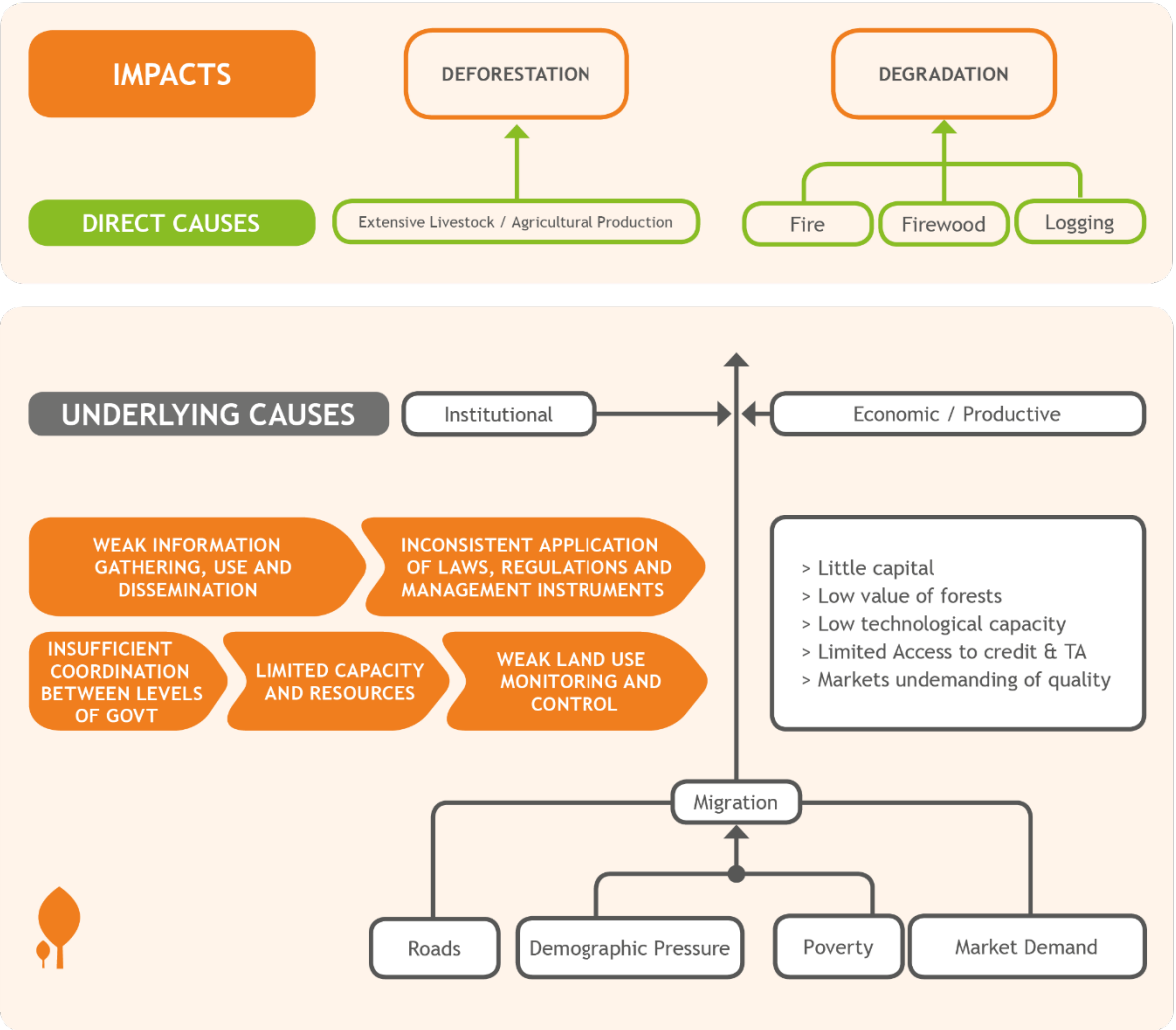
Carbon Enhancement

Increases of carbon stocks are estimated to occur on 16,717 ha/yr, resulting in average removals by new forests of 0.97 Mt CO_2e annually. The large majority of these carbon removals are associated with the transition of fallows (*tacotales)* to new secondary forests.

Causes of Deforestation and Forest Degradation

The causes of deforestation can be divided into direct and underlying causes, as shown by the problem tree in Figure. 9.

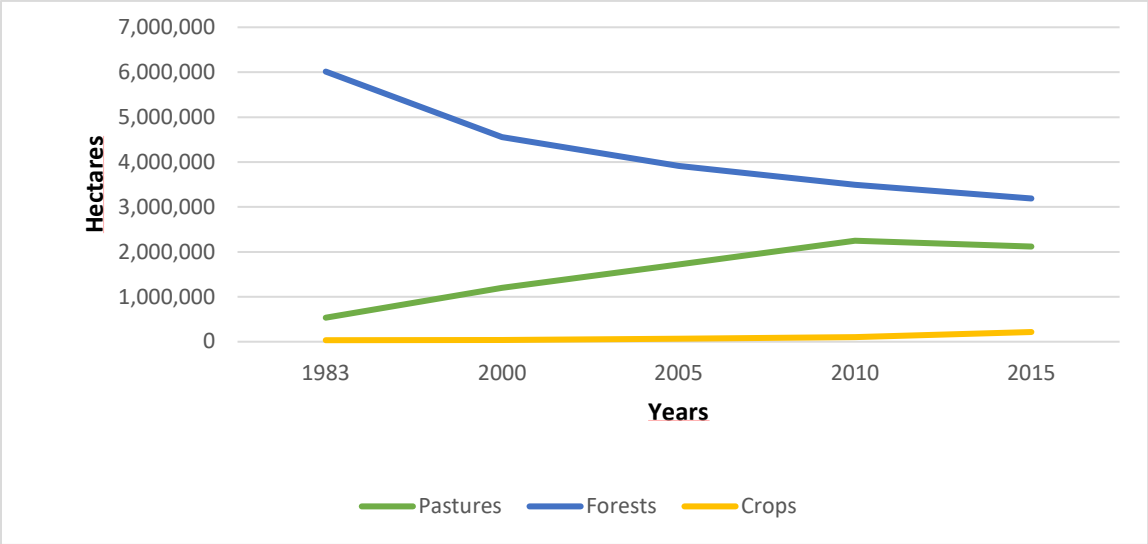
Figure. 9 Problem tree for deforestation and forest degradation.



Direct Causes

The main direct cause of deforestation is extensive livestock and agricultural production associated with the expansion of the agricultural frontier. In general, the expansion of extensive livestock and agriculture on the Caribbean coast of Nicaragua mirrors the loss of forest cover (Figure. 10) - between 1983 and 2015, 2.2 million ha of forest were lost while 1.6 million ha of pastures and approximately 200,000 ha of crops were established. However, in the period between 2010 and 2015, this relationship weakened: the total net area of pastures decreased by 147,000 ha (Figure. 10), due to the creation of approximately 275,000 ha of new pastures from forests, but the concomitant conversion of some 420,000 ha of pastures to other uses, mainly secondary vegetation ("tacotales") (about 345,000 ha) and perennial crops (about 35,000 ha). This suggests recent trends toward intensification of livestock raising and/or a shift towards more productive land uses.

Figure. 10 Area of pastures, crops and forest in the Caribbean Coast, 1983-2015.



Underlying Causes

Extensive land use associated with the expansion of the agricultural frontier is underlain by various factors including migrations to the Caribbean from the Pacific and North-Central regions of Nicaragua, and within the Caribbean region itself, resulting from demographic pressure stemming from annual population growth of 1.4%, poverty, the availability of relatively cheap land in the Caribbean Coast, and road connections to and within the Caribbean Coast. It has also been promoted by favorable internal and external markets for milk, meat, and perennial crop commodities such as oil palm, cocoa, and coffee (BNC, 2015; TechnoServe, 2017)[11].

In effect, high land prices and decreasing land availability in the Pacific and North-Central regions of Nicaragua, driven by increases in population and high value export-oriented agriculture, provide incentives to poor farmers there to sell their land at relatively high prices and to migrate to the Caribbean coast, where land is cheaper (Polvorosa, 2015). Once there, favorable markets for livestock products provide incentives for the establishment of livestock or mixed agricultural (livestock and crops) operations or land speculation based on pastures.

Within this context, seven public investment projects aimed at road construction or improvement in the Caribbean coast may affect future emissions. These projects are aimed at the construction of all-weather roads in order to connect the Caribbean coast with the country´s principal political and commercial centers and involve the i) Laguna de Perlas, ii) Kukrahill, iii) Siuna, iv) Mulukuku, v) El Cua, vi) Bluefields, vii) Rosita, and viii) Nueva Guinea municipalities. Greater inter-institutional coordination and the avoidance, mitigation, or

[11] TechnoServe (2016). Building a Competitive and Inclusive Livestock Sector in Nicaragua USDA. Managua.

compensation of environmental impacts of roads will be needed in order to potentiate the economic impact of these projects while minimizing those on forests.

Within the Caribbean, deforestation driven by these macro socio-economic factors is the result of a) the low value or opportunity cost of forests, stemming from inefficient forest production systems, the low profitability of forest products, and the lack of national or international markets for forest ecosystem services, which provide incentives for forest conversion to other, more economically profitable uses; b) underlying economic/productive conditions that encourage extensive land use and create a comparative advantage for Nicaraguan farmers who produce low cost meat, milk, and other crops based on deforestation; c) limited institutional capacity to monitor and control land and forest use, which is necessary to prevent forest degradation or the conversion of forests to agriculture in the face of land use pressure; and d) limited employment opportunities off-farm that could absorb marginal farmers and reduce the pressure on forests.

These factors interact to cause deforestation and forest degradation. How these factor play out in the context of livestock and crops is further explained below.

Extensive Pasture and Livestock Management

During recent decades, the Caribbean coast has become the most important livestock producing region in the country. In 2010, the livestock sector in the accounting area at that time accounted for about a quarter of the livestock producers, 30% of the livestock farms, and 40-50% of the total pasture area, as well as livestock populations, at the national level (CENAGRO, 2011). At present, these proportions may be even higher, since livestock production has shifted towards the Caribbean coast in recent years due to favorable growing conditions year-round for pastures and the availability of relatively cheap land (CONAGAN, personal communication; survey of BCN, 2015).

Within the accounting area, the RACCS has more than twice the pasture area and head of cattle and about 50% more livestock farms than the RACCN (CENAGRO, 2011). Average farm size in the RACCS is 60 ha compared to 35 ha in the RACCN. In general, the greatest proportion (21%) of livestock are found on farms 35 – 70 ha in size (.

Table. 6); only 7% of the farms are larger than 70 ha in size, but the latter account for 62% of the pasture land and half of the cattle population.

Figure. 11 Bovine herd map (# of head).

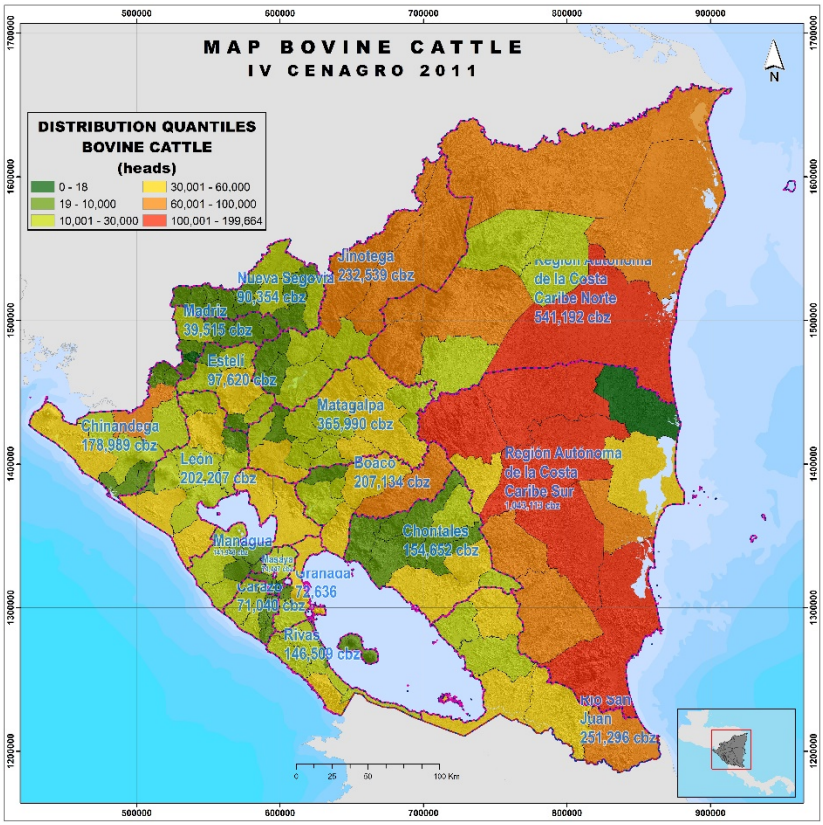


Table. 6 Characterization of the livestock sector in the accounting area (CENAGRO, 2011).

Departament/Region	# of Farms	# Farms with Cattle	# Head	# Head/Farm	% of Total Herd Size
Alto Wangki (Jinotega and Nueva Segovia)	16256	7578	126721	16.72	7.22%
RACCN	20541	13740	466263	33.93	26.55%
RACCS	22704	19183	1128028	58.80	64.23%
Río San Juan	2233	1719	35268	20.52	2.01%
Total	**61734**	**42220**	**1756280**	**41.60**	**100.00%**

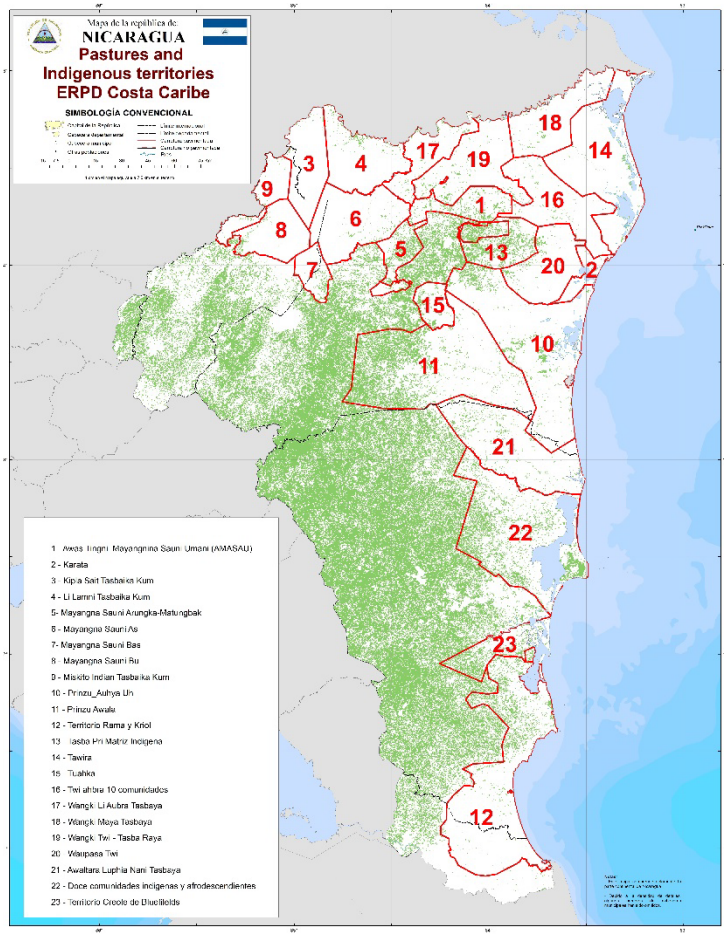
In 2010, the RACCS had about 1.1 million head of cattle, located principally in the municipality of Paiwas (23% of the herd), followed by the municipalities of El Rama (19%), Nueva Guinea (18%), and Muelle Los Bueyes (13%) (Figure. 11) The RACCN had about 460,000 head of cattle distributed mainly in the municipality of Prinzapolka (30%), 15% in each of the Puerto Cabezas, Waslala and Waspan municipalities and 13% in Siuna. In the zone of Bosawas, the municipality of San José de Bocay had 94,763 head, Wiwilí of Jinotega 63,536 head, and El Cuá had 22,436 head. Finally, in the zone of the Indio-Maíz Reserve,

there were 47,239 head of cattle in the municipality of El Castillo and 91,537 head in de San Juan de Nicaragua municipality (CENAGRO, 2011).

Most of the pastures (1,734,636 ha or 82% of the total) in the accounting area are found on private properties (Figure 12) and are managed mainly by individual mestizo producers. In contrast, the area of pastures in the territories of indigenous and Afrodescendant peoples (see polygons numbered in Figure. 12) is much smaller (365,739 ha of pasture equivalent to 18% of the total pasture area in the accounting area). These pastures are mainly found near colonized areas (e.g. the Mining Triangle and polygons #1, 6, 8, and 16 in Figure. 12).

There is evidence that suggests that pastures are associated with the advancement of the agricultural frontier in some indigenous and Afrodescendant territories, in some cases contributing to tensions between community groups and settlers from the outside. In some communal lands, the establishment or use of pastures by members from outside the community has been allowed in order to obtain land rents, but indigenous peoples themselves also establish pastures in response to the growing demographic and economic pressure. In other cases, outsiders have settled in indigenous territories without the consent of the communal owners.

Figure. 12 Pastures (green) in the accounting area, 2015. Numbered polygons represent indigenous and Afrodescendant territories.



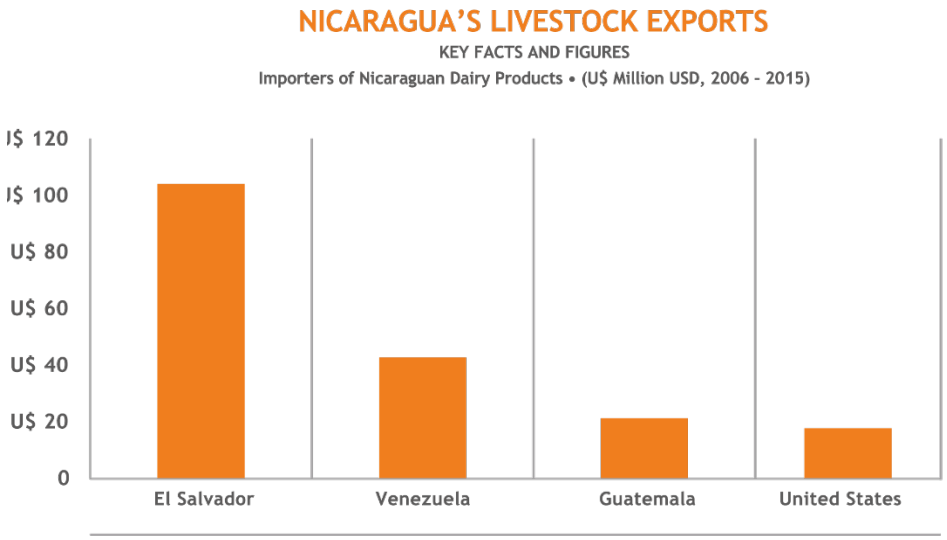
Favorable market conditions created by free trade agreements with Central American countries, Venezuela, and the US have stimulated livestock expansion. Between 2000 - 2009, the national livestock sector grew at a 5% annual rate, and between 2006 and 2015 the export value of livestock products increased 176% (Figure. 13, TechnoServe, 2017). Presently, beef and dairy products are among the top four exports in terms of value. In 2015, Nicaragua exported over 222,000 metric tons of livestock and dairy products, valued at nearly US$700 million, which represents almost 10% of GNP and contributes more than 25% of the total value of exports.

The value of livestock exports is contributed mainly by beef, 76% of which is exported. Dairy products contribute about 30% to livestock sector exports (principally to Central America, especially El Salvador), but it should be noted that most (85%)[12] milk is consumed

[12] Fuente: MIFIC, FMI, Trade Nosis, CETREX, AO; citados por PROGRESA, CRS USDA, 2014. Riesgos y oportunidades del sector de ganadería del doble propósito en Nicaragua.

domestically, since milk and cheese comprise 27% of the shopping basket of Nicaraguan families.

Figure. 13 Livestock sector exports.



Value of Livestock and Dairy Exports

(U$ Million USD, 2006 - 2015)

	2006	2015	Crecimiento
Ganadería	U$ 190.6	U$ 494.3	159%
Leche y productos lácteos	U$ 62.5	U$ 203.5	226%
Total	U$ 253.1	U$ 697.8	176%

The majority of livestock production occurs via double purpose systems (beef and milk production). Small producers tend to favor milk production which accounts for about 55% of their livestock-related income. The importance of beef as a source of income increases with farm size to a maximum contribution of about 60% of total income.

Livestock production gives rise to three parallel value chains, one based on beef and two based on milk (TechnoServe, 2017):

Informal Dairy Value Chain: The highly competitive market for locally processed cheeses comprises about 75% of Nicaragua's total dairy market and has low profit margins and low quality standards. In this chain, small farmers either process the milk they produce directly on farm or sell it to small-scale local processors, who mainly produce simple, un-aged cheeses. This is a risk management strategy (rather than a value adding activity) because producing cheese preserves unrefrigerated milk. The final product is consumed locally and about half is exported by intermediaries to other Central American countries.

Formal Dairy Value Chain: Approximately 25% of Nicaragua's dairy production passes through the formal value chain. In this chain, farmers sell milk to a cooperative or individual

business collection centers that aggregate dairy products to either make cheese or yogurt or to collect and chill milk for sale to large industry. Cooperatives that aggregate chilled milk pay higher prices than those that make cheese, although they also enforce higher quality standards. The milk, cheese, and yogurt in the formal cold chain are sold to national and regional consumers through formal marketing channels.

Beef Value Chain: Farmers typically sell weaned calves either to another farmer that develops or fattens the calf or to an intermediary who aggregates and sells cattle to other farmers or to industrial feedlots and slaughterhouses. After slaughter, beef and other byproducts are sold into national and international markets. In 2015, Nicaragua sacrificed more than 677,000 head of cattle, of which 83% were processed principally for export by the 5 principal slaughterhouses. Seven slaughterhouses are projected - 5 in Managua, 1 in Boaco, and 1 in El Rama in the RACCS. In recent years, the beef value chain has begun to incorporate more intensive on-farm cattle development and the use of feedlots. According to CANICARNE, the five principal feedlots are processing 180,000 head/yr.

Sector participants include: i) public sector institutions such as MAG, MIFIC, MINSA, MARENA, MEFCCA, DGPSA, INTA, MHCP and BFP; (ii) private sector organizations such as CANICARNE, CONAGAN, FAGANIC, UNAG, and UPANIC; (iii) industrial slaughterhouses such as NUEVO CARNIC, SAN MARTIN, NOVATERRA, CONDEGA y MACESA; and (iv) municipal and rural meat processors.

According to TechnoServe (2017) and IICA (2014), the Nicaraguan livestock production chains supplying these markets is characterized by low investment, low input use, low cost, and a low quality production model based on the substitution of natural capital for inputs (Figure 14). Although the model requires little capital, it is characterized by practices such as the use of low quality pastures, inadequate pasture rotation, low stocking rates (the production density of about 1 head of cattle per hectare in the accounting area is the lowest in the region), and low use of technology. As a result, these systems produce low yields and relatively stable, but low incomes, with low levels of risk (Lopez, 2012; IICA, 2014; TechnoServe 2016).

Figure. 14 The process of deforestation on the agricultural frontier of Nicaragua (Polvorosa y Bastiaensen, 2016).

This model is a response to low capitalization and investment capacity of farmers, difficult access to credit, low technological capacity of farmers, and low-priced local and international markets (e.g. markets for dairy products in El Salvador and Honduras) that place little value on product quality or production methods (Lopez, 2012; IICA, 2014)[13, 14] (Also see Annex 3 for more detailed information on the livestock sector). Small farmers are reluctant to invest in inputs (such as forage and mineral salts) and infrastructure (such as fencing and water systems) to intensify production because they lack capital or knowledge of these technologies and are able to achieve substantial output by using the natural capital of their relatively large land holdings. Large livestock producers are less limited by capital, but also prefer to expand production through increases in farm size instead of farm intensification.

Apart from production objectives, forest conversion to pasture is also used by the poorest settlers to increase their capitalization. These settlers, unable to even invest in animals, clear forest and establish pasture for direct lease or under shared production arrangements with larger and better capitalized cattle-ranchers. Others engage in land speculation,

[13] Lopez, M. (2012). Análisis de las causas de la deforestación y avance de la Frontera Agrícola en las zonas de Amortiguamiento y Zona Núcleo de la Reserva de Biósfera de BOSAWAS-RAAN. GIZ- OSFAM Managua.
[14] IICA (2014). Estudio de Factibilidad, Programa de Reconversión Competitiva de la Ganadería Bovina (PRCGB). Managua

clearing forests in order to charge higher sales prices for lands that have been "improved" by forest clearing. Once the lands are sold and profits taken, these settlers then repeat the cycle in new areas of the agricultural frontier (Lezama, 2007[15]; Bermúdez et al., 2015)[16].

This context is an impediment to more intensive and productive land use. The SPPP (2016)[17] states that *"the abundance and low price of land, in combination with low labor costs, has never motivated large farmers to increase their productivity through technological improvements, mechanization and irrigation, because the demand for agricultural products can be satisfied by expanding the agricultural frontier, based on purchasing cheap land…."* as shown in the model illustrated in Figure 15. Thus, in the face of unprotected forest areas with free access at attractive prices, efforts destined to promote changes in farming are hindered and will fail to halt the advance of the agricultural frontier, as long as the agricultural system based on the purchase and increase of relatively cheap farmland persists (Tomich et al., 1998[18]) and market signals remained unchanged. It is only as land becomes more expensive or restricted or changes in market demend occur that farmers will choose to increase production by using intensive farming techniques (Kaimowitz & Angelsen, 2008[19]; Polvorosa and Bastiansen, 2016; White et al., 2001[20]). It should be noted that recent tendencias toward livestock intensification may be due to decreasing land availability, the emergence of markets for sustainable livestock products, the entrance of more agro-business oriented investors, and greater awareness of the environmental impacts of extensive cattle production.

Extensive Crop Production

Crops, alone or in sequence with cattle raising, also contribute directly to deforestation. Principal annual crops include corn and beans, while important perennial crops include oil palm, cocoa, coffee, and coconut. While annual crops are widely scattered throughout the accounting area, the majority of the perennial crops are found in the RACCS (Figure. 15).

Since 2000, cropped areas have about doubled every five years, from 37,433 ha in 2000 to 216,234 ha in 2015. The cropped area in 2015 included 147,885 ha of annual crops and 66,909 ha of perennials (Figure. 16). A large proportion of this area was planted between

[15] Lezama, M. (2007). El Índice de Capital Natural como instrumento de análisis de pérdida de biodiversidad en Nicaragua.
[16] Bermúdez, M, S. Flores, M. Romero, J. Bastiaensen, P. Merlet, F. Huybrechs, G. Van Hecken, y J. Ramirez (2015). POLICY BRIEF: ¿Es posible financiar la ganadería en la frontera agrícola de Nicaragua de manera sostenible? Nitlapan, UCA, Managua.
[17] SPPP (2016). Mejorando la Resiliencia y la Adaptación al Cambio Climático en Nicaragua Mediante el Desarrollo Masivo de Sistemas Agroforestales y plantaciones forestales. Managua.
[18] Tomich T.P., M. Van Noordwijk M., S. Vosti S. y J. Witcover (1998). Agricultural development with rainforest conservation: Methods for seeking best bet alternatives to slash-and-burn, with applications to Brazil and Indonesia. Agricultural Economics, 19, 159–174.
[19] Kaimowitz D. y A. Angelsen (2008).... no lo hacen hasta que ya no hay más bosques para talar. CIFOR. Bogor, Indonesia.
[20] White, D., F. Holmann, S. Fijusaka, K. Reategui, y C. Lascano (2001). Will intensifying pasture management in Latin America protect forests—or is it the other way round? In: A. Angelsen & D. Kaimowitz (eds.). Agricultural Technologies and Tropical Deforestation, pp. 91-111. Wallingford : CABI Publishing.

2010 and 2015, since net increases of about 66,000 ha of annual crops (the majority rice and beans) and 57,000 ha of perennial crops were noted during this period.

Figure. 15 Location of annual and perennial crops in Nicaragua.

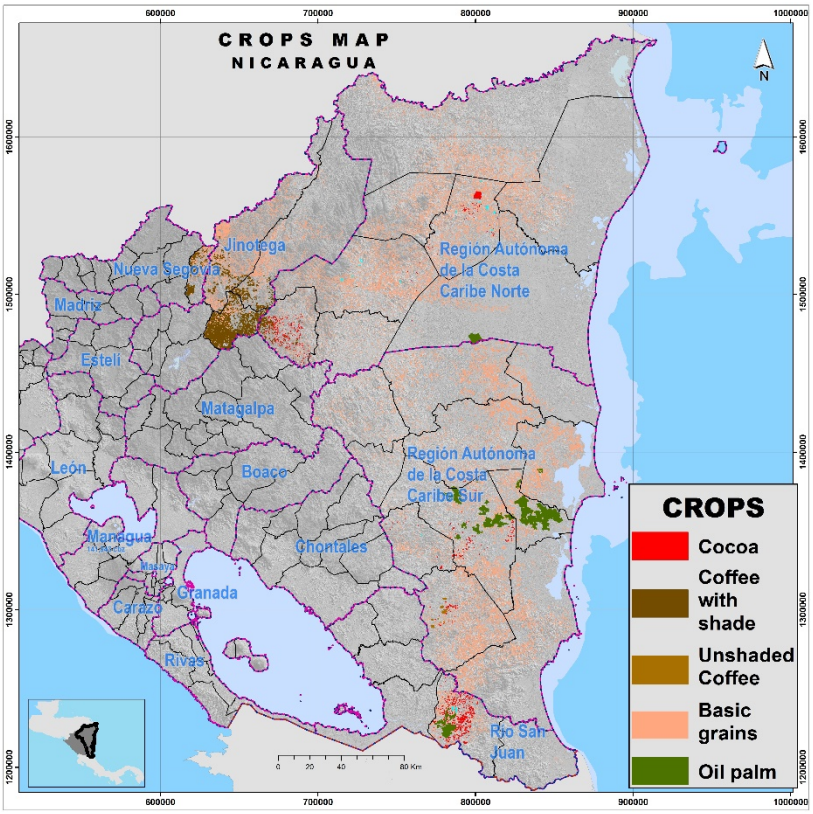
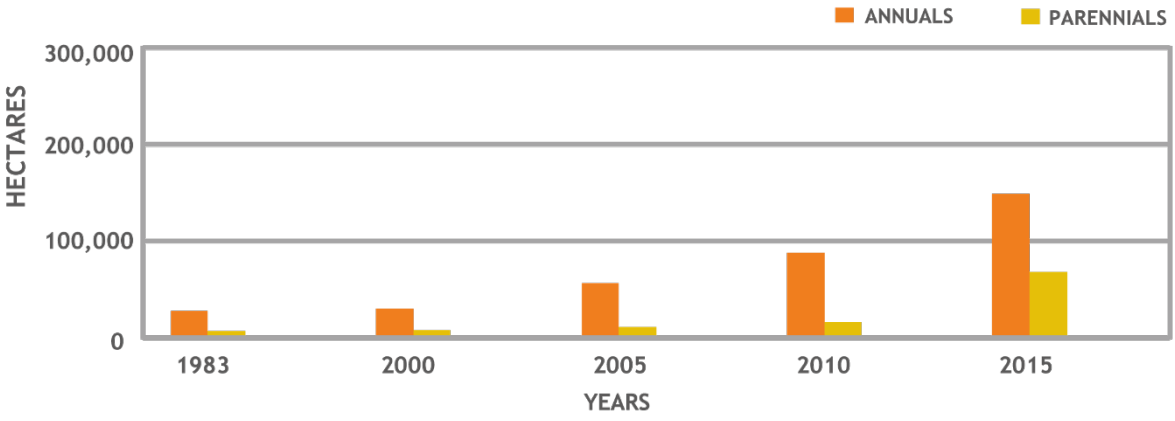


Figure. 16 Annual and perennial crop cover in the Caribbean Coast, 1983-2015



Most (61,000 ha) of the increase of annual crops during the latter period was associated with forest conversion, mainly by small producers. Most annual crops are presumably planted for cash and subsistence purposes, as a stage prior to the establishment of pastures or perennial crops. In contrast, only a third of the new area of perennial crops originated from forest, while more than half of the perennial crop area originated from pasture.

As in the cases of livestock, crop production and cultivated areas have grown at a faster pace than per hectare yields, suggesting that increased demand for crop products has been satisfied largely by increasing the area under production instead of increasing productivity per hectare.

Principal actors related to perennial crop production vary: coffee is dominated by individual or associated producers; coconut, oil palm, and commercial forest plantations are dominated by agribusinesses; and cocoa includes businesses as well as individual producers. Most (96%) of the business are small, having less than 50 employees (CODEXCA - PRONicaragua, 2015[21]).

A brief characterization of the principal perennial crops, based on limited available information from a variety of sources, is shown in Table. 7. The largest areas of perennial crops, and those with the greatest recent expansion in area, are cocoa and oil palm; the latter has attracted interest from medium-to-large businesses. The area of coffee and coconuts is relatively small, since these crops have been promoted only recently. Coconut has attracted interest from medium-to-large businesses, including Coca Cola, and are projected to cover 15,000 – 20,000 ha in the near future, but most of the coconut crop is in the development stage. The situation of commercial forest plantations is unclear, since approximately 17,500 ha were reported in the Caribbean region as of December 2015[22], but only 2,892 ha are registered in the RACCN (Cabrera and Terrero, 2016). Adicionally, 54,678 ha of forestry plantations have been established by small and medium farmers, assisted in part by the social Reforestation Cruzade Program of INAFOR, but the location and status of these plantations is unclear.

It should be noted that government plans aim for an increase in agricultural production of 4% annually and PRONicargua projects an additional $120 million in investments in teak, cocoa, oil palm, coconuts, and tourism for the 2017-2019 period. The potential deforestation associated with this growth can be largely avoided by intensifying production and making use of already cleared lands, a tendency currently evident in the livestock sector in the Caribbean[23], and the promotion of reduced-deforestation sustainable production systems. Public sector productive investment ($58 million) during 2014-2017 in the Caribbean coast, mainly via agricultural projects, suggest that efforts are being made to intensify the production of perennial crops (mainly cocoa and coffee).

[21] CODEXCA, PRONicaragua, 2015. Estudio de potencialidades, barreras, estrategia de promoción de inversiones y conceptualización de proyectos de inversión en la Costa Caribe de Nicaragua.

[22] Presentation of Dr. P. Oquist, Minister, Private Secretariat for National Policies, Presidency of the Republic, Cali, Colombia, March 1, 2017.

[23] Evidence includes increased use of improved pasture seed, fertilizer purchases, establishment of specialized cattle development operations and feedlots, and increased use of credit.

Table. 7 Characterization of principal perennial crops in the Caribbean coast.

Crop	Area (ha)	Production	Location	Principal Actors	Markets	Investment[24,25]
Cocoa	Approx. 30,000 total; aprox. 17,000 ha in production.	**Tabla 7** 0.4-0.5 t/ha; 6,525 t in 2016; Value: $7.1 M en 2015	**Tabla 8** RACCN: Waslala, Rancho Grande, Mining Triangle RACCS: El Rama, Muelle Los Bueyes, Nueva Guinea, La Cruz, Kukra Hill, Bluefields Rio San Juan	Approx. 11,000 families, 62 producer orgs., 65 collection centers International Buyers: Ritter Sport (80%), Etiquable, ECOM, Ingemann, Cacao Bisiesto National buyers: Momotombo, Castillo del Cacao, wholesale and retail outlets	Germany, France, Holland, Italy, Denmark, US, El Salvador, Guatemala	$23.7 M (2014 – 2016)
Oil palm	Approx. 30,000 (22,000 ha in production)	70,000 t crude oil Value: $33 M (2016)	RACCS: Boca de Sabalo, El Rama Rio San Juan	300 SAM producers (20% prodn.), 4000 employees, 8 large businesses: Palcasa, Nicavista, Extraceite, Kukra	Mexico (70%), national market	$375 M to date, $150-200 M additional in next 5 yr

[24] BID (2015) estimates a combined value of $427 – 822 million for cocoa, coconuts, robusta coffee, oil palm, and bamboo.

[25] PRONicaragua projects an additional $120 million in investments in teak, cocoa, oil palm, coconuts, and tourism for the period 2017-2019.

				Development Corp., Oleo Caribe, CANSA, San Jose, Caribbean Dream World		
Coconut	Approx. 15,000 ha planned	n.d	RACCS: Nueva Guinea, Laguna de Perlas	Coconut Corp., XAGRO, Coco Vida	Export	n.d.
Robusta coffee	1700 ha	n.d. Most plantations are in the early stage of production	RACCS: Nueva Guinea, Muello Los Bueyes, Paiwas RACCN	Cooprodecar, Digranisa,	National markets, export	n.d.
Bamboo	3600 ha	18 t fiber/ha/y	RACCS: El Rama y Kukra Hill	EcoPlanet Bamboo		$40 million/5 y; 350+ employees
Natural forest logging and resin	91,768 ha 2000-2015 under all types of forestry mgmt. plans and permits	77,000 m^3 transported to sawmills in 2013 278,000 m3 planned in 2017-2018	RACCN: Puerto Cabezas, Waspam, Mining Trainagle, Prinzapolka RACCS Rio San Juan	2,000 small producers, loggers, forestry technicians and regents, truckers, 21 primary processosrs, and 300 secondary processors in the RACCN; Vida Group Internacional (pine resin)	Export, local processors	$13.2 M (2013-2015) in the RACCN and $7.2 M (2013-2014) in the RACCS

Forest plantations	Approx. 17,500 commercial plantations in the Caribbean (2015); 54,678 ha planted by SAM producers nationwide	4000 m^3 nationwide in 2013	RACCN: Bonanza, Prinzapolka RACCS: Nueva Guinea,	MRL Forestal, NORTEAK, Nica Forestal, New Forestry	US, European Union, Costa Rica	$110 M total to 2016; $9.9 M for teak (2014-2016)

n.d. no data.

In this context, the relation of the expansion of the cover of pastures and perennial crops and deforestation is complex. Limited data suggest that the increase in cover of perennial crops during 2010 – 2015 has come mainly at the expense of pasture (56%), but also forest (33%) and other land uses (11%) (see Annex 2). At the same time, pasture area exhibited a net decreased by 147,000 ha (Figure 10), due to the creation of about 275,000 ha of new pastures from forests (a decrease in pasture-associated deforestation relative to earlier periods), but the concomitant conversion of about 420,000 ha of pastures to other uses, mainly secondary vegetation (about 345,000 ha of "tacotales") and perennial crops (about 35,000 ha). These data suggest that livestock intensification and a change from pastures towards other, more productive land uses is causing the recent reductions in the rates of deforestation.

There are various productive factors underlying extensive land use by both livestock and cropping systems. One is the limited access and use of credit associated with: the high transaction costs of loans, lack of formal loan guarantees, poor technology adaptation resulting in low agricultural productivity and high risk, limited availability of long-term credit funds or financial products adapted to farming conditions, and the lack of a credit or agribusiness culture (IICA, 2014).

According to the SPPP (2016), the percentage of the combined portfolio of all private banks dedicated to agriculture at the national level is only 9%, an amount of approximately $316 million. The CENAGRO (2011) survey indicates that only 7% of farmers access credit, which are aimed at large agricultural enterprises and farmers who can present the corresponding guarantees and have good farm organization (IICA, 2014). In the case of cattle ranching, the percentage of the bank credit portfolio is only 2%, equivalent to approximately $72 million, and only about 3% of livestock farmers access credit.

However, analysis of outstanding credit portfolios of banks and financial institutions in the accounting area indicates that credit for livestock grew from $10 million in 2012 to $35 million in 2016 (an increase of 326%), which combined with the decrease of pasture area is

consistent with the hypothesis of livestock intensification by the substitution of financial for natural capital.

Another underlying productive factor of extensive land use is the low level of technical knowledge and capacities of farmers, which is related to the limited coverage and minimal effectiveness of technical assistance programs. According to the IV CENAGRO[26] agricultural survey, only 11.4% of farmers receive technical assistance and/or training, a good proportion of which is provided by input suppliers, industrial plants, universities, international development projects, livestock or farmer associations, or NGOs. As a result, in many cases farming systems have changed little in 60 years. In the cattle sector, production indicators continue to be low despite a large number of projects focused on sector improvement over the last decades (IICA, 2014).

Local and international markets undemanding of quality and production methods, also contribute to extensive land use of low productivity. Local agricultural markets provide constant demand but mainly value low prices, instead of product origin, legality and quality. Even important regional markets for Nicaraguan agricultural products, principally El Salvador and Honduras, are undemanding as to the quality of agricultural products originating from Nicaragua´s agricultural frontier (Lopez, 2012). Moreover, the relative lack of capital and access to loans prevents farmers from investing in the infrastructure and inputs necessary to comply with the quality standards of more demanding markets that pay higher prices. As a result, the profitability of livestock systems is low, but relatively stable, due to the constant flow of income produced by domestic demand and the growth of export demand.

Logging

Logging is relatively unimportant as a cause of deforestation, but is implicated in forest degradation. Projected timber production of approximately 280,000 m^3 for 2017 by the System for Production, Consumption, and Commerce is equivalent to the selective exploitation of less than 47,000 ha (less than 2% of the actual forest area), assuming a harvest yield of 6 m^3/ha[27]. General forest management plans between 2000 and 2017 only covered 90,000 ha and were likely sub-expolited, since imited data from 2014 (INAFOR, 2014), the first year after a 7 year logging ban, indicate that only 76,873 m^3 of timber of the 103,711 m^3 of timber authorized from the were transported to sawmills, an apparent under-utilization rate of 24%.

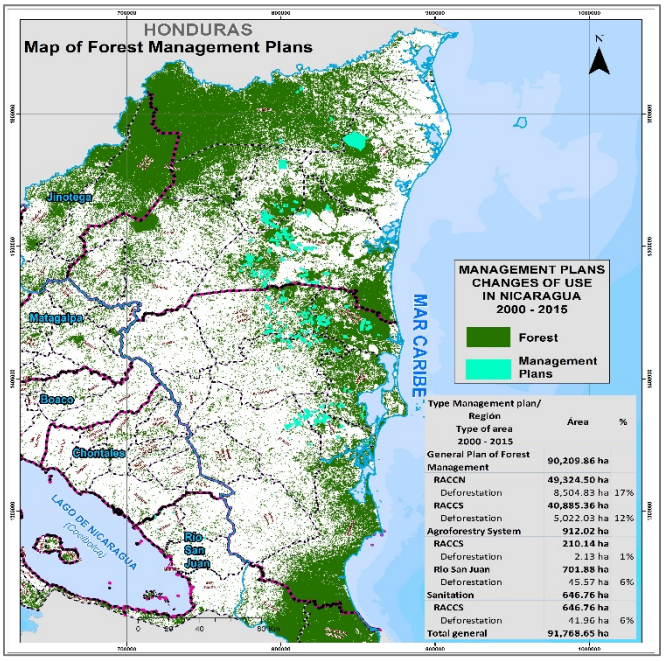
Despite the low use and sub-utilization of forestry plans and permits (General Forestry Management Plans, Agroforestry System Permits, or Salvage Permits), they have an beneficial effect of being associated with low rates of deforestation (Figure. 17). Annual deforestation rates of areas under General Forestry Management Plans during 2000 – 2015 were estimated to be 1.13% in the RACCN and 0.70% in the RACCS, which are similar to or

[26] CENAGRO (2011). Informe Final IV. Managua

[27] If yields were greater, the effective area logged would be even less.

lower than the low rates of deforestation observed in protected areas within indigenous territories (1.07%, see Table. 5). Moreover, deforestation associated with the other types of permits was minimal. This suggests that clearly defined rights and economic interests in forest management can help reduce deforestation through the assertion of greater control of forested areas by permit holders.

Figure. 17 Deforestation associated with forestry management plans and permits, 2000-2015.



The potential causes of apparent sub-utilization of forests are many and complex. The majority of forests are located in indigenous territories where available capital, equipment, technical knowledge, and commercial contacts are limited. This situation creates major challenges for developing forest management plans as well as successfully undertaking timber logging and processing activities which are capital intensive and logistically challenging. Moreover, the knowledge, norms, and procedures of indigenous communities and territorial governments are oftentimes inadequate in order to attract investments and/or to effectively partner with investors interested in forest use and management or to oversee investor activities.

In relation to degradation, the lack of opportunites for legal forest management may thus be creating conditions conducive to small-scale but widespread illegal forest extractive activities, such as logging, firewood harvests and charcoal production, leading to forest degradation.

Processes for obtaining the four types of forestry permits, (forestry management plans, domestic use permits, salvage permits, and resin permits[28]), shown in the Figure below, can also act as disincentives for forest management, and thus provide incentives for the illegal extraction of forest products. While not overly expensive with regards to those of other Latin American countries[29], the procedures for obtained approvals for these permits are time-consuming and bureaucratic (especially for the volumes permitted such as in the case of the domestic permits), requiring multiple steps and levels of oversight and approval (Figure. 18). In addition, fees charged by forestry regents to formulate general forest management or annual operating plans appear to be very expensive, about $16/ha for General Forestry Management Plans (PGMF) and about $20/ha for Annual Operating Plans (POAs), which is suprising given the relatively large estimated number of foresters (3000) and forestry mid-level forestry technicians (500)[30] in the RACCN.

Moreover, once approved there is little supervision of these forestry plans and permits due to underfunding and understaffing of INAFOR, limited capacity of SERENA at the regional government level, low local monitoring capacity of indigenous territories and communities, and little legal enforcement on the part of the environmental inspectors of MARENA and the national Attorney General´s office.

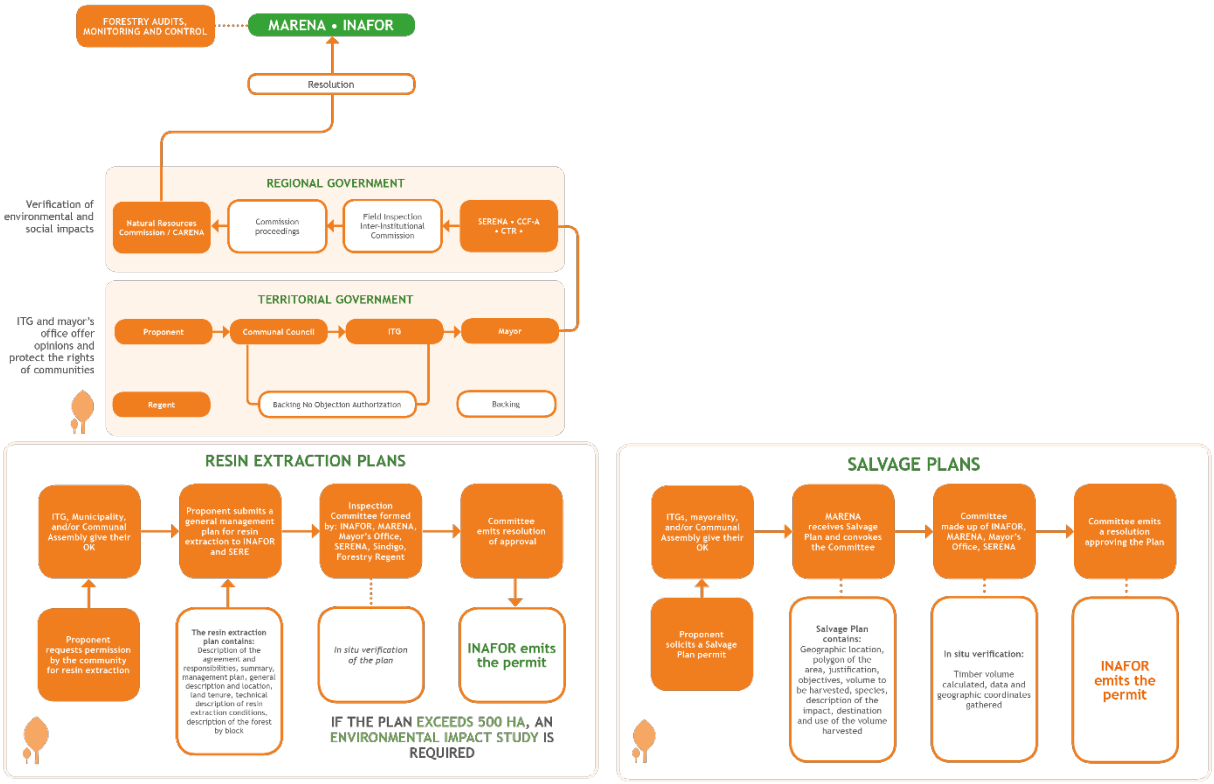
Another element that contributes to the illegal extraction and degradation of forests is related to the limited entrepreneurial capacities of the communities, which hinder the consolidation of new formal forestry companies that could increase the value of the concessions, through higher added value production.

[28] Forestry management plans are aimed principally at the planning, execution, supervision, and evaluation of activities that assure sustainable commercial timber production and involve relatively large areas of forest. Domestic permits are designed to facilitate the use of forests by community dwellers for subsistence and improvement of dwellings that entail volumes less than 10 m^3. Additionally, these permits should follow forestry management guidelines, including planting 10 trees for every one harvested. Salvage plans are aimed at ensuring adequate forest phytosanitary conditions following events, such as hurricanes, that affect large areas of forests. Prerequisites include a study of the magnitude of the damage and the feasibility of salvage by competent authorities. Finally, the objective of resin extraction permits is to produce resin from conifer forests for commercialization, based on silvicultural criteria. If the area is larger than 500 ha, an environmental impact study also needs to be carried out.

[29] See Cabera, C. and Terrero, O. (2016). Diseño de un esquema de incentivos forestales para la Región Autónoma de la Costa Caribe Norte, UICN.

[30] Cabrera, C. and O. Terrero (2016). Diseño de un esquema de incentivos forestales para la Región Autónoma de la Costa Caribe Norte, UICN.

Figure. 18 Flow diagram for the authorization of general forestry management plans, and domestic, salvage, and resin extraction permits.



Institutional/Legal Causes

In recent years, the consolidation of Nicaragua's institutions has increased significantly. A robust legal framework and policies have been formulated in relation to land rights and natural resources, environmental protection and sustainable development, and the indigenous and Afrodescendant territories of the Caribbean Coast, which represent 31.4% of the country's total area, have been titled. Autonomy for the Caribbean regions has also been established, at the same time that efforts have been made to better integrate these regions into the national economy and political life.

Nevertheless, in the face of migration pressure due to demography, poverty and markets, it is necessary to reinforce and extend these positive trends. In this sense, consultation with stakeholders from the public and private sectors of the Caribbean and national levels identified the management, monitoring, and control of land use and natural resources, including the enforcement of laws and regulations, as critical institutional needs (see Table 23 in Section 5), since most deforestation unrelated to approved forest extraction is illegal (see Section 4.4). As a result better coordination, and improved institutional capacities are needed, as mentioned in the previous sections. Additionally, needs at other higher hierarchical levels include:

- Better harmonization and coordination of sectorial policies, based on a shared vision of the need to avoid deforestation,
- Increased use of environmental information in coordination and decision making horizontally (across sectors) and vertically (at multiple government levels) in order to develop better plans and policies and to better respond to the impacts they produce.
- Greater institutional resources, especially for information, monitoring, and control, in order to implement these changes (see Figure 9).

Consideration of these issues should take into account the structure of governance in the Caribbean region which is characterized by two administrative systems (national and territorial) and five levels of government (Figure. 19), and the roles of the natural resource institutions involved (Table. 8). This system is the result of the historical and political evolution of this region, the process of autonomy, and the traditional uses and customs of the indigenous and Afrodescendant peoples and has been instrumental in the recent progress achieved in the region.

Within the "formal" or public administration governance structure for natural resources there are three hierarchical levels of government: the national government, the autonomous regional governments (RACCN and RACCS), and the municipal governments (Figure 19). However, within each of the indigenous and Afrodescendent territories, there are two autonomous traditional governance structures: the territorial governments and communal governments. Within the territories, where the traditional and public administrations overlap, the territorial governments are responsible for actual decision making (although most of their budget is controlled by the central government), whereas the function of the public administration governments is more consultative or to provide opinions or oversight.

The national government is responsible for establishing the regulatory framework for land use and the forestry sector via laws, decrees, resolutions, and obligatory technical norms applied by the ministries and the regional and municipal governments. The autonomous regional governments of the Caribbean Coast articulate national land and forestry policies with specific proposals and actions of the indigenous peoples and ethnic communities, and are assisted in this task by the Secretary for the Development of the Caribbean Coast (SDCC). At the local level, they are aided in this process by the municipal governments. However, in the indigenous and Afrodescendant territories, the territorial and communal governments are responsible for decision making related to land and natural resource use and management, in line with the autonomy of the RACCS and RACCN. The roles of these governments in natural resource decision making in communal lands is shown in Figure. 20.

Figure. 19 Levels of government in the Caribbean region.

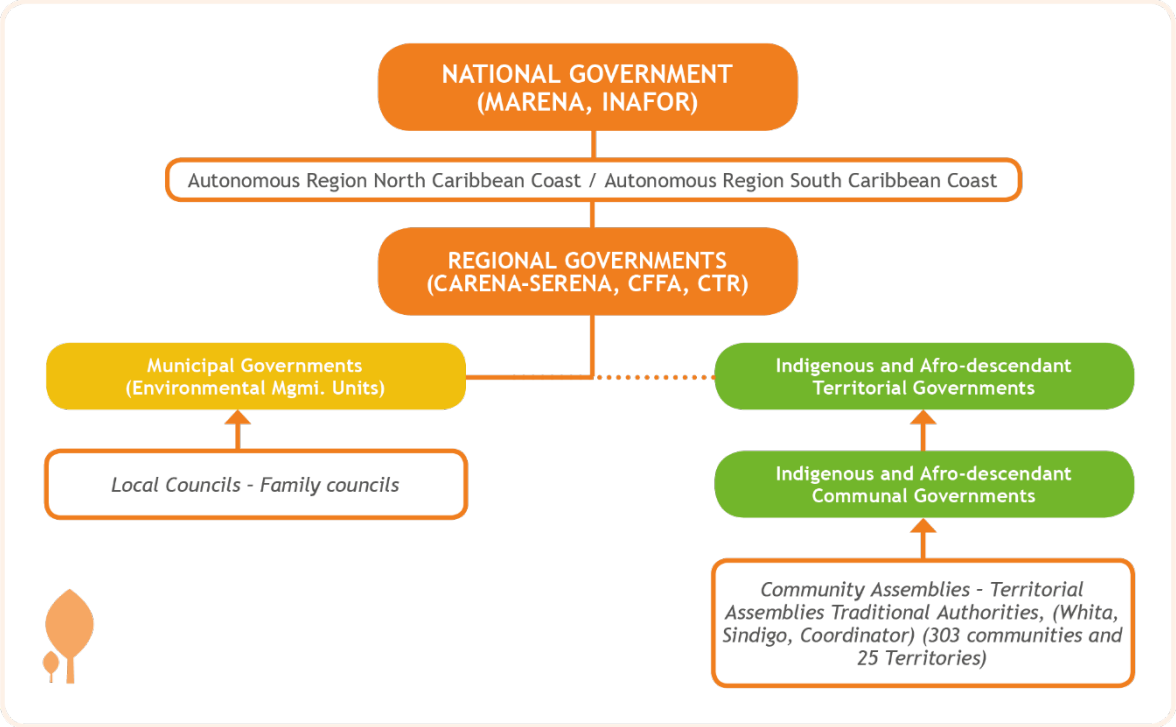
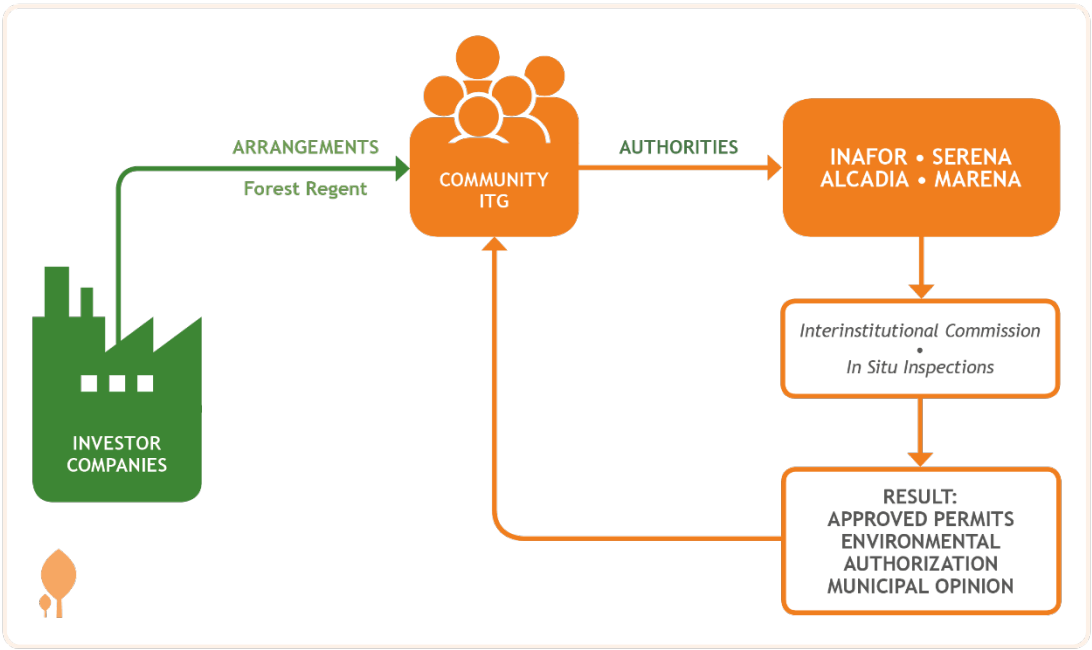


Figure. 20 Process of approval for natural resource use in communal lands.



Sectorial policies and budgets determined at the national level are implemented at the local level via branch offices of the ministries in selected population centers or through the public administration system via the regional and municipal governments. As a result, the degree of integration of environmental or deforestation considerations in non-environmental sectors and policies is dependent on high level coordination via the

Secretary for the Development of the Caribbean Coast and the Production, Consumption, and Commerce cabinet that groups the agricultural, forestry, family economy, and industry sectors. It also depends on the availability and use of adequate and relevant information.

Under this system, different governmental levels have different critical functions and roles related to critical aspects of land and forestry management (planning, authorization, monitoring, and control and enforcement (Table. 8).

Table. 8 Critical functions and roles of different levels of goverments in forest and natural resource management.

Level of govt.	Assignment of Rights	Admin.	Monitor	Enforcement
National	INAFOR: regulates forests, emits permits. MARENA: regulates use of natural resources, approves changes of use. MAG: formulates agriculture and forestry policies. INETER: land use classification.	INAFOR: Forest lands and permits. MARENA: Natural resources, forests in PAs.	INAFOR: Forest lands and permits. MARENA: Natural resources, forests in PAs. INETER: monitors resources. MAG: Supervises and informs re: forestry and agricultural sectors.	INAFOR: sanctions forestry infractions. MARENA: sanctions natural resource infractions. PGR: Prosecutes natural resource or forestry crimes.
Regional govts. (mainly through CARENA and SERENA)	Articulate with national, municipal, territorial and communal governments Approve projects and plans, formulates	SERENA (includes environmental evaluation of permits). CCFA and CTR coordination and technical advice.	SERENA. Monitors environmental and forestry plans, projects, and use.	

	environmental regulations. OK use of natural resources, approves forestry mgmt. plans.			
Territorial govts.	Monitor and administer communal property and administer communal property Emits OK for natural resource use in territories	Coordinate and assist decisions of community assemblies	Monitor and administer formal and verbal contracts	Provide support.
Communal govts.	Forest owners and starting point for natural resource use authorizations. Authorize domestic forestry permits.	Administer natural resources in the community	Sindigo and Commission monitor contracts of natural resource use.	Provide support.
Municipal govts.	Emit opinions on natural resource use, contracts or concessions in their jurisdictions, outside of indigenous territories.	Participate in environmental impact studies. Coordinate use and mgmt. of natural resources.	Participate in inter-institutional monitoring commissions.	Provide support.

Analysis and consultation of this scheme with regional and territorial representatives suggest that a number of institutional weaknesses exist with regards to the management of land and natural resource in the accounting area, which compromise the abilities of those governments to plan, monitor, and control land and natural resource use.
These limitations, hierarchically arranged, include:

- *Application of laws and management instruments.* Nicaragua´s legal and policy framework for natural resource management and forestry is robust, but its

inconsistent or partial application leads to gaps in coverage, red tape, and personalized interpretation, thus posing barriers to sustainable land use, hindering sustainable natural resource management, and contributing to land use conflicts, the use of unsustainable practices, and the conversion of forests to inappropriate or illegal land uses.

Control and enforcement of land and natural resource is largely administered by national level institutions and their regional offices (MARENA, INAFOR, PGR), but is compromised by staff and other resource shortages, which effectively result in partial application of management instruments and sporadic enforcement. In some cases, outdated information (see below), and limited social control of decisions and administration of communal leaders may also lead to the misapplication of regulations and norms.

- *The accessibility, dissemination, and use of information.* The availability, quality, exchange and use of information about land and natural resources at a national level and in particular in the Caribbean, is often dispersed among institutions, which hinders strategic planning, timely decision making of decisions, and a more effective daily management of land and natural resources.

  With respect to the autonomous regions, information on soil and natural resources is reported from the community, territorial and communal bases to regional links through established communication channels. The SINIA information nodes in the regions have been technologically strengthened with computer equipment that facilitates the management and processing of the reports sent by local monitoring teams. Information gathering, however, is limited and information dissemination needs to be improved.

- *Monitoring of land use and natural resources.* Monitoring is a vital source of information for management. At present, the monitoring of natural resources is carried out: 1) through the analysis of satellite images prepared by INETER, MARENA and INAFOR; and 2) local monitoring by regional teams of the GRACCs, community and territorial governments. Currently, the reports generated by the national monitoring committee needs to be better consolidated, articulated, and disseminated. Technical support to the monitoring brigades of the communal governments is also needed in order to optimize local management, control and monitoring of the resources of each territory.

  Partially overlapping institutional responsibilities for monitoring, the lack of use of shared indicators and criteria, and the low institutional capacities contribute to monitoring deficiencies and subsequent informational weaknesses, especially at the territorial and communal levels. The lack of up-to-date or real-time information at both the regional and local scales inhibits timely responses to deforestation and

potential land conflicts, as well as management decisions and longer-term planning based on solid information.

- *Harmonization and coordination of policies and levels of government.* This multi-level governance structure and the partial overlap of responsibilities engenders the need for a large degree of inter-level consultation and coordination based on reliable information and feedback, which is only partially achieved. Within this system of shared institutional responsibilities, effective coordination of policies, programs, and projects is a challenge, especially given resource, capacity, and information limitations and the remoteness of some areas. Moreover, there is little institutional prioritization given to environmental problems, since the environment is not a high priority in the national budget. As a result, sectorial integration of measures to reduce deforestation related to infrastructure development (roads, energy, and water which consume more than 75% of the public budget in the accounting area), or the promotion of more sustainable agricultural production is low, and represents a threat to remaining forests, as evidenced by recent deforestation along the newly constructed road to Bluefields.

- *Financial resources and institutional capacities.* Insufficient budgets, equipment, and trained personnel, especially at the territorial and communal levels, contributes to all of the limitations listed above and affect the good governance of natural resources and land use in the Caribbean region, especially at the regional and local levels.

It is fair to recognize that the governance scheme described above, and the societal values that it embodies (dialogue, consultation, solidarity, shared responsibilities and cooperation) has helped conserve the large quantity of forests found in the indigenous and Afrodescendant territories and has contributed to social peace, despite limited resources and capacities. The governance model promotes the following significant benefits:

- ✓ Assistance and mutual cooperation among governments, communities, and the private sector.
- ✓ Multiple checks for improved control and transparency in the process of letting permits and authorizing forestry management plans which, in turn, improves the climate and security of forestry-based investments and businesses.
- ✓ Ample opportunities for consultation with interested parties and facilitation of inputs into the policy and regulatory processes.
- ✓ Strengthening traditional forms of government of indigenous peoples and people of African descent.

The interventions of the ERPD wil therefore attempt to leverage and take advantage of these benefits while addressing outstanding institutional and governance needs.

4.2 Assessment of the major barriers to REDD+

Recent tendencies suggest that government policies and programs related to the titling of indigenous territories, investment promotion, regional autonomy, large-scale land use monitoring, the intensification of livestock and land use, and the reforestation and regeneration of degraded lands are beginning to slow deforestation. However, these measures can be rendered even more effective through the reduction of the following inter-related barriers.

1) *Low environmental profile.* The profile of environmental / forestry protection in sectoral strategies and plans and in government operating budgets is low. Environmental sustainability needs to be better integrated and visualized with indicators that measure progress in economic development plans, programs and projects, preferably through the general incorporation of coherent environmental indicators and a shared "vision of success" as part of the institutional planning and monitoring processes.

2) *Non-integrated sectoral approaches.* Policies often demonstrate a preference for agricultural development, even in areas with a forestry vocation. This results in a lack of integration of forestry and agriculture in a conservation-production approach. Resistance of some sectoral actors to the application of environmental/forestry instruments and regulations is also present. As a result, greater efforts should be made to include environmental indicators in sectoral planning and to more closely integrate agricultural, forestry, and infrastructure sector development

3) *Limited institutional presence.* There is limited institutional presence in extensive areas of the forested regions of the Caribbean and travel costs are high due to limited means of transport and the long distances involved. This limited presence negatively impacts information flows and communication, monitoring, and the response to problems as well as the application of laws, policies, and regulations.

4) *Cultural barriers.* Although Nicaragua has been successful at promoting public campaigns for fire prevention and control and reforestation for environmental protection, cultural values among some segments of the population undervalue the country's forests and promote deforestation.

5) *Economic and knowledge barriers* by lenders and lendees, as well as high transaction costs, limit access to credit and TA and hinder the widespread adoption of more sustainable production practices, especially on the part of small and medium-sized producers.

6) *Local or regional markets* for agricultural/livestock/forest products do not recognize quality or sustainable production techniques and hence do not compensate increased

investments in these areas. Furthermore, the absence of national markets for ecosystem services reinforces the sub-valuation of forests.

7) *High costs and limited economic returns* of conservation discourage government investment, and hence the adequate protection of protected areas. On the other hand, ecotourism, a potentially important source of private investment in support of conservation, is incipient and of a relatively small scale.

8) *High transaction costs of environmental/forestry compliance* and bureaucratic red tape for small and medium owners are disincentives for sustainable forest use and management.

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

Overall Context

In recent years, Nicaragua has made important strides in growing its economy, reducing poverty and extreme poverty, establishing a robust legal framework for natural resources and the environment, forging productive alliances among businesses, rural people and the government, and achieving a solid credit rated for the national financial system. In the Caribbean region, the autonomy of the Caribbean Autonomous Regions has been consolidated; indigenous and Afrodescendant lands have been titled; private sector investment has been promoted, with the result that the Caribbean captures the second highest amount of foreign investment after Managua, the country´s capital; productive infrastructure such as roads and electricity has been improved; and the regional agricultural credit portfolio has increased. These processes provide a solid base for transitioning from an economic development model based largely on extensive land use to one that is more intensive, more sustainable, more equitable, and less carbon-dependent.

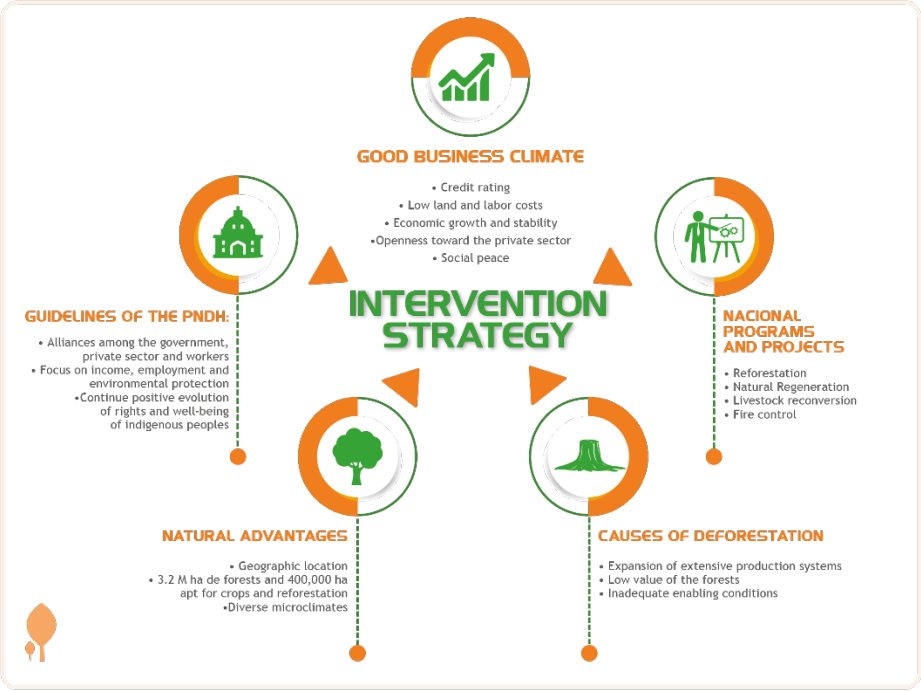
It is expected that the ER Program will enhance and further the evolution of this transition by focusing on a territorial-based production-protection model whereby forest conservation and sustainable forestry and agricultural production, made possible by improvements in underlying economic/productive and institutional/legal enabling conditions, contribute to climate change mitigation and, more sustainable land use, employment and the conservation of biodiversity.

Overall Goal and Strategy

The Emissions Reduction Program is expedted to conserve, recover, and reduce pressure on forests in order to reduce forest emissions by 14.32 Mt CO_2e[31] during 5 years, by improving and intensifying production systems, conserving forests and their biodiversity, and creating off-farm employment. The strategy of the program will be based to a large extent on the existing national policies and legal framework and the aforementioned strengths of the country and the Caribbean region. In doing so, the strategy takes advantage of and improves the ongoing transition to economic development less dependent on deforestation, while promoting inclusion, sustainability, dialogue, partnerships and alliances, and more intensive use of natural resources, as described in the National Human Development Plan of Nicaragua.

In order to keep costs low, the Strategy will leverage the positive business climate and existing or latent opportunities to increase private investment in activities resulting in emissions reductions, align existing programs and projects that can contribute to emissions reductions, and identify synergies whereby interventions can respond to multiple goals or objectives (Figure. 21).

Figure. 21 Elements of the intervention strategy.



[31] Includes 4.5 Mt CO_2e in setasides and Nicaragura´s commitment to the Carbon Fund of 11.0 Mt CO_2e (see Section 13).

Intervention Approach

The Emissions Reduction Program will achieve the overall goal of reducing emissions from deforestation and forest degradation by focusing on four strategic lines:

1. ***imcreasing forest conservation by improving the value and governance of forests***, especially in the indigenous and Afrodescendant territories where most of the forests are found;
2. reducing the need for deforestation by ***intensifying and decarbonizing production systems*** and making them more sustainable;
3. ***increasing off-farm employment*** opportunities in order to absorb marginal farmers or migrants and thus reduce the pressure on existing forests;
4. ***improving the institutional enabling conditions*** underlying improved forest conservation, more sustainable production, and greater institutional capacities to monitor and control undesired land and natural resource use (Figure. 22)).

It is expected that intensification of agricultural and livestock production systems, making them more productive and sustainable, will contribute both to the increase in the carbon stock and to avoided deforestation; forest conservation and the creation of off-farm employment will contribute mainly to avoided deforestation (directly in the case of forest conservation and indirectly in the case of off-farm employment creation); and reforestation and natural regeneration will contribute to increases in carbon stocks. The improvement of institutional enabling conditions will not contribute directly to emission reductions, but rather will potentiate the other interventions and ensure that economic development does not ultimately cause more deforestation.

Taken together, it is expected that these interventions will contribute to co-benefits such as biodiversity conservation and restoration and employment and income. Moreover, greater monitoring and control and the creation of off-farm employment opportunities will also reduce the effect of migrants on forests via, and thus will complement the Nicaraguan government´s efforts to increase employment and income in other parts of the country.

Figure. 22 Outline of overall approach of the ERPD.

Interventions

The interventions are derived from the production-conservation strategy and consist of the following:

Strategic Line #1 – Forest conservation:

1a) Improved forest and land use management and governance in indigenous territories

1b) Community forest management

1c) Promotion of natural regenerations and social reforestation (reforestation cruzade)

Strategic Line #2 – Intensiified sustainable production systems:

2a) Silvopastoral trusts

2b) Promotion of Agrofrestry systems

2c) Commercial reforestation

Strategic Line #3: Creation of off-farm employment via investment promotion:

3a) Strengthening of private or government institutions that promote private investment (PRONicaragua/PRONicaribe) private or government institutions that promote private investment

Strategic Line #4 – Improving institutional enabling conditions for forest and land use management:

4a) Harmonization of policies and improved institutional coordination

4b) Improved regional and local forest and land use monitoring

4c) Better information gathering, use, and dissemination

4d) improved application of laws, policies, regulations, and norms, and

4e) improved institutional resources and capacities in order to better control land and natural resource use and promote sustainable land use.

It should be noted that a number of these interventions will reduce forest degradation due to fires, firewood extraction, and logging, as well as deforestation. Interventions 4b and 4e) will increase the national fire prevention and control program´s capacities to reduce fires. Intervention 1b) will increase sustainable firewood production while 1c) and 3a) will increase the area for young forests from which firewood can be extracted. Interventions 1b), 1c), and 2c) will increase timber production. Additionally, the enabling conditions taken together will improved forest monitoring, control, and enforcement and should reduce illegal logging and other illegal uses.

Strategic Line #1: Forest Conservation

The forest conservation strategic line is implemented *within* the forest, focuses primarily on avoiding deforestation and secondarily on forest production, and is directed principally towards the indigenous and Afrodescendant territories, due to their strategic importance as large reservoirs of forests and the overlap of these territories with a number of protected areas.

This strategic line consists of 3 interventions:

a) improved forest governance in the indigenous and Afrodescendant territories
b) community forest management (CFM), and
c) promotion of natural regeneration and social reforestation, especially in ecologically fragile or important areas.

In effect, improving forest governance, protection, and sustainable forest management and recuperation in the indigenous territories will provide incentives, income and secondary products and services from the forests, thus increasing their perceived value for local indigenous populations and incentivizing their conservation and protection in the face of internally or externally driven pressure for their conversion.

These interventions, taken together, are expected to have a large impact on emissions (14.5 Mt CO_2e) due principally to avoided deforestation[32]; will increase income and well-being due to forest management, conservation incentives, the provision of ecosystem services and products for domestic use (e.g. browse, lumber); will contribute to forest and biodiversity conservation, and the consolidation of protected areas; and will affect principally indigenous and Afrodescendant groups that have been assigned a high priority in the National Human Development Policy. Their contribution to employment, however, is limited to that related to community forest management or local forest monitoring.

Intervention 1a: Improved forest and land use governance in the indigenous and Afrodescendant territories

This intervention is comprehensive in the sense that it seeks to increase the conservation and management of 2.3 million ha of forest found in the indigenous and Afrodescendant territories via a variety of actions including results-based incentives for avoided deforestation, monitoring, and the development of local development plans and capacities of territorial and communal governments. It is expected that this intervention will reduce deforestation in the indigenous and Afrodescendant territories by 30%, thus generating 10 Mt CO_2e in emissions reductions.

Specific actions include:

[32] One hectare of avoided deforestation of broadleaf forest "saves" an average, weighted by the different types of forests, of 50 t C/ha, while interventions that increase carbon stocks do so at a rate of about 3.4 t C/ha/yr (see Section 8.3)

- updating territorial development and land use zoning plans,
- improving territorial and communal legal statutes, internal norms and regulations, and administrative and contractual procedures for forest and land use by community members or outsiders,
- improving natural resource decision making and social control of those decisions at the communal level,
- improving local monitoring and control of forests and land use and forestry permits by community groups, local forest rangers and monitors, including information, capacities, and equipment[33], and
- the creation of a results-based incentive for avoided deforestation. This incentive will be offered to all indigenous territory governments, but it is anticipated that 14 territories will receive most of the benefits due to their high forest cover. Payments of approximately $200/ha will be based on *ex-post* reductions of deforestation measured by annual monitoring and compared against a baseline.

Intervention 1b: Community Forest Management (CFM)

Community forestry management is aimed at increasing employment and income, stimulating increased forest protection, and creating greater value of forests, principally in indigenous territories, via enhanced production of forest products. It is expected that this intervention will reduce deforestation in CFM areas by 50%, thus generating 1.5 Mt CO_2e in emissions reductions.

This intervention will be implemented principally in large compact blocks of well-stocked forests comprising approximately 200,000 ha in the Waspan (pine forests), Prinzapolka (broadleaf forests), and Desembocadura del Rio Grande (broadleaf forests) municipalities. These areas include 7 indigenous and Afrodescendant territories (see section on location of interventions), and contain approximately 31 communities or groups with CFM experience. Nevertheless, other communities or territories outside these blocks are also eligible to participate in CFM.

The CFM actions include:

- Promotion of CFM investments and employment in indigenous territories, through initiatives which are developed in the framework of private or government institutions such as PRONicaragua / PRONicaribe via public-private-producer partnerships (PPPPs). Investors will help overcome capital, technology, and logistical constraints to logging and forest management experienced by indigenous communities and reduce the need for deforestation.

[33] This action will be complemented by the use of forest regents and audits included in the CFM intervention as well as the improvement of the forestry permitting processes and supervision as part of the improvement in enabling onditions.

- Incentives aimed at reducing the costs of the general forest management plans (PGMF) and initial (first two years) annual operating plans (POA)s (approximately $2 million) in order to lower entrance barriers to forestry management and stimulate such investments. These incentives represent an investment with a 20-year life span (one complete rotation of the PGMF and initial costs represented by two POAs, which are assumed to become self-financing after 2 years). It is expected that the investment represented by the incentive will be recovered via increased future fiscal revenues. In order to reduce costs of the PGMFs through economies of scale, INAFOR will attempt to negotiate the formulation of the PGMFs for the 3 large blocks, which can be later concessioned to investors. An additional incentive is the provision of credit guarantees via multi-lateral banks, for loan taken out by investors. These guarantees should reduce the cost of credit for these investors.

- Reduction of barriers related to bureaucratic procedures for obtaining and supervising forestry permits, via a review of current procedures and their effectiveness, and the redesign of the system focused on simplification of permitting and improving permit supervision (see also institutional enabling conditions).

- Legal, technical, and administrative training, technical assistance and accompaniment of territories and communities so that they are better able to enter into and manage relations with investors and businesses interested in forest management (see also Intervention 1a).

- The use of forest regents and periodic forestry audits by INAFOR and regional and territorial governments of the forestry plans in the three priority blocks of forests in order to improve compliance with forestry regulations.

In total, this intervention requires $3,054,500 from the Program and will be financed from the donation mentioned above.

Intervention 1c: Natural regeneration and social reforestation

Natural regeneration and social reforestation will be promoted through expansion and refocusing of the activities of the national social Reforestation Crusade and natural regeneration programs, especially in ecologically sensitive or important areas, such as buffer zones of protected areas, and are expected to produce 2.8 Mt CO_2e in emission reductions as a result of forest enhancement by 40,000 new ha of reforestation, and 50,000 new ha of natural regeneration (*tacotales*) in high priority areas, including the buffer zones of the Bosawas and Indio Maiz Reserves.

This intervention will build upon existing program structures, procedures, and actions. The social Reforestation Crusade includes in-kind incentives (planting material) and technical assistance, while natural regeneration will be promoted by public education and publicity campaigns and group technical assistance. Attainment of the natural regeneration goal will

also be aided indirectly by increased fallowing of low productivity, extensively managed pastures or crops, as a result of the creation of off-farm employment opportunities and the intensification of livestock, coffee, and cocoa production by the sustainable production and off-farm employment creation interventions.

This intervention has a relative low cost ($2.9 million) that will be funded by grants channeled to INAFOR. This grant is part of BioCLIMA proyect for the Green Climate Fund, that includes a credit aimed at improving the livestock agro-forestry sector and is under discussion with the Central American Bank fo Economic Integration (see Section 6.2).

Strategic Line #2: Intensified sustainable production systems

The intensified sustainable production strategic line focuses on interventions outside the forest[34] that increase carbon enhancement, reduce pressure for forest conversion, and conserve on-farm forests. Expected emissions reductions total 2.5 Mt CO2e. These interventions will be implemented in the indigenous and Afrodescendant territories as well as private property, and focus mainly on small and medium-sized farmers and secondarily on reforestation companies.
The interventions include:

a) the establishment of agroforestry and silvopastoral systems, as alternatives to extensive livestock and crop production, among small and medium farmers, anchor businesses, producer groups, and government and financial institutions (trustee) aimed at increasing intensified production, commercialization, and income from shaded coffee and cacao and silvopastoral systems; and
b) commercial reforestation of already deforested land whose principal impacts are the reduction of pressure on forest via the creation of off-farm employment and the enhancement carbon stocks.

Together, these interventions are expected to contribute to reduced-emissions economic development. The emissions reductions will be achieved through: more intensive land use that lessens pressure on forests and results in avoided deforestation; carbon sequestration by coffee and cocoa agroforestry and commercial reforestation; and enhanced on-farm forest conservation by the agroforestry and silvopastoral systems, which is a requisite for farmer participation in silvopastoral and agroforestry trusts.

Intervention 2a: Silvopastoral system trusts

The silvopastsoral system trusts will be aimed at increasing intensified production and commercialization of livestock products, organized under a trust arrangement involving the government, anchor businesses, and producer groups (Figure 23). Relations among these actors will be based on contracts within the trust framework. Contract compliance will be

[34] Although CFM is a productive intervention, it is classified under forest conservation, since it occurs within the forest and its main effect on emissions reductions is via avoided deforestation.

based on continuous monitoring, contingency plans for non-compliance on the part of the producers, the use of farm-based guarantees, as well as the conditioning of incentives to specific activities such as pasture management and on-farm forest conservation (see Annex 4).

Carbon enhancement and reduced on-farm deforestation by the silvopastoral and agroforestry systems are expected to reduce emissions by 2.0 Mt CO_2e. The trust arrangements are also expected to produce: greater farmer associativity; greater access to cheaper credit, via the establishment of lines of credit and credit guarantees; increased access to productive, organizational, and commercial technical assistance; improved crop management, product quality, product traceability; and greater access to markets based on quantity and quality, as well as reduced emissions.

The trusts will link with existing programs and projects whenever possible, in order to reduce costs. These include current programs or projects or their future extension related to livestock, coffee, and cocoa production and technical assistance, including the BOVINOS, PROCACAO, and NICADAPTA projects managed by MEFCCA/INTA (Table 9), as well as the silvopastoral project being initiated by CONAGAN-FOMIN/IADB see Figure. 24 for a schematic description of the silvopastoral trust, as well as Annex 4). Alignment of these projects with the ER Program will aim at coordinating project technical and other assistance and monitoring with the ER Program´s intervention objectives and approaches. It should be noted that the trust arrangement proposed here has been developed collaboratively with CONAGAN, which will facilitate alignment of the silvopastoral initiatives.

Government support of this trust will include the facilitation of credit lines and credit guarantees, trust fund administration35 via, for example, PRODUZCAMOS, Nicaragua´s development bank, and technical assistance. Anchor businesses can also provide funding as well as markets for products and technical assistance. Finally, groups of small and medium-sized farmers will receive credit, inputs at reduced cost, technical, organizational, and commercial assistance, and will participate in profits in return for agreeing to conserve forests found on their farms, the application of specific technological packages for production, and using their farms as credit guarantees (Figure. 23 and see also Annex 4 for more details).

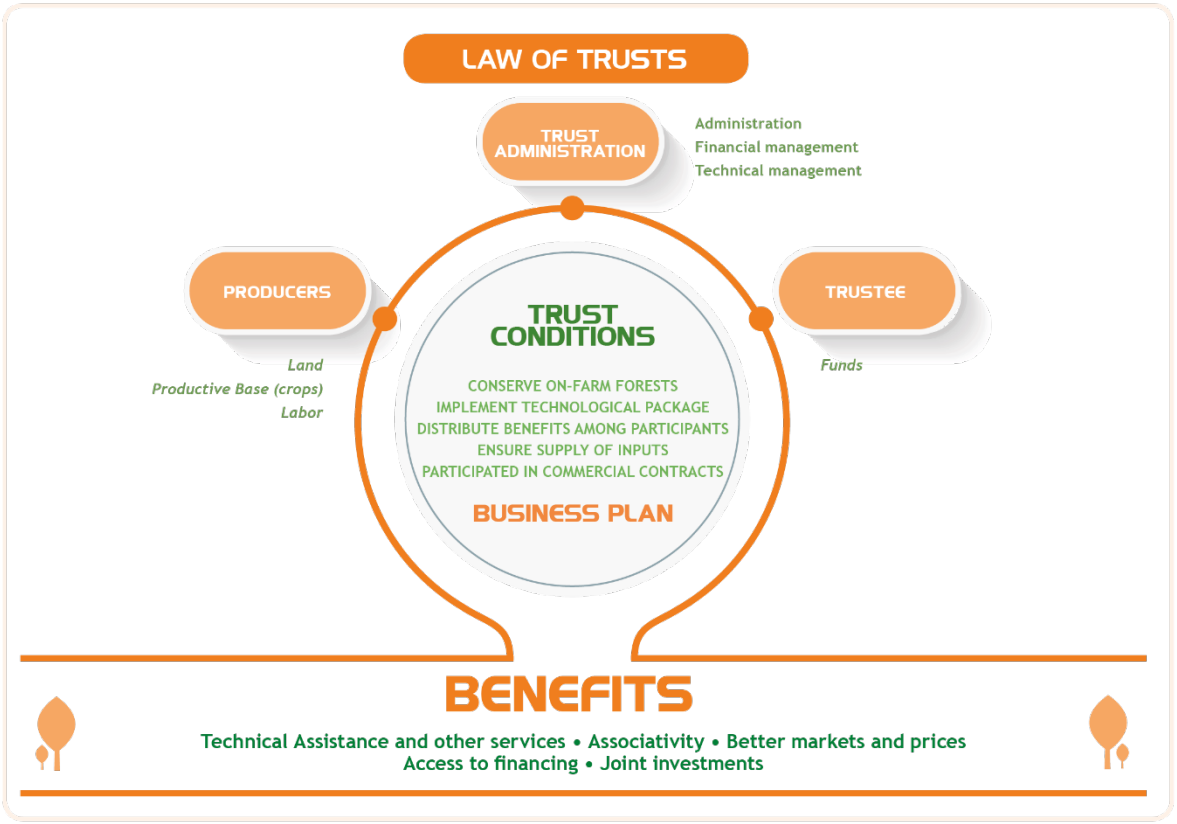
The identification and mix of specific actors and the design of these trusts will be further specified during the coming year, however, the financing of the CONAGAN-FOMIN silvopastoral trust, based on funds from CONAGAN, CANICARNE, and the IADB, is advanced; CONAGAN and PRODUZCAMOS are also in the process of preparing a $50 million proposal to the IADB for follow-up funding. Follow-up of potential credit providers identified, including the Central American Bank fo Economic Integration funding mentioned above, is needed.

[35] The administrative and funding functions within a trust cannot be assumed by the same entity.

Target areas and farmers will be based on areas of intervention of the CONAGAN projects and will include principally private landholders, with lesser emphasis on indigenous and Afrodescendant territories (Table. 9). The silvopastoral intervention, in the CONAGAN and BOVINOS project areas, include Mulukuku, Paiwas, Siuna, Rosita and Bonanza municipalities in the RACCN; the El Ayote, Muelle de los Bueyes, Nueva Guinea, and El Rama municipalities in the RACCS, and the Rio San Juan. Activities will concentrate initially on 800 farms, principally from the CONAGAN project, but will ramp up to 5000 farms starting in year 3. Farms are estimated to average 56 ha in size, including 14 ha of forests.

An estimated total of $22 million in funding for these trusts is needed, of which approximately $17 million in loans from multi-lateral banks will be used to establish credit lines and credit guarantees, which are anticipated to be self-sustaining. Approximately $9 million ($5 million loan, and $4 millon from private and public funds) wil be used for silvopastoral and agroforestry technical assistance and training.

Figure. 23 General characteristics of the silvopastoral and agroforestry trusts.



Interventions 2b: Promotion of agroforestry systems

Unlike the intensification of livestock systems, the promotion of agroforestry systems does not include lines of credit. This intervention will be focus on providing to farmers financial incentives, technical assistance and market access facilitation for the sustainable intensification of coffee and cocoa farming through Agroforestry Systems (AFS).

The coffee and cocoa agroforestry interventions include approximately 10,000 coffee and cocoa farmers in the following: Rosita, Siuna, Bonanza, and Pto Cabezas municipalities and the Wanki Tri, Tasba Raya, Tasbaika Kun and Mayagna Sauni Bu territories in the RACCN; Kukra Hill, Nueva Guinea, El Rama, Muelle de los Bueyes, and Bluefields municipalities and the Rama Kriol territory in the RACCS, and El Castillo in the Rio San Juan. The intervention will begin with these participants and will expand with time to order to reach the goal of 4,600 new ha.

In the case of the MEFCCA/INTA projects, shared technical assistance and the use of common indicators are contemplated; details will be worked out in coming months. Target areas and farmers will be based on areas of intervention of the MEFCCA/INTA projects and will include principally private landholders, with lesser emphasis on indigenous and Afrodescendant territories (Table. 9).

Figure. 24 Schematic description of the silvopastoral trust.

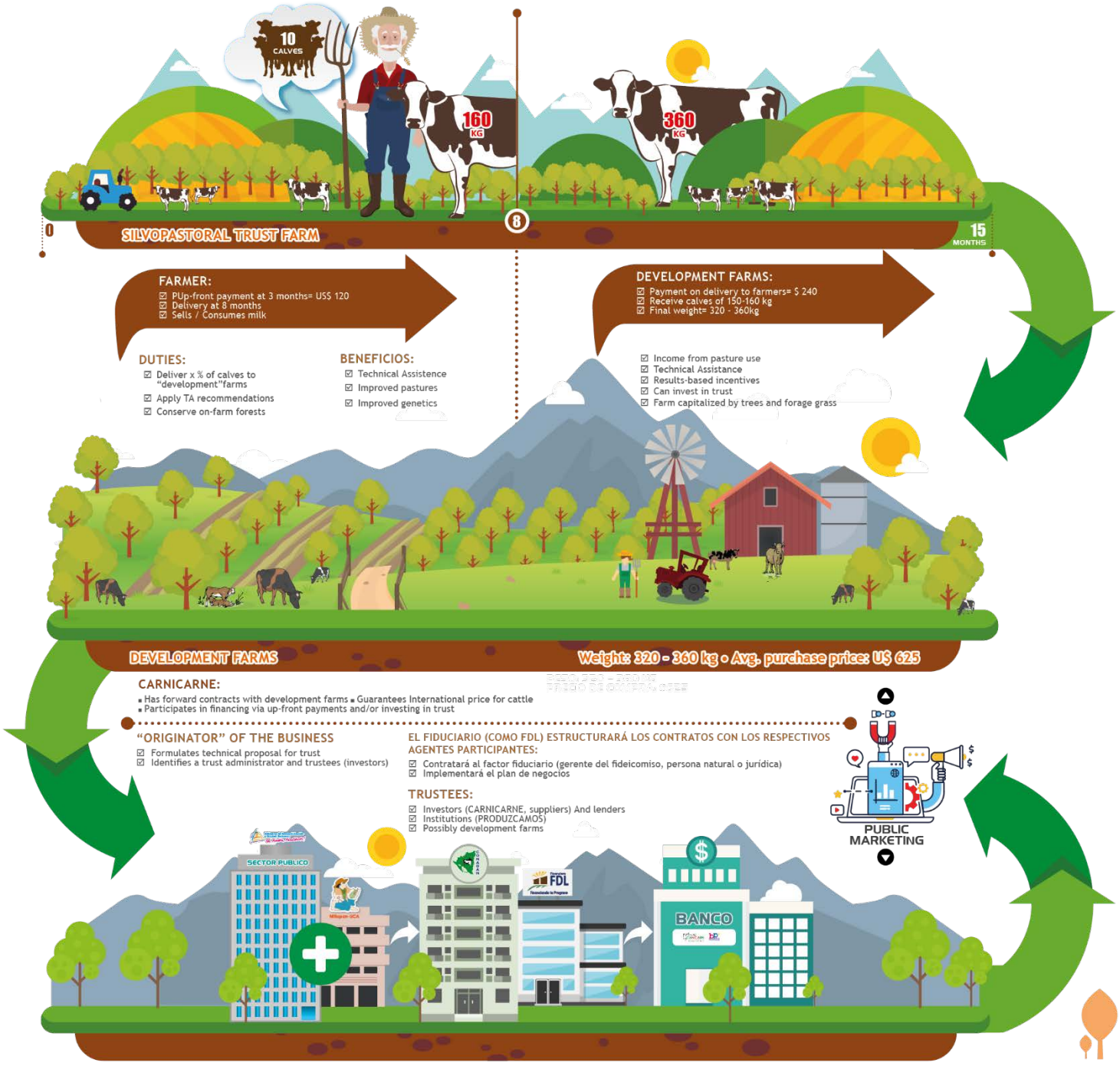


Table. 9 On-going projects that will contribute to the ER Program in the accounting area.

Project/Program	Participants	Thematic focus	Geographic concentration
Cattle Program (BOVINOS) Focus on improved beef and milk production and processing Budget = 8 million euros	9,000 producers with 0.5-50 ha, 60 communities	Silvopastoral systems: TA, traceability, strengthening of 12 producer organizations. Assists with equipment, inputs, AND TA	El Ayote, Muelle de los Bueyes, Nueva Guinea, and El Rama municipalities in the RACCS
CONAGAN – FOMIN/BID Focuses on increased livestock production via silvopastoral systems and improved linkages and coordination along the value chain Budget = approx. $1.9 million	7 municipalities. To be defined further.	Silvopastoral systems: TA, credit, traceability, strengthening of producer organizations, improved value chain integration	Mulukuku, Paiwas, Siuna, Rosita and Bonanza in the RACCN and Nueva Guinea, El Rama and El Ayote in the RACCS.
Programa NICADAPTA Focuses on improved production and organization of coffee and cocoa producers Budget = $7.9 million	4,319 producers, 382 communities	Cocoa, coffee agroforestry: TA, organizational strengthening of 16 producer groups	Waspam, Bonanza, Rosita, Siuna, Mulukuku y Waslala Wiwilí J, Wiwilí NS and San José de Bocay in the RACCN, Bluefields, El Rama, Muelle de los Bueyes, Nueva Guinea, El Ayote and Kukra Hill in the RACCS, and El Castillo in Rio San Juan
PROCACAO Focues on improved production and organization of cocoa Budget = $4.8 million	650 producers, 50 communities	Cocoa agroforestry	The Mining Triangle (Rosita, Bonanza, and Siuna municipalities) in the RACCN

Intervention 2c: Commercial reforestation

Commercial reforestation is estimated to enhance 0.3 Mt CO_2e of carbon stocks during 5 years via the establishment of 10,000 new hectares of forestry plantations whose location will depend on investor criteria, but will be facilitated by private or government institutions that promote private investments.

This intervention will be undertaken primarily by agribusinesses or large private investors, with little input from the ER Program, with the exception of investment promotion services provided by private or government institutions that promote private investment (see Strategic Line #3, below) and fiscal incentives enabled by the Forestry Law. Investments, operational implementation, technical assistance, and markets are expected to be provided or financed by private investors.

This "low profile" approach is justified by the relatively low estimated emission reductions of associated with 2000 ha/yr of new forestry plantations, the large investments entailed by commercial forest plantations (which reduces the potential impact of direct incentives), and public budgetary restrictions on direct incentive payments.

Strategic Line #3: Increasing Off-Farm Employment via "Green" Agroindustrial and Forestry Investment Promotion

Intervention 3a: Strengthening of private or government institutions that promote investment such as PRONicaragua / PRONicaribe

The off-farm employment strategic line consists of one intervention: the promotion of "green", primarily agroindustrial and forestry. investments PRONicaribe. The intervention focuses on strengthening PRONicaragua and private or government institutions which participate in PRONicaribe the Nicaraguan government´s currently successful investment promotion program, in order to deepen and broaden their current activites related to the promotion of agro-industrial agroforestry and forestry investments (principally shaded coffee and cocoa, forestry plantations in deforested areas and CFM in forests).

This intervention has characteristics of an enabling condition as well as a direct intervention aimed at decreasing deforestation. It is expected to reduce pressure on forests via the off-farm employment of marginal farmers and recent migrants and increase investment and reduce transaction costs of commercial agrosilvoforestry production systems that enhance carbon stocks of deforested lands found in either communal or private property. It will also help facilitate the interventions related to CFM, commercial reforestation, promotion of agroforestry systems and the silvopastoral trusts by attracting investors in these activites; additionally, it will provide important input into the training of community and territorial governments under the improved forest goverance in indigenous territories intervention.

These efforts will build upon the notable success of PRONicaribe in attracting investments to the Caribbean region. Projection of PRONicaribe track record in the Caribbean, combined with the dynamic nature of the Caribbean economy and on-going improvements in

infrastructure, suggest that additional investments on the order of $500 million and the creation of 25,000 jobs are possible during the accounting period[36]. The types, scale, and location of these investments, however, are unknown at present, since these factors are under the control of the investors[37]. Due to this uncertainty, as well as that related to the impact of off-farm employment on deforestation, and the need to avoid double accounting of emissions reductions already assigned to CFM, agroforestry, and commercial reforestation, it is assumed that the direct impact of this intervention on emissions reductions is 0.

The intervention will strengthen capacities in the following areas:

a. promotion of branding of the Caribbean region, based on ethnic diversity, conservation, sustainable production systems, and the recognition of indigenous peoples, as well as green production systems and markets (e.g. sustainable beef and cocoa);
b. promotion of investments, including facilitation of business contacts, *joint* ventures, and PPPPs, real estate assistance, formulation of model contracts, assistance with bureaucratic procedures, planning support, identification of potential associates, and facilitation of relocation of investors and their families;
c. collection and dissemination of market intelligence and contacts with markets, especially those for "green" products (e.g. *Consumer Goods Forum* for beef, various systems for coffee and cocoa), including special studies; and
d. the consolidation of "green" criteria in PRONicaribe program as well as the orientation of public functionaries regarding green production and markets.

The budget for this intervention is approximately $4.8 million, of which $4.7 million will be funded from a livestock credit package afforded by a multi-lateral bank.

Strategic Line #4: Institutional Enabling Conditions

The institutional enabling conditions strategic line is aimed at overcoming institutional and other barriers to forest conservation and sustainable production and land use (Table 10). Although most enabling conditions may not directly produce emissions reductions, their presence is essential for the long-term success of the conservation or sustainable production measures and to ensure that economic development does not ultimately cause more deforestation.

[36] Based on experience of the Nicaraguan government´s investment promotion program, ,it is expected to leverage approximately $110 in private investments for every dollar dedicated to investment promotion. Similarly, one job is estimated to be created for every $189 used for investment promotion.

[37] Although investments can occur in indigenous territories and private property, the indigenous territories may have a comparative advantage due to the availability of large blocks of land under a sole "owner" or authority.

This strategic line combines a series of interventions aimed at improving government actions and performance related to:

4a) institutional coordination and policy harmonization,
4b) land use and forestry monitoring,
4c) better information use and dissemination by public institutions and public education and awareness,
4d) improved application of laws, policies, regulations, and norms, and
4e) improved institutional resources and capacities in order to better control land and natural resource use and promote sustainable land use.

The majority of the enabling conditions apply across the regions and activities within the accounting area. Improving monitoring, control, and enforcement of norms governing land and natural resources are considered to be fundamental for reducing deforestation via better control of land and forests, but depend on greater coordination and harmonization of policies and institutions, information availability and use, and institutional resources. The principal elements of the enabling conditions package are shown in Table. 10.

Table. 10 Institutional enabling conditions response to underlying causes and barriers of deforestation.

Causes and Barriers	Institutional Enabling Conditions
Intervention 4a: Harmonization of policies and institutional coordination	
Forest conservation and the avoidance or mitigation of the impacts of deforestation are largely not integrated in sectorial plans and policies. There is also a lack of shared vision of deforestation among institutions and levels of government. Institutional overlaps or gaps in land use and forestry management and services (e.g. technical assistance) exist.	The ultimate responsibility for coordination lies with the Presidency. Nonetheless, at the national level, Working Group I and the Production, Consumption, and Commerce cabinet will be strengthened so that they can better harmonize policies and environmental criteria and indicators across sectors, especially agriculture, forestry, and the environment. Although transportation is not formally part of this cabinet, road construction and its environmental mitigation should be included in the Production, Consumption, and Commerce cabinet´s agenda. At the interface of the national and regional levels, SDCC will be strengthened via the formulation, implementation, and monitoring of and its Strategy and Plan for Development of the Caribbean Coast. The SDCC will also assist with the incorporation of the Strategy and Plan into regional and territorial development plans.

	Part of this process includes the formulation of shared environmental/deforestation indicators among levels of government, programs, and projects (see Monitoring), under the leadership of the Production, Consumption, and Commerce cabinet and the SDCC. At the autonomous region level, the capacities of SERENA and SEPROD (Secretaríes of Production) will be strengthened. Difficulties in aligning diverging ministerial agendas may occur and are apt to most affect migration, the resolution of land use conflicts, and enforcement of laws and regulations, but impacts on the direct interventions related to agriculture and forestry production and off-farm employment creation will be reduced due to greater clarity with respect to mandates and operational plans.
Intervention 4b: Regional and local monitoring of forests and land use	
Resource deficiencies related to monitoring exist at all levels of government, but are accentuated at lower levels, hindering the management of resources by rights holders (communal governments) or local administrative authorities (municipal governments) who should presumably have the most interest in managing and controlling these resources. Partially overlapping institutional responsibilities for monitoring, the lack of use of shared indicators and criteria, and the low institutional capacities contribute to monitoring deficiencies and subsequent informational weaknesses, especially at the regional, territorial, and communal levels. The lack of up-to-date	Improve the capacities of the MRV system at the national level and its linkages at the regional level via SERENA, SINIA and the regional information nodes (also see Information section above). Strengthen the equipment, financing, and institutional coordination of SERENA and SINIA. Create a satellite imagery-based early warning system for deforestation. Improve local monitoring via formation of forest rangers and community monitors in communal territories.

or real-time information at both the regional and local scales inhibits timely responses to deforestation and potential land conflicts, as well as management decisions and longer-term planning based on solid information.	Align local, regional, and national monitoring systems as well as indicators to be monitored among all levels of government.
Intervention 4c: Accessibility, dissemination, and use of information	
Information is partial, frequently dispersed among institutions, and often does not make its way to users or interested parties, thus hindering strategic planning, opportune decision making, and more effective day-to-day management and control of land and natural resources. At the national level this hinders sectorial coordination and integration. At the regional, territorial, and communal levels, information contained in development and land use zoning plans, guidelines for the internal functioning of the ITGs and communal governments, and environmental technical norms is outdated and thus affects negatively the planning and access to forestry resources, rights to their use or extraction, decisions governing natural resource and land use or the relationship of communities with outsiders, and the application of management instruments or enforcement of laws and regulations. Among the general public, awareness, education, and promotion of environmental values and information related with the protection of nature is limited and cultural barriers to more sustainable practices exist.	Increase and improve information generation and dissemination capacities of SINIA and information nodes at the regional level via upgrading of equipment and personnel increases and capacity building. Work with Production, Consumption, and Commerce Cabinet and the Secretary of Development for the Caribbean Coast to incorporate environmental and natural resource information in strategic planning. Increase public access to information via greater publication on institutional web sites as well as culturally appropriate mass media and public events. Update and disseminate territorial and communal development plans, land use zoning, resource maps, environmental guidelines, and technical norms. Increase public information and educational campaigns to raise awareness of deforestation and how it can be avoided or mitigated, as well as specific information packets related to the proposed interventions.
Intervention 4d: Application and enforcement of policies, laws, and regulations	
Control and enforcement of land and natural resource of national level institutions (MARENA, INAFOR, PGR), is compromised by staff and other resource	Expand number and capacities of environmental inspectors of MARENA, forestry supervisors of INAFOR, the SERENA

shortages, resulting in partial application of management instruments and sporadic enforcement. In some cases, outdated information (see below), and limited social control of decisions and administration of communal leaders may also lead to the misapplication of regulations and norms.	and CARENA units of the regional governments, and prosecutors of the PGR. Monitor the application and compliance of the laws, policies, and norms. Promote the environmental training of regional, territorial, and communal governments. Train local forest rangers in communal governments. Improve territorial and communal procedures and norms for land and natural resource use decision making. Improve social control of local resource use decisions by communal governments.
Intervention 4e: Resources and capacities	
Limited resources and capacities exist at all levels of government and result in limited institutional presence, especially in remote areas. Compliance of institutional mandates is hindered by budget limitations. Public budgets for environmental programs and land and forest management are generally low and affect multiple aspects of policy implementation, monitoring, and enforcement.	Cuts across all interventions and enabling conditions. Leverage national credit rating to generate loans that create greater income and fiscal revenues in the future. Expand private sector investment via investment promotion (see Strategic Line 3). Apply for grants to multi-lateral banks for climate change and sustainable land use programs. Incorporate PPPP in environmental activities. Include environmental compensation mechanisms in budgets of sectoral projects and programs (e.g. road construction) with significant environmental/forestry impacts (see Harmonization).

	Strengthen knowledge of public functionaries in regards to deforestation and green production.

A more detailed description of the interventions, goals, and assumptions is found in Annex 5. Emissions calculations are found in Annex 6.

Intervention Locations

Multiple criteria were used to determine priority geographic areas for the interventions. For both conservation and sustainable production interventions, a principal criterion was the high risk of substantial carbon losses, determined by comparing carbon density with active deforestation fronts (Figure. 8).

An additional screening factor for conservation interventions was the presence of indigenous and Afrodescendant territories and PAs within the territories. Although all indigenous and Afrodescendant territories will be targeted for the strengthening of forest and land use management, it is likely that the results-based incentive program for avoided deforestation will be most beneficial to 14 indigenous and Afrodescendant territories with high risk of carbon loss and the presence of PAs. The other 9 territories that are largely deforested, have low carbon stocks, and where PAs are absent, however, are good candidates for sustainable production systems directed towards small and medium producers or agro-industrial investments promoted by PRONicaribe; some will also participate in the agroforestry trust.

In the case of community forestry, 3 areas of compact, well-stocked forests are priority areas and include the Waspam, Prinzapolka, and Desembocadura del Rio Grande municipalities.

With regards to sustainable production system interventions, the Program is constrained to either working in geographical areas targeted by on-going projects related to agroforestry or silvopastoral systems (NICADAPTA, BOVINOS, CONAGAN-FOMIN, PROCACAO – see Table. 9 and

Table. 11) or in areas selected by investors.

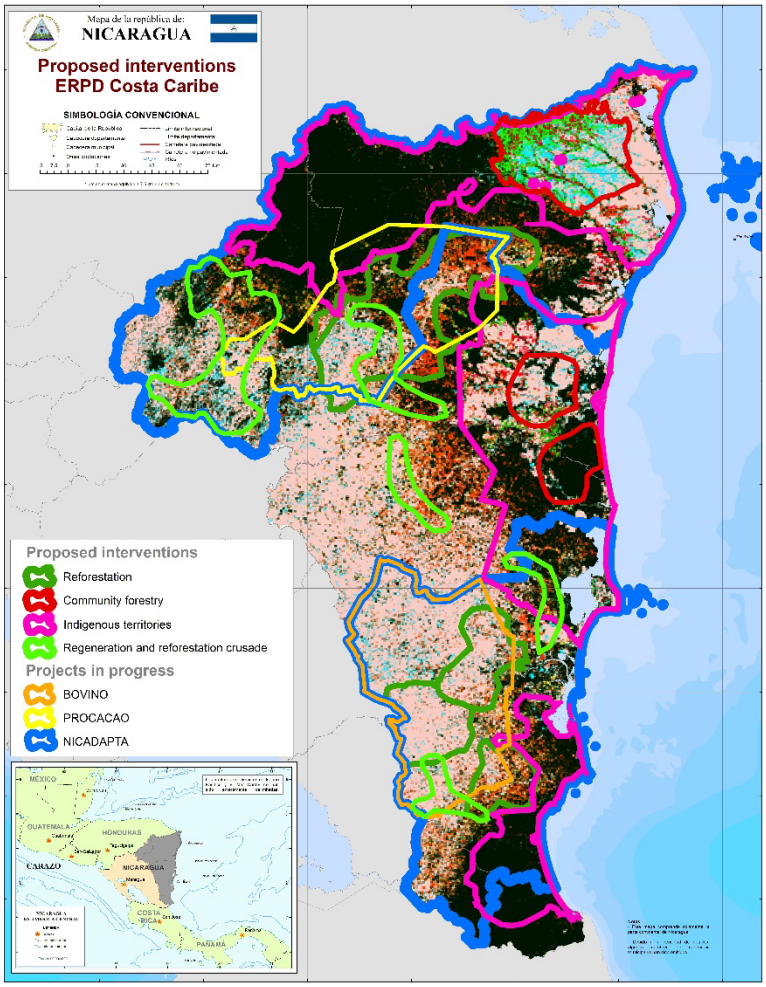
Siting of the interventions based on these criteria results in almost complete geographic coverage of the accounting area and lessens the possibility that unattended areas will continue to contribute to forest-based emissions at current levels (Figure. 25). The agroforestry and silvopastoral projects and natural regeneration interventions are principally located in areas of private property in the western half of the accounting area, although some (PROCACAO and NICADAPTA) are active in indigenous and Afrodescendant territories in the RACCN or around the Mining Triangle. Reforestation is located mainly in the RACCS, near Bluefields, Laguna de Perlas, and Nueva Guinea, and the Mining Triangle in the RACCN. Community forestry and improved forestry governance is concentrated in the indigenous and Afrodescendant territories, most of which are found in the RACCN.

Table. 11 Priority geographical areas for interventions.

Intervention	Potential Location
1a. Forest governance in ITs	All 23 I&A territories will be targeted for territorial government strengthening, including the formulation of territorial development plans based on land use classification and zoning.
	14 I&A territories at high risk for carbon loss and presence of PAs are likely candidates for results-based incentives for avoided deforestation and local monitoring brigades.
1b. Community forest management	3 geographic regions with compact blocks of forest located in Waspan (northern pine forests), Desembocadura de Rio Grande, and Prinzapolka municipalities. Indigenous and Afrodescendant territories include: Wangki Twi Tasba Paya, Wangki Maya Tasbaya, Tawica, Awaltara Luphia Nani Tasbaya, Prinzu Auhya Uh, Prinzu Awala, and Laguna de Perlas. Ultimately, siting will depend on investor and community interest.
1c. Natural regeneration/social reforestation crusades	Priority areas are buffer zones of protected areas and upper reaches of watersheds as well as areas with significant natural regeneration. Candidates include the southern border of BOSAWAS, and the area between Rama and Bluefields.
2a. Silvopastoral trusts	Proximity to on-going BOVINOS and CONAGAN-FOMIN silvopastoral projects. Includes: Mulukuku, Paiwas, Siuna, Rosita and Bonanza municipalities in the RACCN and Nueva Guinea, Rama and El Ayote municipalities in the RACCN.
2b. Promotion of Agroforestry	PROCACAO and NICADAPTA projects´area or close proximity (see Table 9).

2c. Commercial reforestation	Siting will depend on investor interest.
3a. Off-farm employment creation via investment promotion in commercial agrosilvopastoril systems	Depends on investor and landholder interest. 9 largely deforested I&A territories with low carbon stocks are potential candidates within the communal property regime. Selection of sites in private property will depend on investor, community, or current property owners.

Figure. 25 Map of the geographic location of the proposed interventions.



Intervention Road Map

The 12 year duration of the ER Program will include a 2 year preparation period, 5 years of implementation under the aegis of the FCPF, and 5 additional years based on different sources of emissions reduction funding.

Activities during the preparation period will focus on obtaining feedback regarding the ER Program proposal, implementing Readiness activities that are critical for ER Program implementation, consolidating institutional arrangements, beginning work on improving enabling conditions, and identifying and securing sources of funding. These activities include the following:

- Further consultation on the details of the ERPD with regional and territorial governments and stakeholders, as mentioned in Section 5.2.
- Further definition of intervention areas.
- Further definition of the silvopastoral trusts, including the identification of sources of lines of credit, investors, participating farmers, internal structure of the trusts, and their relationship with on-going projects.
- Alignment of the ER Program with MEFCCA/INTA and CONAGAN agroforestry and silvopastoral projects in the accounting area. Relevant themes include the use of budgets, environmental/deforestation indicators, orientation of technical assistance programs to producers and communities, project monitoring, information sharing and reporting, cross-project fertilization and events, inclusion of project producers in trusts, and linking producers with credit.
- More extensive consultation related to the results-based incentive program for avoided deforestation in the ITGs, including the identification of prioritized territories based on indicator maps and dialogue and consensus with the governments concerned, the detailed formulation of basic rules for participation and distribution of benefits, the design of benefit distribution agreements, coordination with the Forest Monitoring Program, and the design of a training program for territorial governments and park rangers.
- In conjunction with the above, the definition of training needs of ITGs and indigenous communities in order to improve forest governance and management and attract investments.
- Reformulation of the National Forestry Plan including analysis and design of improved forest permitting and supervision procedures, a program on secondary forests,
- Coordination with PRONicaribe related to investment promotion strategies for community forestry management, forest plantations, and agroindustrial agroforestry systems, the incorporation of green criteria in the program, and identification of specific capacity building needs of territorial governments in order to attract and form successful alliances with private investors.
- The preparation and submission of funding proposals to close financial gaps of the ER Program, as well as to establish credit lines for the trust.
- The preparation of an operative structure and operational plans for the ER Program.

REDD+ Readiness will complement the activities mentioned above. These activities include:

- The execution of special studies and the improvement plan for the Reference Level, including more precise determination of forest degradation, emission factors, and the formulation of baselines for carbon enhancement by agroforestry systems and existing secondary forests.
- Design and testing of an early warning system for deforestation in near real time.
- Further progress on the plan for the distribution of benefits (see Section 15), refinement of the mechanism for feedback and redress of grievances (Mechanism for Communication Strengthening, see Section 14), and the methodologies for data gathering and analysis related to non-carbon benefits.
- More detailed design and testing of the various registries, including safeguards and non-carbon benefits, and the mechanisms for reporting.

The tentative chronogram for these activities in shown in Table. 12.

Implementation will begin in 2021 (although work on some enabling conditions will begin prior to that date and the natural regeneration and the social reforestation crusade are on-going programs) for a period of 10 years. However, the majority of enabling conditions and direct interventions will begin in year 1 of implementation.

Table. 12 Chronogram of tentative activities for preliminary activities and ER Program roll-out.

Activity	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030
Preliminary Activities									
Consultation of the ER Program at the sub-national level									
Further definition of the silvopastoral trust									
Alignment of on-going MEFCCA and CONAGAN projects with the ER Program									
Preparation and submission of funding proposals (i. Project Bioclima (grant and loan) submited to GCF and BCIE; ii. GCF readiness funding to close financial gaps of the ER Program)									

Activity	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030
Preliminary Activities									
Coordination with PRONicaribe									
Consultation and final design of incentives for avoided deforestation in ITGs									
Identify ITG training priorities and communities of indigenous peoples and people of African descent									
Reformulation of the National Forestry Plan, including components on forestry permitting and supervision, secondary forests									
Preparation of operational structure and operational plans of the ER Program									
Further advances on REDD+ Readiness									
Implementation of Interventions									
Direct Interventions: Strategic Line 1. Forest Conservation									
Intervention 1a: Improved forest and land use management and governance in ITGs									
Updating territorial development and land use zoning plans									
Improving territorial and communal legal statutes, internal norms and regulations, and administrative and contractual procedures for forest and land use by									

Activity	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030
Preliminary Activities									
community members or outsiders									
Improving natural resource decision making and social control of those decisions at the communal level									
Improving local monitoring and control of forests and land use and forestry permits by community groups and local forest rangers and monitors, including information capacities, equipment and human resources,									
Direct incentives for avoided deforestation									
Intervention 1b: Community forest management (CFM)									
Promotion of investments in CFM via PPPPs (also see Intervention 3)									
Direct incentives for CFM									
Reform of forestry permit process (also see Enabling Condition 4d)									
Training and improvement of ITG procedures and structures related to contracts and investments									
Forestry regents and audits									

Activity	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030
Preliminary Activities									
Intervention 1c. Promotion of natural regeneration and social reforestation crusade									
Provide in-kind incentives and TA for social reforestation									
Provide group TA for natural regeneration									
Public promotion									
Direct Interventions: Strategic Line 2. Sustainable intensified production systems									
Intervention 2a: Silvopastoral trusts									
Align with CONAGAN project									
Obtain credit line and credit guarantees									
Organize trust structure, procedures, and participants									
Tailor TA system to needs									
Monitor compliance and on-farm forest conservation									
Intervention 2b: Agroforestry trusts									
Align with MEFCCA/INTA projects									
Tailor TA system to needs									
Monitor compliance and on-farm forest conservation									
Intervention 2c: Promotion of commercial reforestation									
Promote investments in forest plantations (see Intervention 3)									
Direct Interventions: Strategic Line 3. Off-farm employment creation via investment promotion									
Tabla 9 *Intervention 3a. Strengthening investment promotion by private or government institutions that promote private investments*									
Promote branding of the Caribbean region,									

Activity	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030
Preliminary Activities									
based on ethnic diversity, conservation, sustainable production systems, and the recognition of indigenous peoples									
Facilitate business contacts, establish linkages between communities and businesses, and promote investments in private property or communal lands									
Disseminate information to businesses and communities									
Promote market intelligence and contacts with markets, especially those for "green" products (e.g. *Consumer Goods Forum* for beef, various systems for coffee and cocoa).									
Consolidate the use of "green" criteria in PRONicaragua´s program as well as the orientation of public functionaries regarding green production and markets.									
Strategic Line 4. Institutional enabling conditions.									
Intervention 4a. Harmonization of policies and coordination institutional									

Activity	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030
Preliminary Activities									
Formulation of environmental goals and indicators									
Work with Production, Consumption, and Commerce cabinet and regional governments to incorporate environmental and natural resource information and criteria in strategic planning and monitoring									
Strengthen environmental coordination at the national and regional levels – Working Group I, SERENA and SEPROD									
Develop compensation mechanisms for environmental impacts of sectorial projects (e.g. road construction)									
Formulated and monitor the Strategy and Development Plan for the Caribbean Coast and Alt Wangki and Bocay formulation and monitoring									
Alignment of regional, municipal and territorial									

Activity	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030
Preliminary Activities									
development plans with the Strategy and Development Plan of the Caribbean Coast and Alto Wangki and Bocay									
Intervention 4b. Strengthen local and regional forest and land use monitoring									
Improve the capacities of the MRV system at the national level and its linkages at the regional level via SINIA and the regional information nodes.									
Strengthen the equipment, financing, and institutional coordination of SINIA.									
Create and implement a satellite imagery-based early warning system for deforestation.									
Improve and implement local monitoring via formation of forest rangers and community monitors in communal territories.									
Align local, regional, and national monitoring systems as well as indicators to be monitored among all levels of government.									
Intervention 4c. Improve gathering, use and dissemination of information									

Activity	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030
Preliminary Activities									
Increase and improve information generation and dissemination capacities of SINIA and information nodes at the regional level via upgrading of equipment and personnel increases and capacity building.									
Increase public access to information via greater publication on institutional web sites and in mass media									
Update and disseminate territorial and communal development plans, land use zoning, resource maps, environmental guidelines, and technical norms.									
Public education and awareness campaigns									
Intervention 4d. Improved application of policies, laws, regulations and norms									
Expand number and capacities of environmental inspectors of MARENA, forestry supervisors of INAFOR, and prosecutors of the PGR.									
Implement and monitor the application and compliance of the									

Activity	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030
Preliminary Activities									
laws, policies, and norms.									
Promote the environmental training of regional, territorial, and communal governments.									
Train local forest rangers in communal governments.									
Improve territorial and communal procedures and norms for land and natural resource use decision making.									
Improve social control of local resource use decisions by communal governments.									
Intervention 4e. Increase institutional resources and capacities for forestry and land use management									
Leverage national credit rating to generate loans that create greater income and fiscal revenues in the future.									
Expand private sector investment via investment promotion (see Strategic Line 3).									
Apply for grants to multi-lateral banks for climate change and sustainable land use programs.									

Activity	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030
Preliminary Activities									
Include environmental compensation mechanisms in budgets of sectoral projects and programs (e.g. road construction) with significant environmental/ forestry impacts (see Harmonization).									
Strengthen knowledge of public functionaries in regards to deforestation and green production (see Investment Promotion)									

4.4 Assessment of land and resource tenure in the Accounting Area

The following assessment of land and resource tenure is based on an evaluation of the same in the Caribbean Coast, the BOSAWAS Biosphere Reserve and the Indio-Maíz Biological Reserve that complements assessments carried out during the Readiness phase.

The evaluation deepens the analysis of the relation of norms and public polices with i) tenure regimes and their legal status in the accounting area; ii) land use and management; iii) the administration of protected areas; iv) progress related to the titling of communal lands; and v) the use of natural resources[38].

The evaluation was carried out in several phases: 1) search for information; 2) sessions with Working Groups II and III in the Caribbean region; 3) sessions with the legal working group made up of representatives of MARENA, the SDCC and authorities from the Autonomous Regions; 4) the making of maps; and 5) review of the findings by the SDCC, MARENA, and government authorities from the autonomous regions.

Land tenure and property rights

[38] http://enderedd.sinia.net.ni/Docs/Doc_PaqueteR/20.%20Analisis_de_la_Tenencia_de_la_Tierra(040717).pdf

Nicaragua is a pioneer and regional leader in the development of a robust institutional and legal framework as regards the restoration and protection of the rights of indigenous and Afrodescendant peoples. Land tenure is legally guaranteed and there are no barriers or conflicts as concerns legal property rights. The right to property and ownership cannot be the subject of a legal dispute.
The Nicaraguan Constitution (Articles 5, 44, 89, 99, and 103) recognizes and guarantee:

- ✓ Different forms of property (communal, public, private, etc.).
- ✓ The use and enjoyment of the forests and lands and communal forms of property by indigenous and Afrodescendant peoples.
- ✓ The right to private property.
- ✓ Land tenure, without discrimination, with the objective of producing wealth while complying with the social functions of land in order to benefit the country and its inhabitants.
- ✓ State responsibility for the protection, development and promotion, together with its inhabitants, of land-based activities and the protection of its natural resources.
- ✓ Respect for the legal dominion and possession of property rights, except in specific cases determined to be otherwise by the law.

Types of land tenure and its uses

A full 98% of the carbon accounting area is either communal or private property, while the remaining 2% has yet to be titled. Fifty-three percent (53%) of the area is privately owned, while the remainder is communal property. The use and usufruct of these zones affect land management, natural resources, protected areas and the territories of originary and afrodescendant peoples.

According to Law 445 (Communal Property Regime of the Native Peoples and Ethnic Communities of the Autonomous Regions of the Caribbean Coast and the Bocay, Coco, and Maíz Rivers), and the civil code of Nicaragua, **communal property** is defined as collective and is made up of land, water, forests and other natural resources that have traditionally belonged to the community, traditional knowledge, intellectual and cultural property, biodiversity and other goods, rights and actions that belong to one or more indigenous or ethnic communities. Communal land cannot be taxed and is inalienable, not attachable and not subject to prescription.

For its part, **private property** is the legal system that contemplates the rights held by owners, as individuals, associates, or collectives, for the dominion, use, enjoyment, and transmission of property. Under this system, property is considered the right to have and enjoy an asset without any other obligation apart from those established by the law. With regards to private property, most such property (60%) is located in RACCS, 23.8% in RACCN, 13.6% in the BOSAWAS Biosphere Reserve, and 2.6% in the Indio-Maíz Biological Reserve (Table. 14 and Figure. 16).

Private rights to natural resources and soil use

There is a substantial difference between communal and private property, namely that the former cannot be transferred, attached, taxed or sold. Thus, there can be no legal trade nor can rights be acquired by alleging possession, use or usufruct.

A summary table of the differences between communal and private property regimes is shown in Table 15; their presence in the accounting area is presented in Table. 16; and a map of communal and private property in the accounting area is shown in Figure. 26.

Table. 13 Differences among private and communal property systems

Private and Communal Property Regimes	
Private **Individual and Associative Rights**	**Communal** **Collective Communal Rights**
Individual or group decisions	Collective decisions made by communal or territorial assemblies
Property can be sold, transferred or taxed	Property is not subject to prescription and cannot be sold, transferred, donated, embargoed or taxed.
	Property can be leased for a predetermined period of time, upon prior approval of its use by communal or territorial assemblies.
Rights can be acquired by: inheritance, possession, and agrarian reform titles	Rights are acquired by: historical presence or assigned by laws or the constitution (Law 28, Law 445).
	Rights cannot be acquired by possession, use and usufruct of the property. Ownership of the land cannot become the subject of legal controversy. The only type of litigation possible is in the sphere of administration when land is under lease or traditional use conceded by the community.
Use and Usufruct: regulated by contracts under the Civil Code.	Use y Usufruct: Traditional and formal contracts, rental, associative and joint ventures are the types of contracts most frequently used.
	Contractual clauses are established by the communities and territories via internal mechanisms and policies (statutes and norms).
	Concessions have to be approved by communal and territorial assemblies, regional councils, and the Nicaraguan government
The administration of Protected Areas is	By constitutional mandate, the state respects that inhabitants of the communities and territories can use and

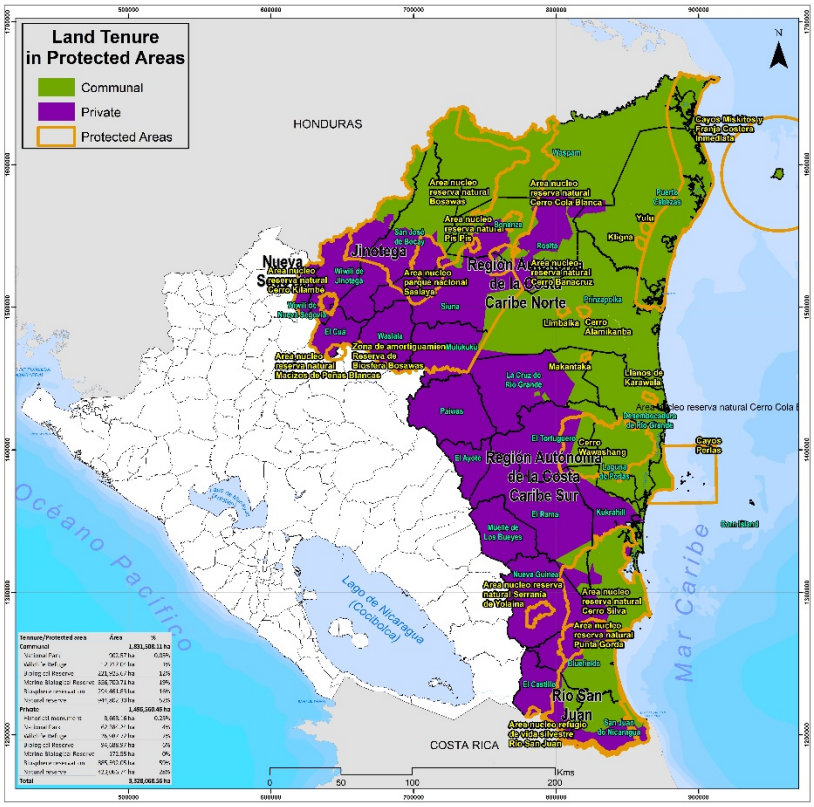
Private and Communal Property Regimes	
Private **Individual and Associative Rights**	**Communal** **Collective Communal Rights**
responsibility of the State, and can be shared with local inhabitants via a collaborative management signed by MARENA and the inhabitants.	enjoy natural resources of Protected Areas according to their customs, traditions and the law. The administration of Protected Areas is a shared responsibility of originary and Afrodescendant peoples and the state. It takes place through an agreement signed by MARENA and the communities. Protected area management plans have to be approved by communal and territorial assemblies.
Rights to the use of soil and resources pertain to the private owner, except when specially regulated for reasons of national interest.	Nicaragua respects rights to the use of soil and natural resources under the communal and territorial system, governed by tradition and the laws on the matter. If there is to be use and usufruct by public or private entities, the communities in the territories must approve this through their communal and territorial assemblies. Even if the national interest so requires, any use these lands may be put to must be approved by of originary and Afrodescendant peoples.

Table. 14 Property regimes in the accounting area.

Geographic Location	% of Accounting Area	Accounting Area Titled as Communal Property	Private Property	
			% of Accounting Area	Private Property Titled
Autonomous Regions of the Caribbean Coast	87.8%	47.9%	39.9%	91.1%
Geographic proportion of the Alto Wangki and Bocay indigenous territory special regime and the BOSAWAS and Indio- Maíz Reserves located in other departments (Río San Juan, Nueva Segovia, Jinotega).	12.2%	5.3%	6.9%	6.9%
Total	**100%**	**53.2%**	**46.8%**	**98%**
By Political Jurisdiction				

Department		Communal (ha)	Private (ha)	Total (ha)
Jinotega		223,301	483,809	707,110
Nueva Segovia		0	40,635	40,635
RACCN		2,401,236	840,616	3,241,852
RACCS		921,581	1,759,814	2,681,396
Río San Juan		115,922	210,936	326,858
Total		**3,662,040**	**3,335,810**	**6,997,850**

Figure. 26 Map of communal and private property in the accounting area.



Tenure in Protected Areas

Protected Areas represent a special case of land tenure, since they contain both communal and private property. There are 22 Protected Areas within the accounting area, containing 1.83 million ha of communal lands and 1.50 million ha of private lands, in which the State recognizes communal and private property rights. Of the 22 Protected Areas in the accounting area, 18 are found in indigenous and Afrodescendant territories.

The administration and management of the Protected Areas is the responsibility of MARENA, which acts through the National System for the Administration of Protected Areas (SINIAP). SINIAP implements planning, organization, direction, and control of the Protected Areas in accordance with their categorization and management plans. Of the 22 Protected

Areas, 9 need to update their management plans while 13 lack this management instrument.

In some cases, MARENA can cede the management of protected areas to other actors via:

i collaborative management, which is an institutional arrangement based on a shared agreement between MARENA and other actors for the implementation of actions in a specific territory of the Protected Area with the objective of conservation and sustainable use of the area.

ii joint management, whereby collaborative administration of a protected area on communal land is exercised by the state and indigenous and Afrodescendant communities. In the accounting area only the Indio-Maíz Biological Reserve has a joint management agreement with the Rama-Kriol territorial government.

The Bosawas and Indio Maiz Reserves are the largest Protected Areas in the accounting area and account for the large majority of the land in protected areas. Indio Maíz contains 94,687 ha of private land and 221,924 ha of communal land (Table. 15). Bosawas includes 187,029 ha of private land and 493,316 ha of communal lands within its nucleus; in the buffer zone there are another 885,592 ha of private land and 294,462 ha of communal lands ((Table. 15). The Bosawas buffer zone includes 6 protected areas within its buffer zone: Banacruz Natural Reserve, Cola Blanca Natural Reserve, Pis Pis Natural Reserve, Kilambe Natural Reserve, Peñas Blancas Natural Reserve, and Saslaya National Park that together account for 129,410 ha (104,159 ha of private lands and 25,006 ha of communal lands).

Table. 15 Private and communal lands in the BOSAWAS and Indio Maiz Reserves.

Protected Area	Private lands (ha)	Communal lands (ha)	Total (ha)
BOSAWAS nucleus	187,029	493,316	680,345
BOSAWAS buffer zone	885,592	294,462	1,180,054
BOSAWAS total	*1,072,621*	*787,778*	*1,860,399*
Indio Maiz	94,687	221,924	316,611
Total	**1,167,308**	**1,009,702**	**2,177,010**

Land use and usufruct of natural resources

During the land tenure study, land use and the usufruct of natural resources were assessed from two angles, as follows: (i) as regards communal property seen from the world view of originary and Afrodescendant peoples; and (ii) the different types of private property, based on the productive agricultural and cattle-raising models being implemented by other population groups that interact with the communities and municipalities in the autonomous regions.

The use and usufruct of the land and natural resources in the accounting area are being affected by two factors. One of these is **exogenous** and is exercised by population groups from different ethnic backgrounds who use extensive agricultural and cattle-raising systems and whose varied cultures contribute to exerting pressure on forests and therefore exacerbate poverty in the communities; the other is **endogenous** and is related to evident institutional weaknesses as concerns follow-up and control over sustainable activities in the area, weak governance and law enforcement.

Current land use in the accounting area

As regards current land use in the accounting area, the following has been determined:

(i) Forests have the greatest area, 3.19 million ha, equivalent to 82% of the national forests. These forests are mainly composed of broadleaf (2,852,392 ha) forest and pine (185,618 ha) forests, with small areas of palm or mangrove forests. A total of 2,054,573 ha of forest are found in the RACCN while the RACCS has 1,134,293 ha of forests (Table 16). In the nucleus of the Bosawas Reserve there are 487,769 ha of forest and 292,570 ha in the buffer zone. The Indio Maíz Reserve still conserves 280,689 ha of forest in its nucleus and 49,368 ha of forest in its buffer zone[39].

(ii) Pastures are the second most extensive land use. In 2015, they covered an area of 2,100,375 ha (30% of the accounting area), of which 365,739 ha were within indigenous territories and 1,734,636 ha (82% of the total pasture area) were outside these territories on private property.

(iii) Other important uses include crops which cover an area of 214,795 ha (3% of the accounting area). Of the crop area, 69% are covered by annuals and 31% by perennial crops. Approximately 73,907 ha (35% of the total crop area) is found in indigenous territories; of this area, 94% is covered by annual crops.

(iv) With respect to fallows (*tacotales*), their presence is significant (613,478 ha). *Tacotales* are not considered forests, but rather as secondary vegetation.

Forests are mainly associated with communal property, both within and outside of protected areas (Table. 16). Private property contains only about one-third the area of forest as communal lands. Similar amounts of forest are found within or outside of protected areas.

According to existing norms, lands defined as forests or having a forest vocation ought to be exploited sustainably and should not suffer changes of use, thus most deforestation in the absence of permits or concessions is illegal. Forest lands and their management are classified as: production forests dedicated to the sustainable development of forest resources, and conservation areas that should be permanently conserved with their forest cover in order to protect and conserve their biodiversity, soils, and water.

[39] The BOSAWAS and Indio-Maíz Reserves are found partially in the RACCN and RACCS, but also in other departments.

Table. 16 Forest cover by region and type of property in the accounting area.

Kind of property	Forest cover (ha), 2015		
	North	South	Total
Protected areas	**771,168**	**638,372**	**1,409,539**
Community property	586,061	470,175	1,056,235
Private property	185,107	168,197	353,304
Outside protected areas	**1,283,406**	**495,922**	**1,779,327**
Community property	995,128	265,765	1,260,892
Private property	288,278	230,157	518,435
Total	**2,054,573**	**1,134,293**	**3,188,867**

Farm characteristics are shown in Table. 17 below. Farms are larger in the RACCS, where livestock predominates, than in the RACCN. On the other hand, farms with the smallest average size are found in municipalities with larger indigenous populations: Waspan and Puerto Cabezas in the RACCN and Desembocadura de Río Grande in the RACCS. In general, livestock and perennial crops are more associated with private property, whereas annual cropping is found in both communal and private property.

Table. 17 Number and area of farms in the RACCN and RACCS (CENAGRO, 2011).

Municipality	# Farms	Area (ha)	Average farm size (ha)
RACCN			
Waspan	3,013	75,540	25.1
Puerto Cabezas	2,416	54,117	22.4
Prinzapolka	711	31,486	44.3
Bonanza	634	30,021	47.5
Rosita	1,152	62,919	54.6
Siuna	6,201	244,207	39.4
Waslala	4,596	101,777	22.1
Mulukuku	1,818	131,923	72.6
Total	**20,541**	**731,993**	**35.6**
RACCS			
La Cruz de Río Grande	2,179	124,887	57.3
Desembocadura de Río Grande	231	4,574	19.8
El Tortuguero	1,990	104,811	52.7
Laguna de Perlas	871	37,130	45.5
Kukra Hill	943	47,725	50.6
Bluefields	1,897	71,793	37.8
Corn Island	10	132	13.2
El Rama	3,933	169,537	43.1

Muelle de los Bueyes	1,910	74,614	39.1
Nueva Guinea	5,893	152,618	25.9
Paiwas	1,910	124,887	65.4
El Ayote	947	48,525	51.2
Total	**22,714**	**959,361**	**42.2**

Rights to resources

According to the Constitution and the Caribbean Coast autonomous legal system, property owners are entitled to the use and usufruct of natural resources en Nicaragua, limited only by the national interest, whenever pertinent.

Taking this constitutional precept for a point of departure, there are special laws that include enabling regulations related to rights to forests and land. For instance, article 2 of Law 462, related to the forestry sector, establishes that "the owner of the land also has dominion over the forest cover existing on it, as well as over the benefits derived therefrom," while article 36 of Law 28, the Autonomy Statute of the two Caribbean Coast regions states that "communal property consists of the land, water and forests that have traditionally belonged to the communities on the Caribbean Coast …".

Based on the foregoing, property rights, regardless of ownership, will always determine who is eligible to enjoy the benefits generated by conservation, preservation and the sustainable management of forest resources. These, however, are a shared obligation between the particular owner, the community, the municipality and the Nicaraguan State. In the case of originary and Afrodescendant peoples, in order for the State to make use of its legal prerogative to protect the national interest, it must first seek approval from the corresponding communal and territorial assemblies, as well as the Regional Government Councils.

The right to forest resources is clearly described in the forestry law and its enabling regulations, although the right to forest carbon is not specifically mentioned (see sections 4.5 and 17).

However, the country needs to improve the enforcement of its laws and regulations, as described in sections 4.1 and 4.2, above. Perhaps the clearest example of insufficient monitoring and control is the conversion of forests to other uses in the carbon accountability area, contrary to that which is set forth in the General Law on the Environment and Natural Resources. Oversight and control regarding management plans for protected areas, forests or natural resources are also inadequate, as are the updating and harmonization of community norms and regulations with national law.

Use and regulation of forest resources

- As concerns the environment, the legal framework establishes that owners, holders or usufructuaries (beneficial owners) may enjoy the use and usufruct of natural resources in a sustainable manner, taking into account the cultural diversity of the country and respecting the rights acknowledged in the Autonomy Statute regarding the two regions on the Caribbean Coast, the Upper Wangki and Bocay rivers and the pertaining municipalities (see section 4.5, on the laws regulating the use of natural resources).
- The natural resources in the protected areas are under the stewardship and special administration of the National Protected Areas System (SINAP) at MARENA. According to the law, those who live inside protected areas are to become the real guardians of these state lands. Further, in protected areas the State must ensure the enforcement of the rights and guaranties pertaining to each and every one of the inhabitants, who in turn are subject to regulations regarding the rational use of natural resources. Laws 217 and 462 establish special regulations for management of natural resources in protected areas. For instance, Law 462, section 4 – Protected Areas, article 26 declares that "the forest activities developed in protected areas will be subject to special regulations." For its part, Law 217 prohibits changing soil use in areas forest vocation.

Activities that take place in protected areas are limited to their classification, according to guidelines for their administration and management plans. The greater the restrictions, the more numerous are the constraints upon owners, holders or usufructuaries. In most protected areas mining, logging and extensive agricultural / cattle-raising activities are prohibited.

Challenges for land use and land rights in the accounting area

There is no evidence of any significant dispute or conflict based on land use rights in the accounting area that might in any way endanger the ERPD program. Land titling is clearly defined and communal property receives special protection, as it may not be attached, prescribed, transferred or sold, nor may rights over possession, use and usufruct of these lands be acquired. Any controversy arising from the use and usufruct of communal land can be resolved by resorting to jurisdictional bodies, renegotiating the terms of leasing contracts / agreements or improving the administration of communal property.

Clear land titles are the result of significant efforts made by the government of Nicaragua through the National Demarcation and Titling Commission (CONADETI), to demarcate and title 23 indigenous and Afrodescendant territories, corresponding to 31.4% of the national territory. Of the 23 titled territories, 16 are located in the RACCN, 4 in the RACCS, and 3 are in the Special Regimen Zone of Alto Wangki and Bocay. They contain 304 communities and 3,819,340 ha.

Given the existence of clear land titles, any potential conflicts or claims based on possession or improvement of communal property by non-community members do not have a legal basis. Nevertheless, land use tensions associated with the expansion of the agricultural frontier and changes of use exist due to the following factors:

(i) Exogenous factor or structural economic problems that are related with the pressure of poor migrants in search of better economic opportunities that entail the development of agricultural systems based on extensive land use, and

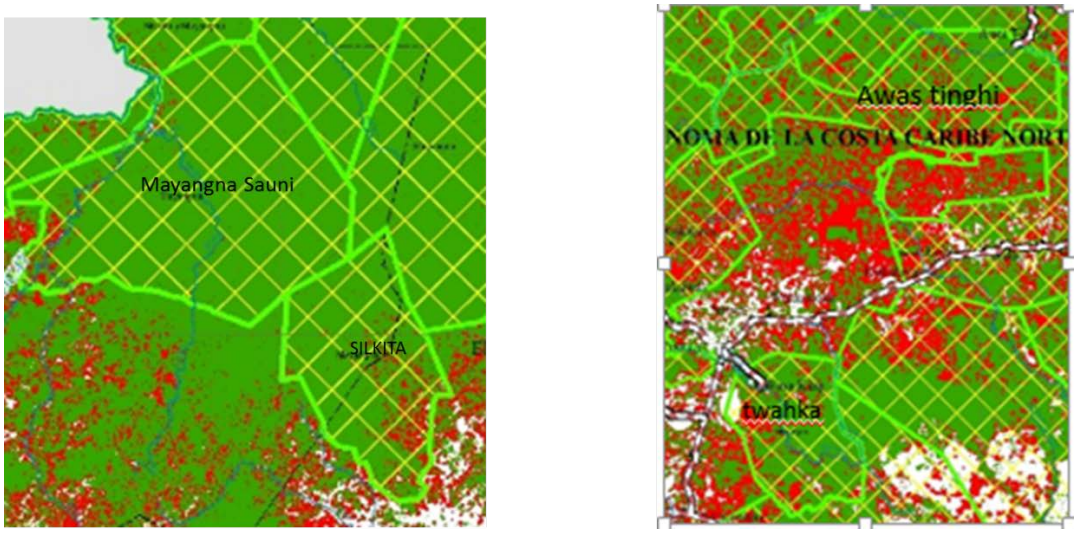
(ii) Endogenous factors that put into relief weaknesses in territorial land use classification and zoning, contract administration, weak monitoring and control, as well as the harmonization of community and territorial norms and regulations, despite the existence of an adequate legal framework

These factors are associated with the presence of third parties in some indigenous territories and protected areas where they convert forests to pastures or other crops.

The situation described in the foregoing can be dealt with by resorting to jurisdictional bodies, renegotiating the terms of leasing contracts/agreements or improving the administration of communal property. Among the territories in which there is most conflict regarding land use are Awastigni, Sikilta, Tuahka, Mayanga Sauni and Tasba Pri (Nitlapan, 2014). In general, these territories are located in RACCN, near the agricultural frontier, are accessible by land and have already been partially deforested. Awastinghi, Tuahka and Tasba Pri are near the so-called “mining triangle.”

The degree of deforestation in these territories is variable, which suggests that deforestation per se is not wholly responsible for land use conflicts (Figure. 27, below). In the figure below, Mayanga Sauni and Sikilta have a relatively low degree of deforestation, while in Awastinghi and Tuahka, at the right, deforestation is considerable, but lower than in neighboring areas. This suggests that other factors, such as a lack of clarity of land use contracts with third parties, transfers of land by third parties to others, or organized incursions of third parties to communal lands may be causes of conflicts. Unfortunately, there is little recent data regarding the presence of third parties in communal lands and the types of land use practiced by them. It is evident that the state and the communal and territorial governments exercise only control of migration and land use, a situation which tends to generate conflicts.

Figure. 27 Deforestation in indigenous territories with a high degree of land use conflicts (red shading indicates deforestation).



Mechanisms for resolving land use tensions

Law 445 includes procedures for protecting the rights of communal lands and resolving land titling conflicts. The latter is the responsibility of the Attorney General of the Republic and CONADETI. This process consists of the following steps: (i) a diagnosis of the situation based on documents and titles; (ii) updating of the legal status of third parties; (iii) research and verification of the registration history of the property; (iv) updating of the land registry; (v) approval of the changes by the Communal or Territorial Assemblies; and (vi) mediation and compliance of third parties with the resolutions.

In other words, this process strengthens the titling of communal property and the governance of the same by indigenous and Afrodescendant peoples. It is considered as the fifth stage of the process of demarcating and titling indigenous lands. As such, it forms part of gradual legal and social process that facilitates the full exercise of indigenous property rights with respect to other groups of inhabitants.

In addition, Executive Decree No. 15-2013 created the Inter-Institutional Commission for the Defense of Mother Earth in Indigenous and Afrodescendant Territories of the Caribbean and the Alto Wangki-Bocay. The Committee is integrated by the Attorney General of the Republic, the Supreme Court of Justice, the Secretary of the Caribbean Coast, the Commission of Ethnic Affairs of the National Assembly, MARENA, the Family, Adolescence, and Childhood Ministry, the national police, and the army.

The responsibilities of this Commission are as follows:

- Articulate the actions necessary to consolidate the ancestral rights of property in the indigenous territories with the operative territorial entities.

- Adopt the measures jointly agreed upon with the communal and territorial authorities.
- Assist the territorial governments with the execution of recommendations contained in the Committee´s resolutions aimed at confronting the threats to Mother Nature.
- Exercise mediation and attempt to find alternative solutions to conflicts that involve third party occupants of indigenous territories, while maintaining the territorial governments permanently informed of all Committee resolutions.

In parallel, the country is attempting to apply specific regulations and procedures to these conflicts. This process includes:

- Actions to reorder or regularize the public property registries in order to assure the full exercise of the rights of communal property, including the potential indemnification of third parties.
- The recognition of agrarian reform titles emitted before 1987, but under the communal property regimen, i.e. land use by third parties is recognized, but land sales are prohibited except to the community.
- Accelerating the judicial processes involving the demands by third parties to communal properties.
- Mediation and conflict resolution involving groups without legal documents or titles, based on dialogue and consensus.

Recently, various territories have also developed more agile instruments and procedures that establish norms for co-habitation of use of land by third parties. These include:

- ✓ The formulation of norms for co-existence and use of natural resources by third parties,
- ✓ Land rental contracts for third parties,
- ✓ The classification and zoning of land use,
- ✓ Conditioning of land use by third parties on the sustainable use of natural resources and respect for the customs and traditions of the indigenous communities.

However, these measures need to harmonized and aligned with the national legal framework.

In the RACCS, some territories have their own instruments of land and natural use administration. For example:

- ✓ Tawira has norms for fisheries.
- ✓ Wangki Twi Tasba Raya has a norm for the control and use of natural resources,
- ✓ Sauni Arunka has a consultation protocol.

- ✓ AMASAU has un regulation for communal property governance and a plan for land use classification and zoning, within the autonomous community framework.
- ✓ The Rama y Kriol and Karatá territories have approved norms that regulate the co-habitation and use of property with other ethnic groups.

It should be noted that since many of the third parties present in indigenous territories have rental contracts or other instruments for permitting the use of certain areas, the strengthening of the capacities of the territories and communities to administer these relations plays an important part of the strategy for promoting sustainable land use in the face of land use pressure.

Contribution of the ERPD interventions to tenure

The interventions described in Section 4.3 are expected to respond to contribute to the consolidation of land and resource tenure (see also Section 4.5). These include:

- Strengthening of forestry governance by the ITGs and communal governments, including the up-dating of the regional development strategy for the Caribbean Coast by the SDCC, the formulation of territorial zoning and development plans, and strengthening of the capacities of these governments to deal with third parties.
- Improvements in enabling conditions related to the application of laws, regulations, and management instruments are aimed at providing financial, physical, and human resources to regional and local governments so that they can more effectively carry out their mandates related to controlling land and natural resource use.
- In this, they will be assisted by improvements in enabling conditions related to the gathering, use, and dissemination of information, monitoring and control of land and resource use, as well as improved institutional coordination, at the regional, territorial, and communal levels. This includes early warning systems that combine satellite and local monitoring, the formation and increase of local monitors, and the strengthening of SERENA at the regional level.
- Harmonization of development and environmental priorities in the context of projects and programs executed at the regional level in order to reduce pressure on forests and reduce potential conflicts.
- Strengthening the monitoring and control of national, regional, communal land territorial entities.
- Strengthen the geographic information system in all administrative spheres and in the territorial governments.

4.5 Analysis of laws, statutes and other regulatory frameworks

The national Constitution of Nicaragua recognizes the important role of the State in the protection of the environment, forests, and forest ecosystem services, which forms the legal basis of the ER Program.

Land tenure and resource use in Nicaragua have as their legal foundation the Nicaraguan Constitution, which recognizes different types of property and guarantees land tenure with no discrimination of any type, for the purpose of producing wealth and complying with social functions that benefit the country and its inhabitants. The state and the country's citizens are responsible for the protection, development and promotion of activities related to property and the care of natural resources, while simultaneously showing respect for the rights of the inhabitants in a particular dominion and their legal possession thereof, except in specific cases as determined by law.

The legal and regulatory framework of the interventions of the ER Program are based on the following articles of the national Constitution:

- Art. 2: Direct participation of the people in national affairs.
- Art. 5: Recognition of indigenous and Afrodescendant peoples, their forms of social organization, administration of local affairs, communal forms of property, and the use and enjoyment of natural resources.
- Art. 8: The people of Nicaragua are multiethnic.
- Art. 44: Recognition of different types of property that ought to comply with social functions.
- Art. 60: Right to a healthy environment and the duties of the State and the citizens to protect it.
- Art. 89: Rights of the peoples of the Caribbean coast to preserve and develop their cultural identity forms of social organization, and natural resource use.
- Art. 102: Natural resources are part of the national patrimony; concessionary contracts can be entered into when in the national interest.
- Art. 103: The State guarantees the different forms of property and will not change legal dominion or possession except when required by law.
- Art. 180: The use and enjoyment of natural resources is an inalienable right of the communities of the Caribbean Coast.
- Art. 181: Autonomy regimen; concessions and contracts granted by the State require approval of the Regional Council.

The principal public policies and their relationship with the ER Program are shown in Table 18. All of the proposed interventions are aligned and permitted under laws and national policies derived from the National Plan for Human Development (PNDH).

Table. 18 Principal public policies and their relationship with the ER Program.

Policy Description	Relation to the ER Program
National Plan for Human Development (PNDH)	
The PNDH provides the guiding axis of national policies, including environment policies. The PNDH is based on a Cristian, socialist, citizen solidarity model. Its strategic lines, policies, and programs are oriented towards: 1) economic growth and macroeconomic stability with increased employment and reduction of poverty and inequality; 2) the strengthening of the alliance among workers, producers, and the government; 3) integrated development of the Caribbean Coast; 4) participatory public management and direct democracy; 5) the common good and social equity of Nicaraguan families; and 6) the protection of nature and adaptation to climate change.	The PNDH provides a general base for the ER Program interventions and all the interventions are supported by the PNDH framework. The ER Program will contribute to the increase and protection of forests via the promotion of: reforestation and natural regeneration, the conservation of forests and protected areas, and the sustainable use and recuperation of degraded soils and ecosystems.
National Policy for the Sustainable Development of the Forestry Sector	
This policy established that Nicaraguan families can improve their well-being via sustainable forest, agroforestry, and agroindustrial management based on an associative model articulated with other actors along national and international value chains. Management should incorporate environmental conservation and sustainable production that contributes to food security and sovereignty and should be based on territorial land use capacity and zoning.	The proposed interventions, within (e.g. community forest management) and outside the forests (e.g. forestry plantations, and silvopastoral and agroforestry systems) are framed within this policy.
General Policy for Territorial Land Use Classification and Zoning	
This policy promotes actions aimed at converting the territory into the motor of programs and projects oriented	The enabling conditions proposed in the ER Program consider territorial land use classification and zoning as an essential

towards the sustainable use of natural resources, including prevention or protection from natural phenomena. It strengthens inter-institutional coordination along the lines described by Law 290, with the goal of avoiding duplication of efforts, the use of financial resources, and functions. It is oriented towards improving land use and maintaining the balance between conservation and production.	element for effective land use management and governance and for the implementation of the interventions. The orientation of the law towards improving land use and maintaining a balance between conservation and production is a principal guiding principal of the interventions proposed. More specifically, the intervention aimed at strengthening land use and forestry governance in the 23 indigenous territories includes actions specifically designed to update land use classification and zoning in these territories as well as the use of this information in territorial development plans.
General Framework for Land Policy, Presidential Decree No.70-2006	
The government of Nicaragua considers secure land tenure as an essential element for economic stability, governability, and social harmony in the country. This policy promotes the productive and sustainable use of the land and its components in order to recuperate its true value as an economic, social, and cultural factor.	Based on this policy, the ordering of land tenure, the consolidation of property rights, and the integration of public policies in the territories can be considered as axes that support social and economic development. The proposed interventions were selected and structured based on criteria related to sustainable rural development based on sustainable and productive land use, including conservation. Moreover, land tenure was used to screen potential interventions and intervention areas. On the other hand, the promotion of secure land tenure and sustainable productive land use by the Program will contribute to the compliance and execution of the policy.
National Environmental and Climate Change Strategy	
Among its strategic lines, this policy includes sustainable land management based on the land use classification and zoning of watersheds as a basis for land use planning.	All the interventions, especially those related to agroforestry and silvopastoral systems and the intensification of sustainable production, will contribute to the execution of the strategy. All the interventions also focus directly or indirectly on reducing greenhouse gas emissions and/or the adaptation to

Sustainable land management focusses especially on good agricultural practices in order to reduce wind and water erosion and the emission of greenhouse gases. It also promotes agroforestry and silvopastoral systems.	climate change and hence are aligned with this Strategy.
Strategy for the Development of the Caribbean Coast and Alto Wangki and Bocay	
The Strategy for the Development of the Caribbean Coast to the year 2020 aims to "develop within a programmatic focus an economic reality that restores the rights of the inhabitants of the Caribbean to quality basic human services and just and equitable productive opportunities, supported by autonomous and dynamic empowerment of the citizenry. The Strategy proposes to continue applying the model of integrated human development to achieve further progress in equitable economic development in order to consolidate the development of the Caribbean and its insertion into the national economy, with social, environmental, cultural sustainability and the exercise of self-government, as well as to contribute to community and direct democracy.	The interventions will provide important inputs for achieving the objectives of the Strategy, since they aim at producing sustainable growth integrated with conservation, coordination and harmonization among different levels of government, the strengthening of territorial and communal governments and their structures, forestry management, territorial administration, and the monitoring and control of natural resources. The Program will also provide assistance for the updating of the Strategy. At the same time, all the activities proposed are compatible with the framework of the Strategy, especially the interventions related to enabling conditions.
Production, Consumption, and Commerce Plan, 2016-2017	
The Plan promotes sustainable and environmentally friendly production, while conserving forests, rationally using water, reducing the damage caused by chemical input use, and protecting biodiversity.	The majority of the proposed interventions coincide with the Plan by aiming at sustainable production by small and medium-sized producers. The Program also supports the Plan´s overall goal of environmentally production by promoting the integration of environmental goals and indicators in other sectors and the possible compensation of negative environmental impacts caused by these sectors.

National Forestry Program	
The objective of the Program is to orient the forestry and agroforestry sector towards sustainable and equitable development based on consensus, that uses articulation to efficiently and effectively provide forest goods and services, with the participation and alliances of the public and private sectors, ethnic communities, and indigenous and Afrodescendant peoples in a model based on sustainable forestry, agroforestry, or agroindustries that also contributes to increased food security and sovereignty.	The Program has a number of interventions aimed at improving the performance and sustainability of the forestry sector that at the same time will aid with the execution and compliance with the Plan. These include an increase in community forestry management, investment promotion for forest and agroforestry activities, promotion of reforestation and natural regeneration, improved forestry permitting and permit supervision, improved forest monitoring at the local level, strengthened institutional coordination, and improved dissemination and use of information.
20 X 20 Initiative	
The objective of the 20 x 20 Initiative is the reforestation of 20 million ha in Latin America and Caribbean by the year 2020.	The ERPD will contribute to the Initiative´s goals via promotion of: reforestation, natural regeneration, agroforestry, and silvopastoral systems.

Legal framework applicable to Autonomy and land and resource rights

Besides national policies, the ER Program also is founded on a broad legislative base related with forest management and protection, autonomy of the Caribbean Coast, the mandate of the Executive branch of government with regards to environmental matters, agroecological production, protected areas and the system of environmental evaluation.

Law 28, Law of Autonomy of the Caribbean Coast and its regulation, Decree 3584.

- Regulates the administrative governance of the Caribbean Coast and corresponding rights and duties enabled by the national Constitution.
- Establishes faculties of the different levels of government.
- Orients the land use classification and zoning of the Autonomous Regions with respect to the use of natural resources, in coordination with INETER.
- Permits the Regional Councils to emit endorsements for commercial forest extraction.
- Determines and defines, together with competent State entities, quotas for the extraction of natural resources and a system of regulation, control, and evaluation, with the object of guaranteeing their sustained use.

Law 445, Law of the Regimen of Communal Property of the Indigenous Peoples and Ethnic Communities of the Autonomous Regions of the Caribbean Coast of Nicaragua and the Bocay, Coco, Indio, and Maiz Rivers.

- Regulates the communal property regime of the indigenous and ethnic communities of the Caribbean Coast and the watersheds of the Coco, Bocy, and Indio Maiz Rivers.
- Determines the legal procedures for the management of natural resources and forest extraction in the indigenous territories and Afrodescendant territories and the relation between the State and communities in protected areas that are superimposed on communal lands.

Law 805, Law of Conservation and Sustainable Use of Biological Diversity

- Regulates the conservations and sustainable use of the country´s biodiversity. Guarantees the equitable participation and just distribution of benefits derived from the use of biodiversity, with special attention to indigenous and Afrodescendant communities as well as the respect and recognition of the intellectual property rights, and traditional uses and customs of local communities.

Legislation applicable to forests, land, and protected areas

Law 217, General Law of the Environment and Natural Resources and its regulation, Decree 9-96

- Establishes the general regulations and instruments for environmental management, including protected areas, the system for environmental evaluation, land use classification and zoning, environmental education, and genetic resources in indigenous territories.
- Establishes the norms for the conservation, protection, improvement, and restoration of the environment and natural resources found therein in order to ensure their rational and sustainable use, as stipulated in the national Constitution.

Law 462, Law of the Conservation, Promotion, and Sustainable Management of the Forestry Sector and its reforms, Law 947.

- Establishes norms and promotes the conversation, foment, and sustainable development of the forestry sector, including the management of natural forests, the foment of forest plantations, and the protection, conservation, and restoration of forest areas.
- Emphasizes the importance of improving the well-being of inhabitants via forest management and the participation of the regional and municipal governments and civil society in forest conservation in order to assure multiple benefits and goods and services produced by forests.
- In relation to land titles and diverse forms of land tenure, the Law defines that the dominion of the existing forest cover and its derived benefits belong to the

landowner, who is responsible for its management under the Law and its regulations.

- Creates incentives for forest owners or legal entities that develop activities related to forest conservation, restoration, or sustainable management.

Decree 01-2007, Regulation of Protected Areas of Nicaragua and its regulations

- Regulates protected areas, their norms and administrative directives. Established procedures for the declaration of protected areas, management with stakeholders, and sustainable planning based on management plans.
- Regulates the administration of protected areas via collaborative or joint management.
- Establishes the administrative procedures for applying sanctions.

Decree 20-2017, System for the Environmental Evaluation of Permits and Authorizations par the Sustainable Use of Natural Resources

- Establishes the System of Environmental Evaluation, with the administrative procedures that regulate permits and authorizations for the sustainable use of natural resources.
- Includes 18 activities as potential subjects of environmental evaluations, including projects subject to Environmental Impact Assessments.
- Establishes the procedure for management plans and timber salvage plans in protected areas.
- Establishes the procedure for the environmental authorization for the use and management of soils and terrestrial ecosystems.

Law 641, Penal Code of Nicaragua

- Regulates crimes against natural resources.
- Illegal natural resource use is punishable under the law under the following circumstances:
    - The exploitation, concealment, commerce, transport, trafficking, or benefiting from forest resources in the absence or of authorization or in excess of the quantities authorized.
    - The unauthorized partial or total removal of trees or plants from State, communal, or abandoned lands.
    - The unauthorized clear-cutting of trees on forest lands. Sanctions include jail, but will increase if the infractions occur in protected or prohibited areas.

Law 765, Law of Promotion of Agro-ecological and Organic Production and its regulation

- Foments the development of agroecological o organic production systems through the regulation, promotion, and stimulation of activities, practices, and processes of production that are environmental, economically, socially, and culturally sustainable and that contribute to the restoration and conservations of natural ecosystems, agroecosystems as well as sustainable land management.

Rights and uses of forestry resources

According to the Constitution, the autonomy statutes governing the Caribbean Coast and sectoral laws, as well as rights to natural resources and benefits derived from the land or that which is found on it belong to the owner, as recognized by the following laws:

- Article 9 of Law 28 (Autonomy of the Caribbean Coast) establishes as communal property the lands, water, and forests that have traditionally belonged to the communities of the Caribbean Coast.
- Law 462 (Conservation, Foment, and Sustainable Development of the Forestry Sector) establishes that the forest use rights, as well as obligation to conserve the forest, accrue to the forest land owner.
- Law 462 also creates incentive mechanisms and a fund destined to the owners of forested lands in order to foment forest protection and conservation with the purpose of capturing carbon. The Law contemplates two types of mechanisms for a) persons or legal entities that invest in natural forests or forest plantations, and b) land owners with forest resources that opt to preserver forests and manage them in order to produce oxygen.
- Article 5 of the Constitution describes the different types of property recognized in Nicaragua, among which is communal property. The recognition of the existence of indigenous peoples is stated expressly, in particular as regards their right to property over their lands. Law 445 regulates communal property rights, as well as the use and administration of natural resources in the traditional communal land of indigenous peoples and ethnic communities. Communal property is defined as collective and is made up of land, water, forests and other natural resources that have traditionally belonged to the community, traditional knowledge, intellectual and cultural property, biodiversity and other goods, rights and actions that belong to one or more indigenous or ethnic communities.
- With respect to the rights to forest carbon, Law 28 states that communal property is constituted by lands, water, and forests that have traditionally belonged to the communities of the Caribbean Coast, while Law 462 established that forest cover and the benefits that it produces belong to the land owner. Based on these Laws, it is concluded that forest carbon belongs to the land owner or community where forests are found.
- With respect to payments for environmental services or carbon, Law 217 (General Law of the Environment and Natural Resources) established payments for environmental services.
- Law 462 also creates the National Fund for Forestry Development (FONADEFO) as part of INAFOR whose function is to “capture and administer financial resources for the development and financing of forestry programs and projects that favor the sustainable management of forestry resources with the objective of increasing the economic development of the country, the conservation of natural resources, the establishment of payments for environmental services, and improvement of the environment”.

ER Program Legal Interventions

Nicaragua has abundant legislation and policies aimed at protecting the environment and natural resources which provides solid backing for the ER Program. However, there is a lack of knowledge of this legal framework which makes the interpretation and application of the laws difficult. This is compounded by institutional weaknesses and scarce resources that limit the monitoring and control of forest and land use.

The ER Program will attempt to overcome weak monitoring and control of forest and land use and the application of relevant laws and regulations via the following activities:

- Dissemination of information related to laws and procedures for sustainable land and forestry.
- Strengthening of land use management and governance by the territorial and communal governments, including internal norms and procedures, decision making, capacities for dealing with third parties, and the updating of land use classification and development plans at the territorial and communal levels.
- Greater control and enforcement via increases in local monitors, forest rangers, environmental inspectors, and prosecutors.
- Improvements in forestry permitting and permit supervision including the use of local monitoring.
- The establishment of a mechanism and the resources necessary in order to monitor the application and compliance of the laws and regulations.
- Strengthening of institutional planning and coordination via the updating of the Development Strategy of the Caribbean Coast, the strengthening of SERENA at the regional level, and better coordination between MARENA, SERENA, and communal governments especially in protected areas.

4.6 Expected lifetime of the proposed ER Program

The ENDE-REDD+ program is programed to 2030. However, the actions contained in the ERPD, and the offer to the Carbon Fund are expected to cover a period of five years starting in 2020 and ending in 2024. Preliminary activities will begin in 2019 and end in 2020 when formal implementation begins (see Intervention Road Map in Section 4.3).

For the period between 2025 and 2030, Nicaragua anticipates obtaining funding from international donors or climate change institutions that will permit continuance and further progress in reducing forest-based emissions.

5. Stakeholder Consultation and Participation

5.1 Description of stakeholder consultation process

This section details the participatory consultation process being carried out in Nicaragua. The consultation process includes two inter-related processes: consultation of the national REDD+ strategy (ENDE-REDD+) and consultations related to the ERPD *per se.* The former is directly relevant to the ERPD since the national emissions reduction strategy (ENDE-REDD+) includes the Caribbean Coast as its highest priority area due to the high incidence of forests and deforestation there (the Caribbean Coast contains 82% of Nicaraguas´s forests and is area where deforestation is most prevalent[40]). Moreover, the discussion during ENDE-REDD+ of basic concepts and the causes and solutions of deforestation form the basis of ER Program in the Caribbean.

Strategy, methodology and consultations regarding ENDE-REDD+

Nicaragua´s governance model is based on dialogue, alliances and consensus, as outlined in the national Constitution, specific laws such as Law 28 and Law 445, and international conventions such as ILO 169, to which Nicaragua is signatory since 2010. This participatory model was incorporated in the design of both ENDE-REDD+ as well as the ER Program, which also is aligned with element 4 of the FCPF's Carbon Fund Methodological Framework: "The design and implementation of the ER programs are based on and use transparent consultation and information exchange mechanisms between the actors involved that ensure broad-based community support and the full and effective participation by said actors, in particular the affected local communities and indigenous peoples."[41]

The design of both ENDE-REDD+ and the ER Program used a formal mechanism for consultation whereby stakeholders were divided into three working groups (Table. 19; see also Section 3).

The design of the ENDE-REDD+ began prior to that of the the ERPD and used a stepwise approach due to the need to gradually increase stakeholder knowledge, account for the complexity of the issues considered, and achieve consensus among actors. In this process, territorial technicians, who were proposed and approved by the indigenous territorial governments and the autonomous regional governments, were used in order to provide for fluid, ongoing communication in indigenous languages. The chronogram of this process was:

2014-2015: Diverse stakeholders were identified and dialogue related to general aspects of REDD+ were held, including an analysis of the causes of deforestation. In brief, favorable conditions were prepared for the consultations on ENDE-REDD+.
2016-2017: Consultations took place on themes such as safeguards, mechanisms to strengthen communication and resolve conflicts, and an analysis of proposed strategic lines of action linked

[40] This approach has been explained in detail in the ENDE-REDD+ Readiness package: http://enderedd.sinia.net.ni/index.php/docpreparacion
[41] FCPF Carbon Fund Methodological Framework, 2013.

to the causes of deforestation. Training on reference levels for the reduction of emissions, forest monitoring, and specific analyses required by the ERPD was also held.

Table. 19 ENDE-REDD+ Dialogue and Consultation Platform.

Working Group I is made up of the heads of those institutions that work on issues related to forest and climate change, the coordinators of the Regional Autonomous Governments, and ITG representatives. This group defines the strategic orientation and policies and must approve all proposals, including ERPD, before these are brought before the President of Nicaragua for final approval. **Working Group II** is the technical entity charged with drawing up proposals and coordination with central government institutions (Group I). Members include technicians of the Program Implementing Unit, technical entities of the regional governments (such as the Secretariat of Natural Resources -SERENA), The Planning Secretariat (SEPLAN), the Regional Nodes, the Forestry Consultative Committee in RACCN, the Natural Resources Commission, and ITGs. Liaison teams made up of regional government representatives, together with territorial technicians of the ENDE-REDD+ program (4 in RACCN and 2 in RACCS), have been the guarantors of ongoing communication with leaders of the territorial governments, the communities, mayor's offices as well as women, youth and social organizations working on forest protection. To that end, visits took place and work sessions were held on the issues related to the design of the ENDE-REDD+ and ERPD. **Working Group III** is a consultative space for grassroots stakeholders. Once proposals have been prepared by Group II, they are submitted for validation and consultation to Group III members, which include community leaders, women, youth, farmers, cattle-ranchers and environmental organizations that have influence in the autonomous regions.

Issues discussed and actors consulted during ENDE-REDD+

Free, prior and informed consent on the part of indigenous and Afrodescendant peoples who form part of the multiethnic population of the Caribbean Coast was used during the ENDE-REDD+ and ER Program consultations. In both processes on the Caribbean Coast, participating stakeholders included the Miskito, Mayangna, Ulwa, Rama, Creole and Garifuna ethnic groups as well as *mestizos* (people of mixed Spanish-indigenous heritage), who have a significant presence in the zone. Most of this population is composed of small farmers (*campesinos*) who make use of forest resources and included migrants.

A variety of partiacipatory mechanisms, including workshops, congresses, forums and work sessions, were used is discuss themes related to emissions reductions due to deforestation and

forest degradation. These sessions incorporated the actors identified in the mapping of actors shown in Table. 20

Table. 20 Summary of the mapping of actors.

ACTORS	INTERESTS/MANDATES
Central government institutions	
MARENA, MAG, INTA, INAFOR, INETER, MEFCCA, MHCP; Presidential Secretary for Public Policy; Secretary for the Development of the Nicaraguan Caribbean Coast; ProNicaribe.	Harmonization of government policy regarding private, public, mixed and community investments in the reduction of carbon emissions due to deforestation and forest degradation. Promote sustainable, inclusive and competitive investments, including the incorporation of good practices leading to a reduction of forest carbon emissions.
Regional, territorial and municipal governments	
Indigenous territorial governments /indiegnous and Afrodescendant peoples; autonomous regional governments (GRACCN y GRACCS); municipal governments.	Formal and ancestral owners of indigenous territories and its goods and services (including ecosystem services). Regional socio-economic growth, institutional strengthening, taking ownership of and deepening autonomy and citizen participation, based on territorial planning. Promote municipal development. Municipal investment projects and environmental plans.
Private sector associations and organizations	
Associations of farmers and cattle-ranchers; UNAG, CONAGAN; private investors; associations of reforesters.	Improvement of family economies and adoption of agroecological technologies. Financial resources and relations with sources of financing. Align investments with good practices in order to reduce forest carbon emissions. Articulate the generation of their investments and public sector business promotion entities (PRONICARIBE).
Small farmer families (*mestizos*).	Represent a soure of labor. Have organized representation in the municipalities. Participate in technical assistance programs, training and technological innovation. This group of actors is sub-divided into property owners and third parties[42]. The latter cannot own communal land, but some have land rental agreements or contracts with indigenous communities.

[42] Law 445 identifies third parties as “Perons or legal entities, distinct from communities that claim property rights within communal lands or indigenous territories”.

Social, youth and women's organizations interested in environmental protection.	Promote values such as love and care for Mother Earth. Manage funds for the protection of biodiversity. Promote environment-friendly technologies.
Academe and social communications	
URACCAN and BICU universities.	Academic education. Contribute knowledge and experience in applied research.
Local communications media.	Influence public opinion on a variety of matters. Promote informal environmental education.
Financial sector and foreign cooperation	
Banks, microfinance institutions, foreign cooperation agencies.	Make available financial resources for productive investments. Incorporate green protocols in their loan policies.
Tutelary institutions and the judicial branch	
Office of the State Prosecutor; National Police; Army of Nicaragua (Ecological Battalions).	Exercise the legal representation and defense of the state's interests. Make available personnel trained to investigate complaints regarding environmental crimes. Accompany oversight and control processes in the territories.

During the preparation of the ENDE-REDD+ a total of 94 workshops were held, of which 79 took place on the Caribbean Coast and are considered to be applicable to the ER Program. In addition, actors participated in 68 SESA working group and coordination sessions. During this process, each of the themes considered was analyzed and prepared by Working Group II and was subsequently presented to Working Group III for validation in workshops attended by leaders of indigenous groups, women, youth, communities, universities, local government authorities and members of the Nicaraguan Army and National Police.

The workshops held on the Caribbean Coast had a total participation of 3,564 persons, of which 35% were women and 54% were of indigenous ethnic origin (Table. 21).

Table. 21 Timetable of ENDE-REDD consultations applicable to ERPD.

	Issues consulted	Workshops held (by year)				Attendance	Group consulted
		2014	2015	2016	2017		
1	Participation in the REDD+ mechanism and causes of deforestation.	1	20	8	1	1444	II y III
2	Analysis of public policy and the legal framework.	0	6	1	0	221	II y III
3	Mechanisms by which to strengthen communication.	0	0	13	1	819	II y III
4	Strategic environmental evaluation (risk identification) • Involuntary resettlement planning framework and safeguards • Planning framework for indigenous peoples	0	3	6	1	369	II y III
5	Design of a monitoring system and reference levels	0	3	8	0	323	II y III
6	Strategic ENDE-REDD+ guidelines	0	2	1	4	388	II y III
	Total = 79	**1**	**34**	**37**	**7**	**3,564**	

Table. 22 Percentage of participation by women, youth and ethnic groups.

Percentages		Percentages for participation by ethnic groups					
Women	Youth	Mestizos	Miskitu	Mayangna	Rama	Ulwas	Afrodescendants
35	18	46	29	14	1	1	9
Percentage of participation by sectors identified in the map of actors							
Central govt.	Regional govt.	ITGs	Mayor's offices	Academia	Organizations	National Police and Army	
14	16	39	5	2	22	1	

The workshops were prepared using a plan or terms of reference (TORs) prepared by Working Group II in consensus with the regional governments. The materials used during the workshops and the subsequent proceedings were prepared or approved by the regional governments and are available on the ENDE-REDD+ web page: http://enderedd.sinia.net.ni/index.php/2015-06-04-16-17-46/2015-06-04-16-22-24/2015-12-21-20-52-28#

Each of the workshops began with a summary of REDD+, followed by a discussion of the main causes of deforestation in the local area of the workshop. A strength of these dialogues and consultations has been the translation from Spanish to the native languages of the ethnic groups in attendance, in order to ensure clarity and understanding of the issues involved.

5.2 Summary of the comments received and how these points of view were taken into account in the design of the ER Program

As mentioned earlier, the ERPD proposal originated from dialogues held in the course of the ENDE-REDD+ process as well as though specific to the ER Program. Table below displays a synthesis of the comments and proposals related to the ERPD by the actors participating in the events. The proceedings of the workshops can be found at: http://enderedd.sinia.net.ni/index.php/2015-06-04-16-17-46/2015-06-04-16-22-24/2015-12-21-20-52-28#

Table. 23 Summary of the comments made by Caribbean Coast actors participating in the ERPD.

Place and type of event	Comments	Participants	Discussion and commentary of proposals for ERPD interventions
Dialogue on REDD+ mechanisms and causes of deforestation			
Waspam 21 April 2015	• The Coco River's diminished flow and forest fires are some of the problems caused by climate change. Lack of coordination between community authorities, INAFOR and the army means trucks laden with logs continue to drive out of the area and there is little or no control regarding permits.	ITGs, National Police, mayor's offices, INAFOR.	• Increase communal forest management. • Monitoring by community forest rangers (enforcement of laws and regulations).
	• It is important to raise awareness on the need to stop deforestation.		• Public education and awareness-raising.
	• It is necessary to prepare a national strategy that includes proposals to protect the forest and deal with the causes of deforestation.		• Update the Caribbean Coast Development Strategy as well as territorial development plans. • Strengthen government control points and similar actions.
Prinzapolka	• It is necessary to raise awareness so that people cease using slash-and-burn agricultural methods and take better care of natural resources.	ITGs, mayor's offices, INAFOR,	• Public education and awareness-raising.

Place and type of event	Comments	Participants	Discussion and commentary of proposals for ERPD interventions
18 December 2015	• It is necessary to strengthen coordination between all institutions involved. Actors request a stronger institutional presence.	university regents	• Improved coordination and harmonization among institutions and policies.
Bluefields 23 July 2015	• The agricultural frontier is advancing due to cattle-ranching or crop monocultures (i.e. palm oil). Companies bring development, but must be regulated. • It is necessary to strengthen SERENA.	GRACCS, SERENA, Universities, Guardabarranco Movement (environmental NGO).	• Improved enforcement of laws, regulations and management instruments.
Nueva Guinea 18 June 2015	• The extraction of timber for domestic use needs to be regulated. • Among the most serious problems in the forests of Nueva Guinea is the lack of awareness among the population, the felling of trees for firewood, poverty and failure to comply with the law.	Mayor's offices, municipal councilors, farmers.	• Public education and awareness-raising.
Bilwi 12 May 2015	• Support to alternatives proposed by organized women in the communities as concerns forest conservation. • Women can use timber residues produced by sawmills and carpentry shops as raw material for handicrafts as part of community forestry enterprises. This would increase family incomes. • Women are interested in participating and being included throughout the process of formulating a strategy as they take ownership of each of the actions and/or activities.	Organized women's groups and indigenous peoples.	• Increase communal forest management. • Public education and awareness-raising.
Waslala 28 April 2017	• We are at a critical point in the cattle-ranching history of our country, and are already experiencing the effects of climate change. • The diversification of our farms is an interesting option by which to improve incomes. Possibilities (among others) are growing cocoa, carbon sequestration, producing timber, growing different types	Organized farmers and cattle-ranchers	• Technical assistance for farmers and cattle-ranchers. • Access to loans for farmers and cattle-ranchers. • Promote investments.

Place and type of event	Comments	Participants	Discussion and commentary of proposals for ERPD interventions
	of fruit and raising calves with a better weight/age ratio. All these can contribute to making cattle-ranching more environment-friendly. We are aware we cannot continue deforesting or degrading our forests. Forest incentives will help us to improve the current situation.		
Rosita 21 and 22 July 2016	• Communicators (the media) can contribute to raising awareness of the need for environmental protection and care.	SERENA, social communicators, mayor's offices	• Public education and awareness-raising.
	• Regarding autonomy, it is necessary to deepen the process in the territories and vis-à-vis the indigenous communities. Their syndicos (representatives) or whitas (judges) are the highest authority, sometimes taking the place of the community assembly.		• Improved coordination and harmonization among institutions and policies. • Improved enforcement of laws, regulations and management instruments.
Dialogues held regarding the legal framework			
Bilwi 27 November 2015	• The territories are doing their part. SERENA must improve communication and join the efforts made by the ITGs and mayor's offices.	SERENA, ITGs, GRACCN	• Improved coordination and harmonization among institutions and policies. • Strengthening government control points and similar actions.
	• It is important to hold consultation assemblies in the territories. The different levels of government need to ensure coordination in order to join efforts in the struggle for environmental conservation and preservation.		
	• The national legal framework must continue to be disseminated, but always with an emphasis on issues that are of interest to the autonomous regions, such as laws 28, 445 and ILO Convention 169.		• Improved enforcement of laws, regulations and management instruments.
	• Law 445 has served to organize land tenure, clarify who owns what land and natural resources. In the RACCN there are 17 indigenous territories that have been		

Place and type of event	Comments	Participants	Discussion and commentary of proposals for ERPD interventions
	titled, as well as another three (3) on the Upper Coco River.		
Prinzapolka 9 June 2015	• Much as in other municipalities, the lack of an institutional presence is a negative factor regarding oversight and control of the use and management of natural resources.	ITGs, mayor's offices, INAFOR.	• Improved enforcement of laws, regulations and management instruments.
	• Community members resent the scarce accompaniment they get from the institutions. This has led to apathy on their part and out of ignorance or convenience they may prefer to undersell the little remaining forests.		
	• Ignorance of the regulatory framework regarding forest use. There are certain species that cannot be used because season is closed.		
Muelle de los Bueyes 13 May 2015	• In this municipality, the Program was shown to SERENA authorities for the first time. SERENA is the regional regulatory body for the management and use of natural resources.	Mayor's offices Councilors Cattle-ranchers	• Strengthening of government control points and similar activities.
	• The problems of environmental pollution in the rivers and the lack of forested areas in their territories have negative consequences for the pastures upon which livestock depends, which in turn decreases milk production. The participating cattle-ranchers stated that technified farms are already being implemented, and that these are more environment-friendly. However, this is still a constant struggle due to greater costs.		• Technical assistance to agricultural producers. • Access to credits with accessible interest for agricultural producers.
Dialogue on the mechanism for communiation strengthening			
Pearl Lagoon	There is weakness because the communities are unaware of environmental laws.	SERENA, CRACCS, ITGs	• ENDE-REDD + must be transparent.

Place and type of event	Comments	Participants	Discussion and commentary of proposals for ERPD interventions
6 May 2016-	• Regarding the communication mechanism, it was pointed out that when people know they can voice their concerns and are being listened to, they are more motivated and feel supported.	Mayor's office	
Sauni Bu 25 May 2016	• The conservation of the BOSAWAS Biosphere Reserve is due to the spirit of conservation and community decision-making practices, where actions are proposed by consensus.	ITGs and community members	• Increase community forest management. • Monitoring community forest rangers (enforcement of laws and regulations).
	• The Bocay River is a natural treasure that facilitates navigation, among other things, so the communities are committed to its protection.		
	• That environmental education efforts must be maximized. With regards to the problem of mestizo families who have settled in the territories, dialogue is proposed. Support forest rangers.		• Public education and awareness-raising.
Musawas 2 June 2016	• The forest we have today has a cost. It has been preserved since the time of our ancestors. When we talk about the forest we are talking about ancient history.	ITGs and community members	• Increase community forest management. • Monitoring community forest rangers (enforcement of laws and regulations).
	• The area of Sauni As is very extensive. It is supposed that the ER Programganize promoters to ensure compliance with the avoidance of deforestation and forest degradation.		
SESA Workshops: Causes of deforestation, strategic guidelines, safeguards, forest management			
Bonanza 20 May 2015	The importance of technical assistance and micro financing to small farmers was analyzed. It was proposed to: • Promote agricultural fairs with agro-ecological products that do not use chemicals to avoid soil contamination. • Encourage and strengthen women's groups who work with handicrafts. • Training in environmental issues / reforestation.	Universities ITGs	• Technical assistance to agricultural producers. • Access to credits with interest for agricultural producers.

Place and type of event	Comments	Participants	Discussion and commentary of proposals for ERPD interventions
	• We must raise awareness regarding soil management and sustainable use. There is a risk there will not be enough money to make payments.		
Bluefields 25 May 2016	• The consultations should be held in the territories with emphasis on the sixteen communities. After this process, the results should be submitted erritorial Assembly to obtaininions of community members and achieve a solid foundation of inputs from the communities tothe leaders.	Mayor's office, SERENA, INAFOR GRACCS Guardabarranco Movement ITGs	• Considered during the consultation with participation by stakeholders.
Bilwi 26 July 2016-	• Involuntary resettlement is not an issue in our region.	Universities ITGs SERENA	• It has been taken up again in the risk analysis – MGAS.
Kukra Hill 9 June 2016	• Establish control and surveillance systems in the territories.	Mayor's office, SERENA, INAFOR GRACCS Guardabarranco Movement ITG	• Increase community forest management. • Monitoring by community forest rangers (enforcement of laws and regulations).
	• Incentives must be created for rural populations that plant trees. Governments at all levels must be technically, legally and administratively strengthened so they can deal with conflicts regarding governance. There must be decentralization of the administration of protected areas. Promote forest incentives. Stop the expansion of areas used for monocultures.		• Technical assistance to agricultural producers. • Access to credits with interest for agricultural producers.

These comments resulted in the inclusion of the following activities or interventions in the ENDE-REDD+ strategy and ERPD:

- Community forest management.
- Local forest monitoring by community forest rangers (enforcement of laws and regulations).

- Updating of the Caribbean Coast development strategy and territorial development plans.
- Strengthening of national government forestry control posts and other forestry supervision activities.
- Technical assistance to agricultural producers.
- Access to credits with accessible rates of interest by agricultural producers.

The suggestions related to enabling conditions included:

- The need for more public education and awareness.
- Improved coordination and harmonization of institutions and policies.
- Improved application and compliance with laws, regulations and management instruments.
- Promotion of investments.

At a more strategic level, the consultations of the autonomous region stakeholders was key to obtaining approval for the strategic interventions proposed in the ENDE-REDD+ and ERPD.

ERPD strategy, methodology and consultations

The preparation of the ERPD proposal was based on input from stakeholders mentioned above and involved the teams of specialists of the ENDE-REDD+ implementation unit, the regional governments, the Caribbean Coast Development Secretariat and INETER, and international consultants.

This process was supported by 7 World Bank technical missions that included the participation of the Autonomous Regional Governments, the SDCC, representatives of the ITGs, MEFCCA, INAFOR, MHCP, SPPP, INETER, MAG, ProNicaribe, agricultural producers and the Chamber of Forestry. A summary of the issues addressed during the missions is shown in Table. 24.

Table. 24 Summary of World Bank missions related to the ERPD.

No	Mission	Date	Participants	Topics addressed	Media download link	
					Proceedings	Agenda of the mission
1	Mission to support the launch of the ERPD process	9 to 20 May 2016	Group II: MARENA, GRACCN and GRACCS, SDCC, SPPN, MHCP	Preparation of the work plan and TDR for the international consultancies for the ERPD. Working sessions were held in the	https://drive.google.com/open?id=0B2NI1SOSCISuNGI2aFBLMTFIUW8	https://drive.google.com/open?id=0B2NI1SOSCISuSEpkc08xZFp5cEk

				autonomous regions.		
2	Technical support mission for the ERPD	23 January to 1 Februar y 2017	Group II and Group III: MARENA, INAFOR, MEFCCA, MAG, SDCC, SPPN, MHCP, GRACCS, GRACCN, CONAGAN, Reforesters PRO-Nicaragua.	Start of the development of the ERPD. Working sessions were held in the autonomous regions and included. agricultural producers, reforesters, ITGs, universities, foreign cooperation agencies.	https://drive.google.com/open?id=0B2NI1SOSCISuSkJuY1VxT0phTjg	https://drive.google.com/open?id=0B2NI1SOSCISuLUgxejFua3NnVm8
3	Mission to continue supporting the development of the REDD+ Readiness Package and the ERPD	20 Februar y to 3 March 2017	Group II: MARENA, INAFOR, MEFCCA, MAG, SDCC, INAFOR, SPPN,BM, RACCS, RACCN	Presentation of advances in international consultancies on causes of deforestation, and proposed interventions. Working sessions were held in the autonomous regions.	https://drive.google.com/open?id=0B2NI1SOSCISua3Bic0ZzbldEVXc	https://drive.google.com/open?id=0B2NI1SOSCISubF9fcEF4QlpuMWs
4	Due diligence mission. Additional funds and technical support to the ER and Readiness Programs.	March 15-30, 2017	Group II: MARENA, INAFOR, CONAGAN, SDCC, SPPN, MHCP, GRACCN, GRACCS, Foreign	Analysis of the causes of deforestation on the Caribbean Coast and the proposed conceptual framework for additional		

			cooperation agencies.	investments required.		
5	Mission to continue supporting the development of the REDD+ Readiness Package and the ERPD.	April 24 to May 22, 2017	Group II: MARENA, INAFOR, MEFCCA, MAG, SDCC, SPPN, MHCP, GRACCS, GRACCN	With the technical support of the WB, legal aspects were worked on, progress was made in the analysis of abatement curves, levels of deforestation, and induction training in carbon accounting was carried out, with the participation of technicians from the Autonomous Regions.	https://drive.google.com/open?id=0B2NI1SOSCISuX1NjU3pFYXZYNm8	https://drive.google.com/open?id=0B2NI1SOSCISuclAtdkk5aElEUlU
6	Technical mission to prepare the emission reduction program to "fight climate change and poverty" on the Caribbean Coast, the BOSAWAS Biosphere Reserve and the Indio Maíz Biological Reserve.	August 28 to Septem -ber 2, 2017.	Group II: MARENA, INFAFOR, INETER, MAG, RACCN, RACCS, MHCP, BM	Review of progress made in the studies required by the ERPD. Teams were formed to incorporate observations to the documents. A working session was held at MEFCCA.		https://drive.google.com/open?id=0B2NI1SOSCISuV2dRV3loMWxVelE
7	Technical mission to support the	Novem ber 20 to Decem	Group I y Group II:	The summary of the ERPD proposal was presented and		

	preparation of the ERPD.	ber 1, 2017	**Tabla 10** MARENA, INFAFOR, INETER, MAG, RACCN, RACCS, MHCP, BM	interinstitutional teams worked on incorporating comments and observations.		

Specific studies for generating critical information for the ERPD were also carried out:

- Causes of deforestation, including deforestation trends and tendencies. Working session were held in each Autonomous Region with actors from the ITG, universities and autonomous regional governments, and international consultants in order to gather information. In addition, the preliminary results of these studies were presented to Working Group II. In total, 2 sessions were held at the regional level and 2 at the central level.
- Analysis of land tenure and use of land and forest resources was carried out by the ENDE-REDD+ technical team, the SDCC, CONADETI, regional autonomous governments technical teams, and local consultants. A total of 6 working sessions were held.
- Mapping of public and private investments, as well as incentives and disincentives to deforestation on the Caribbean Coast involved specialists from PRONicaribe, CONAGAN, MEFCCA and MHCP, and international and local consultants. Four working sessions were held.
- Reference level, monitoring system studies and proposals were carried out with the participation of the MRV team, made up of specialists from INETER, MARENA, INAFOR and the regional governments, and included international consultants. Four working sessions and a training workshop were held.
- Proposed interventions and an environmental and social management framework to achieve 11 Mt CO_2e of emissions reductions in the accountability area were prepared by the ENDE-REDD+ technical team, autonomous regional government specialists, and national and international consultants.

The resulting ERPD was presented a verbally and in writing to the authorities of MARENA, INAFOR, SDCC and the autonomous regional governments. Comments were received and incorporated to the document.

Pending issues for consultation

Two pending issues that should be consulted with Working Group III, especially the indigenous and Afodescendant peoples, and small- and medium-sized producers (property owners and land renters), are the distribution of benefits and interventions and activities in specific geographic areas. Consultation of these issues has been delayed due to the government´s desire to avoid

creating unreasonable expectations on the part of stakeholders before sources of funding are clearly identified and determined.

Consultations on proposed interventions and activities

Consultations on proposed interventions and activities and the benefit distribution plan will be carried out during the second semester of 2018 with relevant actors. The consultations will be carried out in different phase that include:

- Achieving consensus in Working Group I regarding the options for the distribution of benefits.
- A national workshop with representatives of the indigenous and Afrodescendant peoples, producers, and related government institutions.
- Local workshops for the definition of agreements on intervention actions and the distribution of benefits.

In compliance with the principle of free, prior and informed consent, the consultations will be carried out in sites that facilitate the assistance of community actors, agricultural producers (including property owners and renters), ITGs and members of municipal governments. There will be ten consultation workshops: 1 at the national level, 3 in the RACCS, 4 in the RACCN, and 2 in the Upper Wangki (Table. 25).

Table. 25 Location and participants in the pending consultations on porposed interventions and activities.

Location	Participating municipalities	Participating actors
Managua	The two autonomous regiona and the Alta Wangki special zone	INAFOR; EFA, indigenous leaders, producers
RACCS		
Bluefields	Bluefields, Nueva Guinea, Paiwas, Muelle de los Bueyes, Corn Island, El Rama, El Ayote.	ITGs: GTRK and Creole, Bluefields
Pearl Lagoon	Kukra Hill, Pearl Lagoon .	ITGs: Pearl Lagoon and Tasba Pauni
Karawala	El Tortuguero, La Cruz de Rio Grande, La Desembocadura de Rio Grande	ITG: Awaltara Producers
RACCN		
Waspan	Waspan	ITGs: Wangki Maya, Wangki Li Aubra Tasbaya, Li Lamni Tasbaika Kum, Kipla Sait Tasbaika Kum, Awas Tingni, Wangki Twi-Tasba Raya, Wanki Kupia Awala.

Puerto Cabezas	Puerto Cabezas,	ITGs: Prinzu Auhya Un, Tasba Pri, Twi Waupasa, Twi Yahbra, Twi Karatá, TAWIRA Tasbaika
Siuna	Mulukuku, Siuna, Bonanza, Rosita, Prinzapolka	ITGs: Mayangna Sauni Bas, Mayangna Sauni As, Mayangna Sauni Arungka, Mayangna Sauni Tuahka Takalni Balna, Prinzu Awala
Waslala	Waslala	Agricultlural and livestock producers
Jinotega	Wiwilí de Nueva Segovia, El Cua, Wiwilí Jinotega.	ITGs: Miskitu Indian Tasbaika Kum, Kipla Sait Tasbaika
San José de Bocay	San José de Bocay	Mayangra Sauni Bu

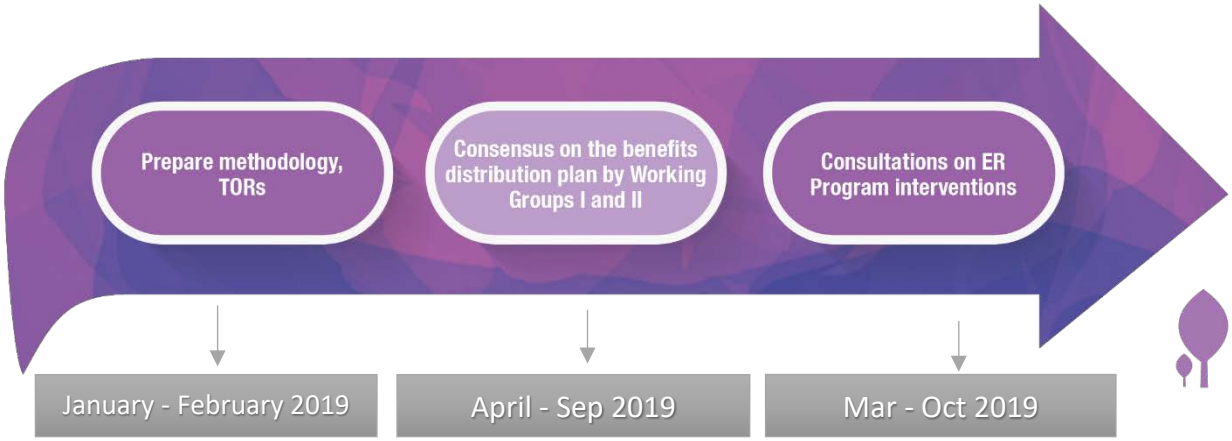
The agenda of the consultation workshops will include the context for the causes of deforestation, the actions and interventions to address these causes, the environmental management framework, reference levels, the monitoring-reporting-verification system and the proposed benefit distribution system.

These consultation workshops will be led by the territorial and regional governments. MARENA will offer methodological support for the preparation of the presentations and materials to be used during the consultations, which will be culturally appropriate and translated into native languages (Miskito, Mayangna, Rama and English). The minutes of the assemblies will be approved by the same assemblies using appropriate ethnic languages and will subsequently be published on the ENDE-REDD+ web page. Figure 28 describes the road map for carrying out the consultations.

Consultation road map

The road map and tentative calendar forf consultations on the interventions and the plan for benefit-sharing is shown in Figure. 28.

Figure. 28 Road map for the implementation of future consultations.



6. Operational and Financial Planning

6.1 Institutional and implementation arrangements

Implementation of the ER Program contemplates actions at the national, regional, and local levels. MARENA will assume overall coordination of the ER Program, with assistance at the national level from the institutional steering committee composed of MARENA, MHCP, MAG, MEFFCA, SPPN, SDCC, INETER, INAFOR, and the regional governments (Figure. 29). The institutions participating in the steering committee have complementary institutional mandates that are necessary for the successful execution of the ER Program, including finance (MHCP), monitoring (INETER; MARENA, INAFOR), policies (SPPN, SDCC, MAG, MARENA), the implementation of rural development projects (MEFCCA), and coordination (regional governments, MARENA, SDCC). They are considered key to overall Program governance and coordination, since they balance national and regional interests as well as the capacities needed for Program planning, coordination, and implementation. These institutions have also been strategically involved in the REDD+ Readiness process.

The regional governments will lead the implementation of the program in their respective regions, and are responsible for regional coordination and execution through the regional councils and the natural resources secretariat, SERENA, and the SEPROD. The CCFA will provide the supervision and regional technical advice in the RACCN and CTR in the RACCS.

It should be noted that the SDCC has important role in technical coordination between the national government and the regional and indigenous communal authorities of the Caribbean and in organizing and ensuring the coherent functioning of government actions in favor of the development of the autonomous regions and their peoples.

The ITGs and communal governments (GC) will coordinate the execution of the ER Program at the communal and territorial levels. The regional governments will lead in their respective spheres the implementation, coordination, monitoring and follow-up in coordination with the delegations of the ministries, the territorial and communal and municipal governments. Likewise, the MRV system will carry out national monitoring, regional nodes will monitor at the regional level, and territorial and community monitors will perform this function at the local level.

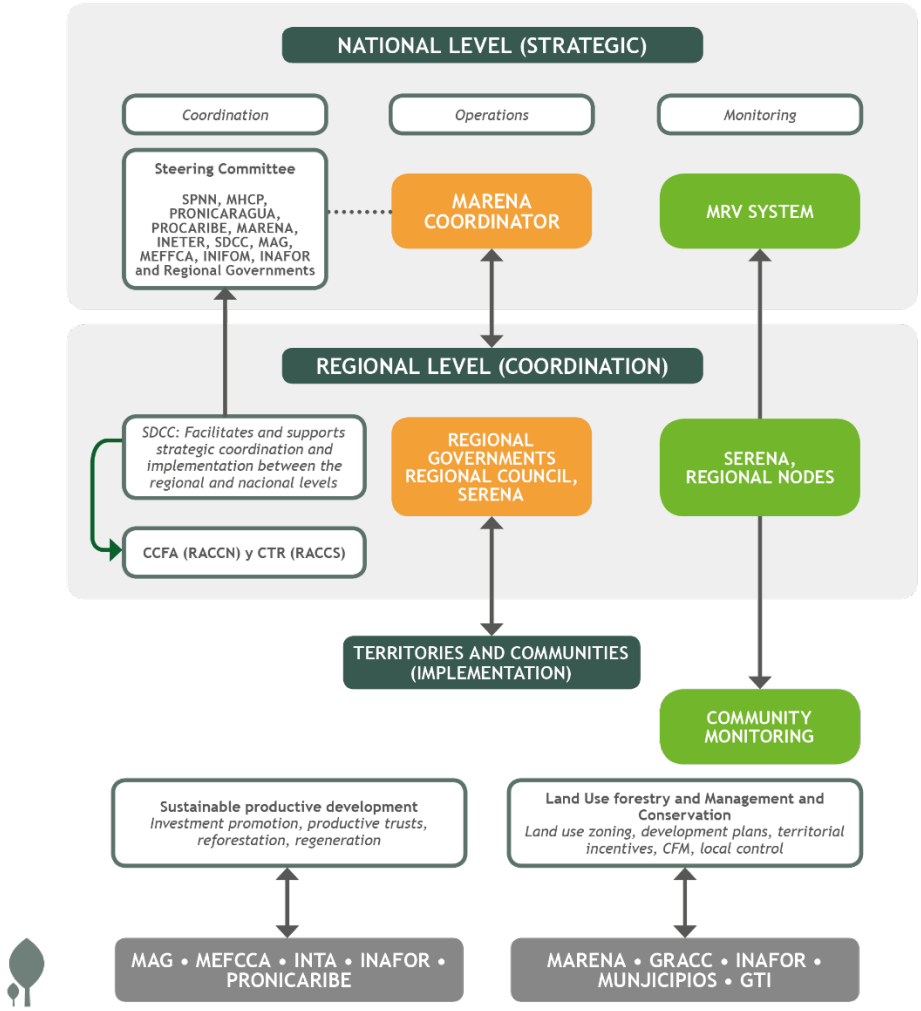
MARENA: MARENA will be the lead organization for technical and administrative oversight. It is presently the national focal point for REDD+ and has led the Readiness and national REDDD+ Strategy (ENDE-REDD+) preparation processes as well as the formulation of the ERPD. MARENA´s leadership and intimate involvement in the preparation and implementation of national REDD+ as well as the FCPF programs, will result in close integration of the implementation of REDD+ in the accounting area and at the national level.

MARENA currently has a core team consists of 14 specialists and technicians and regional technicians and coordinators dedicated to REDD+, who are located in the General Office of

Climate Change. MARENA has also established an effective hierarchy of working groups composed of a broad spectrum of stakeholders and decision makers at the ministerial, technical and grassroots levels who provide political direction, technical assistance, expert advice, and participate in dialogue, consultation, feedback, and consensus building with interested parties. Additionally, MARENA personnel working in SINIA, the Secretaries of the BIOWAS and Indio Maiz Reserves, as well as territorial delegations of the RACCN, RACCS, Jinotega, and Rio San Juan will participate in the execution of the Program.

Besides overall administrative oversight of the ER Program as well as its planning, coordination, and implementation, MARENA will also be directly involved in the areas of forest conservation and avoided deforestation, the monitoring of forest cover and emissions, safeguards, and non-carbon benefits, communication of this information to stakeholders, in line with its institutional mandate.

Figure. 29 Overall coordination of the ER Program.



MHCP: The Ministry of Hacienda and Public Credit has been responsible for assigning and overseeing public expenditures and financial policies related to the execution of REDD+ and the

ER Program and has participated in the design and supervision of development-related incentives. In the context of the ER Program, MHCP will be responsible for identifying potential sources of financing and developing the corresponding proposals. It will also be involved in incorporating environmental criteria and indicators related to the reduction of deforestation and emissions within the methodological guidelines for public pre-investments. Together with MARENA, MHCP will also oversee financial management of the ER Program. The MHCP and the Office of the Comptroller General oversee a well-established legal framework for procurement and financial management, the Integrated Financial, Administrative and Audit Management System.

MEFCCA: The Ministry of Family, Community, Cooperative, and Associative Economy is involved in rural development, agricultural and agro-industrial technical assistance, and the development of family enterprises as well as the promotion of cooperatives and other forms of group associations, and works also with the SDCC in the development of the Caribbean Coast. With INTA, it is a key participating lead institution of the agroforestry and agricultural development projects that will contribute to ER Program objectives on the Caribbean Coast. It is expected that MEFCCA will be involved in the delivery of productive, organizational, and commercial technical assistance to farmers, public education and awareness campaigns related to various of the interventions, as well as the association of groups of farmers.

INTA: The Nicaraguan Institute for Agricultural and Livestock Technology is involved in research, generation, and adaptation of agricultural and livestock technologies, mainly aimed and small- and medium-sized producers. It is also active in training, education, and the dissemination of information to a variety of stakeholder. INTA is partnering with MEFCCA in the implementation of the BOVINOS livestock project.

SDCC: The Secretary for Development of the Caribbean Coast is the technical arm of the Caribbean Coast Council, whose function is to organize and coordinate communications and interactions between the national government, the regional governments and indigenous and Afrodescendant communities; assure the coherent functioning of the various branches of government with respect to the Autonomous Regions of the Caribbean Coast; strengthen regional institutions; coordinate the Executive branch institutions involved in the process of land titling of indigenous territories; and act as the link between the Presidency and other state institutions with regards to themes related to the Caribbean Coast.

In alignment with this coordination role, it is expected that the SDCC will facilitate the processes of articulation and institutional coordination between the national and regional (region, territory, and community) levels and assist with the generation, supervision and feedback of strategic results in the accounting area. It will also assist with strengthening the forest governance of the indigenous and Afrodescendant territories as well as the regional governments and their environmental and natural resource agencies; incorporate approaches and indicators related to reduced deforestation and sustainable production in the regional development strategy and plans; assist with information gathering and the use and dissemination of information among

sub-national governments; and the more effective application of regulations and management instruments by sub-national governments.

INETER: The Nicaragua Institute for Territorial Studies is a member of the inter-institutional platform for forest and land use monitoring consisting of the following institutions: INAFOR, MARENA, INTA, MAG, INETER, municipal mayoralities, regional and territorial governments, and indigenous and Afrodescendant communities (see Section 9.2). INETER has been responsible for the Monitoring System of Land Use, Forest Cover and Production and will provide data and geospatial information on activity data. It is also responsible for reporting on Forest Cover and Changes in Land Use/Estimation of Emissions from the LULUCF sector.

INAFOR: The National Forestry Institute is a member of the inter-institutional platform for forest and land use monitoring. The Institute has been responsible for carrying out the national forest inventory, as well as the implementation of forestry regulations.

Regional governments of the RACCN and RACCS (GRACC): The regional governments are responsible for the formulation and execution of development plans and program in the regions, administration of communal services in coordination with the national ministries, promote intra- and inter-regional market linkages, and environmental management, land use classification and zoning, and the rational use and conservation of natural resources of the Caribbean region, via their specialized Secretaries of Planning (SEPLAN), Production (SEPROD), and the Environment and Natural Resources (SERENA). The regional governments have been involved in the design of the ERPD and will participate in local monitoring, information gathering and analysis, coordination with municipal and territorial governments, the application of laws, regulations, and forest management instruments, and investment promotion via PRONicaribe.

Territorial governments (ITGs): The governments of the territories of the indigenous and Afrodescendant peoples are made up of a number of entities that participate in collective territorial administration and decision making. The territorial governments are responsible for the zoning and use of natural resources, territorial development plans, and the administration of financial resources.

Institutional involvement and responsibilities for Program actions and interventions are shown in Table. 26. The Table illustrates the important roles of MARENA, MEFCCA, and the regional governments in Program implementation.

Table. 26 Institutional involvement in the activities and interventions of the ER Program.

Intervention	Activities	Institution responsible	Participating institutions
Within the forest: Increase forest conservation and value			
	Update development plans in the indigenous and Afrodescendant territories based on land use classification and zoning	ITGs	MARENA/INETER/ GRACC

Forest mgmt. and overnance in ITGs	Results-based incentives for avoided deforestation in ITGs	MARENA	GRACC/MHCP
	Local monitoring and control of deforestation via local monitors and early warning systems	ITGs	INETER/INAFOR/ GRACC/MARENA/ SERENA
	Territorial and communal government training	MEFCCA	GRACC/ITGs
	Promotion/public education campaigns	MEFCCA	ITGs
Community forestry in ITs	Public education campaigns	MEFCCA	INAFOR/ITGs/ GRACC
	Facilitation of community alliances with investors/Commercial advisor	PRONicaribe	
	Technical assistance (TA)	MEFCCA	
	Direct incentives to reduce costs of PGMF and AOPs	INAFOR	Municipal govts.
	Forestry audits and supervision	INAFOR	
Outside the forests: Promote profitable and sustainable productive systems			
Sillvopastoral systems managed by small and medium-sized livestock ranchers	Public education campaigns	MEFCCA	IPSA
	TA/Training	MEFCCA	IPSA/INTA
	Commercial/organizational strengthening	MEFCCA	
	Market linkages	MEFCCA	
	Lines of credit for silvopastoral trust, risk guarantees)	PRODUZCAMOS or multi-lateral development banks	
Alternatives to extensive cattle raising and farming: Perennial crops, agroforestry systems, forest plantations[43]	Public education campaigns	MEFCCA	IPSA
	TA/Training	MEFCCA	IPSA/INTA
	Commercial/organizational strengthening	MEFCAA	
	Market linkages	MEFCCA	
Agroindustrial agroforestry, silvopastoral, or forestry plantations	Investment promotion	PRONicaribe	
	Public education campaigns	MEFCCA	INAFOR

[43] See Annex 5 for details of commercial and conservation reforestation.

Natural forest regeneration/ reforestation crusade	In-kind incentives	INAFOR	
	TA/Group training	MEFCCA	
Transverse Activities: Improved economic enabling conditions			
Promotion of private investments	Promotion of the Caribbean brand (based on ethnic diversity, conservation, sustainable production systems, and recognition of indigenous and Afrodescendant peoples)	PRONicaribe	GRACC
	Promotion of "green" enterprises (e.g. certification of coffee, cocoa, oil palm, or beef)		
	Facilitation of commercial contacts, PPPs, and joint ventures		
	Information gathering and dissemination, special studies		
	Strengthening of "green" production concepts among public functionaries	MEFCCA	
	Incorporate "green" protocols in national and regional financial institutions	PRODUZCAMOS	
	Incorporate or modify criteria and indicators related to the reduction of deforestation and emissions in public pre-investment guidelines	MHCP	
Transversal activities: Improve institutional enabling conditions			
Align and harmonize policies and improve coordination among the different levels of government	Include and monitor uniform environmental indicators in the programs/projects in the region.	Production, Consumption, and Commerce Cabinet	MARENA/INAFOR / ITGs
	Update, implement, and monitor the Development Strategy and Plan for the Caribbean Coast to 2021 and align regional and territorial development plans with the Strategy.	SDCC	
	Strengthen the mechanisms for dialogue among Autonomous Region entities and the national government in order to promote the reduction of deforestation and the increase of green investments.	SDCC	
	Increase the capacities for the definition, monitoring, and evaluation of human development indicators related to the	SDCC, GRACCs	

	reduction of deforestation and "green" public and private investments		
Monitoring, control, and enforcement of land use	Establish and implement an early warning system for deforestation	INETER	GRACC/MARENA
	Monitor incentives for avoided deforestation and adoption of interventions	MARENA	GRACC/INETER
	Improve supervision of forest permits	INAFOR	ITGs, Communal govts., GRACCs
	Improve the follow-up of environmental complaints via an increase in environmental inspectors	MARENA	Min. of Justice/ GRACC/National Police/Army
Public education and awareness, and information gathering, access and dissemination	Environmental public education/ awareness/promotion	MEFCCA	MARENA
	Institutionalize the updating and use of land use and natural resource information by SINIA, SINAP, and regional information nodes	GRACC, MARENA	SDCC/Municipal govts./INETER/ INAFOR/ ITGs
	Promote the joint institutional analysis of information at the regional level under the leadership of the regional governments (GRACC)		
	Promote and monitor the use of information for strategic objectives by regional, municipal, and territorial governments		
	Institutionalize the access to information produced by sectorial institutions (e.g. MARENA, INETER, INAFOR and MAG)		
	Provide advanced technological equipment for the functioning of the regional nodes which will allow the updating, use, and systematization of information		
	Strengthen SICOR in the RACCN and SIMEAR in the RACCS to facilitate communication and access to information related to the environment and land use		
	Assure the assignment of budgetary funds to the regional governments for the operation of the SERENAs, SIGC, and the nodes		
Strengthen the application of laws, regulations,	Harmonize and improve the application and compliance of existing environmental and forestry norms at the national, regional, municipal, and territorial levels, especially	INAFOR. MARENA	SDCC/GRACC/ITGs

and management instruments related to natural resources	the supervision of domicile permits on the part of the ITGs and the monitoring and evaluation of forest harvest plans.		
	Strengthen the Forestry and Environmental Consultative Council in the RACCN and create a Forestry and Environmental Consultative Council in the RACCS		
	Strengthen the forestry, environmental, and productive institutionalization of the regional governments		

The funding of direct incentives for avoided deforestation in the ITGs may be channeled through Benefit Sharing Mechanism according to previously agreed upon investment plans. The detailed procedures are still under study.

6.2 ER Program budget

ER Program budget

The total ER Program budget is estimated at US$57.3 million during seven years (a 2-year preparatory period and 5 years of intervention) and is presented in Table. 27. Annual totals during implementation range from $7.7 million (year 2 of implementation) to $14.8 million (year 5 of implementation). Further breakdown by years is available in Annex 1.

The majority of the budget (50%) is associated with the silvopastoral and agroforestry productive systems, largely due to costs associated with credit lines, credit guarantees, technical assistance, and in-kind incentives for the social reforestation program (planting material). Forest conservation interventions account for 18% of the budget; of this amount, a bit more than three-fourths is dedicated to improved forest governance in indigenous territories (which includes results-based incentives for avoided deforestation), while the remainder is allocated to community forest management in indigenous territories and natural regeneration and social reforestation, mainly in fragile areas in indigenous territories. Sixteen percent of the budget is allocated to institutional enabling conditions, especially monitoring of emissions, land use, the impact of interventions, safeguards, and the distribution of benefits. Small amounts of the budget are used for administration of the safeguard, benefit distribution, and grievance redress systems and the overall Program.

Table. 27 ER Program interventions and budget.

ER Program interventions	Budget US$	%
Preparatory and REDD+ Readiness activities	***921,000***	***2***
Strategic Line 1: Forest conservation	***16,129,500***	***28***
Intervention 1a: Strengthening forest governance in ITGs	10,175,000	
Intervention 1b: Community forest management	3,054,500	
Intervention 1c: Promotion of natural regeneration and social reforestation	2,900,000	
Strategic Line 2: Itensified sustainable production systems	***26,032,499***	***45***
Intervention 2a: Establishment of silvopastoral trusts	24,197,499	
Intervention 2b: Establishment of agroforestry trusts	1,835,000	
Intervention 2c: Promotion of commercial reforestation (included in 3a)	------	
Strategic Line 3: Creation of off-farm employment via investment promotion	***4,807,000***	***8***
Intervention 3a: Strengthening of which are the institutions that promote investment.	4,807,000	
Strategic Line 4: Institutional enabling conditions	***8,863,386***	***15***
Intervention 4a: Harmonization of policies and improved institutional coordination	685,000	
Intervention 4b: Improved regional and local forest and land use monitoring	3,427,386	
Intervention 4c: Better information gathering, use, dissemination, and public awareness	916,000	
Intervention 4d: Improved application of laws, policies, regulations, and norms	3,150,000	
Intervention 4e: Improved institutional resources and capacities in order to better control land and natural resource use and promote sustainable land use (Included in enabling conditions above)	685,000	
REDD+ administration (safeguards, distribution of benefits, feedback and grievance redress mechanism)	***395,391***	***0.7***
General Administration	***148,871***	***0.3***
Total	**$57,297,647**	**100%**

Financing strategy (sources of finance)

Although the ER Program contributes to existing government plans and strategies (including the socio-economic development plans and climate change mitigation and adaptation strategies), the main sources of funding are non-governmental, since as a Least Developed Country (LDC), Nicaragua faces financial challenges and persistent high fiscal deficits and public debt[44] – which are major barriers to making effective and long-term public sector investments.

Public sources

As a result, projected public contributions needed total about $10.8 million, approximately 18% of the budget (Table. 28). About half of the $10.76 million of public investments are dedicated to improving the institutional enabling conditions ($6.21 million), while agroforestry technical assistance and studies related to productive systems ($2.269 million) require 21% of the public funds. The small amount remaining ($1.465 million) is used for preparation and administration of REDD+ and the overall Program.

However, only about $6.89 million of the public funding needed is estimated to be available in the future, thus producing a gap of $3.86 million (Table. 29). Most of this gap is the product of new activities related to the ER Program, especially those related to enabling conditions, including: monitoring (updating of activity data and emission factors; the monitoring of emissions, safeguards, grievance, co-benefits, and incentives; the early warning system), the application of laws and regulations (environmental inspectors,) and institutional alignment and coordination (training related to the incorporation of "green" protocols in public programs). Current activities that need to be reinforced are: technical assistance and research and studies related to productive systems and forest permitting and supervision. The government is contemplating closing this gap using the Readiness resources of the Green Climate Fund, which are destined for Nicaragua (US $ 1 million per year).

Non-governmental sources

The remaining budget needs are contemplated to be financed by non-governmental sources: grants ($8.610 million – 19%), credit ($21.962 million – 38%), and private sector contributions ($1.99 million – 3.5%) (Table. 28).

Nicaragua, for the issue of donations, is working through the MHCP, with the support of the IDB in the design of a manual for the formulation of projects and a portfolio of profiles, which would be applicable to various potential sources of financing, among them the FVC, GEF, et cetera. With the understanding that there would be no double accounting under any circumstance of the emission reduction certificates, CERs, of the FCPF, this will be guaranteed by the registration

[44] http://www.worldbank.org/en/country/nicaragua/overview

system that the World Bank is preparing, in which the country will be integrated on an interim basis. to host the CERs, while strengthening the capacities in this direction within the country.

Table. 28 Funding sources and uses

Use/Interventions	Source of Funding (US $)			
	Public Budget	Grants	Credit	Private Investment
Forest conservation	715,400	5,954,500	0	0
Productive systems	2,269,916		$17,255,000	1,991,800
Off-farm employment	100,000		$4,707,000	0
Enabling conditions	6,208,386	2,655,000	0	0
Preparation	921,000		0	0
Administration	544,263		0	0
Total	10,758,964* (19%)	8,609,500 (15%)	$21,962,000 (38%)	1,991,800 (3.5%)

*Includes the funding gap of $3,864,134.

Table. 29 Institutional funding gaps associated with public financing of the ER Program.

Institution	**Estimated available funding**	**Funding Gap Years**					
		1	**2**	**3**	**4**	**5**	**Total**
MARENA	3,138,030	118,545	54,473	0	0	0	173,018
INETER	0	432,500	178,000	332,500	78,000	332,500	1,353,500
MEFCCA	1,703,700	281,260	281,260	281,260	281,260	156,260	1,281,300
INAFOR	2,860,000	335,700	285,700	0	0	0	621,400
INTA	0	0	0	144,972	144,972	144,972	434,916
MAG	90000	0	0	0	0	0	0
MHCP	100000	0	0	0	0	0	0
Total	**7,891,730**	**1,168,005**	**799,433**	**758,732**	**504,232**	**633,732**	**3,864,134**

The total credit need is $21,962,000 and is mostly tied to activities that will generate returns on these investments. Activities financed include the silvopastoral systems ($17.255 million), the investment promotion program that will attract agri-businesses and create off-farm employment on the Caribbean Coast ($4.707 million). Conversations are being held with the Central American Bank fo Economic Integration for a credit for livestock sector, with emphasis in the Caribbean region. This credit is part of Project Bio-CLIMA Nicaragua: Integrated climate action for reduced deforestation and strengthened resilience in the BOSAWÁS and Rio San Juan Biosphere Reserves.

BioCLIMA project concept note[45] has been recently submitted to the Green Climate Fund, by Central American Bank for Economic Integration (CABEI - Accredite Entity), in consultation with the National Designated Authority (MHCP) to receive early feedback and recommendation.

Private investment ($1.99 million) in Program activities is provided by the CONAGAN livestock producers´ organization for silvopastoral activities. CONAGAN and the Nicaraguan development bank (PRODUZCAMOS) are presently negotiating financing for the livestock sector with IADB. If successful, some of these funds could be used to reduce the need for credit for the silvopastoral systems mentioned above. Investment promotion by PRONicaribe in the context of the ER Program is expected to increase private investment by about $500 million[46], but will probably not contribute to allaying the financial needs associated with forest conservation or enabling conditions presented in the budget. However, some contributions might contribute to reducing the credit or technical assistance costs contemplated in the budget, but are unspecified at present. Additional private investment of this magnitude is expected to create about 25,000 new jobs and thus reduce pressure on the forests.

Financial and economic analyses of productive investments and the ER Program

Financial and economic analyses were conducted to support investment decisions by the government and investors.

Farm-level cash flow analyses

Financial analyses of cash flows of productive systems were analyzed with and without the facilitation of the ER Program. The analysis without facilitation of the Program is useful from the standpoint of the producer or investor, since it represents cash flows and returns based solely on private investment. The analysis with facilitation of the Program include the costs of incentives and enabling and other conditions assumed by the Program in order to facilitate private investment and adoption of interventions. Since the Program assumes these costs, cash flows and overall returns to private investors or producers are more favorable.

This is shown in Table. 30 below based on farm level cash flow analyses that are scaled-up based on the ambition of each of the interventions. This analysis reflects the farmer/investor´s perspective.

The Table shows that net present value of investments in greater with the facilitation of the Program than without it. In general, more intensified production systems have greater returns

[45] The concept note of BioCLIMA Project can be accessed in the following link:
https://www.dropbox.com/s/0mxpmjumb7g5p3v/Bio-CLIMA-Nicaragua_Concept_Note_12pager.docx?dl=0

[46] Based on Nicaraguan government´s investment promotion program experience, it expects to leverage approximately $110 in private investments for every dollar dedicated to investment promotion. Similarly, one job is estimated to be created for every $189 used for investment promotion.

than those more focused on conservation (an extreme example of the latter is forest governance in ITGs, which is non-productive if the value of carbon is not taken into account). Moreover, many of the forest-based systems are unprofitable in the short-term (5 years) horizon of the ER Program, but exhibit positive returns on longer time scales due to the delay in benefits caused by the time needed for trees to grow and produce economically valuable products (e.g. coffee, cocoa, and reforestation; community forest management is neutral with regard to the length of the evaluation period, since it is based on standing, harvestable forests).

Table. 30 Net present value (in million $) of the interventions based on cash flow analyses for different evaluation periods.

Intervention	With Program Assistance		Without Program Assistance		
	5 yr	10 yr	20 yr	5 yr	10 yr	20 yr
1a Forest governance in ITGs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1b CFM	$0.69	$0.69	$0.69	-$2.94	-$2.94	-$2.94
1c Natural Regeneration	-$0.66	$0.07	$0.91	-$0.85	-$0.03	$0.81
1c Social Reforestation	-$13.41	-$5.36	$35.58	-$14.33	$5.84	$35.10
2a Silvopastoral trust	$11.65	--	--	$9.11	--	--
2b Coffee agroforestry trust	-$0.51	$8.79	$18.10	$-0.80	$8.46	$17.77
2b Cocoa agroforestry trust	-$29.66	$23.22	$74.59	$-32.17	$20.27	$71.63
2c Commercial reforestation	-$3,81	$0.89	$73.82	-$3,81	$0.89	$7.82
3a Investment promotion	$14.47	--	--	n.a.	n.a.	n.a
Overall						

Program level financial analyses

Analyses at the Program level include the farm level analyses mentioned above and the additional investments related to enabling conditions, incentives, training and capacity development, and other institutional costs within the context of the ER Program.

For the estimation of the Program costs, the analysis takes into account the same parameters of the budget estimated for the ER Program. To these are added the costs assumed by producers or private investors in the productive systems at $298.32 million. In total the program cost is estimated at $378.82 million.

On the benefit side (positive welfare), financial benefits of the Program will result in increased levels of production in the forestry and agricultural sectors. For the financial analysis, forest products from natural and plantation forests as well as agricultural products were valued at current farm-gate market prices. In the 5-year implementation period, these benefits will amount to $314.88 million. It should be noted that most financial benefits will accrue after the ER Program implementation period due to the delayed in the production of benefits by trees and are not accounting for in the initial 5-year implementation period shown in Annex 2.

Environmental benefits during the 5-year period include an expected $17.4 million from results-based payments from the Carbon Fund. The amount corresponds to the quantity of emission reductions expected during years 1 and 2. Another, larger payment of $37.6 million from the Carbon Fund, based on emission reductions achieved during years 3-5, is expected in year 6 or 7, but are not included in these calculations.

Other sources of income include public budgets and private investments in Program implementation at the national level, grants for strengthening forest protection and conservation and credits for the silvopastoral and agroforestry sectors. Total revenues are estimated to be $412.76 million.

Financial analyses of the Program indicate that overall net returns are positive, amounting to $67.87 million. The net present value of the financial flows is $16.79 million based on a 10% discount rate and a price of $5/t$CO_2$e; the financial rate of return is 32%. The benefit/cost ratio (B/C) based on total costs and revenues is 1.09.

These analyses do not include the valuation of other (non-market) environmental goods or services besides carbon emissions reductions. Moreover, the value of the carbon emission reductions payments are under-valued since they do not take into account an additional $37.6 million expected in year 7 of implementation for results achieved during the first 5 years. Inclusion of this value in the financial calculations (as if this income was realized in year 5 of implementation) results in a total revenue of $450.36 million, an overall net return of $71.54 million, an NPV of $40.16 million, and a B/C of 1.19 (Table. 31). Finally, the short time period used in these evaluation under-estimates the long-term financial value of tree-based systems. These factor bolster the positive evaluation of the Program based solely on short-term returns.

Table. 31 Results of financial and economic analyses.

	Total Costs	Total Revenue	Net Returns	NPV	B/C
Results-based payment	**Financial Analysis (10% discount, $5/tCO$_2$e)**				
$17.4 million in yr 3	378.82	412.76	67.87	16.79	1.09
$17.4 million in yr 3 + $37.6 million in year 5	378.82	450.36	71.54	40.14	1.19
	Economic Analysis (6% discount, $30/tCO$_2$e)				
$17.4 million in yr 3	378.82	499.76	120.94	95.53	1.32
$17.4 million in yr 3 + $37.6 million in year 5	378.82	725.36	346.54	264.12	1.91

Program level economic analyses

The economic analysis assumes additional economic benefits to the national economy and society and integrates additional imputed benefits in the analysis. The costs remain the same as in the financial analysis.

Compared to the financial analysis, the Program level economic analysis uses a lower discount rate (6%) and a higher shadow price for carbon emission reductions ($30/tCO$_2$e). Other non-carbon environmental benefits were not taken into account and are qualitatively assessed in Section 16. Indirect effects on deforestation of employment creation by investment promotion are also unaccounted.

The results of the economic analysis show an increase in total revenues to $499.76 million, due to an increase of $87 million due to the higher price of carbon, a net return of $120.94 million, an NPV of $95.53 million, and a B/C of 1.32.

Including the final payment of the Carbon Fund, based on a value of $30/t CO$_2$e, in these calculations results in: a total return of $725.41 million, a net return of $346.54 million, an NPV of $264.12 million, and a B/C of 1.91.

7. Carbon Pools, Sources and Sinks

7.1 Description of the sources and sinks selected

Deforestation and enhancement of carbon stocks in new forests are the two activities included in this version of the reference level, since they are considered to be the principal sources of emissions and removals, respectively, in the accounting area and for which reliable information is available (Table. 32). An analysis of forest degradation based on direct methods has also been included in this version of the ERPD. Anthropogenic Forest Degradation has been assessed as a non-significant source of emissions, and therefore, a reference level for this activity was not included. Sinks or sources of emissions related to conservation and forest management have been excluded.

Table. 32 Activities included in the reference level.

Sources/Sinks	Included?	Justification / Explanation
Emissions from deforestation	Yes	Deforestation is the principal source of emissions in the accounting area due to the magnitude of the carbon stocks involved. The average annual emissions due to this source are 14.17 Mt CO_2e/yr, as is detailed in the Sections 8 and 13.
Emissions from forest degradation	Yes	Forest degradation in "forest remaining forest" has been analyzed using a systematic grid of visual assessment plots nested in the National Forest Inventory net (10' x 10' grid) during the reference period (2005-2015). The 10'x10' 2007-08 National Forest Inventory net (371 clusters x 4 plots) was intensified within the accounting area, so finally a 2.5'x2.5' grid (4.5 - 4.8 km approx.) was prepared for a visual assessment exercise. The 2005-2015 multitemporal visual assessment exercise was performed (on ArcGIS and Collect Earth) using HR imagery (from Google Earth and Bing Maps and other available collections: Spot and RapidEye) on a systematic grid of 3082 (regular grid) visual assessment plots of 90 x 90 m size (equivalent to a 3 x 3 Landsat pixels). A 3 x 3 inner grid (within each 90 x 90 m plot) was used to measure canopy cover. The number of sampling plots assessed is 1391 of the total grid points (3082). Anthropogenic and non-anthropogenic forest degradation have been distinguished in the analysis. The splitting criterion was to consider as non-anthropogenic forest degradation the sampling

		points where forest degradation processes were detected and located in those areas: - Areas farther than 1 km from roads and pathways. - Areas farther than 1 km from villages. - Areas farther than 1 km from rivers. - Areas farther than 1 km from the agricultural frontier and deforestation sites. The results show that emissions from anthropogenic forest degradation are significant, 2.426 Mt CO_2e/yr, about 16% with respect to total emissions. So consequently, and after being analyzed they have been included in the forest reference level.
Enhancement of carbon stocks	Yes	This sink is included in the reference level and is comprised of the conversion from non-forest land to forest land but does not include the accumulation of carbon stocks in existing secondary forests and primary forest, due to the lack of data needed to generate a reference level for this activity. The Program interventions will contribute to the establishment of secondary forest via two interventions: reforestation and the establishment of natural regeneration on land previously under livestock and agriculture. In the accounting area, 16,232 ha of young regenerating forests and 484 ha/yr of new permanent crops (>30% cc) are estimated to exist during the reference period (2005-2015) which corresponds to 0.97 tCO_2e/yr of annual removals due to this activity. Interventions related to agricultural and livestock intensification are expected to significantly increase the conversion to new forests in large areas of the program.
Conservation of carbon stocks	No	These GHG sinks are excluded due to the lack of reliable local data.
Sustainable forest management	No	These GHG sinks are excluded due to the lack of reliable local data. Sustainable community forestry is included as an intervention, but its principal impact is on avoided deforestation.

7.2 Description of Carbon Pools and greenhouse gases selected

The carbon pools and GHG used in the construction of the reference level and that will be accounted for in the ER Program are shown in the following Tables.

Table. 33 Compartments included in the reference level.

Carbon Pools	Selected?	Justification / Explanation
Aboveground biomass	Yes	Aboveground biomass is the principal sink included in the reference level, accounting for approximately 80% of forest emissions. The values are based on the National Forest Inventory performed by INAFOR and IPCC default values.
Belowground biomass	Yes	Below ground biomass of forests and young secondary vegetation ("tacotales") were calculated using the equation of Cairns, which is detailed in Section 8. In the case of the other vegetation categories, default values of the IPCC were used.
Litter	No	The national forest inventory did not include data on litter. It was not possible to identify, in the scientific literature, data from direct measurements made in the country for relevant categories of land cover, disaggregated by carbon stocks and with uncertainties related to C stock estimates. This component is not included in the reference level.
Dead wood	No	With regards to the activities considered by the ER Program (deforestation and enhancement of carbon stocks), the Nicaragua National Forest Inventory did not include data on dead wood which could be used consistently for all land cover categories considered in the ERPD. As a result, dead wood is excluded. The exclusion of dead wood is considered to be conservative. In the case of deforestation, dead wood stocks are higher in forest than in non-forest so conversion from one to another would result in emissions. This is confirmed by the 2006 IPCC that recommends that in the forestland to non-forestland category it should be assumed that the DOM pools in non-forest land categories after the conversion are zero. On the other hand, in the case of enhancement of carbon stocks, it is expected that dead wood would increase, since forestlands have higher carbon stocks than non-forestlands.
Soil organic matter	No	The national forest inventory did not include data on soil organic matter. It was also not possible to identify in the scientific literature data direct measurements of soil organic

		matter made in the country for relevant categories of land cover, disaggregated by carbon stocks and with uncertainties related to C stock estimates. This component is not included in the reference level.

Table. 34 Greenhouse gases included in the reference level.

Greenhouse gases	Selected	Justification / Explanation
CO_2	Yes	In all cases, the ER Program will account for CO_2 emissions and removals.
CH_4	No	**Tabla 11** The Reference Level does not include emissions of non-CO_2 gases resulting from forest fires, since the historical data available is not spatially explicit. The information available is representative at the national level, but not for the Accounting Area. On the other hand, given that historical data on forest fires are not spatially explicit, it is not possible to estimate separately the effect of fires on forest lands converted to other uses nor on forests that remain as forests. Likewise, according to Nicaragua's Third National Communication (2010), emissions of CH4 and N2O are estimated at 129,510 tCO2e*yr-1. Thus the emissions of CH4 and N2O represent 1% of estimated emissions during the period of reference (15,630,067 tCO2e*yr-1).
N_2O	No	

8. Reference Level

The Forest Emissions Reference Level (REL/FRL) for the accounting area considers CO_2 emissions caused by deforestation of tropical forest and GHG removals due to enhancement of carbon stocks in non-forest land converted to forest (new forests). The definitions and methodologies used in this process were reviewed and validated through participatory processes of dialogue and consensus with inter-institutional technicians that form part of the MRV platform comprised of MARENA, INAFOR, INETER, MAG, INTA, and the North and South Caribbean Autonomous Regional governments (GRACCN and GRACCS).

In addition to considering the decisions of the UNFCCC, the FRL follows the guidelines of the Intergovernmental Panel on Climate Change (IPCC) as indicated in Annex 9/CP17. The information presented in this section includes:

i. Transparent, complete, consistent and accurate information used as inputs for the reference level (REL)
ii. Data and methods applied during the construction of the FRL
iii. Sinks, gases and activities referred to in decision 1/CP. 16, paragraph 70

iv. Forest definition used in the construction of the FRL.

The reference level focuses on the accounting area and it is considered dynamic, since it will allow updates and improvements to the data and methodologies used to produce the estimates. The national database used for the construction of the national RL is the same database used for the construction of the FRL of the accounting area of the ER Program and is the basis, as well, for estimating the impact of specific interventions in the accounting area.

8.1 Reference period

Based on the FCPF Methodological Framework, the period 2005 – 2015 has been selected as the reference period for the Emissions Reduction Program. This period complies with Methodological Framework requirements related to the ending date of the period selected, which should be within two years of the first mission of the Technical Advisory Committee, in this case, 2017. The choice of the 2005 – 2015 period is also appropriate because rates of land use change are more stable during this time frame than in earlier periods.

8.2 Forest definition used in the construction of the Reference Level

The definition of forest used by Nicaragua in the context of the ERPD is: a continuous area, equal to or greater than 1 hectare in area, with tree cover equal to or greater than 30%, and an average tree height of 4 m or greater. This definition includes ecosystems of bamboo, mangroves, natural palms, dry forests, scrub riparian vegetation and permanent crops with shade trees.

This definition of “forest” was approved by the working groups of the ENDE-REDD+ Program[47], which serve as a space for the construction and review of technical proposals based on national and international standards, and includes the participation of a wide variety of stakeholders, including decision makers, technical specialists, and regional technicians. This definition is in line with the current National Greenhouse Gas inventory, which is still in a preparatory stage.

It is relevant to note that, according to this definition, areas covered with natural secondary vegetation and / or isolated trees, combined or not with agricultural areas, which do not reach the minimum of 30% canopy cover, were not considered as forest; such as "tacotales", wooded pastures, natural savannas, wetlands or open forests.

There follow the definitions of deforestation, forest degradation and reforestation being used for puposes of carbon accounting in the estimate of the reference level:

Deforestation: Caused by human activity, deforestation is considered to be the reduction of forest cover to beneath a threshold of 30% of the canopy biomass established in the definition of a forest. The elimination of forest cover is a long-term or permanent event, and results in non-forest land use.

[47] MRV Board working session act of 1st December, 2017.

Degradation: The elimination of trees due to human activity on lands that continue to be considered forestland, as the extent thereof does not lead to a change in land use. The calculation of carbon flows due to degradation is given as a net value, taking into account losses and gains in carbon stocks.
Reforestation. These are activities that convert non-forestland to forestland, including the reestablishment of forests to canopy biomass cover superior to 30%, by means both natural and artificial, in deforested territories. It also includes the establishment of agroforestry systems with canopy biomass cover superior to 30% in previously deforested land.

8.3 Average annual historical emissions during the Reference Period

Considerations

Construction of the REL/FRL is based on the guidelines established by the Intergovernmental Panel on Climate Change (IPCC), the United Nations Framework Convention on Climate Change (UNFCCC) and the Carbon Fund Methodological Framework. Nicaragua is working to reach consistency between the current REL/FRL and the National Greenhouse Gas Inventory, which is being updated, since both are based on the guidelines from the 2006 IPCC for National Greenhouse Gas Inventories. At the same time, care is been taken to use the same land-use categories and methodologies to calculate CO_2e emissions.

According to the Carbon Fund Methodological Framework, the emissions reduced by an Emission Reduction Program (ERP) should be reported in relation to the Reference Emissions Level (REL) and Forest Reference Level (FRL). For the Conference of the Parties, the REL/FRL are “reference points to assess the performance of each country in the execution of REDD+ activities.” These should be expressed in tons of carbon dioxide equivalent per year and must be established in a transparent manner, providing complete information and explanations about its development.

The REL/FRL that the country is presenting to the Carbon Fund through the ER Program is based on regional coverage and will have a lifespan of 10 years, which is in line with the Reference Period that begins in 2005 and ends in 2015, as well as corresponding to the duration proposed for the Program. It is important to point out that the REL/FRL incorporates a gradual approach, enabling it to evolve according to adjustments made in response to improvement in data and methodologies.

While it is true that the REL/FRL of ENDE-REDD+ is still in a preparation phase, it is believed that the REL/FRL of the Emissions Reduction Program will eventually be consistent with the former, since the same technical and methodological guidelines, as well as the information sources, are being used (input data, causes of deforestation and scope) by both. Variants and inconsistencies between the regional and national levels and the steps proposed for their alignment are documented in Section 8.6.

Approach for estimation of emissions and removals

Annual historical emissions for the reference period have been calculated for deforestation, degradation and enhancement of carbon stock in new forests as indicated in Section 7.1. Greenhouse gas emissions from deforestation and degradation have been estimated by the "stock difference approach" as proposed in Chapter 2, Vol. 4 of the IPCC Guidelines (2006)48 and adapted to the REDD+ context. Changes in carbon stocks in the accounting area are calculated as the sum of the annual changes in the different pools (aboveground and belowground biomass, AGB and BGB, respectively).

Following good practices proposed in the IPCC Guidelines (2006), deforestation has been broken down into five strata corresponding to diverse types of forest and non-forest cover identified in the National Forest Inventory (INF) carried out by INAFOR and canopy cover classes. This will enable more accurate accounting of emissions and better matching of interventions in the field. Deforestation and forest degradation have been assessed on broadleaf and coniferous forests separately, since they represent the two most important forest types in the program area. However, the conversion of forests was further sub-divided into two other categories: their conversion to woody vegetation, and forest conversion to non-woody vegetation.

A single emissions factor has been calculated for woody vegetation and other for non-woody vegetation. These categories include different land covers: i. woody vegetation includes silvopastures, scattered trees in grassland, early secondary vegetation "tacotal", tree orchards, wooded savannahs and permanent crops with less than 30% canopy cover; ii. Non-woody vegetation includes shrubland, grassland, wetlands, annual crops, human settlements and bare soil. This was done using an average emission factor for each of these categories.

The following equation has been used to assess annual CO_2 emissions from deforestation:

$$E = 0.47 * \frac{44}{12} * \frac{1}{10}\left[A_{\mathrm{DBL70-WV}} * [CD_{BL70} - CD_{WV}] + A_{\mathrm{DBL70-NWV}} * [CD_{BL70} - CD_{NWV}] + A_{\mathrm{DBL30-69-}WV} * [CD_{BL30-69} - CD_{WV}] + A_{\mathrm{DBL30-69-NWV}} * [CD_{BL30-69} - CD_{NWV}] + A_{DP30-69-NWV} * [CD_{P30-69} - CD_{NWV}]\right]$$

where,

A_{DBL70_WV}: Deforestation from Broadleaf forest >70% canopy cover to Woody vegetation (ha)

A_{DBL70_NWV}: Deforestation from Broadleaf forest >70% canopy cover to Non-woody vegetation (ha)

$A_{DBL39\text{-}69\_WV}$: Deforestation from Broadleaf degraded forest 30-69% canopy cover to Woody vegetation (ha)

[48] IPCC, 2006. IPCC Guidelines for National Greenhouse Gas Inventories. Volume 4 Agriculture, Forestry and Other Land Use.

$A_{DBL39\text{-}69\_NWV}$: Deforestation from Broadleaf degraded forest 30-69% canopy cover to Non-woody vegetation (ha)
$A_{DP39\text{-}69\_NWV}$: Deforestation from Pine forest >70% canopy cover to Non-woody vegetation (ha)
CD_{BL70}: Carbon density of Broadleaf forest > 70% canopy cover (t.m.s/ha)
$CD_{BL30\text{-}69}$: Carbon density of Broadleaf forest 30-69% canopy cover (t.m.s/ha)
$CD_{P30\text{-}69}$: Carbon density of Pine forest >70% canopy cover t.m.s/ha)
CD_{WV}: Carbon density of Woody vegetation t.m.s/ha)
CD_{NWV}: Carbon density of Non-Woody vegetation t.m.s/ha)

The following equation has been used to assess annual CO_2 emissions from degradation:

$$D = \frac{44}{12} * \frac{1}{10}\left[A_{\mathrm{Deg-BL}} * ASC_{BL} + A_{\mathrm{Deg-P}} * ASC_{P}\right]$$

Where,

$A_{Deg\text{-}BL}$: Area of Broadleaf forest degraded or recovered (ha)
$A_{Deg\text{-}BL}$: Area of Pine forest degraded or recovered (ha)
ASC_{BL}: Average change in carbon stock of permanent Broadleaf Forest
ASC_{P}: Average change in carbon stock of permanent Pine Forest

Forest enhancement includes the conversion of non-forest land to forest land, subdivided into four strata: i. regeneration of new broadleaf forests from *woody vegetation*, ii. regeneration of new broadleaf forests from non-woody vegetation, iii. regeneration of secondary conifer forests from non-woody vegetation and iv. establishment of perennial crops with more than 30% of canopy cover. Increases of carbon stocks in pre-existing secondary forest have not been included, due to the lack of data for the generation of a reference level for this activity.

The removal of carbon due to enhancement in new forests has been calculated following the equation:

$$R = a_1 * \frac{SR}{2} + \sum_{k=2}^{10}(a_k * \frac{SR}{2} + \sum_{i=2}^{k} a_{i-1} * SR)$$

where,

R is the removal of carbon in the reference period in t CO_2
a is the annually area converted from non-forest land to secondary forests in the period 2005-2015 (ha/yr)
SR is the sequestration rate (t CO_2/ha yr).

This equation is implemented through the reference period as detailed in the Table 35.

Table. 35 Formulation of the calculation of the enhancement of carbon stocks in new forests.

Year of the Reference period	Area of growing new forests	R (t CO_2/ha)
1	a_1	a_1*SR/2
2	a_1 +a_2	a_1*SR +a_2*SR/2
3	a_1+a_2+a_3	a_1*SR +a_2*SR + a_3*SR/2
4	a_1+a_2+a_3+a_4	…
5	a_1+a_2+a_3+a_4+a_5	…
…	…	…
….	…	…
10	**Tabla 12** a_1+a_2+a_3+a_4+a_5+a_6+a_7+a_8+a_9+a_{10}	(a_1+ a_2+…+a_9)*SR + a_{10}*SR/2

The parameters and information for setting these reference levels for emissions and removals of carbon stocks and the stratification used in both cases are detailed in Table 36 and will be explained in detail in the following section.

Table. 36 Summary of the stratification of each activity and the parameters used for the calculation.

ACTIVITY	STRATA	PARAMETERS
Deforestation	Broadleaf forests to woody vegetation	• Deforestation from Broadleaf forest >70% canopy cover to Woody vegetation (ha) • Deforestation from Broadleaf degraded forest 30-69% canopy cover to Woody vegetation (ha) • Carbon density of Broadleaf forest > 70% canopy cover (t.m.s/ha) • Carbon density of Broadleaf forest 30-69% canopy cover (t.m.s/ha) • Carbon density of Woody vegetation t.m.s/ha)
	Broadleaf forests to non-woody vegetation	• Deforestation from Broadleaf forest >70% canopy cover to Non-woody vegetation (ha) • Deforestation from Broadleaf degraded forest 30-69% canopy cover to Non-woody vegetation (ha) • Carbon density of Broadleaf forest > 70% canopy cover (t.m.s/ha) • Carbon density of Broadleaf forest 30-69% canopy cover (t.m.s/ha) • Carbon density of Non-Woody vegetation t.m.s/ha)
	Conifer forest to non-woody vegetation	• Deforestation from Pine forest >70% canopy cover to Non-woody vegetation (ha) • Carbon density of Pine forest >70% canopy cover t.m.s/ha)

		• Carbon density of Non-Woody vegetation t.m.s/ha)
Degradation	Broadleaf forests	• Permanent Broadleaf forest degraded or enhanced (ha) • Average change in carbon stock in Broadleaf forest (t C/ha)
	Conifer forest	• Permanent Conifer forest susceptible of forest degradation - no change in forest cover, degraded or enhanced (ha) • Average change in carbon stock in Pine forest (t C/ha)
Enhancement of Carbon stocks	Woody vegetation to secondary Broadleaf forest	• Area of secondary Broadleaf forests derived from woody vegetation land cover (ha) • Sequestration rate of secondary Broadleaf forests (tC/ha/yr)
	Non-woody vegetation land covers to secondary Broadleaf forest	• Area of secondary Broadleaf forests derived from other non-woody land covers (ha) • Sequestration rate of secondary Broadleaf forests (tC/ha/yr)
	Non-woody vegetation land covers to new Conifer forest	• Area of secondary Conifer forests derived from non-woody vegetation land covers (ha) • Sequestration rate of secondary Conifer forests (tC/ha/yr)
	Non-woody vegetation land covers to Permanent Crops (>30% canopy cover)	• Area of perennial crops with more than 30% of canopy cover established in former non-woody vegetation land covers (ha) • Sequestration rate of Permanent Crops (tC/ha/yr)

Activity data and emission factors

Activity data

The activity data analysis (deforestation, forest gain, forest degradation) has been conducted using a systematic grid of visual assessment plots nested in the National Forest Inventory net (10' x 10' grid) and the estimation of the EFs for each of the transitions, was based on the carbon stocks data from the National Forest Inventory (Figure 30).

The 10'x10' 2007-08 National Forest Inventory net (371 clusters x 4 plots) was intensified within the accounting area, so a 2.5'x2.5' grid (4.5 - 4.8 km approx.) was prepared for the visual assessment exercise. The number of sampling plots, 3082, is greater enough than the estimated sample size (stratified random sampling approach) for the accounting area (1215 sampling plots - 23 classes, standard error of the estimated overall accuracy S(ô) = 0.01).

A 2005-2015 multitemporal visual assessment exercise was performed (on ArcGIS and Collect Earth) using High-Resolution and Medium-Resolution imagery (from Google Earth and Bing Maps

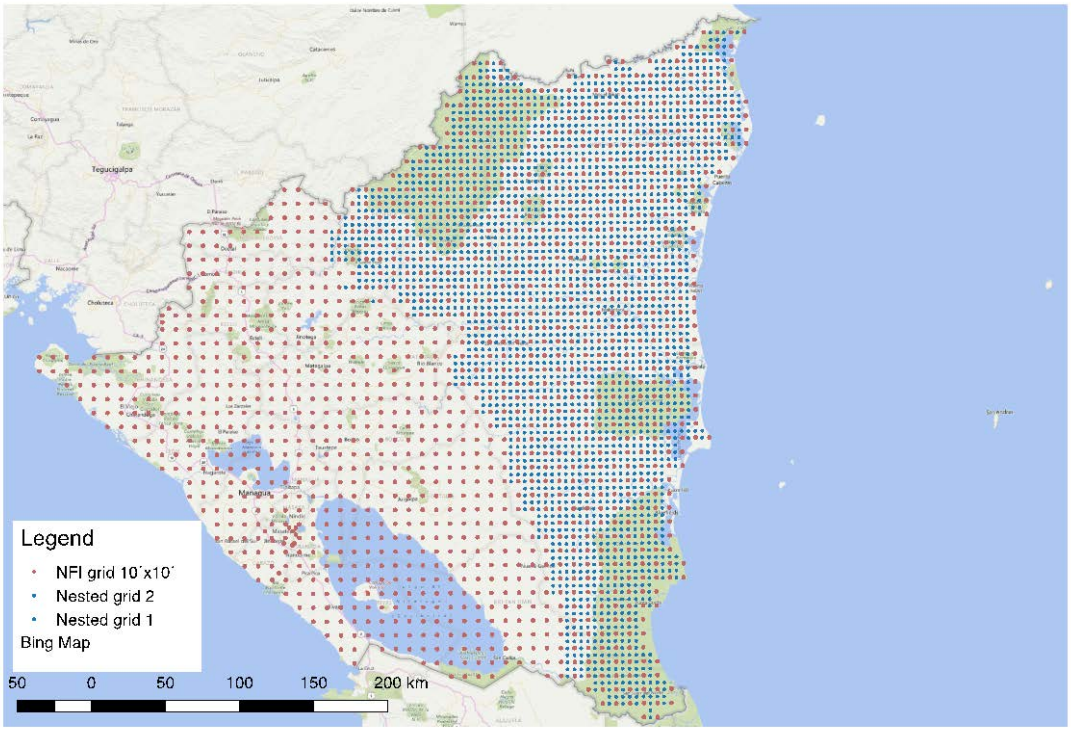
and other available collections: Spot and RapidEye) on a systematic grid of 3082 (regular grid) visual assessment plots of 90 x 90 m size (equivalent to a 3 x 3 Landsat pixels). A 3 x 3 inner grid (within each 90 x 90 m plot) was used to measure each element coverage.

This methodological approach replaces the estimation of the change areas based on the combination of map data and reference data (Olofsson et al, 2014), by directly estimating areas of change from only reference data of a systematic sampling grid (SYS).

According to GFOI (2018)[49], countries are progressively using reference sampling approaches to estimate change areas. A compilation of the approach followed by countries in their Forest Reference Levels submitted to the UNFCCC or to the Forest Carbon Partnership Fund (FCPF) shows that currently, 17 of the 35 submissions use sampling approaches to estimate activity data.

According to GFOI, the role of reference data (precision assessment data), is to serve as a basis for change areas and uncertainty estimates (confidence intervals for compliance with the IPCC good practices). These data provide the best information available to estimate the change areas. The calculations report for the data resulting from the activity can be accessed at the following link:
http://www.marena.gob.ni/Enderedd/etapas/programa-de-reduccion-de-emisiones/

Figure. 30 Systematic sampling grid (2.5'x2.5') of visual assessment plots nested in the National Forest Inventory (10'x10').



[49] GFOI, 2018. Summary of Country experiences and critical issues related to estimation of activity data.

Land cover change categories

The estimation of Activity Data and Emission Factors is made according to the change categories defined from the Transition Matrix (Table 37). In the Transition Matrix, the Perennial Crops Category with canopy cover > 30% is included as forest and the Broadleaf and Coniferous forests are subdivided into two subcategories of canopy cover (> 70% and 30-69%). The areas with natural secondary vegetation and / or isolated trees, combined or not with agricultural areas, that do not reach the minimum of 30% of canopy cover, such as "tacotales", wooded pastures and natural savannas, wetlands or open forests were not considered as forest.

23 change categories are considered in the reference level (Table. 37). Changes in LULC are broken down according to the level of degradation of the forests and types of non-forest cover (woody and non-woody vegetation).

Table. 37 LULC change categories

Num		Land cover change classes
1	Forests that remains as forests	Stable Broadleaf forest >70%
2	Forests that remains as forests	Stable Broadleaf degraded forest 30%-69%
3	Forests that remains as forests	Degradation from Broadleaf forest>70% to 30%-69%
4	Forests that remains as forests	Enhancement from Broadleaf degraded forest 30%-69% to 70%
5	Forests that remains as forests	Stable Pine forest >70%
6	Forests that remains as forests	Stable Pine degraded forest 30%-69%
7	Forests that remains as forests	Degradation from Pine forest>70% to 30%-69%
8	Forests that remains as forests	Enhancement from Pine degraded forest 30%-69% to 70%
9	Forests that remains as forests	Stable Permanent Crops >30%
10	Deforestation	Deforestation from Broadleaf forest to Woody vegetation
11	Deforestation	Deforestation from Broadleaf forest to Non-woody vegetation
12	Deforestation	Deforestation from Pine forest to Woody vegetation
13	Deforestation	Deforestation from Pine forest to Non-woody vegetation
14	Deforestation	Deforestation from Permanent Crops >30% to Non-woody vegetation
15	Forest Gain	Additions from Woody vegetation to Broadleaf forest
16	Forest Gain	Additions from Non-woody vegetation to Broadleaf forest
17	Forest Gain	Additions from Woody vegetation to Pine forest
18	Forest Gain	Additions from Non-woody vegetation to Pine Forest

19	Forest Gain	Additions from Non-woody vegetation to Permanent Crops >30%
20	Non-Forest that remains as non-forest	Stable Non-woody vegetation
21	Non-Forest that remains as non-forest	Stable Woody Vegetation
22	Non-Forest that remains as non-forest	Woody vegetation to Non-woody vegetation
23	Non-Forest that remains as non-forest	Non-woody vegetation to Woody Vegetation

Visual assessment grid

A systematic sampling grid was overlapped on the program's accounting area, which guarantees a homogeneous distribution of sampling points among all classes of land cover change (Rosenfeld, 1982). In the United States and Europe, systematic sampling grids of 2x2 km have been used for land use change studies (in South America, grids of 10x10 km have been used at the continental level).

The systematic grid of visual assessment plots in Nicaragua was nested in the National Forest Inventory net, 10' x 10' grid (9.1-9.6 km). The 10'x10' 2007-2008 National Forest Inventory net[50] (Figure 30) consists of 816 clusters (x 4 plots) and it was intensified within the accounting area, so a 2.5'x2.5' grid (4.5 - 4.8 km approx.) was prepared for the visual assessment analysis. The number of sampling plots, 3082, is greater enough than the estimated sample size, considering a stratified random sampling approach for the accounting area (1215 sampling plots considering 23 classes and a standard error of the estimated overall accuracy S(ô) = 0.01)[51].

Considering a proportional distribution to the change categories of the 3082 points of the intensified grid, we always obtain a greater number of points than the estimated sample for all classes of LULCC[52].

Response Design

A 2005-2015 multitemporal visual assessment exercise was performed (on ArcGIS and Collect Earth) using HR and MR imagery (from Google Earth and Bing Maps and other available collections: Spot and RapidEye) on a systematic grid of 3082 visual assessment plots of 90 x 90 m size (equivalent to a 3 x 3 Landsat pixels). A 3 x 3 inner grid (within each 90 x 90 m plot) was used to measure each element coverage.

Response design characteristics for the visual assessment exercise were:

[50] INAFOR, 2009. Results from the National Forest Inventory in Nicaragua 2007-2008

[51] Source of data: random sample of 1306 points for the visual asessment of the LULCC map 2005-2015, 23 LULCC classes (Table 3) and a standard error of the estimated overall accuracy S(ô) = 0.01.

[52] The file in shape format (.shp) of the intensified grid for visual assessment can be accessed here.

- Visual assessment unit: a size plot of 90x90 meters (corresponding to 3x3 pixels of Landsat) is used and interpreted by means of a 3x3 inner grid (9 points in total) within each plot. Each point of this inner grid means in terms of coverage a 11% (close to 10% that is the minimum unit of tree coverage that needs to be identified).

- Reference data sources (2005-2015): the repository of high resolution imagery available through Google Earth, Bing Maps, as well as additional Landsat, Sentinel-2, Spot and Rapid Eye images.

- Classification protocol: A protocol was discussed and established for the reference classification of the spatial evaluation units before proceeding with the visual assessment analysis. This is part of the QA/QC procedures with the aim of reducing the uncertainty of the classification, with special attention to: a) the bias associated to the spatial registration of the reference location, b) the bias of the interpreter, or error in the assignment of the reference class to the spatial unit; and c) the variability of the interpreter (differences among interpreters to the reference class assigned to the same spatial unit).

- Reference classifications: The categories of land cover used in the visual assessment are shown in Table. 38. These classes are mostly consistent with those established in the National Forest Inventory (INAFOR, 2008). The deviations correspond to adjustments in the discrimination capacity between categories through the photointerpretation of medium and high-resolution images, and the need to create the category of wooded agricultural areas.

- Software for the visual assessment: the visual assessment exercise was conducted with ArcGIS (and Collect Earth) due to the availability of Spot, Landsat and Rapid Eye mosaics. MARENA and INETER staff have conducted visual assessments for validation of LULC maps using ArcGIS in the past.

Quality Assessment/Quality Control procedures

The quality assessment and quality control procedures applied during the visual assessment of land cover changes included the following tasks:

- Control of the photo-interpretation bias: The methodological aspects and the homologation of the photo-interpretation criteria were carried out through a Workshop with the members of the REDD + Monitoring, Reporting and Verification Team, made up of regional and national government institutions: SERENA, INETER, MARENA and INAFOR. A decision tree was elaborated for the visual assessment using high resolution images (Figure. 31 Non-response visual assessment plots distribution) and medium resolution images to reduce the bias in the coverage photointerpretation procedure. These diagrams clearly indicate how and in what order the auxiliary information should be used.

- Control of the variability between photo-interpreters: Three national experts, two from MARENA and one from INETER were responsible for the photo-interpretation of the images. These specialists have experience in land cover visual interpretation using high and medium resolution images. Despite their experience, before starting with the visual assessment exercise, a joint training session of the three specialists was conducted to reduce the variability among interpreters. The training consisted in the evaluation of a common sample of 30 points by all the evaluators. With the inputs of this work session, the corresponding adjustments were made to the methodology and the decision tree of photointerpretation.

- Verification of the photo-interpretation: a specialist from INAFOR was in charge of carrying out the process of verification and quality control of the visual assessment. For the verification of the coverage interpretation, the coverage data obtained in the field during the National Forest Inventory (207 sampling units) and the re-measurement of NFI plots (69 sampling units) made in 2005 were used as reference information.

- Data consistency control: before the end of the data collection process, a session was held at MARENA to verify the data and detect any anomalies before starting the final analysis of the reference information.

Table. 38 Reference points used for each of the REDD+ activities.

Land cover change classes	Area (ha)	Points
Stable Broadleaf forest >70%	1,863,127	769
Stable Broadleaf degraded forest 30%-69%	705,032	291
Degradation from Broadleaf forest>70% to 30%-69%	491,827	203
Enhancement from Broadleaf degraded forest 30%-69% to 70%	147,790	61
Stable Pine forest >70%	29,073	12
Stable Pine degraded forest 30%-69%	87,220	36
Degradation from Pine forest>70% to 30%-69%	21,805	9
Enhancement from Pine degraded forest 30%-69% to 70%	16,960	7
Stable Permanent Crops >30%	7,268	3
Deforestation from Broadleaf forest >70 to Woody vegetation	172,018	71
Deforestation from Broadleaf degraded forest 30-69% to Woody vegetation	339,191	140
Deforestation from Broadleaf forest >70 to Non-woody vegetation	205,937	85
Deforestation from Broadleaf degraded forest 30-69% to Non-woody vegetation	188,978	78
Deforestation from Pine forest >70 to Woody vegetation	-	0
Deforestation from Pine degraded forest 30-69% to Woody vegetation	-	0
Deforestation from Pine forest >70 to Non-woody vegetation	2,423	1
Deforestation from Pine degraded 30-69% to Non-woody vegetation	-	0
Deforestation from Permanent Crops >30% to Non-woody vegetation	-	0

Additions from Woody vegetation to Broadleaf forest		104,180	43
Additions from Non-woody vegetation to Broadleaf forest		43,610	18
Additions from Woody vegetation to Pine forest		-	0
Additions from Non-woody vegetation to Pine Forest		14,537	6
Additions from Non-woody vegetation to Permanent Crops >30%		4,846	2
Stable Non-woody vegetation		1,579,660	652
Stable Woody vegetation		658,999	272
Woody vegetation to Non-woody vegetation		201,092	83
Non-woody vegetation to Woody vegetation		130,831	54
	Accounting Area	7,016,404	2896

Figure. 31 Non-response visual assessment plots distribution

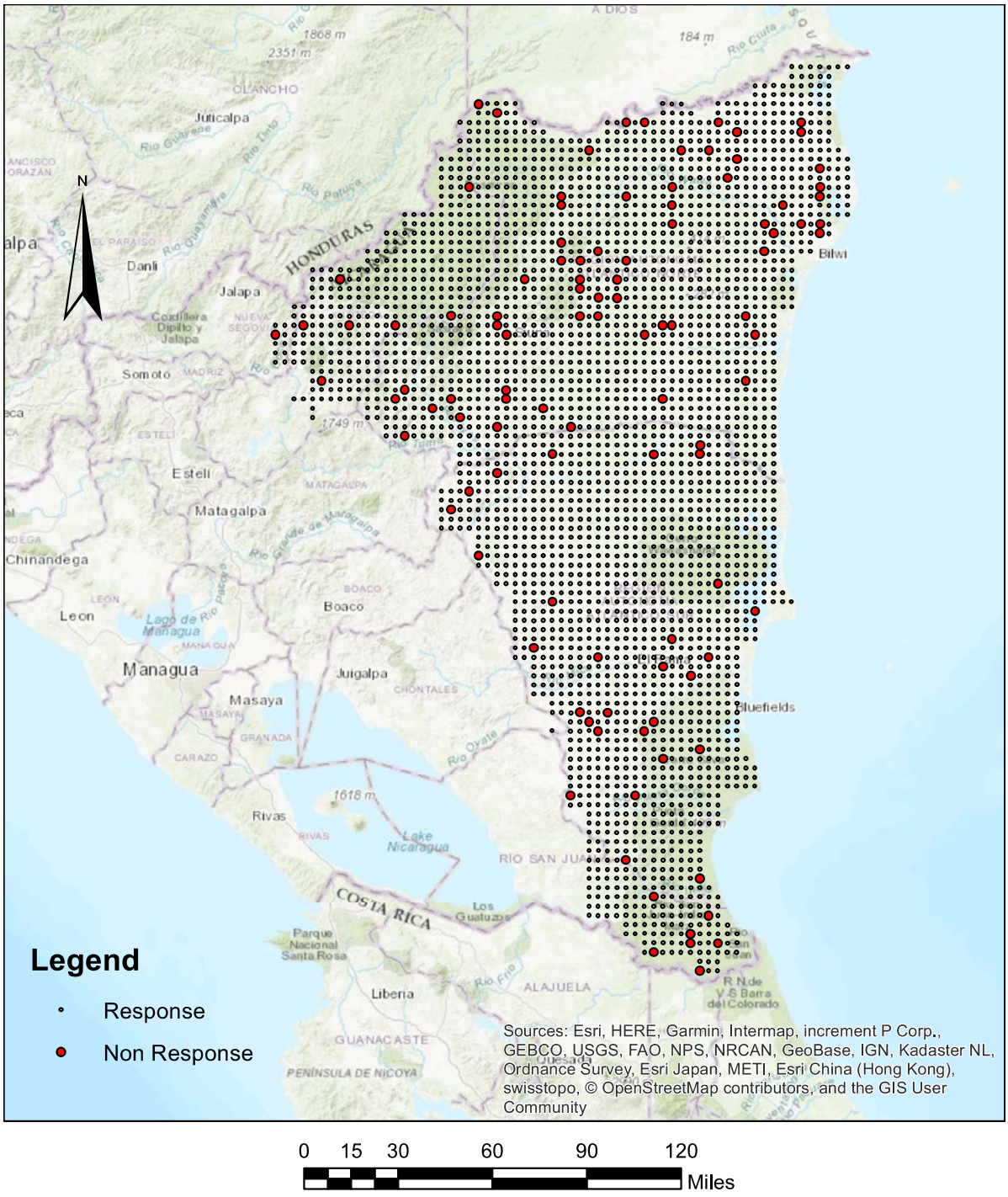


Table. 39 LULC classes considered for the estimation of deforestation, degradation and regeneration of forests in the accounting area of the Emission Reduction Program of Nicaragua.

Num	LULC category	Cde	Description	Auxiliary information for classification	
				2005 Assessment	2015 Assessment
1	Broadleaf degraded forest 30-69%	BL-d	Forest with more than 70% of the tree cover of broadleaf species. It includes the mixed forests and natural ecosystems of Palma and Mangroves.	NDVI value 2005	N/A
2	Broadleaf forest >70%	BL-i			
3	Pine degraded forest 30-69%	BP-d	Forest with more than 70% of the tree cover of coniferous species. Forest dominated by pine in different stages of maturity.		
4	Pine forest >70%	BP-i			
5	Permanent crop > 30% (forest)	Bos-CP	Coffee, Cocoa, Fruit trees, Forest Plantations	Coffee systems map MAGFOR 2002	Crop production map 2016-2017. INETER. Natural regeneration map 2017, MARENA. Reforested areas map 2015-16-17. Project CAVAMA. INAFOR.
6	Permanent crop < 30% (non-forest)	Nbos-CP	Coffee and cocoa with shade <30%, Oil Palm, Musaceae, Bamboo, Coconut		
7	Agricultural land with scatter trees and tacotal	Tac	Mixed area of crops and pastures with shrub vegetation, tacotales and wooded annual crops	NDVI value 2005	N/A
8	Annual crops and bare soils	Ca	Annual crops and land without vegetation or in preparation for cultivation. It includes sandy and rocky soils, very limited or not suitable for agricultural production. It includes landslides, riverbeds with evidence of recent flooding, and areas for the extraction of materials. (e.g. beaches, coasts, rocky outcrops, mining)	NDVI value 2005	Crop production map 2016-2017. INETER.
9	Pastures (sown)	P	Grassslands (sown) with and without management without trees	NDVI value 2005	N/A
10	Natural savannah (natural pastures)	Snat	Natural pastures associated to pine.	N/A	N/A

Num	LULC category	Cde	Description	Auxiliary information for classification	
				2005 Assessment	2015 Assessment
11	Wetlands	Tsi	Land covered periodically and temporarily by water and dominated by grasses, without significant presence of trees and shrubs. Tree canopy cover <10%. Presence of herbaceous vegetation typical of wetlands.	Wetlands in topographic maps (1988)	N/A
12	Water	Lag	Areas occupied by rivers, lakes, lagoons and important reservoirs/dams. It includes coastal lagoons and seas.	Physical map of Nicaragua, Layer of Water Network of INETER and NDVI value 2005	Physical map of Nicaragua, Layer of Water Network of INETER and NDVI value 2005
13	Settlements and Roads	Urb	Populated Areas with significant buildings. It also includes scattered housing in the countryside and all populated areas. Areas subject to intensive use covered in large part by structures, including cities, towns, villages and strip along roads and transport routes. It also includes areas where facilities and buildings such as poultry farms and other industrial complexes are located.	Settlement polygon layer of INETER 2015 and road layer of ENDE-MARENA	Settlement polygon layer of INETER 2015 and road layer of ENDE-MARENA
14	Clouds and shadows	Nub	This is not a LULC category. It corresponds to the area covered by clouds and cloud shadows in the reference image.	N/A	N/A
15	No information	No-info	This is not a LULC category. It corresponds to the area without available reference images for the visual assessment of the LULC.	N/A	N/A

Figure. 32 Decision tree for the LULC photo-interpretation in the accounting area using HR imagery.

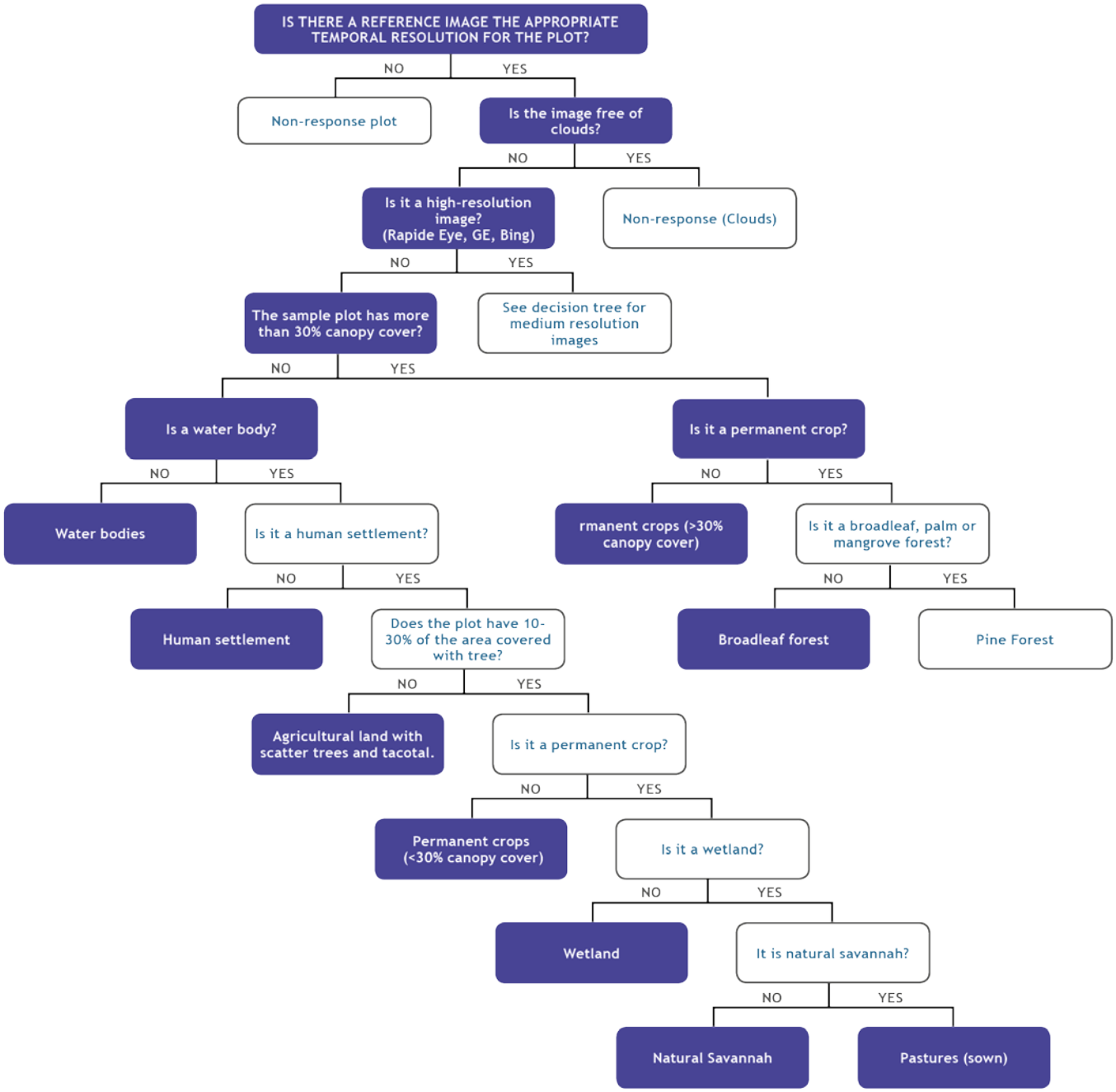


Figure. 33 Decision tree for the LULC photo-interpretation in the accounting area using MR imagery.

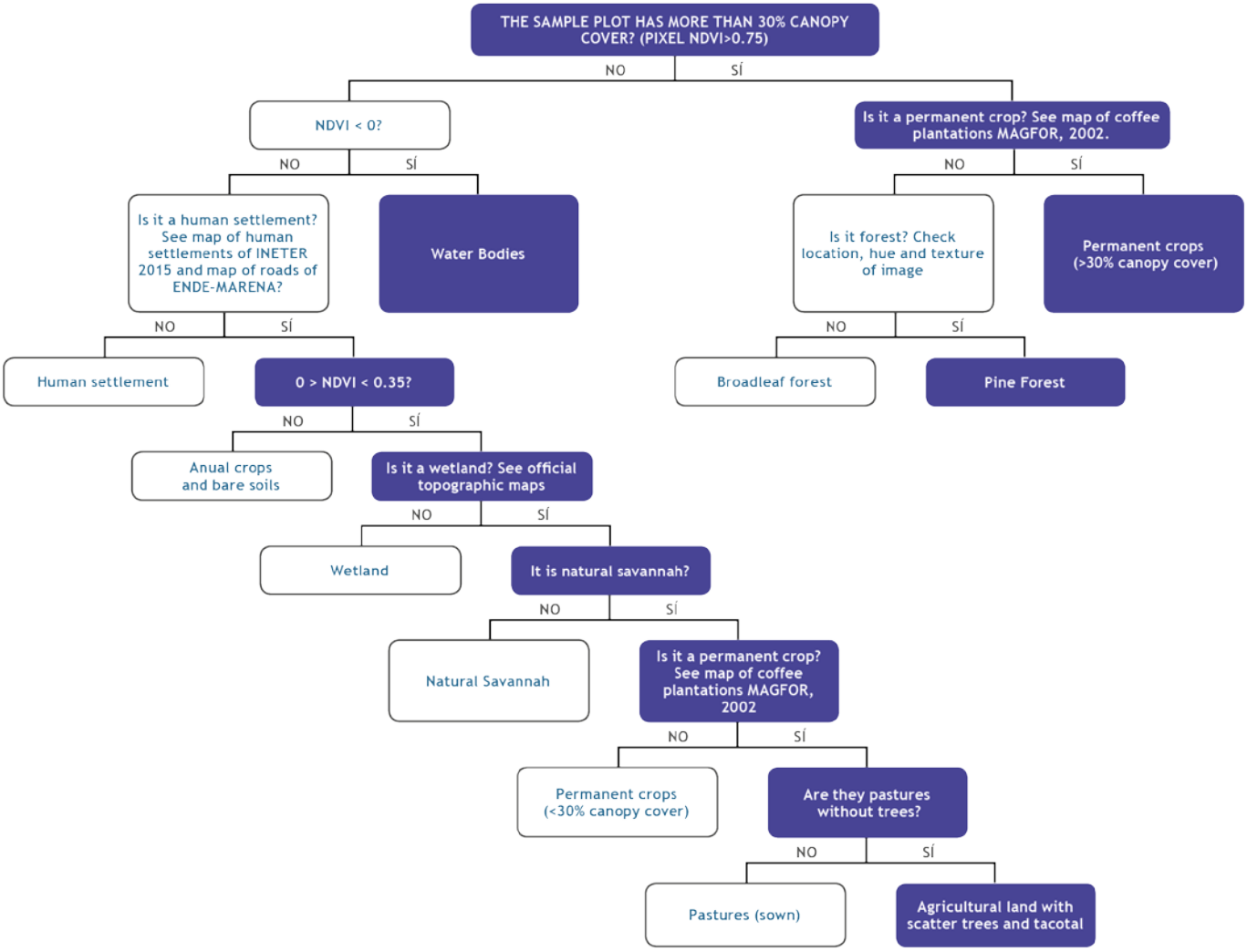


Table. 40 Categories of REDD+ activities in the accounting area according to the transition matrix.

<table>
<tr><td colspan="8">2015</td></tr>
<tr><td colspan="4" rowspan="3">LULC classes</td><td colspan="5">Forest</td><td colspan="8">Non-Forest</td><td rowspan="3">Total</td></tr>
<tr><td colspan="2">Pine</td><td colspan="2">Broadleaf</td><td rowspan="2">Permanent Crops > 30% canopy cover</td><td colspan="2">Woody Vegetation</td><td colspan="6">Non-Woody Vegetation</td></tr>
<tr><td>Degraded 30--69% canopy cover</td><td>Intact >70% canopy cover</td><td>Degraded 30--69% canopy cover</td><td>Intact >70% canopy cover</td><td>Agricultural land with scatter trees and tacotal</td><td>Permanent Crops < 30% canopy cover</td><td>Annual crops</td><td>Pastures (sown)</td><td>Natural savannah (natural pastures)</td><td>Bare soils</td><td>Wetlands</td><td>Settlements and Roads</td></tr>
<tr><td rowspan="13">2005</td><td rowspan="6">Forest</td><td rowspan="2">Pine</td><td>Degraded 30--69% canopy cover</td><td>Stable</td><td>Enhancement</td><td></td><td></td><td></td><td rowspan="4">Deforestation to Woody Vegetation</td><td colspan="6" rowspan="4">Deforestation to Non-Woody Vegetation</td><td></td></tr>
<tr><td>Intact >70% canopy cover</td><td>Degradation</td><td>Stable</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Broadleaf</td><td>Degraded 30--69% canopy cover</td><td></td><td></td><td>Stable</td><td>Enhancement</td><td></td><td></td></tr>
<tr><td>Intact >70% canopy cover</td><td></td><td></td><td>Degradation</td><td>Stable</td><td></td><td></td></tr>
<tr><td colspan="2">Permanent Crops > 30% canopy cover</td><td></td><td></td><td></td><td></td><td>Stable</td><td></td></tr>
<tr><td rowspan="7">Non-Forest</td><td rowspan="2">Woody Vegetation</td><td>Agricultural land with scatter trees and tacotal</td><td colspan="4" rowspan="2">Additions of forest from Woody vegetation</td><td rowspan="2"></td><td rowspan="2">Stable Woody Vegetation</td><td colspan="6" rowspan="2">Woody to Non-woody vegetation</td><td></td></tr>
<tr><td>Permanent Crops < 30% canopy cover</td><td></td></tr>
<tr><td rowspan="6">Non-Woody Vegetation</td><td>Annual crops</td><td colspan="4" rowspan="6">Additions of forest from Non-woody vegetation</td><td rowspan="6">Additions of Permanent Crops from Non-woody Vegetation</td><td rowspan="6">Non-woody to woody vegetation</td><td colspan="6" rowspan="6">Stable Non-woody Vegetation</td><td></td></tr>
<tr><td>Pastures (sown)</td><td></td></tr>
<tr><td>Natural savannah (natural pastures)</td><td></td></tr>
<tr><td>Bare soils</td><td></td></tr>
<tr><td>Wetlands</td><td></td></tr>
<tr><td>Settlements and Roads</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Estimation of coverage change areas

Finally, 2896 land cover information points were obtained in 2005 and 2015, based on the visual assessment carried out on the systematic grid of the 3082 points in the accounting area, to estimate the change land cover in the reference period.

The 186 points of difference, to complete the 3082 original points, correspond to the unanswered plots, due to the absence of images, cloud cover or the presence of bodies of water. It should be noted that the unanswered points are distributed throughout the accounting area (Figure 31). The change classes assessed and the number of points used for each activity are shown in Table. 41.

Based on the 2986 plots of LULC visual assessment, the transition analysis 2005-2015 was carried out (Table 42), and the land cover change areas are estimated. The estimation of the LULC change area of each category "k" and its respective confidence intervals are calculated according to $\hat{A}_k = A\,\hat{p}_k$, where A is the total map area and $\hat{p}_k = \frac{n_k}{n}$, where n_k is the number of the k category plots, and n the total number of assessed plots. The standard error of the estimated area is calculated as $S(\hat{A}_k) = A\,S(\hat{p}_k)$. The 95% confidence interval is calculated as $\hat{A}_k \pm 1.96\,S(\hat{A}_k)$, where $S(\hat{A}_k) = A\sqrt{\frac{\hat{p}_k(1-\hat{p}_k)}{(n-1)}}$.

Table. 41 Transition matrix from the LULCC visual assessment for the reference period 2005-2015 in the accounting area of the ERP of Nicaragua.

		2015							
	Land cover classes	Broadleaf forest >70%	Broadleaf degraded forest	Pine Forest >70%	Pine degraded forest 30-69%	Permanent crop > 30% (Forest)	Woody vegetation	Non-woody vegetation	Grand Total
2005	Broadleaf forest >70%	769	203				71	85	1128
	Broadleaf degraded forest 30-69%	61	291				140	78	570
	Pine forest >70%			12	9			1	22
	Pine degraded forest 30-69%			7	36				43
	Permanent crop > 30% (forest)					3			3
	Woody vegetation	3	40				272	83	398
	Non-woody vegetation		18		6	2	54	652	732
	Grand Total	833	552	19	51	5	537	899	2896

Table. 42 LULC change areas in the accounting area of the ERP of de Nicaragua.

Numb	Land cover change classes		Area (ha)	Confidence interval	Error %	Wi	Visual plots	Standard error
1	Forests that remains as forests	Stable Broadleaf forest >70%	1,863,127	112,874	0.0606	0.2655	769	57,589
2		Stable Broadleaf degraded forest 30%-69%	705,032	76,842	0.1090	0.1005	291	39,205
3		Degradation from Broadleaf forest>70% to 30%-69%	491,827	65,255	0.1327	0.0701	203	33,293
4		Enhancement from Broadleaf degraded forest 30%-69% to 70%	147,790	36,702	0.2483	0.0211	61	18,725
5		Stable Pine forest >70%	29,073	16,419	0.5647	0.0041	12	8,377
6		Stable Pine degraded forest 30%-69%	87,220	28,319	0.3247	0.0124	36	14,449
7		Degradation from Pine forest>70% to 30%-69%	21,805	14,226	0.6524	0.0031	9	7,258
8		Enhancement from Pine degraded forest 30%-69% to 70%	16,960	12,551	0.7400	0.0024	7	6,403
9		Stable Permanent Crops >30%	7,268	8,222	1.1312	0.0010	3	4,195
10	Deforestation	Deforestation from Broadleaf forest >70 to (Woody vegetation	172,018	39,526	0.2298	0.0245	71	20,166
11		Deforestation from Broadleaf degraded forest 30-69% to Woody vegetation	339,191	54,822	0.1616	0.0483	140	27,970
12		Deforestation from Broadleaf forest >70 to Non-woody vegetation	205,937	43,141	0.2095	0.0294	85	22,011
13		Deforestation from Broadleaf degraded forest 30-69% to Non-woody vegetation	188,978	41,378	0.2190	0.0269	78	21,111
14		Deforestation from Pine forest >70 to Woody vegetation	-	-		0.0000	0	-
15		Deforestation from Pine degraded forest 30-69% to Woody vegetation	-	-		0.0000	0	-
16		Deforestation from Pine forest >70 to Non-woody vegetation	2,423	4,749	1.9600	0.0003	1	2,423
17		Deforestation from Pine degraded 30-69% to Non-woody vegetation	-	-			0	-
18		Deforestation from Permanent Crops >30% to Non-woody vegetation	-	-		0.0000	0	-
19	Forest Gain	Additions from Woody vegetation to Broadleaf forest	104,180	30,912	0.2967	0.0148	43	15,772
20		Additions from Non-woody vegetation to Broadleaf forest	43,610	20,088	0.4606	0.0062	18	10,249
21		Additions from Woody vegetation to Pine forest	-	-		0.0000	0	-
22		Additions from Non-woody vegetation to Pine Forest	14,537	11,622	0.7995	0.0021	6	5,929
23		Additions from Non-woody vegetation to Permanent Crops >30%	4,846	6,714	1.3857	0.0007	2	3,426
24	Non-Forest	Stable Non-woody vegetation	1,579,660	106,754	0.0676	0.2251	652	54,466
25		Stable Woody vegetation	658,999	74,561	0.1131	0.0939	272	38,042
26		Woody vegetation to Non-woody vegetation	201,092	42,645	0.2121	0.0287	83	21,758
27		Non-woody vegetation to Woody vegetation	130,831	34,575	0.2643	0.0186	54	17,640
		Total	7,016,404			1	2896	

A summary of the procedures and values obtained are shown in Tables 43, 44 and 45.

Table. 43 Summary of activity data for deforestation.

<table>
<tr><td>Parameter description, including the time period covered:</td><td>Deforested area of broadleaf and conifer forests, 2005 - 2015.</td></tr>
<tr><td>Explanation for which sources or sinks the parameter is used:</td><td>Deforestation</td></tr>
<tr><td>Data unit:</td><td>ha</td></tr>
<tr><td>Value for the parameter:</td><td>
<table>
<tr><th>Activity Category</th><th>Area (ha)</th></tr>
<tr><td>AD_BL_70-WV</td><td>172,018</td></tr>
<tr><td>AD_BL_70-NWV</td><td>205,937</td></tr>
<tr><td>AD_BL_30-69-WV</td><td>339,191</td></tr>
<tr><td>AD_BL_30-69-NWV</td><td>188,977</td></tr>
<tr><td>AD_P>70-NWV</td><td>2,423</td></tr>
</table>
where,
AD_BL_70-WV: Deforestation from Broadleaf forest >70 to Woody vegetation
AD_BL_70-NWV: Deforestation from Broadleaf forest >70 to Non-woody vegetation
AD_BL_30-69-WV: Deforestation from Broadleaf degraded forest 30-69% to Woody vegetation
AD_BL_30-69-NWV: Deforestation from Broadleaf degraded forest 30-69% to Non-woody vegetation
AD_P>70-NWV: Deforestation from Pine forest >70 to Non-woody vegetation</td></tr>
<tr><td>Source of data (e.g. official statistics) or description of the method for developing the data, including (pre-)processing methods for data derived from remote sensing images (including the type of</td><td>The activity data analysis (deforestation, forest gain, forest degradation) has been conducted using a systematic grid of visual assessment plots nested in the National Forest Inventory net (10’ x 10’ grid) (Figure 30). A 2005-2015 multitemporal visual assessment exercise was performed (on ArcGIS and Collect Earth) using High-Resolution and Medium-Resolution imagery (from Google Earth and Bing Maps and other available collections: Spot and RapidEye) on a systematic grid of 3082 (regular grid) visual assessment plots of 90 x 90 m size</td></tr>
</table>

<table>
<tr><td>sensors and the details of the images used):</td><td>(equivalent to a 3 x 3 Landsat pixels). A 3 x 3 inner grid (within each 90 x 90 m plot) was used to measure each element coverage.</td></tr>
<tr><td>Spatial level:</td><td>National</td></tr>
<tr><td>Discussion of key uncertainties for this parameter:</td><td>The activity data uncertainties are related to: i. the number of visual assessment plots with information available for the LULCC analysis; ii. the bias of the visual interpreters, and iii. the quality and resolution of the images available for the years 2005 and 2015.</td></tr>
<tr><td>Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of assumptions/methodology in the estimation:</td><td>The precision of the activity data is presented in the Table below.
<table>
<tr><th>Activity Category</th><th>Standard error (ha)</th><th>Confidence Interval (95%)</th></tr>
<tr><td>AD_BL_70-WV</td><td>20,166</td><td>132,492 - 211,545</td></tr>
<tr><td>AD_BL_70-NWV</td><td>22,011</td><td>162,797 - 249,078</td></tr>
<tr><td>AD_BL_30-69-WV</td><td>27,970</td><td>284,369 – 394,012</td></tr>
<tr><td>AD_BL_30-69-NWV</td><td>21,111</td><td>147,600 – 230,355</td></tr>
<tr><td>AD_P>70-NWV</td><td>2,422</td><td>-2,326 – 7,171</td></tr>
</table></td></tr>
</table>

Table. 44 Summary of Activity data for enhancement of carbon stocks.

<table>
<tr><td>Parameter description, including the time period covered:</td><td>Area of secondary broadleaf and conifer forests</td></tr>
<tr><td>Explanation for which sources or sinks the parameter is used:</td><td>Carbon stock enhancement</td></tr>
<tr><td>Data unit:</td><td>ha</td></tr>
<tr><td>Value for the parameter:</td><td><table>
<tr><th>Activity Category</th><th>Area (ha)</th></tr>
<tr><td>Add_WV_BL</td><td>104,180</td></tr>
<tr><td>Add_NWV_BL</td><td>43,610</td></tr>
<tr><td>Add_NWV_P</td><td>14,537</td></tr>
<tr><td>Add_NWV_PC</td><td>4,846</td></tr>
</table>
where,</td></tr>
</table>

<table>
<tr><td></td><td>Add_WV_BL: Additions from Woody vegetation to Broadleaf forest
Add_NWV_BL: Additions from Non-woody vegetation to Broadleaf forest
Add_NWV_P: Additions from Non-woody vegetation to Pine Forest
Add_NWV_PC: Additions from Non-woody vegetation to Permanent Crops >30%</td></tr>
<tr><td>Source of data (e.g. official statistics) or description of the method for developing the data, including (pre-)processing methods for data derived from remote sensing images (including the type of sensors and the details of the images used):</td><td>The activity data analysis (deforestation, forest gain, forest degradation) has been conducted using a systematic grid of visual assessment plots nested in the National Forest Inventory net (10’ x 10’ grid) (See Figura 1). A 2005-2015 multitemporal visual assessment exercise was performed (on ArcGIS and Collect Earth) using High-Resolution and Medium-Resolution imagery (from Google Earth and Bing Maps and other available collections: Spot and RapidEye) on a systematic grid of 3082 (regular grid) visual assessment plots of 90 x 90 m size (equivalent to a 3 x 3 Landsat pixels). A 3 x 3 inner grid (within each 90 x 90 m plot) was used to measure each element coverage.</td></tr>
<tr><td>Spatial level:</td><td>National</td></tr>
<tr><td>Discussion of key uncertainties for this parameter:</td><td>The activity data uncertainties are related to: i. the number of visual assessment plots with information available for the LULCC analysis; ii. the bias of the visual interpreters, and iii. the quality and resolution of the images available for the years 2005 and 2015.</td></tr>
<tr><td>Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of assumptions/methodology in the estimation:</td><td>The precision of the activity data is presented in the Table below

<table><tr><th>Activity Category</th><th>Standard error (ha)</th><th>Confidence Interval (95%)</th></tr><tr><td>Add_WV_BL</td><td>15,772</td><td>73,268 - 135,092</td></tr><tr><td>Add_NWV_BL</td><td>10,249</td><td>23,523 - 63,698</td></tr><tr><td>Add_NWV_P</td><td>5,929</td><td>2,915 – 26,159</td></tr><tr><td>Add_NWV_PC</td><td>3,426</td><td>-1,869 – 11,560</td></tr></table></td></tr>
</table>

Table. 45 Summary of activity data for degradation

<table>
<tr><td>Parameter description, including the time period covered:</td><td>Degraded area of broadleaf and conifer forests, 2005 - 2015</td></tr>
<tr><td>Explanation for which sources or sinks the parameter is used:</td><td>Degradation</td></tr>
<tr><td>Data unit:</td><td>ha</td></tr>
<tr><td>Value for the parameter:</td><td>
<table>
<tr><th>Activity Category</th><th>Area (ha)</th></tr>
<tr><td>Deg_BL</td><td>700,187</td></tr>
<tr><td>Deg_P</td><td>67,838</td></tr>
</table>
where,
Deg_BL: Anthropogenic degraded/recoverd area in Broadleaf forest
Deg_P: Anthropogenic no changed/degraded/recovered area in Pine forest
</td></tr>
<tr><td>Source of data (e.g. official statistics) or description of the method for developing the data, including (pre-)processing methods for data derived from remote sensing images (including the type of sensors and the details of the images used):</td><td>Forest degradation in “forest remaining forest” has been analyzed using a systematic grid of visual assessment plots nested in the National Forest Inventory net (10’ x 10’ grid) during the reference period (2005-2015). The 10'x10' 2007-08 National Forest Inventory net (371 clusters x 4 plots) was intensified within the accounting area, so finally a 2.5’x2.5’ grid (4.5 - 4.8 km approx.) was prepared for a visual assessment exercise.

The 2005-2015 multitemporal visual assessment exercise was performed (on ArcGIS and Collect Earth) using HR imagery (from Google Earth and Bing Maps and other available collections: Spot and RapidEye) on a systematic grid of 3082 (regular grid) visual assessment plots of 90 x 90 m size (equivalent to a 3 x 3 Landsat pixels). A 3 x 3 inner grid (within each 90 x 90 m plot) was used to measure canopy cover. The number of sampling plots assessed is 1391 of the total grid points (3082). Anthropogenic and non-anthropogenic forest degradation have been distinguished in the analysis. The splitting criterion was to consider as non-anthropogenic forest degradation the sampling points where forest degradation processes were detected and located in those areas:
- Areas farther than 1 km from roads and pathways.</td></tr>
</table>

<table>
<tr><td></td><td>- Areas farther than 1 km from villages.
- Areas farther than 1 km from rivers.
- Areas farther than 1 km from the agricultural frontier and deforestation sites.

Main drivers of degradation (firewood collection and illegal logging[53]) are related to accessibility to forest. Regarding Illegal logging activities, a review of skidding distances in Neotropical Forest (Eastern Amazonia[54], Guyana[55], and Costa Rica[56]), in conventional and reduced impact logging, using crawler tractors, skidders and animals (oxen), was carried out None of the cases skidding distance exceeded 1000 m. Skidding average distance is between 120 and 400 m, depending on the topographic conditions and the size of the trees.

MARENA, in coordination with INETER, has produced a map of existing roads based on the interpretation of 2015 RapidEye imagery. This map has been used to delimit areas based on road accessibility (accessible and inaccessible). Degradation in accessible forest areas will be assumed to be anthropogenic, whereas degradation in inaccessible forest areas will be considered to be non-anthropogenic.</td></tr>
<tr><td>Spatial level:</td><td>National</td></tr>
<tr><td>Discussion of key uncertainties for this parameter:</td><td>The activity data uncertainties are related to: i. the number of visual assessment plots with information available for the LULCC analysis; ii. the bias of the visual interpreters, and iii. the quality and resolution of the images available for the years 2005 and 2015 and iv. the splitting criteria for anthropogenic and non-anthropogenic forest degradation (distance thresholds to roads and villages).</td></tr>
<tr><td>Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of</td><td>The precision of the activity data is presented in the Table below

<table><tr><th>Activity Data</th><th>Standard error (ha)</th><th>Confidence Interval (95%)</th></tr></table></td></tr>
</table>

[53] For further details on degradation drivers see Section 4.

[54] Schulze, M., & Zweede, J. (2006). Canopy dynamics in unlogged and logged forest stands in the eastern Amazon. Forest Ecology and Management, 236(1), 56–64. http://doi.org/10.1016/j.foreco.2006.08.333
Barreto, P., Amaral, P., Vidal, E., & Uhl, C. (1998). Costs and benefits of forest management for timber production in eastern Amazonia. Forestr Ecology and Management, (108), 9–26. http://doi.org/10.1016/S0378-1127(97)00251-X

[55] Forestry Trainning Centre. (2004). Trainning manual reduced impact logging. Guyana.

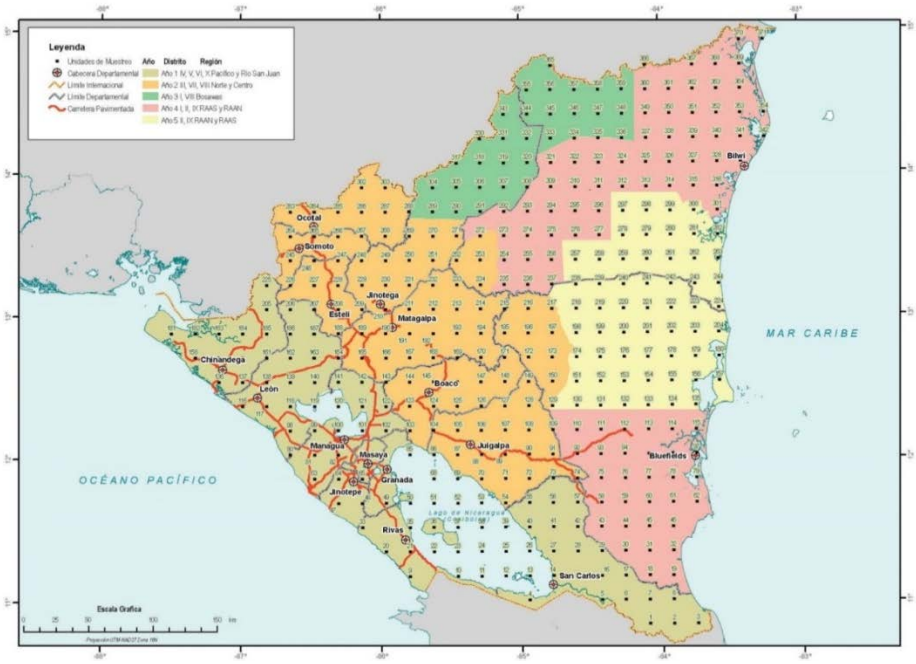
[56] Cordero, W., & Howard, A. (1995). Use of oxen in logging operations in rural areas of Costa Rica. In D. (IUFRO) Dykstra (Ed.), Forest Operations in the Tropics (p. 61). Tampere, Finland.

assumptions/methodology in the estimation:	Deg_BL	39,085	623,580 – 776,794
	Deg_P	12,760	42,828 – 92,848

Emission factors

Data from the National Forest Inventory (INF), carried out by INAFOR in 2007[57], were used to calculate the emission factors for various categories of forest, young secondary vegetation (*tacotales*) and non-forest class. The INF contains information from 371 sample units situated over a systematic grid over inland Nicaragua (Figure. 34). The grid is the world 10´x10´ (18 km x 18 Km approximately) grid proposed by FAO.

Figure. 34 Distribution of the INF sample units in Nicaragua following the systematic design of a world 10´x10´ grid.



INF sample units were formed by 4 plots (of 0.5 ha), 12 rectangular nested subplots (of 0.02 ha) and 12 circular nested subplots arranged according to Figure 35, following the land use/land cover inventory design proposed by FAO[58].

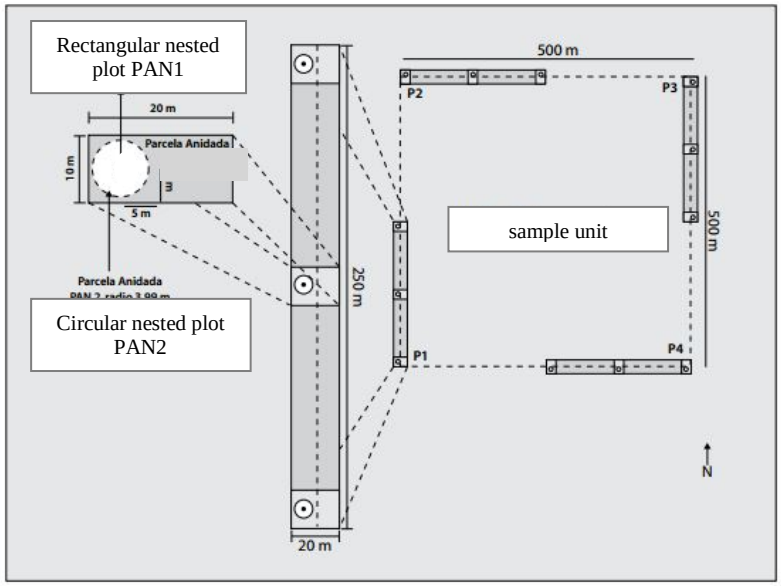
Calculations of the emission factors were performed for the tree database, taking into account the area of the plot or subplot (PAN1) were the tree was measured. Land cover types of the INF were aggregated as detailed in Table 46. Detailed information regarding INF classes and about

[57] INAFOR, 2009. Resultados del Inventario Nacional Forestal de Nicaragua 2007-2008.
[58] Detailed description of the INF design can be found in the Field Guidebook for the Nicaragua Forest Inventory published by FAO in 2007 available at http://enderedd.sinia.net.ni/index.php/etapas/fondo-de-carbono

information contained in the INF data base can be found in the Field Guidebook for the Nicaragua Forest inventory[59].

National forest inventory forest classes are categorized based on forest cover (Broadleaf forests) and basal area (Conifer forests). Based on these parameters, open Broadleaf forests (BL_R) and open Conifer forests (BC_R) were disaggregated from the Broadleaf (BL) and conifer (BC) forests respectively. Since BL_R and BC_R is defined in the INF with a forest cover between 10-39%, most of these classes do not meet the forest definition; consequently, they have not been used for the computation of the emission factor. Coffee and cacao with shade trees are included in the forest definition, INF plots of these two land cover classes were used to estimate permanent crops with canopy cover greater than 30%. **¡Error! No se encuentra el origen de la referencia.**Table. 46shows the aggregation of INF classes corresponding with land cover classes.

Figure. 35 Sample unit design of the INF of Nicaragua (INAFOR, 2007).



At present, Nicaragua does not have official allometric equations for tree biomass that are calibrated with national data. In addition, there have been few field studies of forest volume and biomass carried out in Nicaragua which can be used as references. Given this situation, the general allometric equations of Chave et al. 2014[60] were used to calculate tree aboveground biomass.

AGB for each land use category has been calculated based on the INF information. The AGB of trees were calculated using the abovementioned allometric equations for each tree and finally calculating mean ABG (t d.m./ha) following classical statistic calculations based on the forest

[59] INF classes are described in detail in the Field Guidebook for the Nicaragua Forest Inventory published by FAO in 2007 available at http://enderedd.sinia.net.ni/index.php/etapas/fondo-de-carbono

[60] Chave, J., Réjou-Méchain, M., Búrquez, A., Chidumayo, E., Colgan, M. S., Delitti, W. B., and Henry, M. (2014). Improved allometric models to estimate the aboveground biomass of tropical trees. Global change biology, 20(10), 3177-3190.

inventory plot areas[61]. BGB per tree has been calculated using the equation of Cairns et al 1997 based on ABG of each tree.

Table. 46 Aggregation of INF classes corresponding with REDD classes. A full description of INF classes can be found in FAO, 2007.

Land cover class	INF class	Land cover class	INF class
Broadleaf forest >70% (**BL_70**)	BNLIMD BNLPMD BNLSMD	Woody vegetation (**WV**)	Ar CAA CP GEA HUE PNA SA SILVO TA
Broadleaf degraded forest 30-69% (**BL_30-69**)	BNLID BNLPD BNLSD		
Pine forest >70% (**P_70**)	BNCDD BNCMD BNCMD		
Pine degraded forest 30-69% (**P_30-69**)	BNCDMR BNCDR BNCJR BNCMMR BNCMR BNCRR	Non-woody vegetation (**NWV**)	AH CA GPCM GPSM H Pn S SD
Permanent crop > 30% (forest) (**PC_30**)	CAFESA CAFESN CC FR		

The emission factors include aboveground (AGB) and belowground biomass (BGB). It is assumed that emissions from the latter occur at the moment of conversion, following IPCC Tier 1 methodology. Determination of the emission factors for the deforestation activity used the "stock-difference" method proposed by the IPCC (IPCC, 2006) based on the differences in stocks of carbon before and after deforestation.

The accounting area is situated in the wet and moist climatic regions. Emissions factors used in this ERPD has been calculated considering both wet and moist plots. Table 47 shows the emission factor of each land cover class.

The calculations report for the emissions factors can be accessed at the following link: http://www.marena.gob.ni/Enderedd/etapas/programa-de-reduccion-de-emisiones/

[61] Calculations of emission factors based on the national forest inventory are included in the worksheet EF_estimation.xlsx

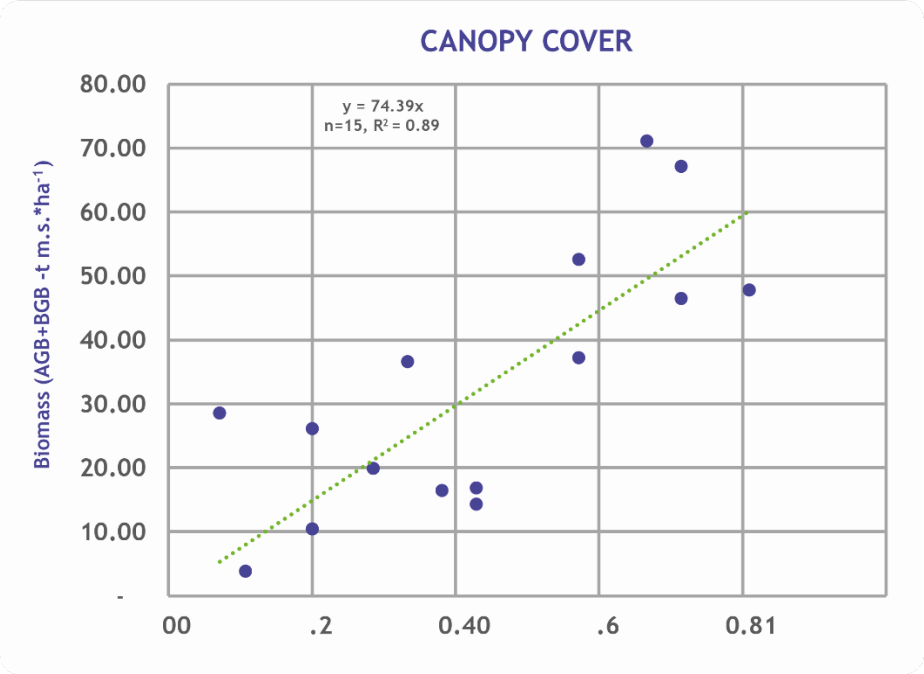
Table. 47 Emission factors calculated from the INF database.

Land cover class	EF: Mean AGB+BGB (t d.m./ha)	#sample units	S.D. (t d.m./ha)^2	Probability density function	p value
BL_70	115.54	26	108.998	Exponential	0.45
BL_30-69	102.70	98	71.446	Weibull (2)	0.67
P_70	63.23	Model	7.08 (Standard Error)		
P_30-69	34.32	25	33.754	Negative binomial	0.81
PC_30	45.51	35	54.672	Negative binomial	0.50
WV	24.25	357	26.854	Weibull (2)	0.52
NWV	8.60	366	17.837	Weibull (2)	0.32

All emission factors correspond to the average of AGB + BGB observations, with the exception of pine forests with canopy cover greater than 70%. For the purpose of estimating the uncertainty associated with the reference level using the Monte de Carlo method, the probability density function for each EF was adjusted.

In the NFI database there are only 3 Pine plots with canopy cover greater than 70% (P_70), for this reason the EF_{P_70} was estimated from a regression of the AGB + BGB vs the canopy cover percentage (Figure. 36). The canopy cover of each of the NFI sampling units with pine cover was determined by visual evaluation in high resolution images. EF_{P_70} corresponds to the average biomass of a pine forest with 85% canopy cover.

Figure. 36 Relationship between Pine Forest Cover and biomass



Removal factors

Removal factors in the framework of this removal estimation approach expresses the annual growth rate of secondary forests and permanent crops (Agroforestry Systems) in t CO_2/ha yr. The NFI database does not account for incremental biomass rates for forest in Nicaragua.

The broadleaf forest growth rate has been obtained from literature references of forest regeneration and biomass accumulation in Nicaragua. The mean annual increment of forest biomass has been estimated based on the study developed by Mascaro et al 2005[62] of regeneration of new forests in the Bluefields region on the Atlantic coast of southern Nicaragua. This study estimated growth rates at 4 sample sites and a total of 12 plots. Only the 10 plots with reported standard errors were used for estimating the removal factor (Table 48), using the average biomass mean annual increment of the plots (3.41 t C/ha ± 1.02 SE).

Table. 48 Mean AGB annual increment and standard error reported by Mascaro et al 2005 in 10 forest plots in Nicaragua. (Adapted from Mascaro et al 2005).

# plot	Mean AGB increment	BGB increment	Total Biomass increment	Standard Error
	Mascaro et al 2005	Cairns equation		Mascaro et al 2005
	(t d.m. /ha yr)	(t d.m. /ha yr)	(t C /ha yr)	(t C /ha yr)
1	5.19	1.49	3.14	0.18
2	6.02	1.69	3.63	0.59
3	4.5	1.31	2.73	1.41
4	6.1	1.71	3.67	0.67
5	4.88	1.41	2.96	0.75
6	7.01	1.94	4.21	0.76
7	2.86	0.88	1.76	0.79
8	6.85	1.90	4.11	2.62
9	4.85	1.40	2.94	0.47
10	8.38	2.27	5.01	1.95
Mean			**3.41**	**1.02**

Concerning the mean annual increment in biomass of Conifer forests of Nicaragua, there is no published information available at the moment. Therefore, a growth rate was calculated based on the emission factor derived from the INF database for steady-state 33 years-old Conifer

[62] Mascaro, J., Perfecto, I., Barros, O., Boucher, D. H., La Cerda, D., Granzow, I., and Vandermeer, J. (2005). Aboveground biomass accumulation in a tropical wet forest in Nicaragua following a catastrophic hurricane disturbance. *Biotropica*, *37*(4), 600-608.

forests[63]. With this information the removal factor in Conifer forest has been calculated as follows:

$$SR_P = EF_{P\_70}/33$$

Since EF_{P_70} is 29.71 t C /ha, the Sequestration rate SR_P is 0.90 t C /ha. Although considerable uncertainty exists over the age selected, the removal factor obtained is considered conservative and consistent with the available INF information.

Finally, the carbon sequestration rate of perennial crops with canopy cover greater than 30% (SR_{PC_30}), has been obtained from bibliographic references on carbon accumulation in Cocoa Agroforestry Systems (Cocoa-AFS) in Nicaragua. According to the specialists of the MRV team, in the area of accounting, most of the PC_30 will correspond to Cocoa-AFS. Poveda et al (2013)[64], estimated the carbon stored in 50 cocoa-AFS plantations in Waslala, Nicaragua, at 91.45 (± 31.44) t C / ha, with a sequestration rate of 5.4 t C / ha / yr. Considering that the author indicates that a 35.86% corresponds to AGB, and 11.67% to coarse and fine roots, the carbon sequestration rate corresponding to AGB-BGB is SR_{PC_30}= 2.57 (± 0.88) t C/ha/yr.

Biomass loss due to anthropogenic degradation

Emissions from forest degradation have been assessed by relating forest cover loss to the loss of biomass (hence emissions) at these visual assessment points. In order to estimate biomass loss associated with degradation in Broadleaf forest, INF forest plots were stratified into 3 categories based on forest cover: open forest, dense forest, and very dense (Table. 49). In each category, biomass was estimated using the equation of Chave et al (2014). Biomass was then related to forest cover using a linear regression shown in **¡Error! No se encuentra el origen de la referencia.**. This regression was subsequently applied at each visual assessment plot in order to estimate the loss of biomass. In the case of pine forests, the loss or gain of biomass due to degradation was estimated using the model presented in Figure 37. Considering only the points with an anthropogenic influence (654 of 1391) there is an average biomass loss of 9.48 t C/ha and 0.28 t C/ha in broadleaf and conifer forest respectively.

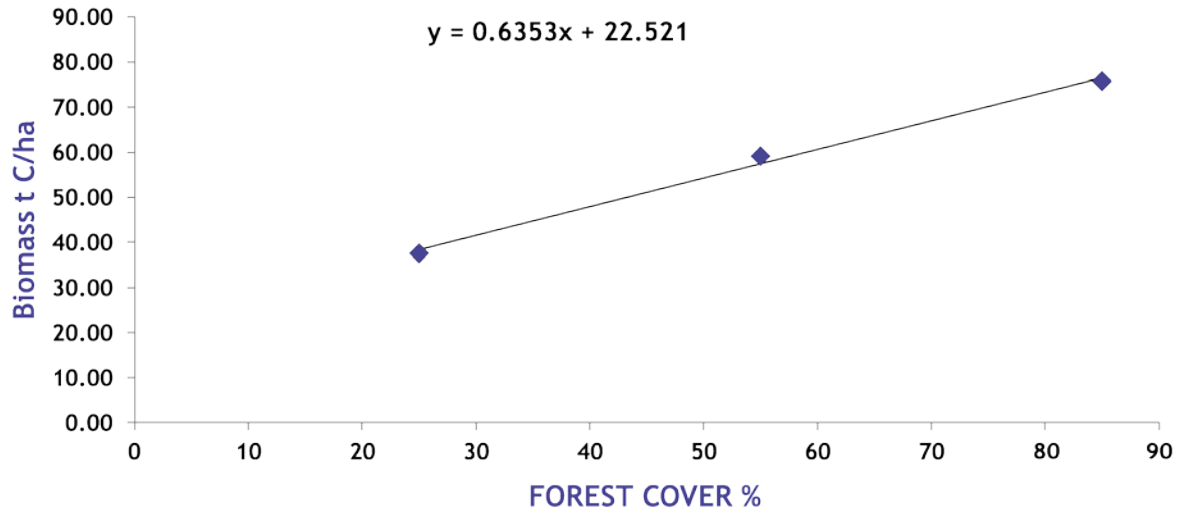
Table. 49 Forest cover and biomass relation based on the Nicaragua forest inventory information.

Forest cover (%)	Biomasa t C/ha
85 (very dense forest)	75.68
55 (dense forest)	59.14
25 (open forest)	37.56

[63] Calderón and Solís,2012. Bachelor Thesis: Cuantificación del carbono almacenado en tres fincas en tres estados de desarrollo del bosque de Pino (Pinus oocarpa, L.) Dipilto, Nueva Segovia, Nicaragua. Universidad Nacional Agraria

[64] Poveda, V., Orozco, L., Medina, C., Cerda, R., & López, A. (2013). Almacenamiento de carbono en sistemas agroforestales de cacao en Waslala, Nicaragua. Agroforesteria En Las Amercias, 49, 42–50.

Figure. 37 Relation between forest Cover and biomass.



Relation between forest Cover and biomass.

Table. 50 Emission factors for forest and non-forest categories.

Description of the parameter including the forest class if applicable:	Emission factors (EF) for the following categories including aboveground and belowground biomass: - Broadleaf forest >70% (EF_{BL_70}) - Broadleaf degraded forest 30-69% (EF_{BL_30-69}) - Pine forest >70% (EF_{P_70}) - Pine degraded forest 30-69% (EF_{P_30-69}) - Permanent crop > 30% (forest) (EF_{PC_30}) - Woody vegetation (EF_{WV}) - Non-woody vegetation (EF_{NWV})
Data unit	t C /ha
Value for the parameter:	

CATEGORY	VALUE	STANDARD ERROR
EF_{BL_70}	54.30	10.05
EF_{BL_30-69}	48.27	3.39
EF_{P_70}	29.72	3.33
EF_{P_30-69}	16.13	3.17
EF_{PC_30}	21.39	4.34
EF_{WV}	11.40	0.67
EF_{NWV}	4.04	0.44

Source of data (e.g. official statistics, IPCC, scientific literature) or description of the assumptions, methods and results of any underlying studies that have been used to determine the parameter:

National forest inventory carried out by INAFOR in 2007, following the procedures detailed in INAFOR, 2009[65]. The following allometric equations of Chave et al 2014 were used to calculate aboveground biomass:

Equation	Forest type
$AGB= 0.0673*(\rho*D^2*H)^{0.976}$	All types

where

ρ is the wood density

D is the diameter at breast height (cm)

H is tree height (m)

Belowground biomass was calculated based on aboveground biomass using the equation of Cairns et al 1997[66]:

Equation	R^2/sample size
Y = exp(-1.0850+0.9256*ln(ABG))	0.83/151

Where:

Y= belowground dry matter, Mg/ha

AGB = aboveground dry matter, Mg/ha

ln = natural logarithm

exp = "e raised to the power of"

Spatial level:

National

Discussion of key uncertainties for this parameter:

The equations used to calculate above and belowground biomass are not calibrated specifically for Nicaragua and there is only one study that validates their suitability for the estimation of forest biomass there.

Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of assumptions/methodology in the estimation:

The estimation of errors and uncertainties was based on classical statistic calculations based on the sampling units of the forest inventory. The results are shown in the following Table:

Category	EF t d.m./ha	# of samples	S.D. t d.m./ha	Student t	Error %	EF tC/ha	Standard error t C/ha
BL_70	115.54	26	108.998	2.06	38%	54.30	10.05

[65] INAFOR, 2009. Resultados del Inventario Nacional Forestal de Nicaragua 2007-2008.

[66] Cairns, Michael A., et al. "Root biomass allocation in the world's upland forests." *Oecologia* 111.1 (1997): 1-11.

BL_30-69	102.7	98	71.446	1.98	14%	48.27	3.39
P_70	63.23	Model		1.98	22%	29.72	3.33
P_30-69	34.32	25	33.754	2.06	41%	16.13	3.17
PC_30	45.51	35	54.672	1.97	41%	21.39	4.34
WV	24.25	357	26.854	1.97	12%	11.40	0.67
NWV	8.6	366	17.837	1.97	21%	4.04	0.44

Table. 51 Sequestration rate estimation for secondary broadleaf forests.

Description of the parameter including the forest class if applicable:	Removal factors for Broadleaf forest, (SR_{bl}) including aboveground and belowground biomass:
Data unit	**t C/ha**
Value for the parameter:	**RF** / **VALUE (t C/ha)** / **STANDARD ERROR**: Broadleaf (RF_{bl}) / 3.41 / 1.02
Source of data (e.g. official statistics, IPCC, scientific literature) or description of the assumptions, methods and results of any underlying studies that have been used to determine the parameter:	The Removal factor represents the annual net growth in carbon stocks per hectare of forest in the accounting area. It has been calculated based on Mascaro et al 2005[67] data from plots sited in new forests areas of southern Nicaragua. The Removal factor has been estimated as an average of the mean annual biomass increment in 10 plots.
Spatial level:	National
Discussion of key uncertainties for this parameter:	The Mascaro study measured regeneration of forest stands in 10 plots in only one region of Nicaragua in areas affected by Hurricane Joanne. Broadleaf forests of the program area could

[67] Mascaro, J., Perfecto, I., Barros, O., Boucher, D. H., La Cerda, D., Granzow, I., and Vandermeer, J. (2005). Aboveground biomass accumulation in a tropical wet forest in Nicaragua following a catastrophic hurricane disturbance. *Biotropica*, *37*(4), 600-608.

	develop differently depending the prior use of the land, and this variability may not be represented in Mascaro´s data.
Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of assumptions/methodology in the estimation:	Although some uncertainties for the parameter exist, the removal factor is consistent with the emission factor obtained through the INF information. Considering broadleaf forests growing 3.41 t C /ha yr, in approximately 20 years, forests would account for similar carbon content as the one obtained from the INF plots.

Table. 52 Sequestration rate estimation for secondary conifer forests.

Description of the parameter including the forest class if applicable:	Removal factors for conifer forest (RF_{bc}) including aboveground and belowground biomass:		
Data unit	**t C/ha**		
Value for the parameter:	**RF**	**VALUE (t C/ha)**	**STANDARD ERROR**
	Pine (SR_P)	0.90	0.10
Source of data (e.g. official statistics, IPCC, scientific literature) or description of the assumptions, methods and results of any underlying studies that have been used to determine the parameter:	Removal factors represent the annual net growth in carbon stocks per hectare of forest in the accounting area. The emission factor for conifer forests has been used to define its removal factor. Concerning the mean annual increment in biomass of Conifer forests of Nicaragua, there is no published information available at the moment. Therefore, a growth rate was calculated based on the emission factor derived from the INF database for steady-state 33 years-old Conifer forests[68]. With this information the removal factor in Conifer forest has been calculated as follows: $SR_P = EF_{P\_70}/33$ Since EF_{P_70} is 29.72 t C /ha, the sequester rate SR_P is 0.90 t C /ha. Although considerable uncertainty exists over the age selected, the removal factor obtained is considered conservative and consistent with the available INF information.		
Spatial level:	National		

[68] Calderón and Solís,2012. Bachelor Thesis: Cuantificación del carbono almacenado en tres fincas en tres estados de desarrollo del bosque de Pino (Pinus oocarpa, L.) Dipilto, Nueva Segovia, Nicaragua. Universidad Nacional Agraria

Discussion of key uncertainties for this parameter:	Although considerable uncertainty exists over the age selected, the removal factor obtained is considered conservative and consistent with the available INF information.
Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of assumptions/methodology in the estimation:	An assumption of a steady-state for Conifer forest has been made based on literature information available for Nicaragua. The accuracy of the parameter is assumed to be related with the accuracy of the emission factor:

Category	F	Standard error
	t C/ha yr^{-1}	t C/ha yr^{-1}
SR_P	0.90	0.10

Table. 53 Sequestration rate estimation for new tree shaded perennial crops (canopy cover>30%).

Description of the parameter including the forest class if applicable:	Removal factors for tree shaded perennial crops (canopy cover>30%)., (SR_{PC}) including aboveground and belowground biomass:
Data unit	**t C/ha**
Value for the parameter:	

RF	VALUE (t C/ha)	STANDARD ERROR
Tree shaded Perennial Crop (SR_{PC})	2.57	0.44

Source of data (e.g. official statistics, IPCC, scientific literature) or description of the assumptions, methods and results of any underlying studies that have been used to determine the parameter:	The Removal factor represents the annual net growth in carbon stocks per hectare of new tree shaded perennial crops in the accounting area. It has been calculated based on Poveda et al (2013)[69] data from plots of cocoa agroforestry systems sited in Waslala, Nicaragua . The Removal factor has been estimated as an average of the mean annual AGB-BGB increment in 50 plots.
Spatial level:	National
Discussion of key uncertainties for this parameter:	The Poveda study measured cocoa AFS in 50 plots in only one region of Nicaragua (Waslala), very close to west boundary of accounting area. Cococa AFS of the program area could develop

[69] Poveda, V., Orozco, L., Medina, C., Cerda, R., & López, A. (2013). Almacenamiento de carbono en sistemas agroforestales de cacao en Waslala, Nicaragua. Agroforestería en Las Americas, 49, 42–50.

	differently depending on precipitation and site quality, and this variability may not be represented in Povedas´s data.
Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of assumptions/methodology in the estimation:	

Category	RF	Error
	t C/ha yr^{-1}	%
SR_{PC}	2.57	17%

Table. 54 Biomass loss factors due to anthropogenic degradation

Description of the parameter including the forest class if applicable:	Biomass loss factors due to anthropogenic degradation including aboveground and belowground biomass:
Data unit	**t C/ha**
Value for the parameter:	

Degradation Factor	VALUE (t C/ha)
Average net change in carbon stock of Broadleaf Forest (ASC_{BL})	-9.48
Average net change in carbon stock of Pine Forest (ASC_P)	0.28

Source of data (e.g. official statistics, IPCC, scientific literature) or description of the assumptions, methods and results of any underlying studies that have been used to determine the parameter:	Emissions from forest degradation have been assessed by relating forest cover loss to the loss of biomass (hence emissions) at these visual assessment points. In order to estimate biomass loss associated with degradation in Broadleaf forest, INF forest plots were stratified into 3 categories based on forest cover: open forest, dense forest, and very dense forest (Table. 49). In each category, biomass was estimated using the equation of Chave et al (2014). Biomass was then related to forest cover using a linear regression shown in Figure 37. This regression was subsequently applied at each visual assessment plot in order to estimate the loss of biomass. In the case of pine forests, the loss or gain of biomass due to degradation was estimated using the model presented in Figure 37.
Spatial level:	National
Discussion of key uncertainties for this parameter:	There is a close relationship between the percentage of canopy cover and AGB-BGB for both broad-leaved forests and pine forests in the accounting area. In both cases the % of canopy

cover and biomass relationships were constructed with data from INF plots. However, the small number of sample units in pine forest (n = 14) raises the error in estimating the net change in the carbon stock due to the loss of canopy cover.

The limits of confidence in the net gains / losses factors due to degradation were estimated with the Monte Carlo method, carrying out 10,000 iterations of the estimated average change in AGB (losses and gains) and using the mean square error (RMS) of the adjusted model, thus truncating the randomization of intervals [0, maximum AGB value].

Forest type	Coefficient (tC/ha)	intercept (tC/ha)	RMS	AGB max (tCO2/ha)
Broadleaf forest	34.963	0.000	16.466	74.5
Pine	63.530	22.521	35.327	330.8

Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of assumptions/methodology in the estimation:

Degradation Factor	Mean	Confidence limits
	t C/ha	t C/ha
ASC_{BL}	-9.48	-13.33 - -4.47
ASC_{P}	0.28	-5.98 – 5.98

Calculation of average annual historical emissions during the Reference Period

Deforestation

Average historical emissions are defined as the sum of the emissions due to deforestation of each of the various forest categories during the reference period; the latter are calculated from the adjusted areas of the activities and the emissions factors described in the section above. Table. 55 The average annual emissions from deforestation for the 10-year reference period is 14.17 Mt CO_2e/yr and are mainly due to the deforestation of broadleaf forests.

Table. 55 Carbon emissions from deforestation in the accounting area, 2005 – 2015.

Forest type	Activity	Annual area converted	EF class prior conversion	EF class post conversion	Net change of EF		Annual Emissions / Removals
		(ha/yr)	t C/ha	t C/ha	t C/ha	t CO_2/ha	(Mt CO_2/yr)
BL	Deforestation from Broadleaf forest >70 to Woody vegetation	17,202	54.30	11.40	42.91	157.32	2,706,244

BL	Deforestation from Broadleaf forest >70 to Non-woody vegetation	20,594	54.30	4.04	50.26	184.29	3,795,285
BL	Deforestation from Broadleaf degraded forest 30-69% to Woody vegetation	33,919	48.27	11.40	36.87	135.20	4,585,707
BL	Deforestation from Broadleaf degraded forest 30-69% to Non-woody vegetation	18,898	48.27	4.04	44.23	162.17	3,064,570
P	Deforestation from Pine forest >70 to Non-woody vegetation	242	29.72	4.04	25.68	94.15	22,810

Carbon Removals

Average historical removals from enhancement of carbon stocks in new forests and permanent crops have been calculated as the sum of the removals due to new forests of each of the two forest categories and new permanent crops areas, during the reference period following the same procedures described above. Removals of carbon stocks in the accounting area are 0.97 Mt CO_2e/yr during the reference period (Table. 56)

Table. 56 Carbon removals from enhancement of carbon stocks in new forests in the accounting area, during the reference period 2005 – 2015.

Year of the reference period	Secondary growth Broadleaf forest over Woody vegetation	Secondary growth Broadleaf forest over non-woody vegetation	Growing new Conifer forest	Growing new Tree shaded permanent crops	Annual historical removals by Broadleaf forests [a]	Annual historical removals by Pine forests [b]	Annual historical removals by Perm Crops [c]	Total Average annual historical removals by all sinks
yr	ha/yr	ha/yr	ha/yr	ha/yr	t C/yr	t C/yr	t C/yr	t CO_2/yr
1	10,418	4,361	1,454	485	25,198	654	622	97,072
2	20,836	8,722	2,907	969	75,595	1,962	1,866	291,217
3	31,254	13,083	4,361	1,454	125,991	3,271	3,109	485,361
4	41,672	17,444	5,815	1,938	176,388	4,579	4,353	679,505
5	52,090	21,805	7,268	2,423	226,784	5,887	5,597	873,650
6	62,508	26,166	8,722	2,907	277,181	7,196	6,840	1,067,794
7	72,926	30,527	10,176	3,392	327,577	8,504	8,084	1,261,939
8	83,344	34,888	11,629	3,876	377,974	9,812	9,328	1,456,083
9	93,762	39,249	13,083	4,361	428,370	11,121	10,571	1,650,227
10	104,180	43,610	14,537	4,846	478,767	12,429	11,815	1,844,372

[a] Biomass mean annual increment for broadleaf forest is SR_{BL}= 3.41 t C/ha yr.
[b] Biomass mean annual increment for Conifer forest is SR_P= 0.90 t C/ha yr.
[c] Biomass mean annual increment for Permanent crops SR_{PC}=2.57 t C/ha yr.

Degradation

Considering the area of forest remaining as forest (permanent forest), biomass loss due to anthropogenic degradation accounts for 16% of total forest-related emissions in the Accounting Area during the reference period (Table. 57).

Table. 57 Estimation of forest degradation.

Number of sample plots	Anthropogenic	Non-Anthropogenic
Number of sample plots in Broadleaf forest with no change in forest cover	365	362
Number of sample plots in Broadleaf forest degraded or recovered	289	308
Number of sample plots in Conifer forest (No change in forest cover, degraded and recovered)	28	36
Total of plots	682	706
Forest that remains as forest		
Permanent Broadleaf forest with no change in forest cover (ha)	884,319	877,051
Permanent Broadleaf forest susceptible of forest degradation / enhancement (ha)	700,187	746,220
Permanent Conifer forest susceptible of forest degradation / enhancement (ha)	67,838	87,220
Total area of permanent forest (ha)	1,652,344	1,710,491
Average change in carbon stock		
Broadleaf forest (t C/ha)	-9.48	-5.16
Tabla 13 Conifer forest (t C/ha)	0.28	-0.86
Emission from Degradation		
Broadleaf forest (t C)	6,635,660	3,847,999
Conifer forest (t C)	(18,824)	75,297
Total Emissions due to anthropogenic forest degradation	6,616,836	3,923,295
Significance of degradation		
Emissions due to anthropogenic forest degradation (t CO_2/yr.)	2,426,173	1,438,542
Total emissions (t CO_2/yr.)	15,630,067	15,630,067
% Emissions due to degradation	**16%**	**9%**

8.4 Upward or downward adjustments to the average annual historical emissions over the Reference Period (if applicable)

Not applicable. No adjustments to the average annual historical emissions are necessary.

8.5 Estimated Reference Level

The estimated reference level for the accounting area of Nicaragua's Emission Reduction Program is 15,630,067 tCO2e*yr-1 (Table. 58). The reference level includes net emissions due to forest degradation, since they represent 16% of total forest-related emissions in the accounting area during the reference period, and are above the 10% threshold of significance established in the methodological framework.

The calculations report for the level of reference can be accessed at the following link: http://www.marena.gob.ni/Enderedd/etapas/programa-de-reduccion-de-emisiones/

Table. 58 Estimated reference level for the ER Program.

Year of the reference period	Average annual historical emissions from deforestation over the Reference Period	Average annual historical removals by sinks over the Reference Period	Average annual historical net emissions from degradation over the Reference Period	Reference level
yr	Tabla 14 (t CO_2e/yr)	Tabla 15 (t CO_2e/yr)	Tabla 16 (t CO2e/yr)	Tabla 17 (t CO_2e/yr)
1	14,174,616	-97,072	2,426,173	16,503,717
2	14,174,616	-291,217	2,426,173	16,309,572
3	14,174,616	-485,361	2,426,173	16,115,428
4	14,174,616	-679,505	2,426,173	15,921,283
5	14,174,616	-873,650	2,426,173	15,727,139
6	14,174,616	-1,067,794	2,426,173	15,532,995
7	14,174,616	-1,261,939	2,426,173	15,338,850
8	14,174,616	-1,456,083	2,426,173	15,144,706
9	14,174,616	-1,650,227	2,426,173	14,950,562
10	14,174,616	-1,844,372	2,426,173	14,756,417
			Average	15,630,067

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

Nicaragua is working to align the national reference level, the National Greenhouse Gas Inventory, and the reference level of the ERPD. Nicaragua will update its national level and the reports to the INGEI, considering the methodological improvements implemented for the construction of the Program's reference level. This updating process will ensure the consistency of national reports and those submitted to the UNFCCC. Harmonization of the different levels will include a review of the significance of forest degradation, emission factors, removal factors and gases.

Table. 59 shows the correspondence among the national and ERPD reference levels and the INGEI. The national and ERPD reference levels and the INGEI use the same activity data and emissions factors, but they differ in removal factors. The INGEI also used the same allometric equations to estimate aboveground and belowground biomass.

Roadmap of harmonization of reference levels and INGEI

During 2018 Nicaragua will update the national reference level using the new emission factors and data generated in the framework of the ERPD. Based on the results obtained from the analysis of the significance of forest degradation in the ER accounting area, this activity will be considered for inclusion in the national REL, if necessary. In addition, during the fourth GHG inventory, to be formulated in 2018, estimates of the AFOLU sector will also be updated with the new DA, EF and RL produced by MARENA and INAFOR. Milestones in this roadmap are included in Table. 60.

Table. 59 Correspondence among the national and ERPD reference levels and the INGEI.

DATA	NATIONAL REL	ERPD REL	INGEI
Forest definition	ENDE-REDD definition	ENDE-REDD definition	ENDE-REDD definition
Forest categories	Broadleaf and conifer	Broadleaf and conifer	Broadleaf and conifer
REDD+ activities	Deforestation Enhancement	Deforestation Enhancement	Deforestation Enhancement Conservation of carbon stocks
Pools	AGB BGB	AGB BGB	AGB BGB

Gases	CO_2	CO_2	CO_2, NH4, N2Oand precursors
Emission Factors - allometric equation	Chave	Chave	Chave
Emission Factors non-forest classes	IPCC	Estimated from INF	IPCC
Removal Factors	IPCC	Scientific literature	IPCC
Activity Data	Not Adjusted	Visual Assessment	Not Adjusted
Reference period	2005-2015	2005-2015	2000-2005-2010
Tier method	3	3	3
Uncertainty Analysis	Error propagation	Monte Carlo	Error Propagation

Table. 60 Roadmap of harmonization of reference levels and INGEI.

Task	Objective	Responsible	Date
Adjustment of Activity Data	• Create grid of points for the Pacific, Central and North of Nicaragua. • Validate land use change for the periods of the national FREL and INGEI	MARENA e INETER	February 2018
Recalculation of National FREL	• Update estimates of emissions and removals based on adjusted Activity Data and national EFs for forest, *tacotal* and non-forest class	MARENA	April 2018
Estimation of uncertainty with Monte Carlo method	• Quantify the uncertainty of the FREL considering errors of DA and FE by the Monte Carlo method	MARENA	April 2018
Presentation of National FREL and AFOLU results in the regions (RACCS, RACCN and PCN)[70]	• Conduct three regional workshops with technicians and authorities to present the national NREF updated.	MARENA, INETER, INAFOR, GRACCs	June 2018

[70] Update of the third GHG inventory for Nicaragua

	• Conduct a national workshop for the presentation of INGEI (AFOLU sector).	

9. Approach for Measurement, Monitoring and Reporting

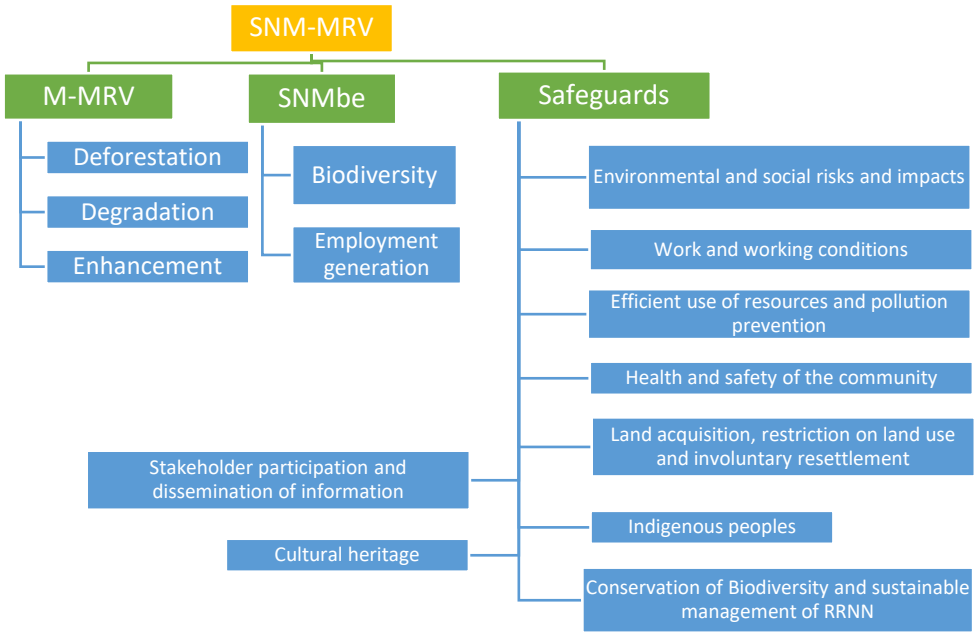
9.1 Measurement, monitoring and reporting approach for emissions occurring under the ER Program within the Accounting Area

Nicaragua is implementing a National System of Measurement, Monitoring, Reporting and Verification (SNM-MRV) for the collection and processing of forest cover and biomass information, obtained from remote sensing and field measurements of forest inventories. This information will be used for the periodic estimation of forest emissions and reduction of forest emissions, and for the periodic evaluation of the safeguards compliance indicators (see Section 14.2) and the monitoring of the co-benefits. The SNM-MRV will establish a platform where national institutions, regional governments, indigenous and territorial communities will contribute and make available to the general public the results of monitoring, estimation protocols, and geographic information.

The System is composed of 3 sub-modules (Figure. 39):

- The Carbon Module which will measure, monitor, report, and verify (M-MRV) the state and condition of Nicaragua´s forests, as well as deforestation and forest recovery. It will report avoided emissions as well as those that occur due to changes in carbon stocks at the national level.
- The Multiple Benefits Module which will monitor indicators related to biodiversity and food security (SNMbe).
- The Safeguards Module which will provide and manage information related to the application of safeguards (Safeguards).

Figure. 38 Sub-modules of the National System of Measurement, Monitoring, Reporting and Verification for the Emission Reduction Program



The Monitoring, Reporting, and Verification (MRV) system for the ER Program will be based on the Carbon Module, which has a national monitoring plan approved by the national inter-institutional MRV roundtable. This plan will enable the management of coherent, transparent, and consistent information needed for biennial reports related to emissions, removals, and emissions reductions due to avoided deforestation. The proposed chronogram of monitoring events includes the following:

- Monitoring event prior to signing of the ERPA: 2016-2019, Nicaragua will estimate the forecasted emissions for the period 2016 - 2019 in order to evaluate the behavior of deforestation, forest degradation and increase of carbon reserves with respect to the NREF of the ERPD
- First monitoring event: 2020-2021
- Second monitoring event: 2022-2024
- Third monitoring event: 2024-2026

In accordance with criterion 5 of the Carbon Fund Methodological Framework, the National Monitoring, Reporting, and Verification Systems (NMRVS) will be congruent with the methodologies and protocols used for the estimation of the Reference Level, which is based on IPCC (2006) guidelines. In this way, it will guarantee comparable and consistent measurements of performance during the periods evaluated.

Estimates of forest emissions will be calculated based on activity data derived from the systematic grid of visual assessment of High-Resolution and Medium-Resolution imagery satellite images, via the application of national protocols for classification and quality control. Although spatial monitoring will be performed annually, national reports of forest cover, deforestation, and carbon emissions and removals will be prepared on a biannual basis.

Emission factors used to estimate the Reference Level and report carbon emissions and removals during the ER Program were estimated based on official information from the 2007 National Forest Inventory. The National Forestry Inventory System NFI) has been in place since 2007. The NFI contains information from 371 sample units situated over a systematic grid (18 km x 18 km) over inland Nicaragua (see Section 8.2-Emission Factors). The NFI is in the process of being updated, but until now it has not been possible to complete a new measurement of the total network of forest inventory plots. In 2015 with the aid of the ENDE-REDD+ program, it was possible to update the measurement of 37 plots in the accounting area. With the additional Readiness funds, 50 new plots will be added to the NFI network in order to update the EF and SF (Table. 61). Furthermore, the development of allometric equations calibrated with national data, prior to the first monitoring event during the ERPA, is also anticipated.

Therefore, emission factors may change as a result of future updates of NFI that will be made by INAFOR. Should changes be required during the reference period, these changes will be incorporated in the Reference Level as well as the reports generated.

Finally, the protocols for determining the key information used to determine the reference level, as well as the spreadsheets with the activity data, emission factors, removal factors and error

propagation, necessary to reconstruct the reference level, are available to the public on the SINIA website (http://enderedd.sinia.net.ni/).

Table. 61 Summary of the procedures for the generation of activity data during the M-MRV.

Characteristic	Description
Parameter	Activity data
Description	Activity data for the categories represented in the land cover change matrix used to estimate the Reference Level: i. Average annual deforested area of broadleaf, conifer forests and tree shaded permanent crops: • AD_BL_70-WV: Deforestation from Broadleaf forest >70 to Woody vegetation • AD_BL_70-NWV: Deforestation from Broadleaf forest >70 to Non-woody vegetation • AD_BL_30-69-WV: Deforestation from Broadleaf degraded forest 30-69% to Woody vegetation • AD_BL_30-69-NWV: Deforestation from Broadleaf degraded forest 30-69% to Non-woody vegetation • AD_P>70-WV: Deforestation from Pine forest >70 to Woody vegetation • AD_P>70-NWV: Deforestation from Pine forest >70 to Non-woody vegetation ii. Average annual area of new broadleaf and conifer forests (ABT, ABL and ACN) • Add_WV_BL: Additions from Woody vegetation to Broadleaf forest • Add_NWV_BL: Additions from Non-woody vegetation to Broadleaf forest • Add_NWV_P: Additions from Non-woody vegetation to Pine Forest • Add_NWV_PC: Additions from Non-woody vegetation to Permanent Crops >30% iii. Average annual area of anthropogenic degraded/recovered broadleaf and conifer forest (Deg_BL and Deg_P) • Deg_BL: Anthropogenic degraded/recoverd area in Broadleaf forest

	• Deg_P: Anthropogenic no changed/degraded/recovered area in Pine forest
Data unit	ha/yr
Source of data or measurement/calculation methods and procedures to be applied (e.g. field measurements, remote sensing data, national data, official statistics, IPCC Guidelines, commercial and scientific literature), including the spatial level of the data (local, regional, national, international) and if and how the data or methods will be approved during the Term of the ERPA	Activity data are estimated following good practices and methods of GFOI (2016). For each monitoring period, annual deforestation and forest enhancement is obtained by calculating the land cover change during the monitoring period divided by the number of years. Total change areas and uncertainties are calculated from a systematic grid of 3082 visual assessment plots of 90 x 90 m size (equivalent to a 3 x 3 Landsat pixels). A 3 x 3 inner grid (within each 90 x 90 m plot) is used to measure each element coverage. Land cover is assessed for the beginning and end of monitoring period, using two types of remote sensing images with a minimum resolution of 10 m. Anthropogenic Degraded/recovered area on lands that remains forest lands will be estimated by calculating canopy cover change, from multitemporal visual assessment exercise using HR imagery (from Google Earth and Bing Maps and other available collections: Spot and RapidEye) on the same systematic grid of 3082 (regular grid) visual assessment plots of 90 x 90 m size (equivalent to a 3 x 3 Landsat pixels). A 3 x 3 inner grid (within each 90 x 90 m plot) will be used to measure canopy cover. Anthropogenic and non-anthropogenic forest degradation will be distinguished in the analysis. The splitting criterion is to consider as non-anthropogenic forest degradation the sampling points where forest degradation processes were detected and located in those areas: - Areas farther than 1 km from roads and pathways. - Areas farther than 1 km from villages. - Areas farther than 1 km from rivers. - Areas farther than 1 km from the agricultural frontier and deforestation sites.
Frequency of monitoring/recording	Biannual (every 2 years)
Monitoring equipment	At present, MARENA (SINIA), INETER and INAFOR possess a robust and modern technological platform, which is able to analyze and store the information necessary in order to produce emission reduction reports every two years, as well as to make available to the general public the information generated during the process

	of estimation of emission reductions. Nevertheless, a new evaluation of technological needs is foreseen in the medium-term in order to identify new needs and make the adjustments needed in order to ensure the continual good performance of the monitoring system. Local communities will be involved in the field validation of the land cover visual assessment. Community-based monitoring involves the recruitment of local monitoring teams, the establishment of collaborative agreements with local organizations involved in this activity, and the preparation of simple monitoring protocols that will be validated by INETER or INAFOR. Finally, the data and information collected by the local teams will be registered in an electronic platform that will enable the subsequent evaluation of the accuracy of the land cover maps.
Quality Assurance/Quality Control procedures to be applied	Quality assurance and control procedures are applied to the visual assessment of land cover and degradation, in the systematic grid, similar to procedures used for the Reference Level[71]: i. Control of the photo-interpretation bias, ii. Control of the variability between photo-interpreters, iii. Verification of the photo-interpretation, and iv. Data consistency control. These reference points are interpreted by independent national experts, and subsequently validated by experts from INETER. The three major features of the response design are: 1. Visual assessment unit. The spatial unit used corresponds a size plot of 90x90 meters (corresponding to 3x3 pixels of Landsat) interpreted by means of a 3x3 inner grid (9 points in total) within each plot. 2. Sources of reference information. the repository of high-resolution imagery available through Planet, Google Earth, Bing Maps, as well as additional Landsat, Sentinel-2, Spot and Rapid Eye image. 3. Classification protocol: A protocol was discussed and established for the reference classification of the spatial evaluation units. This is part of the QA/QC procedures with the aim of reducing the uncertainty of the classification. 4. Reference classifications: The categories of land cover used in the visual assessment are shown in Table. 36 section 8. These classes are mostly consistent with those established in

[71] described in the Protocol for the Estimation of the Reference Level Activity Data (Annex 9)

	the National Forest Inventory (INAFOR, 2008). Finally, based on the visual assessment plots, an analysis of the uncertainty is performed and the areas of each of the REDD activity data is estimated to a 90% significance level. These areas are used in the calculation of emissions and their errors are incorporated in the Monte Carlo simulations.
Identification of sources of uncertainty for this parameter	Uncertainty of activity data is associated to the visual interpretation of the systematic grid. The potential sources of uncertainty in the visual assessment of the systematic grid are associated to i. sample size (systematic grid density), ii. interpretation of the LULC and iii. quality of the images available to evaluate the LULC. **Sample size:** The number of sampling plots of the systematic grid is 3082, which is larger than the estimated sample size (stratified random sampling method) for the accounting area (1215 sampling plots - 23 classes, error standard of the estimated global precision S (ô) = 0.01). **Photo-interpretation of the LULC:** this bias is controlled by the standardization of criteria established in the decision trees for the visual assessment of high and medium resolution images. The variability between photo-interpreters is minimized by training exercises using common samples, until achieving the expected consistency. **Image quality:** There is a high availability of high-resolution images for assessments after 2010.
Process for managing and reducing uncertainty associated with this parameter	Uncertainty of activity data is minimized by considering the following best practices: o Uncertainty related to the visual interpretation of systematic grid. ▪ In the medium-term, Nicaragua will obtain higher resolution images in order to reduce the uncertainty of the activity data used (e.g. Planet) ▪ The national experts responsible for Quality Assurance/Quality Control procedures are the same as those who were involved in the work related to the Reference Level. ▪ The national experts, together with INETER, have defined consistent and homogeneous criteria for the

	interpretation of the land use cover, the information to be collected, the table format, and the labels or codification for each attribute. Furthermore, disagreements among the interpreters evaluating the same sampling unit is minimized by a constant communication among experts. The independent validation of the reference classification made by INETER also ensures higher quality results ▪ Before beginning the final analysis of the reference information, the data is reviewed to detect any anomalies.
Comments	INETER will be responsible for the processing of the cover maps in order to generate the stratification of activities and willalso be responsible for QA/QC of the reference points. Nicaragua is open and reflective on lessons learned from previous approaches and shortcomings with a clear aim to improve MRV system over time. For example, to have quality annual stratification for changes (in particular for forest degradation and forest gain), wall to wall maps will be prepared to obtain more detail time series (from Landsat) for stratification, to go back in time a couple of years (i.e. from 2010 onwards) and then also for the future years (2015 onwards). The use of more dense wall to wall time series maps could provide an efficient stratification and targeted interpretation of high-res. data in areas of active change. Likewise, Nicaragua will improve its emissions estimates for forest degradation with the support of the consulting firm TerraPULSE. The main objective is to improve the data on deforestation activity, forest degradation and increases in the annual forest reserve, by analyzing a large amount of satellite images taken each year from 2002 to 2018. In order to ensure a better adjustment of the classification model and the mapping of the aforementioned REDD activities, national data will be considered that is related to: i) results of the NREF multitemporal visual evaluation grid; ii) the national forest inventory; iii) monitoring of agricultural and agroforestry crops in the field, to be done by INETER, INTA and MAG; and iv) DEM. Through an annual analysis of the historical series, it will be possible to determine the year of change, whether toward

	deforestation or forest cover recovery. This analysis of change is validated by a confusion matrix using data from the forest cover change map and independent data. Finally, by means of map algebra, DA is calculated for each type of forest, deforestation, forest degradation and recovery of forest cover. The improvement of activity-based data on the part of TerraPULSE will take at least four months, meaning that the updated NREF information will be aailale in 2019, before starting the ERPA.

Table. 62 Summary of the procedures for the generation of Emission Factors for deforestation and anthropogenic degradation, during the M-MRV.

Characteristic	Description
Parameter	Emission factors
Description	Emission factors (EF) for deforestation, including aboveground and belowground biomass: - Broadleaf forest >70% (EFBL_70) - Broadleaf degraded forest 30-69% (EFBL_30-69) - Pine forest >70% (EFP_70) - Pine degraded forest 30-69% (EFP_30-69) - Permanent crop > 30% (forest) (EFPC_30) - Woody vegetation (EFWV) - Non-woody vegetation (EFNWV) Emission factors (EF) for degradation including aboveground and belowground biomass: - Average net change in carbon stock of Broadleaf Forest (ASC_{BL}) - Average net change in carbon stock of Pine Forest (ASCP)
Data unit	t C/ha
Source of data or measurement/calculation methods and procedures to be applied (e.g. field	For future monitoring events, the country will implement the same procedures for the construction of the reference level; emission factors employed will be identical to the ones used in the reference level (See Section 8.3 – Emission Factors).

measurements, remote sensing data, national data, official statistics, IPCC Guidelines, commercial and scientific literature), including the spatial level of the data (local, regional, national, international) and if and how the data or methods will be approved during the Term of the ERPA

Data from the National Forest Inventory (INF), carried out by INAFOR in 2007[72], were used to calculate the emission and removal factors for categories of forest and woody and non-woody vegetation class. The INF contains information from 371 sample units situated over a systematic grid over inland Nicaragua (Figure 35). The grid is the world 10´x10´ (18 km x 18 km approximately) proposed by FAO. This data base was adjusted based on activity data classes. Detailed information regarding this data base and the methods used in calculating the factors is found in the Emission and Removal Factors construction protocol (Annex 9).

At present, Nicaragua does not have official allometric equations, calibrated with national data, for tree biomass. In addition, there have been few field studies of tree volume and biomass carried out in Nicaragua which can be used as references.

Furthermore, both the National FREL and National Greenhaouse gases inventory (INGEI) used general allometric equation of Chave et al. (2014) to estimate biomass.

Given this situation and to be consistent with the National FREL and INGEI, the general allometric equations of Chave et al. 2014 are used to calculate aboveground biomass:

Equation	Forest type
$AGB= 0.0673*(\rho*D^2*H)^{0.976}$	All types

where

ρ is the wood density

Dis the diameter at breast height (cm)

H is tree height (m)

Belowground biomass was calculated based on aboveground biomass using the equation of Cairns et al 1997[73]:

Equation	R^2/sample size
Y = exp(-1.0850+0.9256*ln(ABG))	0.83/151

Where:

Y= belowground dry matter, Mg/ha

AGB = aboveground dry matter, Mg/ha

ln = natural logarithm

[72] INAFOR, 2009. Resultados del Inventario Nacional Forestal de Nicaragua 2007-2008.

[73] Cairns, Michael A., et al. "Root biomass allocation in the world's upland forests." *Oecologia* 111.1 (1997): 1-11.

	exp = "e raised to the power of" The emission factors include aboveground (AGB) and belowground biomass (BGB). It is assumed that emissions from the latter occur at the moment of conversion, following IPCC Tier 1 methodology. Determination of the emission factors for the deforestation activity used the "stock-difference" method proposed by the IPCC (IPCC, 2006) based on the differences in stocks of carbon before and after deforestation. AGB for each land use category has been calculated based on the NFI information, calculating the AGB per tree using the abovementioned allometric equations and finally calculating mean ABG (t d.m./ha) following classical statistic calculations based on the forest inventory plot areas[74]. BGB per tree has been calculated using the equation of Cairns et al 1997 based on ABG of each tree. Emissions from forest degradation will be assessed by relating forest cover loss to the loss of biomass (hence emissions) at these visual assessment points. In order to estimate biomass loss associated with degradation in Broadleaf forest, biomass was related to forest cover using a linear regression shown in Figure 37. This regression will be subsequently applied at each visual assessment plot in order to estimate the loss of biomass. In the case of pine forests, the loss or gain of biomass due to degradation is estimated using the model presented in Figure 37. The confidence limits of the emission factors due to degradation are estimated with the Monte Carlo method, making 10,000 iterations of the average change in AGB (loss and gain) estimation using the mean squared error (RMS) of the adjusted model, truncating randomization to the interval [0, maximum AGB value].
Frequency of monitoring/recording	Nicaragua has a National Forestry Inventory System (NIF) in place since 2007. The NIF is in the process of being updated, but until now it has not been possible to complete a new measurement of the total network of forest inventory plots. With additional funds of the FCPF, 50 new plots will be added to the NFI network in the accounting area distributed in the categories of use: i. Dense

[74] Calculations of emission factors based on the national forest inventory are included in the worksheet calculo_FE.xlsx

coniferous forest, ii. Open coniferous forests, iii. Secondary coniferous forests and iv. Secondary broad-leaved forests. It is necessary to increase the number of plots in these categories to improve the estimates of the emission and removal factors, as well as reduce the estimation error prior to the first monitoring event of the ERPD. These new plots were distributed through a spatial analysis of land use maps for 2010 and 2015, as follows:

Plots	Forest type
16	Dense coniferous forest
16	Open coniferous forest
9	Secondary coniferous forest
9	Secondary broadleved forest
50	**Total**

The design of the monitoring proposal considers the following aspects:

Location of plots	Intensified grid of NFI (INF 2007-2008)
Forest inventory protocol	The sampling methodology implemented in the NFI and validated by FAO will be applied
Additional variables	Dominant tree height in meters (Site quality indicator) in secondary forest
Sample units	NFI sample units
Estimation of above and below ground Biomass	For the calculation of AGB / BGB, the protocol for determining EF and RF developed for the estimation of the Reference Level will be followed.

In the year 2019, INAFOR will undertake a survey of 47 new plots in the accounting area. These will be distributed in open and closed coniferous forests, as well as secondary boradleaf forests. INAFOR proposes the following tentative schedule to add 50 new plots to the NFI network in the accounting area:

Activities	Dates
Training: Monitoring Teams trained by INAFOR on the NFI methodology for the measurement and establishment of forest inventory plots.	March – April 2019

<table>
<tr><td></td><td>
<table>
<tr><td>Field work: INAFOR determines the location of the inventory plots and distributes them among the monitoring team. INAFOR and MARENA technical staff will supervise the field work.</td><td>May – August 2019</td></tr>
<tr><td>Reporting and information processing: Quality control and data storage is carried out according to previously defined categories of use. The field information is digitized in the official NFI database.</td><td>Sep - Oct 2019</td></tr>
<tr><td>NR update: INAFOR in coordination with MARENA, updates the EF and RF. MARENA updates the NR on deforestation, degradation and carbon enhancement.</td><td>Nov 2019</td></tr>
</table>
The development of allometric equations calibrated with national data, prior to the first monitoring event during the ERPA, is also anticipated.

Once the second measurement of the INF plots has been carried out, and new plots have been ~~the~~ established the Emission Factors for deforestation will be updated. Also, with this information, biomass canopy cover models for broadleaf and coniferous forests will be adjusted again.</td></tr>
<tr><td>Monitoring equipment</td><td>INAFOR is responsible for updating the National Forestry Inventory (INF), as well as carrying out specific inventories to assess the state of forests nationwide. INAFOR has a decentralized structure for the monitoring of natural forests through the forest districts. The country is divided into ten forest districts, each with a district delegate.</td></tr>
<tr><td>Quality Assurance/Quality Control procedures to be applied</td><td>Since the emission factors for the estimation of forest emissions during the monitoring events will be identical to those used in the construction of the reference level, it is not necessary to apply a QA/QC procedure.</td></tr>
<tr><td>Identification of sources of uncertainty for this parameter</td><td>Since emissions are calculated as the difference between two estimates of average carbon stocks per hectare, the uncertainty of emissions is determined essentially by the errors associated with estimates of the carbon stocks in each compartment in each year of the reference period. These errors are associated</td></tr>
</table>

	with (Cunia, 1987): i. Measurement errors (for example, tree diameter at breast height (DBH) measurements on field) ii. Prediction errors of the allometric equations used to estimate biomass due to uncertainty related to model residuals and model parameters iii. Sampling error. iv. Errors associated with the different parameters used in the estimation of emissions, such as the carbon fraction of the material in question.
Process for managing and reducing uncertainty associated with this parameter	Since the emission factors for the estimation of forest emissions during the monitoring events will be identical to those used in the construction of the reference level, it is not necessary to apply a process for managing and reducing uncertainty.

Table. 63 Summary of the procedures for the generation of Removal Factor for new forests, during the M-MRV

Characteristic	Description
Parameter	Removal factors for Broadleaf forest (SR_{BL}) including aboveground and belowground biomass. Removal factors for pine forest (SR_{P}) including aboveground and belowground biomass. Removal factors for tree shaded perennial crops (canopy cover>30%), (SR_{PC}) including aboveground and belowground biomass
Description	The removal of carbon due to enhancement in new forests has been calculated following the equation: $$R = a_1 * \frac{SR}{2} + \sum_{i=2}^{10} a_{i-1} * RF + a_i * \frac{SR}{2}$$ where, R is the removal of carbon in t CO_2/yr a is the annually area converted from non-forest land to new forests in the period 2005-2015 (ha/yr) SF is the sequestration rate (t CO_2/ha yr).
Data unit	t C/ha

Source of data or measurement/calculation methods and procedures to be applied (e.g. field measurements, remote sensing data, national data, official statistics, IPCC Guidelines, commercial and scientific literature), including the spatial level of the data (local, regional, national, international) and if and how the data or methods will be approved during the Term of the ERPA	Removal factors in the framework of this removal estimation approach, expresses the annual growth rate of new forests in t CO_2/ha-yr. The NFI data base does not account for rates of biomass increment in forests in Nicaragua. The broadleaf forest growth rate has been obtained from literature references of forest regeneration and biomass accumulation in Nicaragua. The mean annual increment of forest biomass has been estimated based on the study developed by Mascaro et al 2005[75] of regeneration of new forests in the Bluefields region on the Atlantic coast of southern Nicaragua. This study reports growth rates from 4 sample sites and a total of 12 plots. Only 10 plots with reported standard errors were used for estimating the removal factor as the average of the biomass mean annual increment of the plots (3.41 t C/ha ± 1.02 SE). Concerning the mean annual increment in biomass of Conifer forests of Nicaragua, there is no published information available at the moment. Therefore, a growth rate was calculated based on the emission factor derived from the NFI data base for steady.state 33 years-old Conifer forests[76]. With this information the removal factor in Conifer forest has been calculated as follows: $RF_{bc} = EF_{bc}/33$ Since EF_{bc} is 24.59 t C /ha, the removal factor RF_{bc} is 0.75 t C /ha. Although considerable uncertainty exists over the age selected, the removal factor obtained is considered conservative and consistent with the available INF information.
Frequency of monitoring/recording	Same as Emission factors (EF) for forest categories (Broadleaf forest). See Table 50.
Monitoring equipment	Same as Emission factors (EF) for forest categories (Broadleaf forest). See Table 50.
Quality Assurance/Quality Control procedures to be applied	Same as Emission factors (EF) for forest categories (Broadleaf forest). See Table 50.

[75] Mascaro, J., Perfecto, I., Barros, O., Boucher, D. H., La Cerda, D., Granzow, I., ... & Vandermeer, J. (2005). Aboveground biomass accumulation in a tropical wet forest in Nicaragua following a catastrophic hurricane disturbance. *Biotropica*, *37*(4), 600-608.

[76] Calderón and Solís,2012. Bachelor Thesis: Cuantificación del carbono almacenado en tres fincas en tres estados de desarrollo del bosque de Pino (Pinus oocarpa, L.) Dipilto, Nueva Segovia, Nicaragua. Universidad Nacional Agraria

Identification of sources of uncertainty for this parameter	Removal factor uncertainty is the emission factor uncertainty divided by 2.
Process for managing and reducing uncertainty associated with this parameter	Same as Emission factors (EF) for forest categories (Broadleaf forest). See Table 54.

9.2 Organizational structure for measurement, monitoring and reporting

Nicaragua has established an inter-institutional platform for forest and land use monitoring consisting of the following institutions: INAFOR, MARENA, INTA, MAG, INETER, municipal mayoralities, regional and territorial governments, and indigenous communities. The MRV institutional platform reflects the MRV legal framework,[77] which distributes the GHG monitoring functions of the LULUCF sector among three institutions:

- MARENA: quality control and verification of activity data and emissions factors used in the estimation of the NREF; also responsible for the Biennial Update Reports (BUR) and the National Communications.
- INAFOR: execution of the national forestry inventory whose data is used to estimate the carbon density of the different land uses (including the "non- forestry" uses) expressed in the emission factors.
- INETER: estimation of activity data and the NREF.

Technical units were established in MARENA and INETER, and the technical unit of INAFOR was strengthened; responsibilities for MRV were distributed among these technical units. Joint collaborative agreements among MARENA, INAFOR, and INETER establish the responsibilities of each institution and the corresponding chronograms of activities for the implementation of monitoring.

In order to comply with the technical and methodological requirements of MRV of the RE Program, 11 specialists with expertise in the following are needed: forestry, GHG accounting, teledetection and interpretation, and information systems (Table. 64). The technical units were established and strengthened with funds from the second donation of the FCPF; during the implementation of the ERPA, a loan from the World Bank to the Nicaraguan government for the development of agrosilvopastoral systems on the Caribbean Coast, con emphasis on emissions reductions, is contemplated in order to continually update monitoring capacities and finance operations.

[77] Legal framewor fothe MREV Instituional Platform:

- Law 290 and its reforms (2017): Law of organization, competencies, and procedures of the Executive branch. Law 462 (2016): Law of conservation, foment, and sustainable development of the forestry sector.

In Table. 65 a general description of institutional roles and responsibilities, and the internal entities with direct or indirect responsibilities for MRV, monitoring events, or the generation of emission reduction reports are shown.

Table. 64 ER Program monitoring technical team and functions.

Personnel	Institn.	Functions	Begin	End
Specialist, carbon accounting LULUCF	MARENA	Quality control of EF, estimation of national and regional NREF	April 2018	Dec. 2024
Specialist 1 Teledetection (AD)	MARENA	VEM for AD in Central Pacific North Subregion	April 2018	Dec. 2024
Specialist 2 Teledetection (AD)	MARENA	EVM for AD in RAACN, RACCS	June 2019	Dec. 2024
Information specialist 1	MARENA	Community Monitoring Apps, Grievance Mechanism	June 2019	Dec. 2024
Specialist 3 Teledetection (AD)	INETER	Wall-to-wall mapping and VEM for national AD	June 2019	Dec. 2024
Specialist 4 Teledetection (AD)	INETER	Wall-to-wall mapping and VEM for national AD	June 2019	Dec. 2024
Specialist 5 Teledetection (SAT)	INETER	Implement early warning system	June 2019	Dec. 2024
Information specialist 2	INETER	Administration and publication of geospatial data (IDE)	June 2019	Dec. 2024
Specialist Carbon Accounting AFOLU	INETER	Estimation of GHG emissions, AFOLU sector	June 2019	Dec. 2024
12Forestry Engineers (EF)	INAFOR	Remeasruement of NFI plots and establishment of new plots in conifer and secondary forests	November 2018	Dec. 2024
Forstry Specialist (EF)	MARENA/INAFOR	Quality control and verification of AD, community monitoring, advising of INAFOR, and establishment of temporary plots	June 2019	Dec. 2024

Table. 65 Institutional functions and internal entities related directly or indirectly to MRV, monitoring, and the generation of emission reductions reports to the ER Program.

Institution	Internal Entity	Responsibilities and Function
MARENA	• Climate Change Directorate	**Final Product: Official Report of Emission Reductions by the ER Program** • Highest level institution within the system and the only one authorized to emit official annual and biannual reports on emissions from deforestation and the recuperation of forests. • Formulates the protocols used by the system, in coordination with other institutions. • Quality control of emission/removal calculations due to the addition or loss of forest cover. • Emits official estimates of forest emissions and removals. • Receives feedback from the regions and other information users. • Makes public information, maps, and protocols employed by the MRV system in the estimation of forest emissions and removals in the accounting area.
	• National System of Environmental Information (SINIA)	**Final Product: With INETER, make available to the public, the information generated by the SNM-MRV, including maps, data, and protocols used in the estimation of emission reductions.**

Institution	Internal Entity	Responsibilities and Function
		• Administers all information generated by the institutions that form part of the SNM-MRV. • Presents, via web pages, the results of monitoring carried out by INETER, MAG, INTA and local monitors. • Guarantees the fluid and transparent exchange of information between SINIA and the regional nodes. • Technical strengthening of regional nodes related to information administration and management. • Develops a plan to disseminate information and results.
INAFOR	• Forest Protection, Promotion, and Development Directorate • Forest Control and Monitoring Directorate • Forest Registry Office • Departmental Delegations	**Final Product: Official Report on Emission Factors of the ER Program** • Selects the sampling design and permanent plots. • Establishes protocols for data gathering by local communities. • Organizes the acquisition of equipment and instruments for data gathering. • Carries out the forest inventory. • Processes and analyzes data. • Calculates biomass and carbon stocks. • Calculates changes in stocks over time. • Monitors forest fires and non-anthropogenic land use changes • Generates the report on uncertainty. • Emits official emission factors. • Coordinates with the land cover mapping team. • Coordinates with the regions and other users of the results of the forestry inventory. • Organizes and trains field teams. • Controls quality of data gathered by field teams. • Transmits data to the national central office.
INETER	• Territorial Classification and Zoning Directorate	**Final Product: Report on Monitoring of Forest Cover and Changes in Land Use/Estimation of Emissions from the LULUCF sector.** • Determines which satellite data are most appropriate for monitoring land use categories. • Determines methods for validation, including the sources of data and sampling procedures.

Institution	Internal Entity	Responsibilities and Function
		• Documents all analytical processes related to satellite imagery. • Makes available the processed images to all SNM-MRV users. • Generates annual information on forest cover and changes in land use. • Quantifies annually the quantity of emissions and/or removals due to forest additions or losses, following the guidelines of the IPCC. • Calculates rates of change. • Evaluates the accuracy and uncertainty of data. • Emits reports on the state of forest cover, in coordination with INAFOR. • Receives feedback from the regions and other information users.
MAG	• Agricultural Monitoring General Directorate	**Final Product: Measurement, mapping, and administration of agricultural information** • Formulation and measurement of indicators and the agricultural census. • Produces annual reports on agricultural monitoring, in coordination with INETER. • Administers national livestock statistics. • Maps, via satellite imagery, the areas of annual and perennial crops. • Emits statistical reports on the increase or decrease of agricultural areas. • Receives feedback from the regions and information users.
Mayor Offices	• Municipal Environmental Units	**Final Product: Assist field validation of the cover map and the measurement of National Forest Inventory plots.** • Coordinates inter-institutional efforts on the monitoring of local variables and indicators. • Defines local forestry monitoring teams. • Obtains financing for monitoring. • Trains and raises awareness of volunteers. • Collaborates with organizations with experience in monitoring. • Uses simple methodologies validated by INETER or INAFOR.
Regional Governments	• SERENAs	
Indigenous Territorial Governments (ITG)	• ITG Commission for MRV/SESA (in the process of being established)	

Institution	Internal Entity	Responsibilities and Function
		• Incorporates training related to monitoring protocols, on-the-ground supervision, and data verification in the design of community monitoring systems. • Creates a program for the recognition of volunteers. • Focuses on producing results that are useful for society via the generation of relevant information for the formulation of policies.

Figure 41 and 42 present the proposed organizational structure, designed by the MRV technical roundtable of the ENDE-REDD+ Program during 2016-2017, based on the actual systems and institutions involved in the monitoring of the variables and indicators of interest for ENDE-REDD+. The articulation of monitoring within the context of the ER Program with the national monitoring system (SNM-MRV) is shown in Figure. 39. The SNM-MRV will include community monitoring in support of the generation of activity data, resampling of the national forest inventory, and an early warning system for deforestation. The national systems and institutions that form part of the national system of measurement, monitoring, reporting, and verification are described below.

Figure. 39 Inter-institutional platform responsible for monitoring variables associated with emission reductions in Nicaragua.

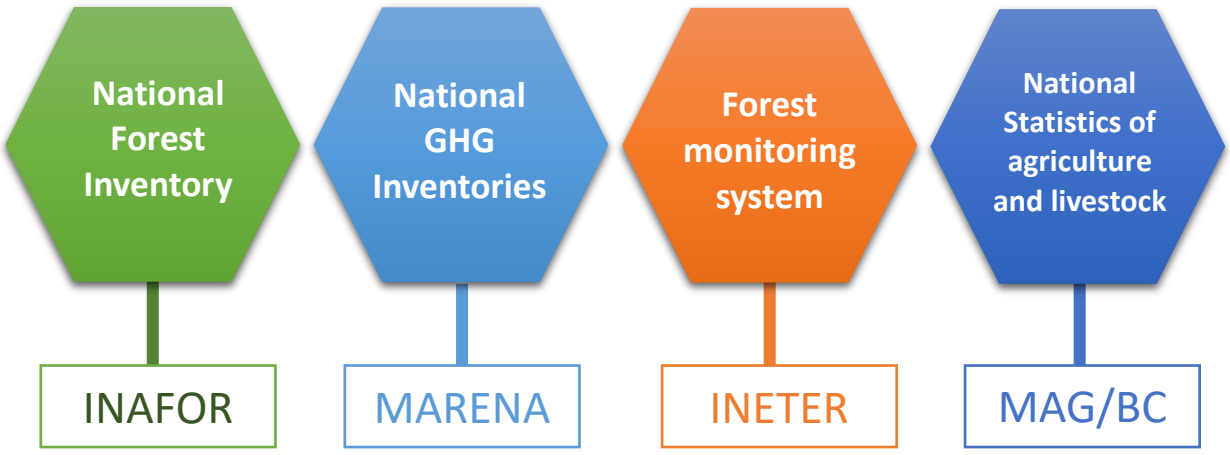


Figure. 40 Proposed organizational structure of MRV for the ER Program.

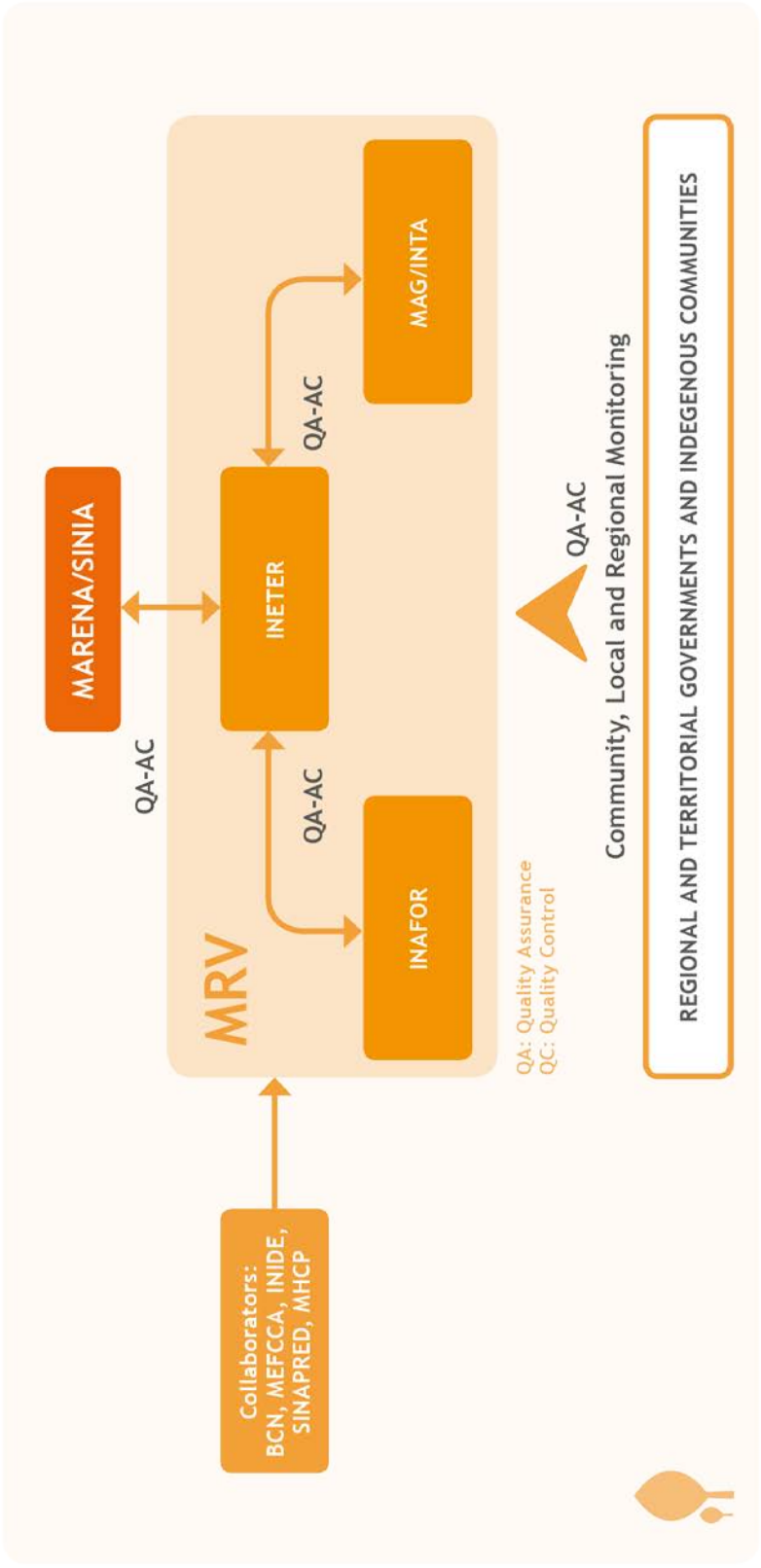
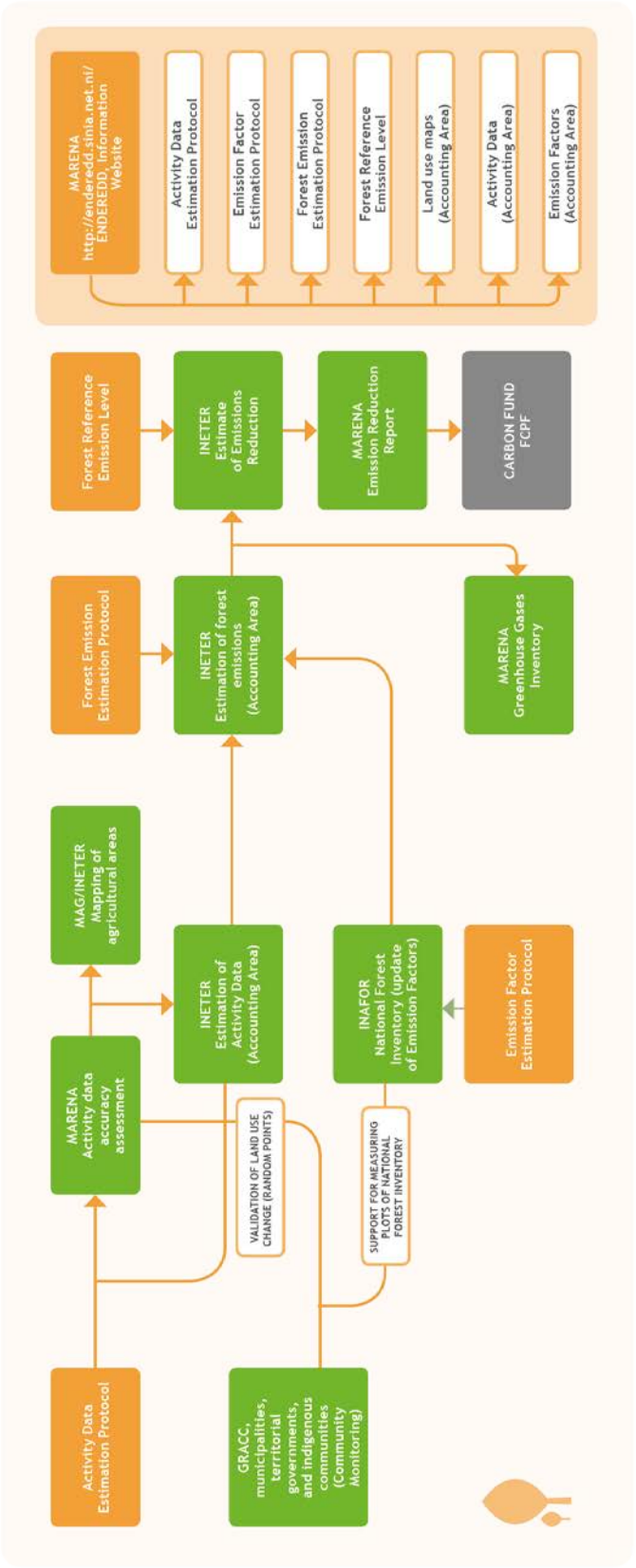


Figure. 41 Articulation of ER Program monitoring with the National Monitoring System (SNM-MRV).



- **System of Monitoring of Land Use, Forest Cover and Production:** administered by INETER; will provide data and geospatial information on Activity data.
- **National Forest Inventory:** administered by INAFOR through the office of national forest inventories. Responsible for information regarding the state of the forests and forest biomass. Data provided by the Inventory will be used to calculate and update national emission factors.
- **National Inventories of Greenhouse Gases:** administered by MARENA through the Climate Change Directorate. Compiles inputs and data generated by other institutions in order to control the quality of the estimates and reports generated.
- **National Agricultural Census:** administered by MAG and INTA. Provides information related to annual and perennial crops and livestock.
- **National Statistics and Census:** administered by INIDE. Monitors social variables and indicators such as: poverty, access to health services, education, etc.
- **National System of Environmental Indicators:** administered by MARENA. Analyzes and systematizes socioeconomic-environmental information and national indicators originating from the monitoring, vigilance, and control of environmental management, natural resources, and the economic valuation of natural assets. Works in coordination with different information systems and statistical directorates at the national, regional, and territorial levels, in line with the policies and strategic guidelines of the National Plan for Human Development.
- **ENDEREDD information website:** administered by MARENA. The ENDE-REDD+ information website (http://enderedd.sinia.net.ni/) includes a spatial data infrastructure web tool (SDI); based on Open Geospatial Consortium (OGC) methodologies and protocols for the exchange and interoperability of inter-institutional data and processes, and will also serve as a viewer, at different scales, of processed land cover maps and any spatially explicit variable mapped for estimation of forest emissions.

  This GeoPortal also includes layers of national information on historical and current land uses, in vector format, allowing visual analysis by overlay layers of different subjects in the same geographical area of interest. It works as a data exchange mechanism at the regional and community level. Metadata catalogs with methodological details are included for each layer. Protocols and data used for the estimation of Reference level and monitoring events are also available in the ENDE-REDD+ Information website: Activity Data, Emission Factors, Forest emissions and Forest Reference Level.

Community, local and regional monitoring

The implementation of the SNM-MRV will strengthen the regional capacities to monitor and report the state of forests and non-carbon benefits in the accounting area during the ERPD. In addition, it will generate on-site information and enhance the technical and ancestral knowledge of local forest rangers and monitors.

Territorial structural models have been identified that will be incorporated to the community monitoring system, as follows:

a) Network of environmental observers. The network consists of 359 observers, distributed nationide, who report on environmental incidents (firest fires, deforestation, forest degradation). Some of them are part of the network of biodiversity observers.
b) A network of 110 environmental foresters. They too are spread throughout the country and report on environmental incidents (firest fires, deforestation, forest degradation).
c) A network of 19 observer networks who are in charge of surveillance in protected areas. They coordinate their oversight activities with the regional governments and the MARENA delegations.

d) ITGs monitoring teams of 15 to 20 people, including leaders and community technicians. The function of these teams is to protect, monitor and provide alerts of deforestation and forest degradation. These teams will work in coordination with the technicians of SERENA, INAFOR, MAG and mayors´offices;

The teams are distributed throughout the territory and collect information on land uses, annual and perennial crop areas, and support the updating of the national forest inventory, among other things. Forest ranger teams currently monitor their territory in periods of 2-3 months, recording the information in notebooks that are administrated by the community leaders of the ITGs.

In order to assist local personnel with data collection, during 2017 the ENDE-REDD+ program carried out tests with the ODK collect application for the collection of field information. The results were not positive, for this reason it was decided to elaborate an application built from consultations with the regional monitoring teams, taking up the monitoring indicators proposed by the early warning system, forest monitoring system and control information required by the communities of its territory.

March 2019 a regional workshop was held on the northern Caribbean Coast to introduce the application of the community--based model. Tests were run and results were satisfactory as concerns the gathering of information and generation of warnings regarding deforestation and forest degradation. During the second semester of 2019, additional tests will take place intended to validate the biodiversity monitoring modules, including an early earning system and forest fires. The validation process is to be supervised by the interinstitutional technical team whose members are representatives sent by MARENA, INETER and INAFOR.

Table. 66 Data capture with an Android platform for the SNM-MRV.

Phase	Description
I. Establishment of the monitoring committee	Based on the structure and working modality of the ITG, the official monitoring teams will be formed. The coverage of monitoring of territorial structures located inside the project's accounting area will be evaluated. They are to be strengthened and included in the community monitoring system.
II. Monitoring work plan.	The analysis of deforestation hot spots from satellite images will define the areas with the highest intensity of monitoring and the work schedule for ITG forestry teams.
III. Training to collect field data with android application	ITG forestry teams will receive training in managing and recording information with the Android application
IV. Testing and validation of tools	During the testing phase, the ITG forestry teams will report the results of the monitoring through the Android application. Subsequently, the central and regional monitoring team will review, adjust and validate the data collection forms and the information received from the field teams.
V. Adjustment of the collection tool for its incorporation into the early warning system.	The national monitoring team will establish a commission to validate the field data collection tool and approve its incorporation into the early warning system of the ERPD.

Early Warning System for Deforestation (EWSD)

The early warning system for deforestation (EWSD) is part of the National Forest Monitoring System and is also linked with the community monitoring system. The EWSD identifies deforestation "hot sopts", while the community monitoring teams visit these sites and verify and collect on-the-ground information.

The ESWD is based on a low-cost, early detection tool that opates on the Googel Earth Engine (GEE) platform and its bank of free-access remote sensing images. Based on high temporal resolution and low spatial resolution (e.g. LandSat or Sentinel) satellite images, temporal mosaics will be generated for digital processing using automated algorithms (e.g. Time Series) that will enable the identification of areas of deforestation. It should be noted that the use of Landsat 7 and 8 images to define land use changes are less useful during rainy periods with high cloud cover; in the case, the use of radar images will be evaluated.

The ESWD is a good alternative for monitoring changes in forest cover at the national or regional level on a semesterly basis. The information generated is key for rapid decision making and responses regarding activities that threaten forest conservation, as well as illegal logging, the conversion of forests to agriculture, and forest fires. In this context, in 2019, Nicaragua prepared the conceptual and strategic design of the EWSD, where the monitoring indicators for land use change are proposed; instruments and technical tools necessary to create early warnings and alert communication strategies. [78]

Additional Readiness funds will be used to develop a monitoring application that runs on GEE (e.g. adjustments to the Timer Series script) and modified to the needs of ESWD in the accounting area, including the training of ESWD technicians in INETER, MARENA, and INAFOR. The head of the ESWD will be the Teledetection Specialist 5 assigned to the Technical MRV Unit of INETER.

9.3 Relation and consistency with the National Forest Monitoring System

The data used to estimate emissions are generated following the good practices and guidelines established by the IPCC for forest monitoring and are applied at the national level in a consistent fashion. As a result, the data reported by the ER Program form part of the National Forest Monitoring System and will be used in national emissions reporting.

The functioning of the National Monitoring-MRV System is based on the establishment of homologous protocols for the generation of information, pre-treatment and processing of data, as well as conventional and standard systems of classification. These protocols envision the continual up-dating of variables and indicators used in the institutional information systems for the interchange of data in the timeframes established by the National System of Environmental Information (SINIA).

78 https://www.dropbox.com/s/x7sqtvef10tn2vl/Dise%C3%B1o%20conceptual%20SAT_Nicaragua.docx?dl=0

10. Displacement

10.1 Identification of risk of displacement

The factors that drive deforestation in Nicaragua are most accentuated in the Caribbean coast. These include the large proportion of national forests (80%), migration of poor farmers to the region attracted by cheap land, suitable conditions for year-round pasture and crop production, relatively flat topography, and a weak institutional presence. Moreover, the accounting area includes more than half of the land area of the country. The rest of the land elsewhere is largely deforested, settled, much more expensive, and has drier climatic conditions.

In essence, the combination of these factors suggests that significant displacement of deforestation outside of the accounting area is unlikely. As a result, a low[79] risk of displacement could be assigned to the majority of the drivers of deforestation, but there are two cases where a moderate risk has been assigned, as is explained below.

In general, if displacement should occur, it is more likely in areas characterized by:

- Low rates of deforestation or recovering forests,
- Easy accessibility from roads or near to population centers,
- Weak institutional control of land use,
- Low-priced land available for rent, purchase, or forcible occupation[80].

The drivers and their associated risk of displacement are evaluated in the following Table.

Table. 67 Risk of displacement in the accounting area associated with different factors or agents of deforestation.

Driver of deforestation or degradation	Risk of Displacement	Explanation / justification of risk assessment
Extensive cattle production and commercial and subsistence farming based on extensive land use.	Low	As mentioned in Section 4, non-sustainable, extensive pasture management and livestock production is the main driver of deforestation of the Caribbean Coast of Nicaragua. These processes ares intimately associated with the expansion of the agricultural frontier related with extensive land use, especially that of extensive livestock grazing, but also with annual and perennial crops. However, they are underlain by

79 FCPF: Carbon Fund Methodological Framework, December 20,2013

80 MARENA 2017. Analysis of displacements due to the reduction of emissions originating from the Emissions Reduction Programme on the Nicaraguan Caribbean Coast and the project in support of the ENDE-REDD+ Readiness Package – TF099264. General Directorate of Emissions Reduction due to Deforestation and Forest Degradation, Ministry of the Environment and Natural Resources (MARENA), 2017, 33 pgs.

Driver of deforestation or degradation	Risk of Displacement	Explanation / justification of risk assessment
		various factors including migrations to the Caribbean from the Pacific and North-Central regions of Nicaragua, and within the Caribbean region itself, resulting from demographic pressure stemming from an annual population growth of 1.4%, poverty, the availability of relatively cheap land in the Caribbean Coast, and road connections to and within the Caribbean Coast. These conditions are less likely to be found in other parts of the country, so the risk of displacement could be considered as inexistent or categorized as low. Moreover, the project´s economic/productive interventions are aimed at generating more sustainable and profitable alternative for local farmers, and increased jobs for those who are unable to participate in ER Program productive programs or who are forced to abandon their lands due to increased enforcement and control of land use. In the latter cases, off-farm agricultural employment, created by agro-industries or large farms, is apt to reduce the risk of displacement. With regards to displacement due to commercial crops, to date the increase of agro-industrial areas of perennial crops (such as oil palm and coconut) is still relatively low, but is likely to increase due to investment promotion and "copycat" effects. Interventions that promote greater monitoring, control, and enforcement of land use regulations, may diminish the attractiveness of the Caribbean Coast for these investments, which may then subsequently go elsewhere. This risk is considered to be inexistent or low due to the still incipient levels of agro-industrial production on the Caribbean coast, the promotion of economically favorable conditions for sustainable production by PRONicaribe, and the low availability of ecologically suitable conditions for these crops in other areas of the country.

Driver of deforestation or degradation	Risk of Displacement	Explanation / justification of risk assessment
Population growth and migration.	Medium	Deforestation in indigenous and Afrodescendant territories is relatively low, but it has been increasing, presumably due to increasing pressure from population growth and migration and the desire for better livelihoods by indigenous and non-indigenous inhabitants. This pressure may displace some individuals, especially if land use in indigenous and Afrodescendant territories is more tightly controlled. However, increased local employment with forestry or agroindustrial businesses targeted by the investment promotion component, or as local monitors, combined with results-based incentives for avoided deforestation, will decrease the risk that these individuals are displaced. Moreover, the risk of out-migration from the Caribbean is low due to the lack of favorable conditions elsewhere, as mentioned in the section above. Nevertheless, due to the possibility that displacement may occur, this risk is categorized as medium.
Forest degradation due to logging and firewood extraction	Medium	Legal logging levels are low, but data for degradation suggest that illegal logging may be significant, especially in the RACCN. Greater forest monitoring and enforcement of forestry regulations may displace loggers to other parts of the country, such as the Central-North region, but the relatively small quantity of commercial forests in other parts of the country reduces this possibility. Firewood and charcoal extraction may also be displaced as a consequence of establishing an improved regulatory and enforcement framework. This risk is rated as medium.
Undervalued forest lands.	Low	The low value of forest land is due to the undervaluation of goods and services produced by forests, which do not allow forest production to compete with other alternative land uses. Increasing the value of forests may force poor farmers to look for cheaper land elsewhere, but the risk of displacement is low, since cheaper land is less likely to be found. Moreover, outside the

Driver of deforestation or degradation	Risk of Displacement	Explanation / justification of risk assessment
		accounting area, forests are less available and forest carbon stocks are lower. Hence, the risk of displacement of emissions is low.
Low-priced local and regional markets undemanding of product quality.	Low	It is unlikely that improved market conditions for producers in the accounting area will cause displacement, since farmers will still seek areas, such as the Caribbean Coast, with low production costs. This is a principal factor for migration into the Caribbean region and is unlikely to be reversed in the medium-term future. Therefore, this risk is considered to be low.
Institutional weakness in lands monitoring, and control.	Medium	Increased monitoring, control, and enforcement of forest and resource use may provoke displacement among certain social sectors in the Caribbean. On the other hand, the promotion of improved agricultural technologies, improved credit availability, technical assistance, conservation payments, and investments that create off-farm employment may result in greater economic opportunities that offset the increased risk of displacement caused by tighter control. Therefore, this risk is considered to be medium.
Forest fires	Low - Medium	Humid conditions in the Caribbean region, combined with Nicaragua´s fire prevention and control program, will reduce the risk of displacement by forest fires. However, fires can occur, as recently observed in the Indio Maiz Reserve.Therefore, this risk is considered to be low to medium.

10.2 ER Program design features to prevent and minimize potential displacement

Generally, the risk of displacement may occur as a consequence of:

i. The reduction of levels of production, income, or means of subsistence of the participants;
ii. The rejection of the proposed mitigation measures or difficulties in adopting them on the part of farmers; and/or
iii. Increased restrictions on land use that can affect the above and subsequently cause migration to other areas.

The proposed interventions are aimed at reducing the principal direct causes of deforestation (extensive cattle raising or crop production) and their underlying causative factors of low valuation of forest products and services (low opportunity cost of forests), low land prices, an agricultural sector with low productivity associated with low levels of capital and difficult access to credit and investments, low-priced local and regional markets undemanding of product quality, are aimed at intensifying and increasing production and income and creating greater economic opportunites off-farm. Clearly, the interventions incorporating positive incentives are apt to diminish, not increase, displacement. Additionally, greater fire prevention and control should reduce the area affected by fires.,

On the other hand, decreased access to forests and greater enforcement (disincentives or control measures) of allowable forest use may tend to displace farmers unable to participate, for whatever reason, in the economic benefits associated with more sustainable production systems. In this case, the potential for increased off-farm agricultural employment with agro-industrial projects established in already deforested areas, promoted by the ER Program, may alleviate the risk of displacement.

As a result, these actions, taken together, will tend to stabilize farming populations in the Caribbean and thus reduce displacement.

Table. 68 ER Program activities aimed at mitigating the risk of displacement.

Driver of deforestation or degradation	Activities
Extensive cattle production and commercial and subsistence farming based on extensive land use	The overall intervention strategy is based on a combination of positive incentives (production-oriented, or enabling conditions packages) and disincentives or control measures (conservation packages and improved land use monitoring and control). It aims at achieving more sustainable and productive farming systems via greater access to technical assistance, credit (both of which will be conditioned to on-farm forest conservation), and outside investment that creates income and employment. At the same

Driver of deforestation or degradation	Activities
	time it makes it harder to access and convert forest land via greater local land use monitoring, control, and law enforcement, early warning systems for deforestation, financial incentives for forest conservation and sustainable use, and improved forest governance, especially in indigenous and Afrodescendant territories and protected areas. Increased employment, income, and better land governance are apt to act as disincentives for the migration of people to other regions. This will be achieved through: 1) the sustainable production package, which is aimed at stimulating sustainable agroindustries and smallholder production systems that increase production and carbon enhancement, conserve forests, and create off-farm employment that can absorb marginal farmers. It includes: a) strengthening of PRONicaribe in order to increase promotion of green agroindustrial and forestry investments in indigenous territories and private property that in turn will increase off-farm employment, enhance carbon stocks, and reduce deforestation. b) the establishment of agroforestry and silvopastoral trusts among small and medium farmers, anchor businesses, producer groups, and government and financial institutions (trustee) aimed at increasing intensified production and commercialization of coffee, cacao, and livestock products, carbon enhancement, and greater on-farm forest conservation. c) commercial reforestation in order to create off-farm employment and enhance carbon stocks. 2) The conservation package will facilitate better land governance by the ITGs and communal governments, use direct incentives in order to promote forest conservation, increase income and employment via the improvement of community forest management or other community-based economic opportunities, and promote social reforestation and natural regeneration in order to enhance economic yields, ecosystem services, and biodiversity. Both of these packages will increase economic well-being and quality of life and will diminish the need for displacement. As a

Driver of deforestation or degradation	Activities
	result, farmers will have less need to migrate to new forest areas elsewhere.
Population growth and migration.	The sustainable production package aimed at increasing local employment with forestry or agroindustrial businesses or as local monitors, combined with increases in the productivity of livestock and agroforestry crop production, will create more economic opportunities and jobs that that are able to absorb increases in population, thus reducing the need for out-migration.
Forest degradation due to logging and firewood extraction	The proposed actions aim at strengthening the technical and commercial framework (direct incentives, technological improvement and increased marketing and product diversification) for community forestry and investment promotion of commercial forest plantations. Both of these measures which will create forest-based economic opportunities for local inhabitants that can serve as alternatives to illegal logging and firewood extraction. The Program will also promote social reforestation and natural regeneration which can serve as sources of timber for domestic consumption as well as firewood. Together, these measures will diminish the need for migration to other areas.
Undervalued forest lands	Increasing the value of forest lands through activities such as community forest management, the promotion of investments in forested zones, direct incentives for avoided deforestation or for natural regeneration will increase income and employment opportunities in the communities. The intervention of Improved Forest and Land Use Management by Indigenous Territory Governments (ITGs) includes: • updating territorial development and land use zoning plans, • improving territorial and communal legal statutes, internal norms and regulations, and administrative and contractual procedures for forest and land use by community members or outsiders, • improving natural resource decision making and social control of those decisions at the communal level, and • improving local monitoring and control of forests and land use and forestry permits (whose procedures should be improved by the activity found under CFM) by community

Driver of deforestation or degradation	Activities
	groups, including information capacities, equipment and human resources, and local forest rangers and monitors. These measures are expected to improve living conditions via better land use and fewer conflicts over land. These improved conditions are apt to mitigate or prevent displacement.
Low-priced local and regional markets undemanding of product quality.	Actions will be aimed at developing linkages with markets for higher quality, "green" products, while at the same time developing farmers´ technical, organizational, and commercial capacity to participate in these markets. Higher selling prices associated with better quality products will increase income and provide incentives to intensify production instead of migrating to new areas of forest.
Institutional weakness in land use monitoring and control.	Nicaragua has developed a robust legal and policy framework for land and natural resource rights, environmental protection and sustainable development. However, the country needs to more fully integrate and harmonize environmental concerns in development plans at all governmental levels and across sectors. It also needs to better enforce existing policies related to deforestation and land use. Thus, the ER Program envisages strengthening institutional forest governance capacities and structures at the national, regional, and territory levels in order to promote actions for the monitoring, protection and sustainable management of forests within and outside of protected areas, and the enforcement of forestry regulations. The enabling conditions aimed at improving institutional coordination, policy harmonization, information use and dissemination, land use and forestry monitoring, improved application of laws, policies, regulations, and norms, and institutional resources and capacities will improve land use monitoring and control. This, in turn, will decrease opportunities for displacement due to conflicts related to land use or resource use.

In addition to the above-mentioned measures, cross-cutting activities that will reduce the risk of displacement of deforestation and emissions include:

- Promotion of a forestry and environmental education and awareness.
- The generation of information and the monitoring of the risks of displacement associated with new or recurring factors in the accounting area.
- Documentation of lessons learned from measures to mitigate possible displacement under the ER Program.

11. Reversals

11.1 Identification of risk of reversals

Reversals of emissions are the product of changes in the conditions that underlie previously achieved emissions reductions. These changes can be anthropic or natural and can be exercised from inside or outside the accounting area.

Natural changes are most often caused by natural disasters. In the Caribbean context, likely agents of change include hurricanes, outbreaks of forest pests, droughts, floods, and fires. Due to their origin these changes have a medium level of predictability, may be locally or regionally very important, and are difficult to avoid and very difficult to control once present. However, post-event responses can be important for their mitigation.

Anthropic change agents can be exogenous or endogenous to the accounting area. In the latter case, changes may be directly or indirectly related to Program activities. Exogenous agents often reflect broad socioeconomic changes or forces that are difficult to predict, avoid, or mitigate on short time scales. For example, in the problem tree for deforestation and degradation presented in Section 4, these agents can include changes in international markets and demand for agricultural or forestry goods or services. Given their international origin in large-scale consumer patterns and technologies, these conditions are difficult to control at the national level. At the domestic level, demographics, migration patterns and pressure, and poverty levels are also difficult to control in the short- and medium terms, since they are the product of underlying biological and socioeconomic factors, structures, and conditions. In the long-term, these causes of reversals can be changed by laws, policies, institution-building, or changes in underlying economic structures or conditions.

The Program will place a high priority on causes of reversals that operate on the short- or medium-terms, but will also address the threat of reversals beyond the term of the ERPA. Short- and medium-term threats are affected by participation in and support of the Program, institutional capacities and coordination, internal project organization and implementation, finances, and regional or local policies and politics. These factors are more under the control of the Program and therefore are more predictable and easier to prevent, control, or mitigate.

Beyond the term of the ERPA, the Program will attempt to assure the long-term sustainability of the emissions reductions achieved during the Program by promoting new

economic models (intensified production through trust arrangements), economic structural changes via the investment promotion, credit, and new market linkages, further consolidation of land rights and autonomy in the indigenous and Afrodescendant territories, increased knowledge and capacities of producers, and improved institutional capacities to better monitor and control of land use.

In order to evaluate the risk of these reversals (non-permanence), the Carbon Fund[81] tool for evaluating the risk of reversals has been used.

The risk factors analyzed include the following:

Risk Factor A: Lack of comprehensive and sustained support of the relevant stakeholders

- ✓ **Participation of the relevant stakeholders in the design of the Emissions Reduction Program**

A large number of key stakeholders at multiple levels has been involved in the design of REDD+ and the ER Program (see Section 5). These include participants within the three Working Groups described in Sections 2.1 and 5.1 and those involved in the Strategic Environmental and Social Assessment. Due to this widespread participation, and assuming that the Program produces the benefits proposed, this risk considered to be low.

- ✓ **Existence of effective legal instruments and frameworks for the resolution of disputes related to land ownership**

Nicaragua has a robust legal framework for land and resource rights and 31.4% of the country, corresponding to indigenous and Afrodescendant territories in the accounting area, has been titled, leaving little doubt regarding legal rights to land Ninety-eight percent of private property in the accounting area is also titled.

In some territories, tensions exist between indigenous communities and third party settlers due, in part, to weaknesses in enforcement of rights. Moreover, while legal procedures for settling these disputes are clear (see Section 4.4), and some territorial governments have developed innovative solutions for the resolution of these disputes (see Section 4.4), the resolution of these conflicts is often slow.

[81] FCPF, 2015. Directrices de amortiguación del Fondo de Carbono. http://enderedd.sinia.net.ni/Docs/DocENDE/4.%20Reversiones%20Nacionales.pdf. The main bibliographic source for identifyig reversals has been the document "*Reversiones nacionales debido a la reducción de emisiones originadas por el Programa de Reducción de emisiones de la Costa Caribe, Reserva BOSAWAS, Reserva Biológica Indio Maíz de Nicaragua, del paquete ENDE-REDD con fecha de julio de 2017*".

Even though the existence of legal instruments and frameworks for land ownership disputes will contribute to the permanence of the emission reduction during and beyond the term of the ERPA, the risk associated with this indicator is considered medium, due to the existence of deficiencies in enforcement or the agile resolution of conflicts.

- ✓ **Maintenance or improvement of the income and/or production levels of the participants over the long term.**

The ER Program contains a number of economic development interventions to be implemented during and beyond the term of the ERPA, aimed at increasing productivity, income, or off-farm employment as well as the generation of new opportunities for private investments. Intensified and more productive livestock and agricultural systems, community forestry management, incentives for forest conservation, and increase opportunities for off-farm employment are expected to increase income and well-being and thus reduce pressure for the reversion of forests or production systems promoted by the Program. Therefore, this risk is considered to be low.

- ✓ **Existence of adequate benefit sharing mechanisms.**

The design of a benefit sharing mechanism is at a preliminary stage and details will be further specified in the coming semester. The goal is for this mechanism to integrate economic and non-monetary benefits, (including cultural, social, and environmental benefits) under a fair, equitable and transparent approach, whereby most of the benefits are transferred to communal and private stakeholders. It should be noted that the legal foundation for the distribution of benefits originating from natural resource use is legally established and that the country has had experience with benefit distribution and payments for ecosystem services in the context of various projects. Therefore, the risk associated with this factor is considered to be medium, since the benefit sharing is not yet fully designed and consultations with stakeholders are pending.

In summary, since the components of risk factor A are evenly divided between low and medium risk ratings, the overall score for risk factor A is medium low.

Risk Factor B: Lack of institutional capacities and/or ineffective vertical/inter-sectoral coordination, which has been evaluated by the following indicators:

- ✓ **Existence of institutional capacities for the long-term development of the ER Program.**

MARENA and the other institutions (INAFOR, INETER, MEFCCA, MHCP, MAG) cooperating in formulation and future implementation of the ER Program have

made good progress in upgrading their capacities to implement and monitor REDD+ activities. Training activities at all levels have been a major focus of REDD+ Readiness and have been successful and raising awareness and technical skills embodied in the institutions, as noted in the external evaluation of Readiness.

Nevertheless, budget restrictions, which have secondary effects on staffing, equipment, infrastructure, and operations, are a major factor that could potentially limit the successful implementation of the ER Program. As a response, the Nicaragua government has made an official commitment to improving the conditions and attractiveness for private investment, especially in the Caribbean region, through modification of its legal framework and the establishement of an investment promotion program (PRONicaribe) and has been reaching out to environmentally focused donor programs (where the current Private Secretary to the Presidency for Public Policy(holds a position on the governing board of the Green Climate Fund) as well as credit programs of multi-lateral banks.

- ✓ **Experience in collaboration between different government levels.**

Nicaragua's institutionality has made significant progress in recent years. A robust legal and policy framework has been developed for land and natural resource rights, environmental protection and sustainable development.

Formal mechanisms exist for institutional coordination within the Program framework. In general, MARENA has shown good vertical and horizontal coordination during Readiness, preparation of the REDD+ Strategy, and the design of the ERPD and has instituted various Working Groups for coordination at various levels, such as Group I for political coordination, Groups II for technical coordination, and Group III for coordination of grassroots stakeholders (see Sections 3 and 5). Within the highest levels of government, the Production, Consumption, and Commerce cabinet also represents the principal sectors relevant for the implementation of the ER Program. At a more regional level, the SDCC has as one of chief functions the coordination of policies and government actions in the Caribbean region (see Section 6.1). These coordinating mechanisms will be strengthened and incorporated in the efforts to achieve greater institutional alignment and coordination. Coordination with the private section has included principal producers´ organizations (e.g. the CONAGAN livestock producers´ organization) and efforts of PROCaribe for investment promotion. Nevertheless, the capacities of governments and coordination of their programs and projects need to be improved. This need will be addressed, particularly during the preparatory, pre-implementation stage of Program, via discussions related to potential coordination of budgets, indicators, and activities.

Perhaps the greatest threat from inadequate sectorial coordination in represented by road construction projects that are considered for the accounting area in the near future and beyond the term of the ERPA. Unless inter-sectorial coordination improves and the environmental impacts of these roads are avoided, reduced, or compensated, via the implementation of Environmental Impact Analyses and their recommendations, the region runs the risk of repeating the high level of deforestation encountered along the new Bluefields road. As a result, this risk is considered to be medium.

In summary, the overall rating for risk factor B is considered to be medium. To assure the permanence of the emission reduction during and beyond the term of ERPA, recently established coordination mechanisms, technical capacities, and resources need to improve even further. The institutional arrangements for overall Program management have been designed with the aim of improving institutional coordination during Program implementation, capacity strengthening at multiples levels, and greater resource acquisition, especially private sector investments, have been incorporated in Program design. Nevertheless, planned road construction has the potential to cause significant reversion and should be addressed through the implementation of rigorous Environmental Impact Evaluations and their recommendations.

Risk Factor C: Lack of long-term effectiveness in addressing the underlying causes of deforestation[82].

- ✓ **Experiences of decoupling deforestation and forest degradation from economic activities.**

Trends in deforestation, intensification of livestock farming, and economic diversification and development in the Caribbean observed between 2010 and 2015 suggest that a partial decoupling of economic growth and deforestation in the Caribbean is underway. Diversification and intensification of production in already deforested areas include new actors, increased private investment, especially direct foreign investment (DFI) and new and more eco-efficient economic activities that require less deforestation for their development. This process is a product of the institutional strengthening in the accounting area, the establishment of land tenure and land titling, the improvement of basic infrastructure, and the government´s efforts to establish a propitious business climate and to promote investments. These positive changes are indicative of the government´s long-term commitment to reduce the risk of reversals beyond the term of ERPA by promoting a news and more sustainable economic

[82] This factor refers to the risk that proposed interventions to reduce emissions from deforestation and forest degradation may be able to address the underlying causes only temporarily.

development model for the Caribbean Coast which is more in harmony with environmental protection. As a result, this risk factor is considered to be low.

- ✓ **Existence of a legal and regulatory context which is conducive to REDD+ goals.**

Nicaragua has a robust legal framework related to natural resources and land. The establishment of land tenure and land titling is thought to be an important factor behind recent decreases in deforestation. Inconsistent application of the legal framework, however, has been identified as one of the underlying institutional causes of deforestation and land use conflicts and is targeted for interventions related to land and natural resource monitoring, improved forestry supervision, land use governance, and enforcement of laws and regulations at the local level. At the same time, the diagnosis has identified the need to further clarify rights to carbon. As a result of these interventions, the risk associated with this factor is considered to be medium[83].

In summary the rating for risk factor C is considered to be low to medium due the present of a robust legal framework, recent experiences at decoupling economic development from deforestation, and interventions aimed specifically at established a new economic development model, but weaknesses in law enforcement is a significant challenge that must be met in order to reduce reversion.

Factor D. Exposure and vulnerability to natural phenomena.

Nicaragua and the accounting area are at medium risk due to natural disasters such as hurricanes and flooding, which occur infrequently, but have profound local impacts. These impacts are difficult to predict and prevent, but good planning is essential at reducing their impact when they occur.

The Program contemplates the strengthening of the national fire prevention and control program in the Caribbean region and wil work with the Disaster Operations Center (COD) of the National System for Diaster Prevention, Mitigation, and Attention (SINAPRED, http://www.sinapred.gob.ni/), civil defense, and INAFOR in order to reduce reversions in the aftermath of hurricanes.

In summary, the resulting risk of reversal and the corresponding set aside percentages are shown in the Table below.

[83] MARENA 2017. Estudio de las Reversiones nacionales debido a la reducción de emisiones originadas por el Programa de Reducción de emisiones de la Costa Caribe de Nicaragua. Proyecto Apoyo a la Preparación de la Estrategia para la Reducción de Emisiones por Deforestación y Degradación Forestal (ENDE-REDD+) -TF099264. Dirección General de Cambio Climático, Ministerio del Ambiente y los Recursos Naturales (MARENA). 2017. 37 p

Table. 69 Summary of the assessment of risk factors and the resulting set-aside percentage.

Risk Factors	Resulting Reversal Risk Set-Aside Percentage
Default risk	10%
Lack of broad and sustained stakeholder support	Low to medium (10%-7%): 3%
Lack of institutional capacities and/or ineffective vertical/cross sectoral coordination	Medium (10%-5%): 5%
Lack of long term effectiveness in addressing underlying drivers	Low to medium (5%-3%): 2%
Exposure and vulnerability to natural disturbances	Medium (5%-3%): 2%
Actual Reversal Risk Set-Aside Percentage:	**Total= 22%**

11.2 ER Program design features to prevent and mitigate reversals

For the most part, natural and exogenous anthropic risks are largely beyond the scope of project avoidance or mitigation capabilities, although measures can be taken to better respond to some natural disasters via the development of contingency plans or to diminish the magnitude or prevent others through better planning. In the case of many exogenous anthropic changes such as changes in markets or laws, these changes may manifest themselves gradually, thus providing time for the Program to develop adaptive responses.

Given this situation, it is advisable that the Program concentrate its reversal efforts on preventing or mitigating risks endogenous to the accounting area. Given the diversity of risks potentially present it is difficult to develop specific recipes for each. Nevertheless, at a general level the Program needs to assure that during and beyond the term of the ERPA, the the economic interventions and the production systems they promote are profitable, environmentally sustainable, and adaptively managed, and that the regional, municipal, and territorial institutions are more capable of planning, monitoring, and controlling land and resource use and evaluating their own activities.

In order to facilitate this, internally the Program needs to assure: access to sources of good information; adequate internal organization and management; good working relationships with local institutions, organizations, and community leaders and other key stakeholders; good communication capabilities; an effective safeguards management system, and adequate funding.

Existing mechanisms that can be marshalled to these tasks include: a participative planning process, the ENDE-REDD+ communications and participation strategies; the various working groups (Groups I, II, and III) already formed, a monitoring system, the social and

environmental management framework, mechanisms for institutional and stakeholder coordination, a system for the distribution of benefits and a feedback conflict resolution, and grievance redress mechanism. These elements are contained in the current proposal and will help assure the sustainability of emissions reductions beyond the term of the ERPA.

To reduce the risk beyond the term of the ERPA, the Program incorporates a series of measures to promote new economic models (more intensive production through trust fund agreements), structural economic changes through the promotion of investment and new market linkages , a greater consolidation of land rights through the increase of capacities in the administration of property and the autonomy of the territories of the populations of the indigenous and Afrodescendant peoples, greater knowledge and capacities of the producers to strengthen the intensive production models, as well as greater institutional capacities to improve the monitoring and control of land use.

In order to combat and prevent reversals, the following measures are considered for the risk factors mentioned in Section 11.1:

Table. 70 Mitigation strategies for risk factors potentially affecting the ER Program.

Risk Factors	Mitigation strategies [84]
Lack of broad and sustained stakeholder support.	✓ The activities in the program have been carried out with the participation of numerous and wide-ranging stakeholder and the participation and consultation mechanisms will continue during Program implementation. ✓ Communication on the progress of the Program and technical decision-making will be maintained and improved (see Section 4.3 and 6.1) ✓ Indigenous and Afrodescendant groups will be maintained as high-priority actors, as established by the National Human Development Plan (PNDH).
Lack of institutional capacities and/or ineffective	✓ The institutional design of the overall coordination of the ER Program was aimed at improving coordination among key implementing institutions. There are specific interventions

[84] MARENA 2017. Estudio de las Reversiones nacionales debido a la reducción de emisiones originadas por el Programa de Reducción de emisiones de la Costa Caribe de Nicaragua. Proyecto Apoyo a la Preparación de la Estrategia para la Reducción de Emisiones por Deforestación y Degradación Forestal (ENDE-REDD+) -TF099264. Dirección General de Cambio Climático, Ministerio del Ambiente y los Recursos Naturales (MARENA). 2017. 37 p
MARENA 2017. Estudio de las causas de la deforestación y la degradación forestal en Nicaragua. "La problemática de las existencias de carbono forestal y el enfoque estratégico del Programa ENDE-REDD+ para atender estas causas a nivel nacional". Proyecto Apoyo a la Preparación de la Estrategia para la Reducción de Emisiones por Deforestación y Degradación Forestal (ENDE-REDD+) -TF099264. Dirección General de Cambio Climático, Ministerio del Ambiente y los Recursos Naturales. 2017. 125 p.
MARENA 2015. Emission Reductions Program Idea Note (ER-PIN). Version 1. August 26, 2015

Risk Factors	Mitigation strategies [84]
vertical/inter-sectoral coordination	aimed at improving vertical and horizontal institutional and policy coordination (see enabling conditions in Section 4.3.), including the strengthening of the Working Group I, the Production, Consumption, and Commerce cabinet, the SDCC, the formulation of shared indicators at different government levels, and the formulation, implement, and monitoring of the Strategy and Plan For Development of the Caribbean Coast and its incorporation into development plans of regional and territorial governments. coordination of institutional programs and projects and the private sector. ✓ Planned road construction will be considered at the Production, Consumption, and Commerce level and could be addressed through the implementation of rigorous Environmental Impact Evaluations and their recommendations. ✓ Nevertheless, coordination by the Presidency may be incomplete due to diverging ministerial agendas. These difficulties are apt to most affect migration, the resolution of land use conflicts, and enforcement of laws and regulations, but impacts on the direct interventions related to agriculture and forestry production and off-farm employment creation will be reduced due to greater clarity with respect to mandates and operational plans. ✓ With regards to institutional capacities, technical training of institutional personnel, especially in the Caribbean region, will be continued and strengthened. ✓ Greater resource acquisition, especially private sector investments, have been incorporated in Program design via the strengthening of PRONicaribe, negotiation of credits from multi-ateral banks and participation in international environmental donor programs.
Lack of long term effectiveness in addressing underlying drivers of deforestation.	✓ The Government of Nicaragua has defined the conservation of the country's forests and the recovery of degraded areas in harmony with economic development among its priorities and has incorporated these goals in a number of policies, strategies, and plans: the National Human Development Plan (PNDH), the General Territorial Planning Policy, the General Land Policy Framework, the National Policy for Sustainable Development of the Forestry Sector, the National Strategy for Climate Change, the Agro-ecological Strategy, the Development Strategy of the Caribbean Coast

Risk Factors	Mitigation strategies [84]
	and the Alto Wangki and Bocay, the Production, Consumption and Commerce Plan 2016-2017, the National Forestry Program, the National Reforestation Plan, the National Forest Fire Prevention and Control Plan, and the Bovine Livestock Conversion Program[85] (see Section 4.5 and enabling conditions in Section 4.3.) ✓ Interventions are designed to contribute to a new, more sustainable economic model based on increases in the value of the natural forest, the promotion of "green" investments and sustainable production systems, and improvements in the institutional and economic enabling conditions and policy application needed in order to establish a firm base for forest conservation and sustainable economic development while increasing income and employment. ✓ Intensified and more productive farming systems based on self-sustaining structural changes (access to credit and AT) and that include on-farm conservation as a necessary condition will lessen pressure on forests as well as directly avoid deforestation on-farm. ✓ The creation of significant off-farm employment opportunities through the investment promotion program is expected to causes long-term economic changes in the Caribbean Coast that will reduce the need for deforestation. ✓ Increased institutional capacities to monitor and control land and forest use will also help reduce deforestation in the long-term.
Exposure and vulnerability to natural disturbances	✓ The national fire prevention and control program has proven effective in reducing forest fires and will be strengthened in the Caribbean region. ✓ The Program will coordinate with the National System for Disaster Prevention, Mmitigation, and Attention, Civil Defense, INAFOR, and other relevant entities in planning and responding to the aftermath of hurricanes. ✓ Other types of disasters will be monitored to report any reversals due to natural phenomena, and to improve the effectiveness of previous actions during and after the events.

[85] MARENA. 2017. La Identificación y Análisis de Intervenciones Para Reducir las Emisiones de Deforestación y Degradación Forestal en la Costa Caribe de Nicaragua.

11.3 Reversal management mechanism

Table. 71 Selection of Reversal management mechanism

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

For option 2, explanation of Reversal management mechanism

In order to deal with the unforeseen risks, 22% of the avoided emissions from deforestation will be used as buffer reserves, equivalent to 3.9 Mt CO_2e, assuming net emission reductions of 18.5 Mt CO_2e (see Section 13).

11.4 Monitoring and reporting of major events that could lead to reversals of ERs

Vigilance of the occurrence of potential reversals will be carried out through the National Forest Monitoring System, within the framework of ENDE-REDD+. Considering that the risk of reversals is closely related to Institutional capacities to monitor and control deforestation in the accounting area, an early warning mechanism will be established with the SERENA, the ITGs, communal governments, and national agencies (MAG, INETER and INAFOR) (see Section 9), in combination with local monitoring.

The MRV System is in the process of installing this system. When reversals are detected, the Carbon Fund will be notified within the time limit described in the Methodological Framework.

With respect to the monitoring of forest fires, MARENA and INAFOR are in charge of registering the incidence of forest fires nationwide. This forest fire monitoring system provides the government with the information necessary for the operation of an early warning system, which allows immediate implementation of mitigation measures for forest fire reversals.

12. Uncertainties of the Calculations of Emission Reductions

12.1 Identification and assessment of sources of uncertainty

The methodology used to quantify emissions in the accounting area includes a global analysis of uncertainty based on the guidelines of the IPCC (2006). According to the Carbon Fund´s Methodological Framework, the Program should quantify the uncertainty associated with the reference level and attempt to minimize it whenever possible.

A Monte Carlo simulation was used to quantify the uncertainty associated with the emissions reductions and removals. The underlying sources of error in the data and measurements of deforestation and Enhancement in carbon stocks were combined in estimations of uncertainty based on a 95% two-sided confidence interval.

The two principal sources of uncertainty are the errors related with activity data and emission or removal factors. The combination of these two sources of error generates the uncertainty associated with the emissions calculations reported.

Activity Data

The activity data analysis (deforestation, forest gain, forest degradation) has been conducted using a systematic grid of visual assessment plots nested in the National Forest Inventory net. The 10'x10' 2007-08 National Forest Inventory net (371 clusters x 4 plots) was intensified within the accounting area, so a 2.5'x2.5' grid (4.5 - 4.8 km approx.) was prepared for the visual assessment exercise.

The potential sources of uncertainty in the visual assessment of the systematic grid are associated to i. sample size (systematic grid density), ii. interpretation of the LULC and iii. quality of the images available to assess the LULC.

Sample size: The number of sampling plots of the systematic grid is 3082, which is larger than the estimated sample size (stratified random sampling method) for the accounting area (1215 sampling plots - 23 classes, error standard of the estimated global precision S (ô) = 0.01). In the visual assessment exercise, 2896 points with land cover information were obtained in 2005 and 2015. The 186 points of difference, to complete the 3082 original points, correspond to the unanswered plots, due to the absence of images, cloud cover or presence of bodies of water. It should be noted that the unanswered points are distributed throughout the accounting area.

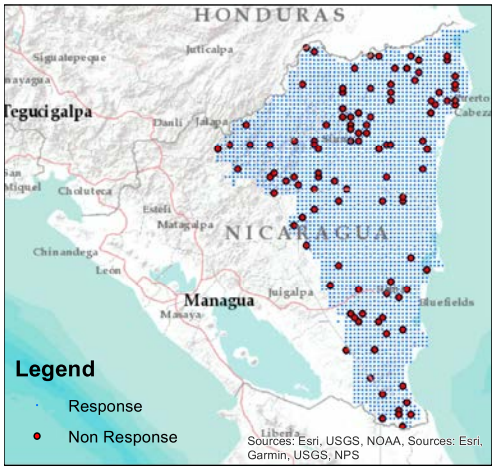
Photo-interpretation of the coverage: this bias was controlled through the standardization of criteria and the establishment of decision trees for the visual assessment of high and medium resolution images. The variability between photo-interpreters was minimized by training exercises using common samples, until achieving the expected consistency. An

independent validation was carried out by INAFOR through the verification of the LULC interpretation using reference data obtained in the field in 2008 by the NFI (207 sampling units) and the re-measurement of NFI plots (69 sampling units) performed in 2005. Figure 42 shows the distribution of the sample of visual assessment plots between photo-interpreters and Figure 43 shows the level of consistency achieved among interpreters, by comparing the estimates of change areas resulting from each sub-sample.

Image quality: The availability of high-resolution images was not the same for 2005 and 2015. 2015 has higher availability of high-resolution images. To minimize the error in the land cover assessment for 2005, supporting information was used, such as NDVI estimation and ecosystem maps. The discrimination between broadleaf and pine forests was carried out with the support of high-resolution images of later dates.

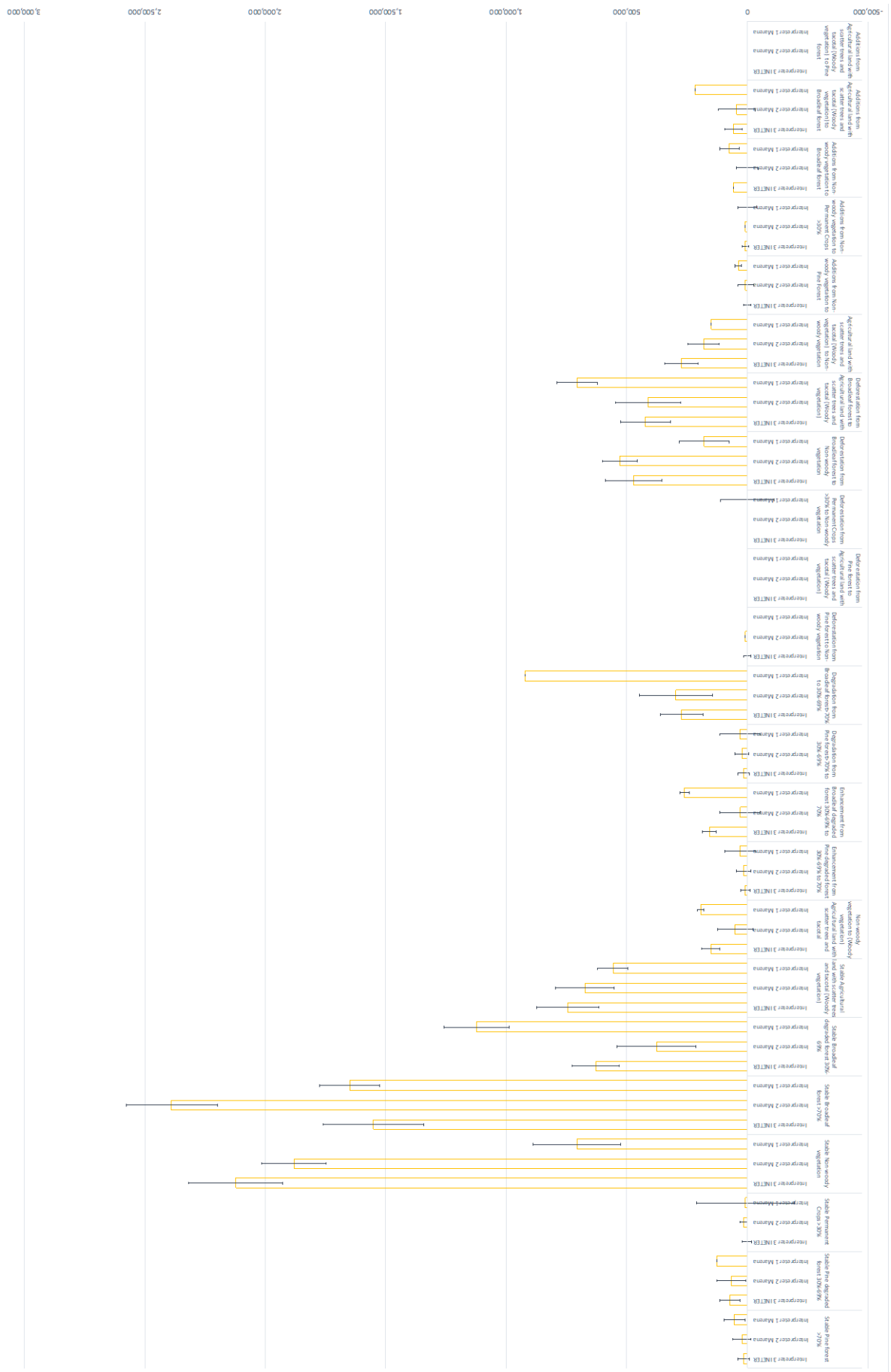
Finally, the estimation of the LULC change area of each category "k" and its respective confidence intervals are calculated according to $\hat{A}_k = A\ \hat{p}_k$, where A is the total map area and $\hat{p}_k = \frac{n_k}{n}$, where n_k is the number of the k category plots, and n the total number of assessed plots. The standard error of the estimated area is calculated as $S(\hat{A}_k) = A\ S(\hat{p}_k)$. The 95% confidence interval is calculated as $\hat{A}_k \pm 1.96\ S(\hat{A}_k)$, where $S(\hat{A}_k) = A\sqrt{\frac{\hat{p}_k(1-\hat{p}_k)}{(n-1)}}$.

Figure. 42 Non-response plots and systematic grid plots distribution (3082) among the photo-interpreters responsible for the multitemporal visual assessment of the LULCC 2005-2015 in the accounting area.



d points

Figure. 43 Comparative graph of the estimation of the land coverage change for each one of the photo-interpreters



Emissions Factors

Deforestation EF

Since emissions are calculated as the difference between two estimates of average carbon stocks per hectare, the uncertainty of emissions is determined essentially by the errors associated with estimates of the carbon stocks in each compartment in each year of the reference period. These errors (Cunia, 1987) are associated with the following: i) measurement errors (for example, tree diameter at breast height (DBH) measurements on field), ii) prediction errors of the allometric equations used to estimate biomass; these errors are due to uncertainty related to model residuals and model parameters, and iii) sampling error. In addition, there are errors associated with the different parameters used in the estimation of emissions, such as the carbon fraction of the material in question.

At present, Nicaragua has not developed biomass tree allometric equations at the national or regional levels and therefore a global allometric model has been selected. Global allometric models are unbiased on a global scale (pantropical), but may have bias when working on a local, regional or national scale. The equation of Chave et al. (2014) has been selected instead of other alternatives such as Brown (1997) equation.

The Chave et al. (2014) biomass equations were produced using a global database of destructively harvested trees at 58 sites, spanning a wide range of climatic conditions and vegetation types. The mean bias of this global allometry was +5.31% across all sites (Chave et al., 2014). According to the authors, this model tended to substantially overestimate total site-level AGB at seven sites (bias > 30%) and underestimate it (bias < 30%) at one site. This allometric equation typically achieves 90% accuracy in AGB stock estimation at a 0.25 ha scale in a moist tropical forest (Chave et al., 2014).

In order to test the performance of the selected global equation in the accounting area, the Chave et al. (2014) equation was compared with the equation calibrated by Moraes 2001 in forest sites of the municipality of San Carlos, Nicaragua. Results of this comparison show that the emission factor based on the Chave equation, 63.01 t C/ha for broadleaf forests, are very similar to the value, 64.33 t C/ha, obtained with Moraes´ equation, with a difference of only 2%.

We considered the mean, its standard deviation and the underlying distribution of the data (probability distribution function) of the emission factors for the estimation of the uncertainty of the reference level; the uncertainty associated with the measurements, the parameters and the allometric equation of the biomass were not taken into account in the estimation of the error by the Monte Carlo method.

The following Table shows emission factors and sampling errors for each REDD+ land cover class.

Table. 72 Estimates of emission factors, associated sampling errors and underlaying distribution data

REDD class	EF: Mean AGB+BGB (t d.m./ha)	#sample units	S.D. (t d.m./ha)²	Student t	Error %	EF (t C/ha)	Standard error (t C/ha)	Probability density function	p value reject Ho
BL_70	115.54	26	108.998	2.06	38%	54.30	10.05	Exponential	0.45
BL_30-69	102.7	98	71.446	1.98	14%	48.27	3.39	Weibull (2)	0.67
P_70	63.23	Model		1.98	22%	29.72	3.33		
P_30-69	34.32	25	33.754	2.06	41%	16.13	3.17	Negative binomial	0.81
PC_30	45.51	35	54.672	1.97	41%	21.39	4.34	Negative binomial	0.50
WV	24.25	357	26.854	1.97	12%	11.40	0.67	Weibull (2)	0.52
NWV	8.6	366	17.837	1.97	21%	4.04	0.44	Weibull (2)	0.32

Where BL_70 is Broadleaf forest >70%, BL_30-69 is Broadleaf degraded forest 30-69%, P_70 is Pine forest >70%; P_30-69 is Pine degraded forest 30-69%, PC_30 is Permanent crop > 30% canopy cover, WV is Woody vegetation and NWV is Non-woody vegetation. The p-value corresponds to the estimated probability to reject the null hypothesis (Ho: the distribution of the data follows a certain distribution), which must be less than p = 0.05.

Degradation EF

Emissions from forest degradation have been assessed by relating forest cover loss to the loss of biomass (hence emissions) at these visual assessment points. In order to estimate biomass loss associated with degradation in Broadleaf forest, INF forest plots were stratified into 3 categories based on forest cover: open forest, dense forest, and very dense forest (Table 49). In each category, biomass was estimated using the equation of Chave et al (2014). Biomass was then related to forest cover using a linear regression shown in Figure 37. This regression was subsequently applied at each visual assessment plot in order to estimate the loss of biomass. In the case of pine forests, the loss or gain of biomass due to degradation was estimated using the model presented in Figure 37.

There is a close relationship between the percentage of canopy cover and AGB-BGB for both broad-leaved forests and pine forests in the accounting area. In both cases the % of canopy cover and biomass relationships were constructed with data from INF plots. However, the small number of sample units in pine forest (n = 14) raises the error in estimating the net change in the carbon stock due to the loss of canopy cover (see RMS in Table. 73).

Table. 73 Linear regression model used to estimate biomass loss/gain in lands that remains as forest in ER-P accounting area

Forest type	Coefficient (tC/ha)	intercept (tC/ha)	RMS	AGB max (tCO2/ha)
Broadleaf forest	34.963	0.000	16.466	74.5
Pine	63.530	22.521	35.327	330.8

The limits of confidence in the net gains / losses factors due to degradation were estimated with the Monte Carlo method, carrying out 10,000 iterations of the estimated average change in AGB (losses and gains)and using the mean square error (RMS) of the adjusted model, thus truncating the randomization of intervals [0, maximum AGB value] (Table. 74).

Table. 74 Confidence limits for degradation factors of Broadleaf and Pine Forest in ER-P accounting area

Degradation Factor	Mean	Confidence interval
	t C/ha	t C/ha
Average net change in carbon stock of Broadleaf Forest	-9.48	-13.33 - -4.47
Average net change in carbon stock of Pine Forest	0.28	-5.98 – 5.98

Removal Factors

The mean annual increment of forest biomass has been estimated based on the study of Mascaro et al. (2005) of regeneration of new forests in the Bluefields region on the Atlantic coast of southern Nicaragua. This study estimated growth rates at 4 sample sites and a total of 12 plots. Only the 10 plots with reported standard errors were used for estimating the removal factor (Table 73), using the average biomass mean annual increment of the plots (3.41 t C/ha ± 1.02 SE). This annual biomass increment was considered the annual removal factor in broadleaf forest for the enhancement reference level.

The mean annual increment of biomass of conifer forests assumed that the average age of coniferous forests is 33 years old. This assumption is based in work carried out in Nueva Segovia, Nicaragua (Calderón and Solís, 2012). Both the removal factor and its uncertainty were calculated by dividing the coniferous emission factor and its uncertainty by 33. This annual mean biomass increment was considered the annual removal factor in conifer forest in the reference level for enhancement.

The Removal factor of new tree shaded perennial crops has been calculated based on Poveda et al (2013)[86] data from plots of cocoa agroforestry systems sited in Waslala, Nicaragua. The Removal factor has been estimated as an average of the mean annual AGB-BGB increment in 50 plots. The Poveda study measured coco-AFS plots in only one region of Nicaragua (Waslala), very close to west boundary of accounting area. Cococa AFS of the program area could develop differently depending on precipitation and site quality, and this variability may not be represented in Povedas´s data

[86] Poveda, V., Orozco, L., Medina, C., Cerda, R., & López, A. (2013). Almacenamiento de carbono en sistemas agroforestales de cacao en Waslala, Nicaragua. Agroforestería en Las Americas, 49, 42–50.

The following table shows the removal factors and their uncertainties:

Table. 75 Summary of the removal factors, uncertainties and information sources.

Parameter	Value	Standard error	Source
SR_{BL}	3.4 t C/year	1.02 t C/year	Mascaro et al. 2005
SR_{P}	0.90 t C/year	0.10 t C/year	Calderón and Solís 2012 and coniferous emission factor from INF
SR_{PC}	2.57 t C/year	0.44 t C/year	Poveda et al. 2013

SR_{BL} is the removal factor in the activity additions due to new broadleaf forest, SR_{P} is the removal factor in the activity additions due to new Conifer forest and SR_{PC} due to new tree shaded perennial crops.

12.2 Quantification of uncertainty of the Reference Level

In order to predict the global uncertainty of the reference level, two different sources of error were considered: 1) the uncertainty of the activity data, and 2) sampling error related to the estimation of the emission factors. The propagation of these two sources of error was performed using Monte Carlo simulation by the propagate procedure of XLSTAT[87]. In order to perform the simulation and quantify the total emissions due to forest loss from the accounting area as well as the associated uncertainty, the expression that relates both groups of variables (activity data and emission factors) was defined.

Uncertainty of Deforestation REL

In the case of the reference level for deforestation, the following land cover transitions were considered:

- A_{DBL70_WV}: Deforestation from Broadleaf forest >70% canopy cover to Woody vegetation (ha)
- A_{DBL70_NWV}: Deforestation from Broadleaf forest >70% canopy cover to Non-woody vegetation (ha)
- $A_{DBL39\text{-}69\_WV}$: Deforestation from Broadleaf degraded forest 30-69% canopy cover to Woody vegetation (ha)
- $A_{DBL39\text{-}69\_NWV:}$ Deforestation from Broadleaf degraded forest 30-69% canopy cover to Non-woody vegetation (ha)
- A_{P70_NWV}: Deforestation from Pine forest >70% canopy cover to Non-woody vegetation (ha)

The results of the areas and their confidence interval are shown in the following Table. 76.

[87] XLSTAT 2017: Data Analysis and Statistical Solution for Microsoft Excel. Addinsoft, Paris, France (2017)

Table. 76 Estimated areas and confidence interval for the forest conversions.

Activity Category	Standard error (ha)	Confidence Interval (95%)
AD_BL_70-WV	20,166	132,492 - 211,545
AD_BL_70-NWV	22,011	162,797 - 249,078
AD_BL_30-69-WV	27,970	284,369 – 394,012
AD_BL_30-69-NWV	21,111	147,600 – 230,355
AD_P>70-NWV	2,422	-2,326 – 7,171

For each of the vegetation categories involved in these conversions (broadleaf forests, conifer forests, woody and non-woody vegetation), the average carbon content (including above and below ground biomass) and its underlaying data distribution were estimated (Table. 77).

Table. 77 Emission factors for land use categories.

Category	Carbon content (t m s/ha) Data		PDF estimate		Probability density function	PDF Parameters
	Mean	Variance	Mean	Variance		
CD_{BL_70}	115.536	11880	115.536	0	Exponential	$\lambda = 0.0087$
CD_{BL_30-69}	102.697	5105	101.786	5998	Weibull (2)	$\beta = 1.327, \gamma = 110.651$
CD_{P_70}	63.230	50			*Normal*	$\mu = 63.23, \sigma = 7.08$
CD_{P_30-69}	34.321	1139	36.173	1201	Negative binomial	$k = 1.124, p = 32.196$
CD_{PC_30}	45.506	2989	44.833	2945	Negative binomial	$k = 0.693, p = 64.685$
CD_{WV}	24.247	721	24.235	778	Weibull (2)	$\beta = 0.871, \gamma = 22.615$
CD_{NWV}	8.597	0.44	8.597	307	Weibull (2)	$\beta = 0.535, \gamma = 4.833$

where CD_{BL70} is Carbon density of Broadleaf forest > 70% canopy cover, $CD_{BL30-69}$ is Carbon density of Broadleaf forest 30-69% canopy cover, CD_{P30-69} is Carbon density of Pine forest >70% canopy cover, CD_{WV} is Carbon density of Woody vegetation and CD_{NWV} is Carbon density of Non-Woody vegetation.

The expression used to estimate the emissions due to deforestation and their uncertainty via the Monte Carlo simulation is:

$$E = 0.47 * \frac{44}{12} * \frac{1}{10}\left[A_{\mathrm{DBL70-WV}} * [CD_{BL70} - CD_{WV}] + A_{\mathrm{DBL70-NWV}} * [CD_{BL70} - CD_{NWV}] + A_{\mathrm{DBL30-69-}WV} * [CD_{BL30-69} - CD_{WV}] + A_{\mathrm{DBL30-69-NWV}} * [CD_{BL30-69} - CD_{NWV}] + A_{DP30-69-NWV} * [CD_{P30-69} - CD_{NWV}]\right]$$

Monte Carlo analysis has been carried out on the assumption that errors in both emission factors and activity data are independent and follow a normal distribution.

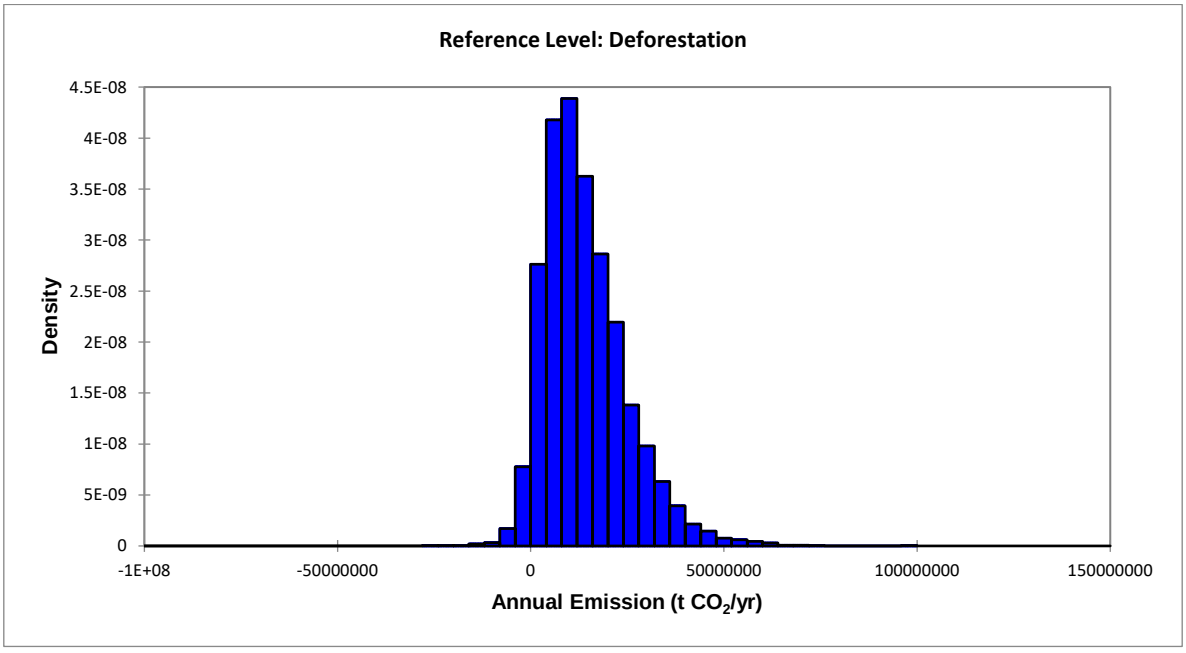
The total emissions due to deforestation and their uncertainty are shown in Table. 78and the Figure below. It is relevant to note that the final distribution of the Monte Carlo results for the deforestation RL is not normal (Figure 44). The confidence limits and the error for the mean and the median are estimated.

Table. 78 Estimated total emissions due to deforestation and their uncertainty.

Parameter	Emissions ($t CO_2/yr$)	SD ($t CO_2/yr$)	5% ($t CO_2/yr$)	95% ($t CO_2/yr$)	Error (90%)
Mean	14,106,317	10,740,130	13,895,778	14,316,856	1.49%
Median [a]	12,190,997		11,956,643	12,446,667	2.01%

[a.] The confidence intervals of the median are estimated by re-sampling 1000 samples with bootstrapping

Figure. 44 Frequency distribution. Results from the Monte Carlo simulation to estimate the deforestation REL uncertainty.



Uncertainty of Carbon Removals REL

In the case of enhancement of carbon stocks in secondary forests and new tree shaded permanent crops, four classes of additions have been considered: i. regeneration of broadleaf forests from woody vegetation (Add_WV_BL), ii. regeneration of broadleaf forests from non-woody vegetation (Add_NWV_BL), iii. regeneration of conifer forests from non-woody vegetation (Add_NWV_P) and iv. establishment of tree shaded perennial crops

with more than 30% of canopy cover (Add_NWV_PC). Carbon removal is calculated by the following equation:

$$R = \frac{44}{12}\left[5 * SR_P \frac{Add_{NWV-P}}{10} + 5 * SR_{BL} \frac{Add_{WV-BL} + Add_{NWV-BL}}{10} + SR_{PC} \frac{Add_{NWV-CP}}{10}\right]$$

where,
R is the removal of carbon in the reference period in t CO_2
Add is the annually area converted from non-forest land to secondary forests or tree shaded permanent crops in the period 2005-2015 (ha/yr)
SR is the sequestration rate (t CO_2/ha yr).

Values and errors associated with these parameters are included in Table. 79.

Table. 79 Activity data and removal factors for new forests.

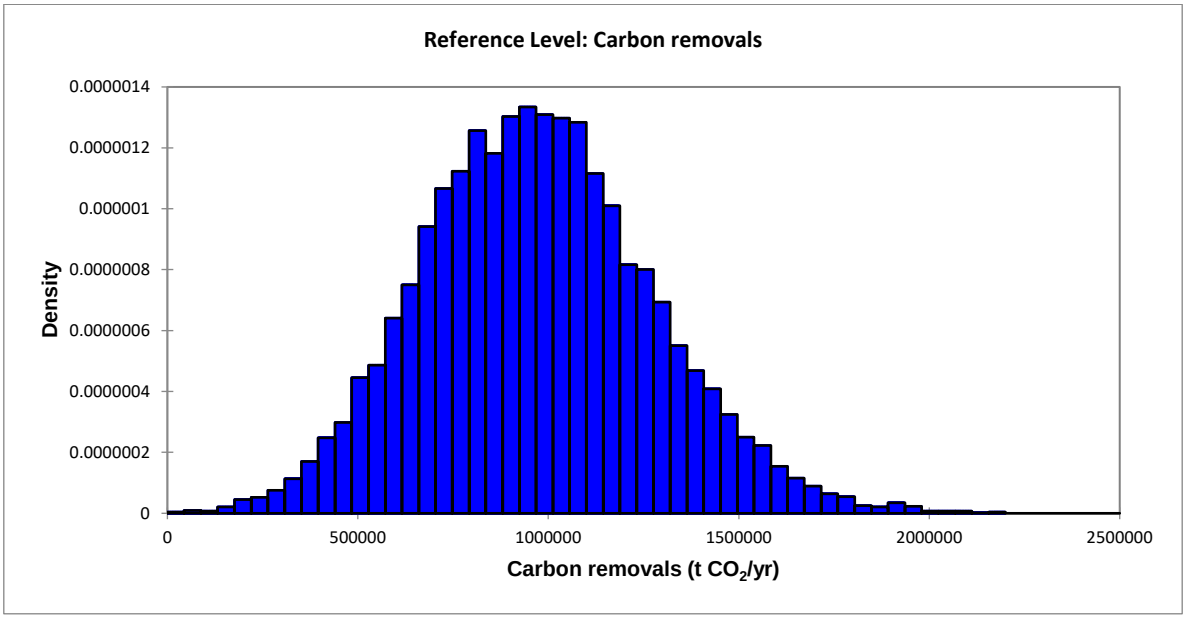
Parameter	Value	Standard error	**Probability density function**
SR_{BL}	3.40 t C/year	1.02 t C/year	Normal
SR_P	0.90 t C/year	0.10 t C/year	Normal
SR_{PC}	2.57 t C/year	0.44 t C/year	Normal
Add_{WV-BL}	140,180 ha	15,772 ha	Normal
Add_{NWV-BL}	46,610 ha	10,249 ha	Normal
Add_{NWV-P}	14.537 ha	5,929 ha	Normal
Add_{NWV-CP}	4,846 ha	3,426 ha	Normal

Total removals by new forests and the associated uncertainty are shown in Table. 80 and the Figure. 45 below.

Table. 80 Total carbon removal by new forests in the accounting area.

Average Removal **(t CO_2/yr)**	Standard Deviation **(t CO_2/yr)**	Confidence Interval **(t CO_2/yr)**		Error 90%
		5%	95%	
970,612	302,216	964,687	976,536	0.61%

Figure. 45 Frequency distribution. Results from the Monte Carlo simulation to estimate the carbon removals REL uncertainty.



Uncertainty of Degradation REL

In the case of the reference level for degradation, the following parameters were considered: i. $A_{Deg\text{-}BL}$: Area of Broadleaf forest degraded or recovered (ha), ii. $A_{Deg\text{-}BL}$: Area of Pine forest degraded or recovered (ha), iii. ASC_{BL}: Average change in carbon stock of permanent Broadleaf Forest, and ASC_P: Average change in carbon stock of permanent Pine Forest. Emission from degradation is calculated by the following equation:

$$D = \frac{44}{12} * \frac{1}{10}\left[A_{\mathrm{Deg-BL}} * ASC_{BL} + A_{\mathrm{Deg-P}} * ASC_P\right]$$

Activity data and Emission factors used to estimate uncertainty for degradation RL are shown in Tables 71 and 80.

Table. 81 Activity data for Degradation

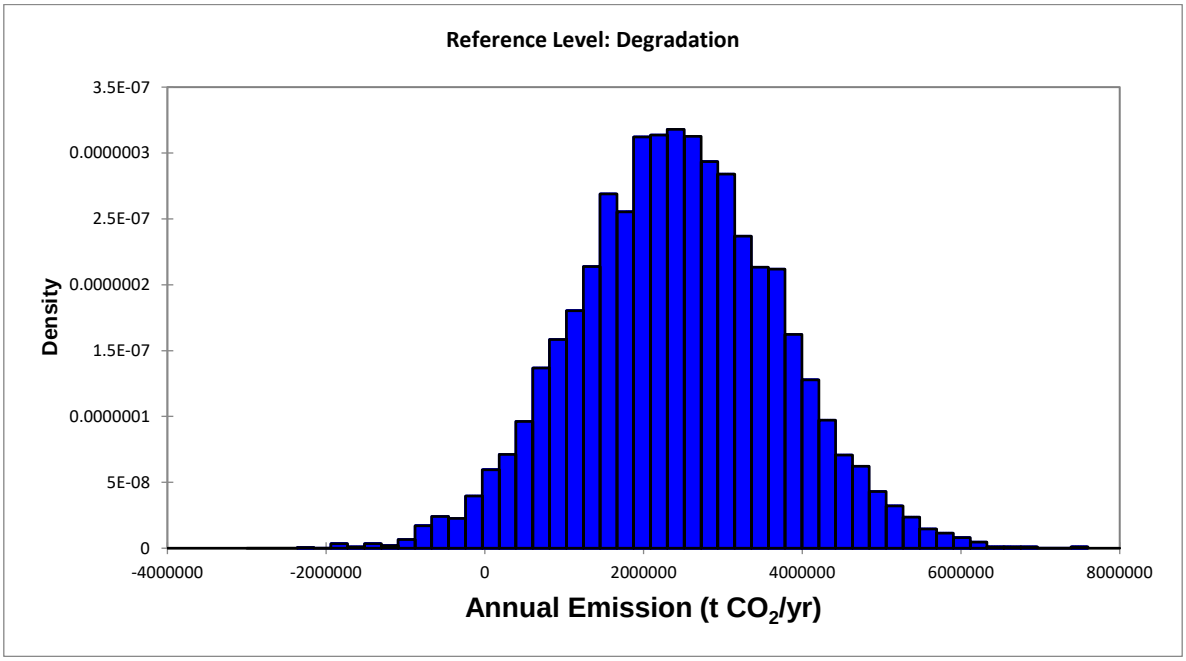
Activity Data	Area (ha)	Standard error (ha)	Confidence Interval (95%)
Deg_BL	700,187	39,085	623,580 – 776,794
Deg_P	67,838	12,760	42,828 – 92,848

Total emission from degradation and the associated uncertainty are shown in Table 80 and the Figure 45 below.

Table. 82 Total emission from degradation and the associated uncertainty

Emissions (Mean) (t CO_2/yr)	Standard Deviation (t CO_2/yr)	Confidence Interval (t CO_2/yr)		Error 90%
		5%	95%	
2,424,580	1,268,285	2,399,718	2,449,442	1.03%

Figure. 46 Frequency distribution. Results from the Monte Carlo simulation to estimate the degradation REL uncertainty.



Uncertainty of Reference Level

Error propagation has also been carried out considering emissions from deforestation, degradation and removals. For this purpose, the following expression, which includes the calculation of emissions and removals for three reference levels, has been considered:

$$E_{net} = E + D + R$$

Where E_{net} is the net annual emissions (in t CO_2/yr) for the historical reference period, *E* is deforestation REL, *D* is degradation REL and *R* is carbon removal REL.

The total net emissions considering reference levels of deforestation, degradation and enhancement of carbon stocks are included in Table 81. It is relevant to note that the final distribution of the Monte Carlo results for the deforestation RL is not normal (figure 46). The confidence limits and the error for the mean and the median are estimated.

According to the Monte Carlo analysis, the overall uncertainty is estimated at 1.56% (Table. 83) This analysis takes into account 23 variables (distributions), of which 5 contribute to 98.86% of the variations in the results (Table 82). i. 49% -EF Broadleaf degraded forest 30-69% (EF_{BL_30-69}), ii. 42% - EF Broadleaf forest >70% (EF_{BL_70}), iii. 5% - EF Woody vegetation (EF_{WV}) and iv. 1% - Average net change in carbon stock of Broadleaf Forest (ASC_{BL}).

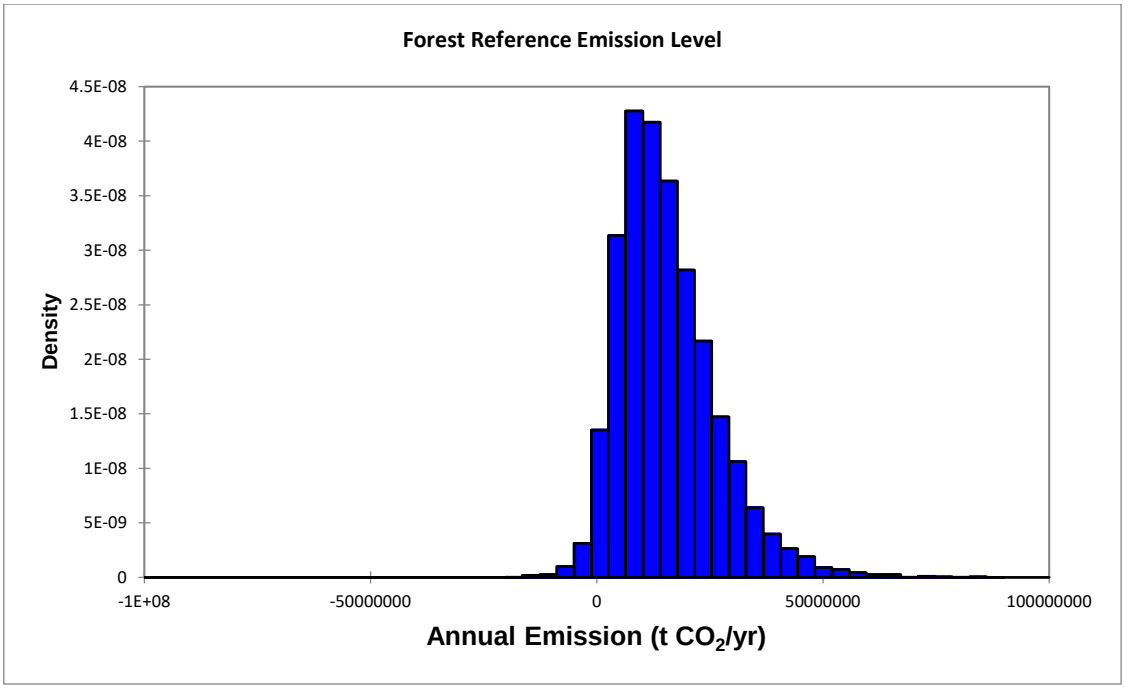
The calculations report for NREF uncertainty in the ER Program can be accessed at the following link:
http://www.marena.gob.ni/Enderedd/etapas/programa-de-reduccion-de-emisiones/ .

Table. 83 Total net emission in the accounting area.

	Net Emissions (t CO_2/yr)	SD (t CO_2/yr)	Confidence interval (t CO_2/yr)		Error 90%
			5%	95%	
Mean	15,572,701	10,830,608	15,360,389	15,785,013	1.36%
Median [a]	13,769,639		13,544,180	13,974,911	1.56%

[a.] The confidence intervals of the median are estimated by re-sampling 1000 samples with bootstrapping.

Figure. 47 Frequency distribution. Results from the Monte Carlo simulation to estimate the emissions REL uncertainty.



The estimation of the uncertainty was quantified from the confidence intervals obtained from 10,000 simulations, as recommended by McMurray et al. (2017). According to the authors, the low uncertainties reflect the firm results produced by the simulations, which are based on the form and scope of the underlying data (that is, the adjusted PDFs), in which the uncertainties are combined and modeled. Also, the fundamental reason for the low uncertainties is the large number of simulations executed (10,000), which inevitably leads to small confidence intervals. The simplest solution to this problem would be to limit the number of simulations. However, the authors do not recommend this, since low simulation numbers (for example, 100 or even 1,000) probably do not lead to stable and reliable distributions. And the number of simulations (and, therefore, the sample size) would be more arbitrary than the most commonly selected value of 10,000.

Table. 84 Results of the sensitivity analysis

Parameter	Correlation	Contribution	Contribution (Absolute)
EF Broadleaf degraded forest 30-69% (EF_{BL_30-69})	0.653	49.41%	49.41%
EF Broadleaf forest >70% (EF_{BL_70})	0.605	42.29%	42.29%
EF Woody vegetation (EF_{WV})	-0.211	-5.16%	5.16%
Average net change in carbon stock of Broadleaf Forest (ASC_{BL})	-0.111	-1.43%	1.43%
Other distributions			1.14%

Adjustment of uncertainty by groupings of non-forest cover categories:

To calculate the NREF the EF for woody vegetation and non-woody vegetation were grouped together. This affects only the estimates for deforestation emissions. The uncertainty resulting from this grouping together of non-forest cover categories is estimated using a Monte Carlo analysis with 1001 iterations, in which the contribution in terms of area for the different types of cover found under the categories of woody and non-woody are taken into account. Considering the percentile 5% and 95% of the number of estimates obtained through the iterations, a bias of $tCO2*yr^{-1}$ was obtained. Upon adding the bias caused by the grouping together of the non-forest cover categories and overall uncertainty, it is estimated that the total NREF uncertainty is of 14% (see Table 82). The calculation report for this analysis can be acceded at the following link: http://www.marena.gob.ni/Enderedd/etapas/programa-de-reduccion-de-emisiones/

Table. 85 Ajuste de la incertidumbre por agrupación de categorías de cobertura no forestal

FREL	Confidence interval	Adjusted Confidence Interval
Lower Limit	13,544,180	11,882,997
Upper Limit	13,974,911	15,636,094
Median	13,769,639	13,769,639
Uncertainity	1.56%	14 %

13. Calculation of Emission Reductions

13.1 Ex-ante estimation of the Emission Reductions

The ER-P is expected to generate 13,69 Mt CO_2e of emission reductions and 1.56 Mt CO_2e removals, with a total balance of emission reduction/removals of 14.32 Mt CO_2e (see Table below). Excluding the calculated 4%[88] uncertainty factor and the 22% buffer (as quantified under Sections 11 and 12), the net *ex-ante* estimated GHG emission reductions amount to 11 Mt CO_2e during 5 years.

[88] Given the 14% uncertainty for deforestation and forest carbon stock enhancement, the conservativeness factor, according to the Methodological Framework, is 4%.

Table. 86 Ex-ante estimation of the ERs expected from the ER Program.

Net Reference emission level (tCO2e/yr)	Reference level annual GHG emissions+ (deforestation and degradation) (tCO2e/yr)	Reference level GHG removals (tCO2/yr)	Estimation of expected emissions under the ER Program (tCO2e/yr)	Estimation of expected removals (tCO2e/yr)	Estimation of total expected emissions (incl. removals) under the ER Program (tCO2e/yr)	Total Estimated net Emission Reductions /carbon removal benefit [A] (tCO2e/yr) (without setaside)	Expected setaside to reflect the level of uncertainty associated with the estimation of ERs during the Term of the ERPA (4%) [B=A*0.04] (tCO2e/yr)	Expected setaside buffer to reflect the level of reversal risks (22%) [C=D*0.22] (tCO2e/yr)	Total Estimated net Emission Reductions /carbon removal benefit [D=(A-B)/1.22] (tCO2e/yr)
15,630,067	16,600,789	-97,072	14,188,209	-221,739	13,966,470	1,663,597	66,544	287,993	1,309,060
15,630,067	16,600,789	-291,217	14,210,057	-665,217	13,544,841	2,085,226	83,409	360,983	1,640,834
15,630,067	16,600,789	-485,361	13,637,305	-1,108,694	12,528,611	3,101,456	124,058	536,908	2,440,490
15,630,067	16,600,789	-679,505	13,658,740	-1,552,172	12,106,567	3,523,500	140,940	609,970	2,772,590
15,630,067	16,600,789	-873,650	13,679,970	-1,995,650	11,684,321	3,945,746	157,830	683,067	3,104,850
78,150,334	**83,003,944**	**-2,426,805**	**69,374,282**	**-5,543,472**	**63,830,810**	**14,319,525**	**572,781**	**2,478,921**	**11,267,823**

14. Safeguards

14.1 Description of how the ER Program meets the World Bank social and environmental standards and promotes and supports the safeguards included in the REDD+ - related UNFCCC guidance

Both the United Nations Framework Convention on Climate Change (UNFCCC[2]) and the World Bank have defined social and environmental conditions or criteria, known as safeguards, that must be taken into account in order to prevent or mitigate possible negative impacts and increase positive impacts on ecosystems and communities during the implementation of interventions intended to reduce greenhouse gas emissions due to deforestation or forest degradation.

The UNFCCC safeguards, known at the REDD+ Safeguards or the Cancun Agreements (Annex 14 to decision 1/CP.16). They refer to the measures that are already regulated by the different international instruments that form an international framework of environmental, social, and governance principles, to which the REDD+ activities must comply. The REDD+ safeguards are as follows:

a) REDD+ actions must complement or be consistent with the objectives of national forest programs and relevant international conventions and agreements;
b) National forest governance structures must be transparent and effective and should take into account national legislation and sovereignty;
c) The knowledge and rights of indigenous peoples and members of local communities must be respected, taking into account relevant international obligations, national circumstances and laws, and the United Nations Declaration on the Rights of Indigenous Peoples;
d) There must be full and effective participation of relevant stakeholders, in particular indigenous peoples and local communities;
e) REDD+ measures must be compatible with the conservation of natural forests and biological diversity, ensuring that they are not used for the conversion of natural forests, but that they serve, instead, to encourage the protection and conservation of these forests, the services derived from these ecosystems, and the enhancement of other social and environmental benefits;
f) Actions must be taken to reduce displacement of emissions.

Nicaragua assumes these safeguards as a framework of principles for the execution of the ER Program and they are already incorporated in the legal environmental framework of the country.

The World Bank has recently defined a new set of Environmental and Social Standards (ESS), that must be met in the programs and projects with the objective to reduce environmental and social impacts and at the same time, enhance positive outcomes.

The standards are the following:
1: Environmental and Social Impact Risk Evaluation and Management.

Establishes the responsibilities related to evaluation, management and monitoring of the environmental and social risks and impacts associated with each stage of a project supported by the World Bank, with the objective to achieve environmental and social results in accordance with the Environmental and Social Standards (ESS).

2: Work and Labor Conditions.

Written procedures will be prepared and applied for the management of labor for the project. The procedures will establish the manner in which the project workers will be treated in accordance with national laws and the present ESS.

3: Efficiency in the Use of Resources and Pollution Prevention and Management.

Technical measures (and possibly financial) must be implemented to achieve greater efficiency in the use of energy, water, raw materials and other resources. Such measures will incorporate the principles of cleaner production in the design of products and production processes with the objective to conserve raw materials, energy, water, and other resources, and will include the management of chemical products and dangerous materials. When reference parameters are available, the supplier will make a comparison to establish a relative indication of efficiency.

4: Community Health and Safety.

Risks and impacts of the project on the health and safety of the affected communities during the entire project cycle, including those persons who, for their particular circumstances, are vulnerable. The risks and impacts will be identified and a hierarchy of mitigation measures will be proposed.

5: Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement.

Permanent or temporary physical and economic displacement that will result from the acquisition of lands and the restrictions on land use occurring in relation to the execution of the project.

6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.

Adverse impacts on biodiversity and habitats must be avoided. When it is not possible to avoid impacts, measures to minimize them must be implemented, while applying specialized knowledge in the management of biodiversity. Once the risks and adverse impacts are identified, a Biodiversity Management Plan will be developed and implemented.

7: Indigenous Peoples / Historically Neglected Traditional Local Communities from Sub-Saharan Africa.

Contribute to the reduction of poverty and sustainable development, guaranteeing that the projects backed by the World Bank improve the opportunities of the indigenous Peoples to participate in the development process and that they benefit from it, in such a manner that their unique cultural identities nor their welfare are threatened.

8: Cultural Heritage

General arrangements are established regarding risks and impacts on the cultural heritage, understanding as such the tangible or intangible heritage on a local, regional, national, or world level.

9: Financial Intermediaries (FI).

The FI must manage and monitor the environmental and social risks and impacts in their portfolio and those of their sub-projects.

10: Participation of the Interested Parties and Disclosure of Information.

Significant consultations must be held among all the interested parties. Opportune, pertinent, comprehensible, and accessible information must be presented and consulted in a culturally appropriate manner. Access will be provided to raise claims and receive responses.

Environmental and Social Standards and the Legal Framework of Nicaragua

An analysis of the current national and international legislation in the country and its link to the Environmental and Social Standards of the World Bank. In Table 84, there is a synthesis of this analysis, including indications of how the legal framework of Nicaragua specifically addresses each ESS that is implicated in the ER Program. From this analysis, it is concluded that the country contains a solid legal framework which, accompanied by the Environmental and Social Management Framework, will permit compliance with the ESS of the World Bank.

The legal framework of the country for ENDE-REDD+ is founded in the articles 60 and 102 of the Political Constitution of Nicaragua, in which is established the responsibility for a healthy environment, protection of the natural resources, recognition and protection of the different property regimens, recognition of communal property of the indigenous and Afro-descendant communities, promotion of sustainable economic development in harmony with Mother Earth, recognition of the use and enjoyment of natural resources, the primacy of the owners of forests, and the Autonomy of the Autonomous Regions of the Caribbean Coast.

To strengthen this analysis, a systematization of the administrative procedures related to the application of the laws related to the compliance of the ESS of the WB is being conducted. The idea is to be able to identify the existing gaps related to the ESS that affect the ER Program. This systematization has facilitated the formulation of the Environmental and Social Management Framework (ESMF), which will be executed by the ER Program (Table. 87).

Table. 87 Relation between the ESS of the World Bank and the Legal Framework

Environmental and Social Standards (ESS) for the ER Program, and its relation to the legal framework	
Related local regulations	**Provisions of the related local regulations**
ESS 1: Evaluation and Management of Environmental and Social Risks and Impacts	
Law 217 General Law of the Environment and Natural Resources	Nicaragua has clearly defined the reach of the System of Environmental Evaluation, which is defined in the general Law and in specific regulations that dictate the procedures, requisites, and time requirements for the authorization of programs, projects, works, and other activities, according to the environmental impacts. For the activation of the ESS the relevant parts of the Environmental Evaluation System will be applied. Law 217 establishes a Section referring to the System of Environmental Evaluation, containing: Administration of the System by MARENA and the respective Regional Councils; The obligation of the Plans and Programs of Investment and of Municipal and Sectorial Development to execute a Strategic Environmental Evaluation (SEE); Obligation of the projects, works, industries, or any other activity, whether public or private, of national or foreign investments, during the phase of pre-investment, execution, amplification, rehabilitation, or reconversion, if by its characteristics could produce deterioration of the environment or natural resources, must obtain, prior to its execution, Environmental Permit or Environmental Authorization. The fragmentation of works or projects to avoid responsibility of the Study in its entire dimension is prohibited. All natural persons or legal entities that do not comply with the requirements, arrangements, or controls that apply, will be sanctioned by MARENA, without prejudice to the civil or penal actions that are exercised against them, according to the current legislation.
Decree 20-2017. System of Environmental Evaluation in Nicaragua	The System of Environmental Evaluation of Permits and Authorizations for the Sustainable Use of Natural Resources guarantees to the ER Program the procedures and requirements for environmental permits and authorizations for the sustainable use of natural resources. The activities performed in the interventions require environmental permits and authorizations, when the following are involved: Use and working of the soil and terrestrial ecosystems; plans, programs, and projects that cause high, moderate, and low impacts; management plans in protected areas; o Establishes the System of Environmental Evaluation with the administrative controls that regulate permits and authorizations. The System evaluates the technical and scientific activities involved in the identification, prediction, and control of environmental impacts of a

	project and its alternatives, presenting an adequate technical report and executed according to the established criteria by the existing rules.
ESS 2: Work and labor conditions	
The Political Constitution of Nicaragua of 1987 establishes in Chapter III Social Rights and in Chapter V Labor Rights (Arts. 80 – 88). , Law No. 185, Labor Code and Social Security of Nicaragua. Law 476, Law of Civil Service and Administrative Career	In matters of work and labor conditions, Nicaragua contains a Labor Code and social security is a legal instrument of public order by means of which the State regulates labor relations and work relations, establishing minimum rights and obligations of employers and workers. And Law 476, this normative framework regulates the rights and obligations of the project personnel according to the forms of contracts in the public institutions. For the project workers, the Law contemplates the same rights of the Labor Code with exception of the payment for years of service.
ESS 3: Efficiency in resource use and prevention and management of pollution.	
Law 274, Basic Law for the regulation and control of pesticides and toxic, dangerous and similar substances	For ESS 3, Nicaragua has laws for the control of toxic and dangerous substances. To carry out the initial evaluation of a project, pest control must be defined. In this case, it must be done based on the Regulations from Law 274. For this safeguard, special attention will be given to the monitoring and support of the Integrated Crop Management (ICM) and the Integrated Pest Management (IPM). Law 274, the Basic Law for the Regulation and Control of Pesticides and Toxic, Dangerous and Similar Substances, in Article 36 Paragraph 2, establishes as one of the conditions for the registration of the production, composition, storage, re-bottling, re-packaging, transport, marketing, and application as well as the installations for warehouses and storage, sale and distribution sites, to comply with all the legal aspects, including those environmental. Later, Article 38 declares that it must be included in the environmental aspects of the environmental impact Declaration emitted by MARENA. The program requires that the stakeholders implement Agroforestry, Silvopastoral and Reforestation Systems, plantings and plantations, which require the use of pest control during the establishment of forestry nurseries, perennial crops and pastures such as cacao and coffee under shade, or pest control in forestry plantations.
Ley 291, Law No. 291, Basic law on animal and plant health.	
NTON 11037-12, Approved 30 April, 2013. Published in La Gaceta, No. 123, 03 July, 2013.	Nicaraguan Obligatory Technical Normative, characterization, regulation, certification of agro-ecological production units.
ESS 4: Health and Social Security	
Law No. 185 Labor code and social security of Nicaragua. Law No. 337, National System for Disaster Prevention, Mitigation, and Attention (SINAPRED).	The normative framework in labor and social security matters regulates the relations and obligations in social security and occupational health. This normative body establishes minimum guarantees for the workers that are found involved in projects and that within them may be at risk.

Decree 20-2017, System of Environmental Evaluation	Law 337 has as its objective to reduce the vulnerability of the people at risk of disasters from natural or human-provoked events that could endanger the lives of citizens, their possessions, ecosystems and the national economy. Through this law, warnings are activated on the local, regional, departmental, and national levels. And, the System of Environmental Evaluation identifies the impacts, risks, and mitigating actions, for projects that could create them, in the Environmental Impact Study are established measures for the reduction of impacts on the personnel of the project, the nearby communities, and the environment.
ESS 5: Acquisition of Lands, Restrictions on their use, and involuntary resettlement.	
Political Constitution of Nicaragua. Law 28. Autonomy Statutes for the Autonomous Regions of the Caribbean Coast of Nicaragua. Law 445 – Law of Rules of Communal Property of the Indigenous Peoples and Ethnic Communities of the Autonomous Regions of the Atlantic Coast of Nicaragua and the Coco, Indio and Maiz Rivers. Law No. 509, General Law of Land Registry	Nicaragua has a legal framework that recognizes and guarantees human rights, property rights, self-determination, and participation. The Political Constitution of Nicaragua protects the rights to a healthy environment, protection of natural resources, recognition and protection of the various property regimens, recognition of the communal property of the original and Afro-descendant peoples, promotion of a sustainable economic development in harmony with Mother Earth, recognition of the use and enjoyment of natural resources, primacy of ownership of forests, and autonomy of the Autonomous Regions of the Caribbean Coast. Law No. 509 establishes that the Municipal Land Registry will have other responsibilities, to assess the values of the real estate in their territories, for compensations and to quantify costs of damage of natural and other disasters, in accordance with the technical norms emitted by the Fiscal Cadastral Office, approved by the Nacional Cadastral Commission. The ER Program has a political framework for resettlement that must be taken into account at the moment of activation of the ESS.
ESS 6: Conservation of Biodiversity and Sustainable Management of the Living Natural Resources	
Law 28, Autonomy Statute of the Regions of the Caribbean Coast of Nicaragua. Decree 1142, Law of Cultural Heritage of the Nation. Law 217, General Law for the Environment and Natural Resources Law 445 – Law of the Regimen of Communal Property of the Indigenous Peoples and Ethnic Communities of the Autonomous Regions of the Atlantic Coast and the Coco, Indio and Maiz Rivers.	The country has ample legislation that regulates the use, management, and control of biodiversity and natural resources in the protected areas and outside of them, which are identified in the ER Program. Laws No. 28 and No. 445 establish the procedures for natural resource use for the original and Afro-descendant Peoples. Law No. 217, General Law of the Environment and Natural Resources, has the objective to establish norms for the conservation, protection, improvement, and restoration of the environment and natural resources that are within it, assuring rational and sustainable use, in agreement with the indications of the Political Constitution. Law No. 807 has the objective to regulate the conservation and sustainable use of the biological diversity existing in the country, guaranteeing equitable and just participation in the benefits derived from their use, with special attention to the original and Afro-descendant

Law 462, Law of Conservation, Promotion, and Sustainable Development of the Forestry Sector. Law 807, Law of Conservation and Sustainable Utilization of Biological Diversity. Decree 01-2007, Regulations for Protected Areas of Nicaragua. Management Plans Ecological territory management norms.	peoples, as well as the respect and recognition of the rights of intellectual property, traditional and customary uses of the local communities. The Regulations of Protected Areas of Nicaragua develops the National System of Protected Areas (SINAP). The purpose of SINAP is to protect the natural resources of the country, preserve representative natural ecosystems of the diverse biogeographic and ecological regions of the country, protect watersheds, water cycles, underground water deposits, examples of biotic communities, genetic resources, and wild genetic diversity of flora and fauna, protect natural landscapes and the setting of national historical, archeological, and artistic monuments, promote local sustainable development promoting the implementation of clean processes and technologies for the improvement of rational and sustainable use of natural ecosystems, and drive in an integral manner the environmental services that are provided by the protected areas to the benefit of the local inhabitants, the national economy, and sustainable development.
ESS 7: Indigenous Peoples / Local, Traditional, Historically Neglected Communities from Sub-Saharan Africa.	
Law 28, Autonomy Statutes for the Autonomous Regions of the Caribbean Coast of Nicaragua, Decree 1142 of Law of Cultural Heritage of the Nation. Law 445 – Law of the Regimen of Communal Property of the Indigenous Peoples and Ethnic Communities of the Autonomous Regions of the Atlantic Coast of Nicaragua and the Coco, Indio, and Maiz Rivers. Convention 169	Law 445, has as its objective to regulate the regimen of communal property in the lands of indigenous and ethnic communities, and its specific objectives are: (i): guarantee the full recognition of the rights of communal property, the use, administration, and management of the traditional lands, and their natural resources, through their demarcation and titling; (ii) regulate the rights of communal property, the use and administration of natural resources in the traditional communal lands; (iii) determine the necessary legal procedures for such recognition; (iv) establish the fundamental principles of the administrative regimen of the indigenous peoples and ethnic communities, in the management of the communal territories; (v) establish the norms and procedures for the process of demarcation and titling using the rights of communal property; and (v) define the institutional order that will dictate the process of titling of the communal lands. It contains a Framework of planning for indigenous peoples.
ESS 8: Cultural Heritage	

Law for the Protection of the Cultural Heritage of the Nation. Cultural Policy of the Autonomous Regions of the Caribbean Coast of Nicaragua, with respect to the Indigenous Peoples, Afro-descendant Communities, and Coastal Mestizos; as well as the Strategy, Action Plan and Institutionality necessary for their implementation Bilwi, Autonomous Coastal Caribbean North Region. Law 445 – Law of Regimen of Communal Property of the Indigenous Peoples and Ethnic Communities of the Atlantic Coast of Nicaragua and the Coco, Indio and Maiz Rivers. Decree 01-2007, Regulations for Protected Areas	The indigenous and Afro-descendant peoples have defined their sacred sites, which must be respected and protected. The original peoples and Afro-descendant communities of the Caribbean Coast of Nicaragua have among their strengths a legal framework that guarantees their fundamental rights over their territory, the collective ownership of their lands and resources, their cultural practices, their language, the organizational systems, and the recognition of the traditional community and territorial authorities. The laws contribute to the recognition, rescue, conservation, restoration, revitalization, and spreading of the cultural values, declarations, practices, and heritage of the indigenous peoples and ethnic communities of the autonomous regions. They provide elements that contribute to the full recognition, exercise, and respect of the cultural rights of the indigenous peoples and ethnic communities of the autonomous regions. They strengthen the identity and social cohesion of the indigenous peoples and Afro-descendant communities of the Caribbean Coast of Nicaragua.
ESS 9: Financial Intermediaries	
Law on the trust contract. LEY No. 741, Approved 4 November 2010. Published in La Gaceta, Official Diary No. 11, 19 January 2011, and its regulations.	The country has a regulatory framework for the trust figure, as an instrument of administration of assets and channeling of public and private investments. This instrument permits the State to sign contracts with third parties for the administration of funds for programs, projects, or other sources.
ESS 10: Participation of the interested parties and information disclosure.	
Law 28, Autonomy Statue of the Caribbean Coast. La Gaceta No. 238, 30 October 1987. Art. 8. **Tabla 18** Law 217, General Law for the Environment and Natural Resources. **La Gaceta No. 20, 31 January 2014. Articles 21, 27 paragraph 72 paragraph 2.** Law 445, La Gaceta No. 16, 23 January 2003, Articles 2 paragraph 3 , 3, 12, 16, 17, 18, 40 paragraph a; 44 paragraph b numeral Law 475, Law for Citizen Participation. Law 807, Law of Conservation and Sustainable Utilization of Biological Diversity. Articles 1; 10 paragraphs 4, 60 to 63, 70 numeral 1 and 77.	The currently valid legal framework consolidates the direct participation model for the women and men stakeholders in the public administration at different levels, confirming the model of Alliances, Dialogue, and Consensus. This model of direct participation permits the definition of the role of the State as facilitator of the productive activity and participation and direct impact of the women and men stakeholders in the national economy of the country, where the objective is to achieve sustainable development. The special laws that regulate the environmental management in the country have different procedures for the participation and decision-making, from a formal process through consultation, presentations, and work sessions. The Nicaraguan State recognizes the individual, the family, and the community as the origin and the objective of the activity, and it is organized to assure the common good, assuming the task of promoting human development of each and every one of the Nicaraguans, under

	the inspiration of Christian values, socialist ideals, supportive, democratic, and humanistic practices, as universal and general values.

Impact of the ESS in the activities of the ER Program

Table 88 details the relation between the proposed interventions and the Environmental and Social Standards that are involved; this analysis permits us to design a Framework for Environmental and Social Management well-oriented toward their compliance.

ESS 1: Evaluation and Management of Environmental and Social Risks and Impacts.
ESS 2: Work and Labor Conditions.
ESS 3: Efficiency in the Use of Resources and the Prevention and Management of Pollution.
ESS 4: Community Health and Safety
ESS 5: Acquisition of Lands, Restrictions over Land Use, and Involuntary Resettlement.
ESS 6: Conservation of Biodiversity and Sustainable Management of Living Natural Resources.
ESS 7: Indigenous Peoples
ESS 8: Cultural Heritage
ESS 9: Financial Intermediaries
ESS 10: Participation of the Interested Parties and Information Disclosure.

Table. 88 Guidelines of intervention and their relation with the ESS

Guidelines of intervention and their relation with the ESS											
Strategic Guideline	Actions	ESS									
		1	2	3	4	5	6	7	8	9	10
1: Forest conservation	1a Improvement of forest governance in the indigenous and Afro-descendant territories.	X	X		X		X	X			X
	1b Community forest management (CFM)	X	X	X	X		X	X			X
	1c Promotion of natural regeneration and social reforestation	X	X	X	X		X	X			X

Guidelines of intervention and their relation with the ESS											
Strategic Guideline	Actions	ESS									
		1	2	3	4	5	6	7	8	9	10
2: Systems of intensified sustainable production	2a y 2b Establishment of agroforestry and silvopastoral trusts.		X	X	X		X		X	X	X
	2c Commercial reforestation in areas already deforested.	X	X	X	X		X				X
3: Increase in employment off-farm	Promotion of "green" agro-industrial and forestry investments, by PRONicaribe.	These guidelines of intervention have the characteristic of being enabling activities, that can be effected to achieve the prior interventions, the concrete results that are achieved from these guidelines are reflected in improved forest governance in the indigenous and Afro-descendant territories , strengthened community forest management, promotion of natural regeneration and social reforestation, the establishment of agroforestry and silvopastoral trusts and commercial reforestation in areas already deforested. For this reason, there is not a need for a particular analysis of the environmental and social impacts.									
4: Enabling institutional enabling conditions	4a) Institutional coordination and the harmonization of policies										
	4b) Forest and land-use monitoring.										
	4c) Improved use and delivery of information by the public institutions										
	4d) Improved application of laws, policies, regulations and norms										
	4e) Improved institutional capacity and resources										

Plan for Safeguards

As can be seen in the previous sections, Nicaragua enjoys a robust legal framework that contains procedures to deal with the Environmental and Social Standards. In spite of this legal backstop, and in accordance with the requirements established in the Environmental and Social Framework of the World Bank, a Framework for Environmental and Social Management has been developed, which establishes the reach, procedures, and responsibilities for environmental and social management of the ER Program, which in annexes a Political Framework for Involuntary Resettlement and a Framework for Planning for Indigenous Peoples is included.

The Framework of Policies for the Acquisition of Lands, Restrictions on Land Use, and Involuntary Resettlement previsages a future in which cases will be presented with re-definitions of the categories of the protected areas, or of definition of the areas for natural regeneration or of plantations, that could affect the families in terms of economic re-organization, by restriction of their access to certain natural resources; the level of precision of these activities at this moment do not permit clarity in how to define a plan for re-organization precisely.

With respect to the Framework for Planning for the Indigenous and Afro-descendant Peoples (FPIA), 53.22 % of the accounting area of the Emissions Reduction Program is found titled to original and Afro-descendant Peoples, Miskitos, Mayangnas, Ulwas, Ramas, Creoles, and Garifunas.

For compliance with the Framework of Environmental and Social Management and the Framework for Involuntary Resettlement Policy and the FPIA, the responsible institution for general coordination will be MARENA. It will be coordinated with MHCP, MEFFCA, SDCC, INETER, INAFOR and the Regional Autonomous Governments and the Governments of Indigenous and Afro-descendant Territories, which will act in accordance with their own constitutional mandates and their participation in the ER Program. Once the ER Program is approved, an inter-institutional agreement that will define the responsibilities of each institution with reference to the fulfillment of the Environmental and Social Standards and the roles within the Framework for Environmental and Social Management.

The definition of the FESM derives from the analyses performed during the implementation of the methodology of the Strategic Social and Environmental Evaluation (SSEE) that has been widely used in the indigenous and Afro-descendant communities and peoples of the Caribbean Coast. In the SSEE Report, developed with the intention of preparation for the ENDE-REDD+ Strategy, is detailed the participative process utilized in the preparation of the social and environmental instruments that have been applied for the Emissions Reduction Program, given that the initial focus of this Strategy was concentrated in the Caribbean Coast; also, work sessions have been conducted on the local level with the Indigenous and Afro-descendant Territorial Governments and with the inter-institutional team of the SSEE roundtable for the Emissions Reduction Program, that includes the participation of leaders of the ITG, the Regional Governments, and the SDCC.

In compliance with the new Environmental and Social Framework of the World Bank, the prepared safeguards instruments will be adjusted, and a Participation Plan for the interested parties will be developed. These instruments will be contained in the Environmental and Social Commitment Plan (PCAS) to be signed between the Government of Nicaragua and the World Bank, which will summarize the measures and significant actions for the Program to comply with the Environmental and Social Standards in a satisfactory manner for the World Bank.

In accordance with the World Bank's Environmental and Social Framework, the formulation of the Emissions Reduction program includes the formulation of the following instruments:

a) Environmental and Social Commitment Plan (PCAS).
b) Stakeholder Engagement Plan (SEP).
c) Environmental and Social Management Framework (MGAS)
d) Indigenous Peoples Planning Framework (MPPI)
e) Framework of Procedure
f) Framework for Involuntary Resettlement (in case there are economic losses)

The PCAS in formulation comprises a summary of the measures and actions to be implemented to address the environmental and social risks and impacts of the Program. This PCAS will be the basis for the subsequent monitoring of the environmental and social performance of the Program.

The PCAS will also include a summary of the organizational structure that will be established and maintained to implement the actions agreed upon, taking into account the different roles and responsibilities and the agencies responsible for executing the Program. It will also contain information on the systems, resources and personnel that will carry out the monitoring of the safeguards.

It should be noted that, in compliance with the provisions of the Law for the Protection of the Cultural Heritage of Nicaragua and the Environmental and Social Standard 8 on Cultural Heritage, as part of the Environmental and Social Management Framework (ESMF), the procedure before findings will be integrated fortuitous, which aims to protect cultural heritage in the event of adverse impacts from the activities included in the Program.

It is emphasized that the SEP in formulation, will contain the detail of the methodology and instances of dialogue and communication that will be carried out during the formulation and implementation of the Program with respect to the safeguards instruments (those that will be aligned with the established guidelines in Environmental and Social Standard N ° 1 and 10).

The MGAS of the Program will present the guidelines that should be applied by all actors / sectors that carry out REDD + actions, in order to ensure that the REDD + actions to be implemented are environmentally sustainable in accordance with the provisions of national legislation and the guidelines established in the applicable World Bank Environmental and Social Standards

Regarding the SEP, said document will describe the methods and timing of stakeholder participation during the entire program cycle, distinguishing between parties affected by the Program and other interested parties. The scope of the information and the time it will be communicated will be described, as well as the type of information that will be disclosed and requested. The SEP will determine how the communication with interested parties will be managed during the preparation and execution of the Program, describing the measures that will be used to eliminate obstacles to participation and the way in which the opinions of affected groups will be obtained in a different way. The SEP will be agreed with the interested parties.

The final versions of the instruments that are part of MGAS will be delivered in May 2019. The Indigenous Peoples Planning Framework (MPPI) and the Framework for Involuntary Resettlement (in case there are economic losses), will be presented in advanced versions.

Social and environmental risks related to the ER Program interventions

The analysis of social and environmental risks integrates information received from the dialogue and consultations from interested parties, among them agricultural producers, cacao producers, women, social communication workers, leaders, and members of the indigenous and Afro-descendant Peoples. Reports were reviewed in the meetings and workshops that were conducted (79), plus the work sessions with the SSEE roundtables in the Autonomous Regions, meetings of Monitoring, Reporting, and Verification, as well as the coordination group meetings (see Section 5).

In Table 88 is presented a matrix of environmental and social risks and impacts for the ER Program, in which are identified mitigation methods, as well as positive impacts which correspond to each strategic guideline. In general terms, it is considered that the negative impacts of the Program will be few.

Prior to the presentation of the matrix of environmental and social risks and impacts, the analysis of different risks includes the following:

The expansion of the agricultural frontier. The migration of populations from the central region of the country towards the Caribbean Coast threaten the last remaining territories with tropical forests. These movements are encouraged by the low value attributed to forests, mirrored by low prices of forest lands, as well as attractive prices of domestic and international markets for milk, meat and perennial crops such as oil palms, cacao and coffee; on the other hand, weak property control and management by the communities and indigenous and Afro-descendant territories facilitate migration and changes in land use.

In general, the potential deforestation resulting from these factors can be largely avoided by the promotion of sustainable, intensive farming practices (e.g. the adoption of intensive productive practices such as the use of improved pasture and other silvopastoral practices) and by using already cleared land, a current tendency in the cattle-ranching sector of the Caribbean Coast. In parallel, greater inter-institutional coordination is necessary to boost the economic impact of these initiatives, while minimizing their effects on forests.

Another response to the threat of migration in concert with weak governance and administration of the indigenous and Afro-descendant territories is based on the legal titling of the 23 indigenous and Afro-descendant territories (53% of the total accounting area) by CONADETI, a task that was completed in October, 2016, as well as the titling of 98% of private property (47% of the accounting area). The final stage of producing clear land titles is underway and needs to be accelerated (see Section 4.4).

The existence of clear land titles reduces the possibility of conflicts or complaints stemming from the possession or improvement of communal property by persons from outside the communities. This solid legal base, combined with negotiated solutions to existing conflicts between outside settles and communities, more formal jurisdictional procedures under CONADETI, as well as the strengthening of the administration and governance of communal property, will reduce this risk. The systematization of the administrative procedures related to the application of the laws, mentioned above, will also identify gaps that need to be addressed within the context of the ER Program.

Institutional capacities for implementation and monitoring. Institutional needs have identified at the local (community and territory) and regional levels related to the management and control of land and natural resources, the strengthening of monitoring, control, and enforcement of land and natural resource use, and improved institutional coordination and capacities. Responses include the establishment of early warning systems, local monitoring capacities, improved territorial governance of forests, increased supervision of forestry plans, an increase in forest regents, audits, and environmental

inspectors, and the strengthening of coordination by the Production, Consumption, and Commerce cabinet, Working Group I, and the SDCC.

Road construction. Road connectivity is necessary for economic development, but at the same time poses risks of deforestation and forest degradation by colonists who access forests via roads. In order to reduce this risk, there will be a follow-up on compliance with the Environmental Impact Assessments (EIA) of road construction , following the procedures of Articles 26 and 27 of the System for the Environmental Evaluation of Sustainable Natural Resource Permits and Authorizations. In the indigenous territories, the EIAs have to be approved first by the territorial assembly and subsequently by SERENA and the Territorial Delegation of MARENA. In the autonomous regions, *in situ* inspections will be carried out by the inter-institutional Environmental Commission, while the Environmental Authorizations are given by the Regional Councils and the Territorial Delegations of MARENA.

Table. 89 Environmental and social risks and impacts by intervention and the corresponding mitigation measures

Matrix of environmental and social risks and impacts associated with the ER Program						
Strategic line 1: Forest conservation						
Actions	**Social Aspects**			**Environmental Aspects**		
	Positive Impacts	**Risks and Impacts**	**Mitigation Measures**	**Positive Impacts**	**Risks and Impacts**	**Mitigation measures**
1a. Improvement of forest governance in indigenous and Afrodescendant territories						
• Technical assistance and work sessions to update territorial development and land-use plans (meaning the updating of land-use planning instruments, such as the Strategic Development Plan, Forest-use Plan, Land-use Plan, inventory of natural resources, definition of forest management planning areas).	•Incorporation of new sustainable forest management techniques for the production of goods and services and the protection of Mother Earth. • Protagonists have greater capacities for environmental management **Tabla 19** • Poverty reduction in indigenous, Afrodescendant and rural communities • Generation of income	•Risk: Sacred sites are not taken into account • Risk: Social criteria are not taken into account during the design of land-use plans, which will later affect their implementation • Risk: zoning and opening or improvement of access roads facilitate inflow of illegal traders or invaders into the territory	•Ensure compliance with Convention 169, Laws no. 28 and 445. •Working on the basis of a social and environmental assessment • Leaders have to negotiate to reduce migration	Deforestation is avoided and the conservation of biodiversity improved • Enhanced conservation of Protected Areas • Improvement of ecosystem services	•Risk: The zoning of land use will open new access roads, which can facilitate the exit of wildlife and illegal wood from the forest. Forest degradation with potential loss of biodiversity, promoted by various factors such as increased incidence of fires and illegal deforestation. • Risk: Territorial and forest zoning plans lack elements related to biological connectivity or biological corridors	Conduct Environmental Impact Assessment to road projects. • Apply regulation and control of environmentally damaging activities, based on Law 217 General Law on the Environment, and Forestry Law 462 • Definition of potential biological corridors according to the fragmentation index of the intervention areas • Inclusion of the topic of biological corridor zoning in trainings • Proceeding in accordance with Mandatory Technical Regulation on Sustainable Management of Broadleaf and coniferous forests. "In areas of mature forest, a minimum of 0.05 hectares with trees grouped in at least 5

						groups per 20 hectares shall be designated as wildlife habitat. • In the zoning process, the forest-covered parts in the area to be managed have to be classified according to the type of forest, whether for production, protection or biodiversity conservation purposes, and marked as such on a map." •Definition of biological corridors and their protection, indicating possible measures to be implemented
• Technical assistance and work sessions to update and improve internal statutes, rules and regulations at the territorial and community levels (i.e., the improvement of administrative and contract procedures for the exploitation of the forest and soil by members of the community or by outsiders; updating of ecological standards, alignment with Law on Forest Moratorium, improvement of organizational structures, etc.	• Strengthening of organization, leadership and cultural identity of indigenous peoples for the management of their resources and territories • More effective implementation of the legal and political framework • Enhanced capacities for the training of protagonists • Generation of employment •Strengthening of cultural identity through the use of native indigenous languages •Higher income for community members	•Risk: Due to the broad cultural and territorial diversity, sometimes training packages do not take into account the particularities of some territories • Risk: the updating of some instruments could create gaps which subsequently may cause dissatisfaction and conflicts. •Risk: Ancestral knowledge is not taken into account	• MARENA, the respective Regional Government, and the territorial governments, in alliance with the indigenous universities, ensure the necessary coordination to guarantee the quality of the technical assistance. • Enforcement of Law 162 on the Official use of the languages of the Nicaraguan Caribbean Coast communities • Compliance with Convention 169, Laws no. 28 and 445 • Enhancing values and promoting the cosmovision of native and Afrodescendant peoples • Validation of the training plans with a	• Higher level of forest protection, improvement of biodiversity index •Improved capacities for the management of Biological Reserves Bosawás and Indio Maíz • Protection of watersheds • Protagonists with higher levels of knowledge help to improve quality of forest and biodiversity	•Impact: Deterioration of biodiversity in case natural forests are destroyed to establish tree-lined perennial crops and forest plantations	•Consolidation of the traceability system for forest products • Inclusion of Mandatory Technical Regulation on felling: authorized annual felling on the property may not exceed annual forest growth, the calculation basis shall be the average annual increase. • Reinforcement of the management of endemic forest species •Opening of market for species of high economic value

			group of elders from the territory			
		• Risk: Women to not effectively participate in work sessions, which reduces their role in decision-taking.	Ensuring the participation of female leaders in work sessions In the area of Waspán, ensuring the participation of the group "Organized women from the Wangki" in the area of Waspan In the area of Bonanza, ensuring participation of "Women of the Mayagna Nation"		Risk: Illicit trafficking of flora and fauna on the new roads.	•Strengthening governmental actions for the control and surveillance of illicit trafficking of flora and fauna •Strengthening the monitoring of hot spots • Reinforcement of the surveillance and control by the institutions involved (INAFOR, MARENA and SERENAs, National Police and Army)
Improvement of the local forest monitoring and control capacities and the permits for land and forest use	• Protagonists have better know-how, more awareness and sensitivity regarding environmental topics and love for Mother Earth.	• There is a risk that training priorities and designs are not worked out in consensus and accordance with the CLPI, causing a negative impact on the program due to conflicts between protagonists	• Compliance with Convention 169, Laws no. 28 and 445 •Design of programs in consensus with territorial authorities in the region.	• Stricter control of environmental deterioration and increase of environmental benefits (erosion control, protection of water sources, carbon fixation) •Improvement of ecosystem services • CO2 capture	Risk: The misuse of management techniques can lead to the degradation of the environment.	Guarantee of technical assistance, monitoring and follow-up of the proposed improvement actions.
	• Protagonists have more knowledge, which will facilitate finding adequate responses to deforestation and potential land conflicts, as well as long-term management and planning decisions based on solid information •The community manages its area adequately •Permits are issued on behalf of the community			•Deforestation and degradation control		

• Creation of a results-based incentive for avoided deforestation. This incentive will be offered to all governments of indigenous territories, based on ex-post reductions of deforestation measured by annual monitoring, compared to baseline	Territories and communities will count on forests resources to improve their living conditions. Autonomous institutions will be strengthened through financial resources. The autonomous institutions will be consolidated through financial resources. •Increased income for the communities	•Risk: Needs of women are not taken into account when distributing benefits, which would have a negative impact on governance in the territory and equity in the project	• Ensuring that actions to improve women's living conditions are incorporated in operative plans and farm plans designed for the use of benefits •Inclusion of women in technical teams •The feedback and complaint mechanism is widely publicized	•Resources are available to strengthen forest and biodiversity conservation and management actions •Reduced deforestation in managed areas •Improved community forest management	•Risk: Increased illegal deforestation in areas excluded from results-based payments	•Strengthening the traceability system for forest products from the area
1.b Community forest management (GFC)						
•Promotion of investments and employment in CFM in indigenous territories by PRO Nicaragua /PRO Nicaribe through public-private-producer partnerships (holding meetings, promoting field visits, working out project portfolios, organization and participation in business meetings)	•Strengthening of the traditional forms of government of indigenous and Afrodescendant peoples • Consolidation of community forest enterprises •Diversification of community members' incomes through the expansion of forest by-product markets •Strengthening of forest governance	•**Risk:** Limited incorporation of cultural elements of indigenous and Afrodescendant peoples during the design of programs and projects has negative effects on territorial governance •**Impact:** The promoted farming transformations affect the traditional livelihoods of indigenous and Afrodescendant peoples	•Compliance with Convention 169, Laws no. 28 and 445	•Promotion of forest regeneration •CO2 capture	• Risk: Overexploitation of biological resources (flora and fauna) as a result of the opening of new markets	•Enhancing governmental counseling actions regarding the environmental quality of projects and programs • Incorporation of regular forest inspections and audits by the Interinstitutional Commission (INAFOR, regional governments, MARENA, forest regents and owners) into forestry plans • Design of Environmental Commitment Plan for the fulfillment of the Mandatory Technical Regulation, indicating potential measures to be implemented
		•**Risk:** If not all communities are included in decision-making processes, this will generate problems in the management of resources	•Mechanism for Communication Strengthening is widely publicized			
•Building INAFOR's capacities to negotiate forest management plans for the 3 large blocks in order to reduce entry barriers to forest management and encourage investments	•Improvement of forest governance in the territory •Improvement of the forest management plans for the blocks (Prinzapolka, Awaltara and Waspan) •Implementation of the technical-operational regulation •Strengthening of INAFOR actions in areas of project incidence •Acceleration of permit request procedures •Attraction of private investment	•**Risk:** technical and social criteria of ITGs are not taken into account, leading to weak ownership of the public policy in forest and environmental governance	•Work sessions with ITG technical teams to make agreements on technical aspects •Mandatory compliance of the technical regulation on sustainable management of tropical broadleaf and coniferous forests	•Reduction of illegal felling caused by extended forest permit procedures		

• Review of current procedures and their effectiveness in issuing and supervising forest permits, and re-design of the system, focusing on simplification of permit procedures and improved supervision	This is an enabling activity, which is incorporated into the Forest Governance activities in indigenous territories; therefore, risks and impacts are analyzed during these activities.					
•Building capacities in territories and communities to establish and manage relations with investors and enterprises connected with forest management.	Refers to trainings and technical assistance in legal and administrative topics dealt with in Intervention 1a.					
•Employment of forest regents (through contracts) and regular forest audits by INAFOR and regional and territorial governments for the implementation of forestry plans in the three priority forest blocks, with the objective of improving compliance with forestry regulations.	•Improved forest governance in the territory •Improved forest management plans in the blocks (Prinzapolka, Awaltara and Waspan) •Application of the technical-operational regulation	**•Impact:** In areas not included in the project, the economic value of the forest is reduced, causing a decrease of land prices in the territory.	• Expansion of training on negotiation in initially separate strategic areas	• Increased economic value of forest byproducts	• Risk: Increased deforestation in non-intervention areas	•Negotiating projects and resources for territories with no forest management potential, and increasing income by exploiting alternatives without causing deforestation.
1c. Promotion of natural regeneration and social reforestation						
•Reforestation (new area of 40,000 hectares) requires the establishment of agreements of collaboration and incentives for the creation of tree nurseries (planting material) and technical assistance for the reforestation of 8,000 hectares per year	•Greater participation of volunteer rangers in wildfire control and community-based environmental-monitoring	•Risk: The participation of indigenous women and their organizations is not strengthened, having potential impacts on forest governance	•Mechanism for Communication Strengthening is widely publicized •Incorporation of organized women in the activities	•Systematic recovery of forest coverage in areas with forest production potential •Recovery of biological corridors which have been degraded as a consequence of the fragmentation of native forests •Increased soil stabilization	Risk: Intensification in the sowing of commercial species that do not correspond to the environmental objectives of the area and may increase the pressure on natural environments. Impact: Loss of biological connectivity due to absence of tree species which are important for the development of	• Incorporation of elements in zoning plans that identify adequate species, in accordance with environmental objectives • Strengthening of public-private partnerships for the establishment and maintenance of nurseries •Definition of areas of biological corridors Definition of biological corridors and their protection, indicating potential measures to be implemented.

					wild fauna, mainly in specialized specimen. •Risk: The reduced offer of tree nurseries in the area leads to the risk of not obtaining the number of plants necessary for reforestation • Risk: that the nurseries where the plants for reforestation come from do not comply with phytosanitary controls. Introduction of invasive non-native species and the use of pesticides and herbicides	• Carry out the phytosanitary controls corresponding to the nurseries. Ensure monitoring and technical assistance during the process
			•Building capacities of communities to create sustainable tree nurseries		•Impacto: • Loss of biodiversity due to the introduction of non-native species. •Impact: Loss of biodiversity due to the introduction of non-native species. •Risk: Introduction of new pests.	• Inclusion of native species with economic value and of biological importance for the communities in nurseries • In the case of the appearance of pests or diseases, INAFOR will have to extend exploitation permits in accordance with the specific sanitary measures for each case.

•Natural regeneration (new area of 50,000 hectares); campaigns have to be designed and developed to raise awareness and promote the values of love and care for forests, technical assistance has to be given to the groups.	•Greater participation of youth from the communities • Protagonists have better know-how, more awareness and sensitivity regarding environmental topics and love for Mother Earth.	• Risk: Once protection measures for natural regeneration purposes are implemented, families will have reduced access to forest resources	• Drafting of a plan to reduce negative effects on families due to reduced access to natural resources • Mechanism for Communication Strengthening is widely publicized	• Increased forest cover, recovery of secondary forest and protection of water recharge areas CO2 capture	• Risk: Indirect promotion of the regeneration of species of little ecological or economic interest, thereby affecting the capacity of forests to generate ecosystem services.	• Implementation of forest management techniques to facilitate the propagation of species of ecological and economic interest (selective slashing, protection of seed sources) •In stands located in protected areas containing mature forest with a density of over 300 trees/hectare, 20% of the trees will be left standing as seed sources. •Definition of species of economic and biological interest for regeneration
Strategic line 2: Intensified sustainable production systems						
2a and 2b Establishment of agroforestry and silvopastoral trusts						
• Establishment of agroforestry and silvopastoral trusts, with the objective of increasing intensive production, commercialization and incomes from shade-grown coffee and cocoa, and silvopastoral systems (through projects in partnership with small and medium-sized farmers)	• Increased production for domestic consumption •Strengthened territorial management • The use of species associated with agroforestry systems contributes to the transformation of the country's production by increasing and diversifying agricultural production, with increased yields and added value, thereby improving food and nutrition security. • Export production with greater added value, focusing on the protection of natural resources	•Risk: Economic investments in agro-silvopastoral systems reduce the access of families to the forest's natural resources • Risk: weak coordination between municipal and territorial authorities has a negative impact on the implementation of regulations and procedures.	• Drafting of a plan to reduce effects on families affected as to their Access to the forest's natural resources •Technical assistance to improve existing technologies • Technical assistance to farmers for correct farm planning •Implementation of popular methodologies to carry out practical/technical studies with the objective of reducing costs	• Increase of biodiversity due to the opening of new habitats and landscape connectivity • Conversion of degraded areas into low-impact farming systems. • The recovery of farming areas with the help of investment funds reduces the expansion of farming lands into forest areas, thereby slowing down the advance of the agricultural frontier	• Risk: Increase in forest fires for the expansion of agricultural, silvicultural and agroforestry areas in degraded lands. Risk: the non-introduction of short-cycle forest species could lead to the desistimulación of the protagonists due to the prolonged times of economic return.	•Promotion of sustainable agroecological farming alternatives •Strengthening of wildfire prevention campaigns •Expansion of hot spot monitoring system into communities •Reinforcement of surveillance and control by INAFOR, MARENA and SERENAs • Strengthening of traceability systems for

	• Conservation and improvement of livelihoods (creation of employment) •Increased food offer for domestic consumption and local markets		• Mechanism for Communication Strengthening is widely publicized	• Increased percentage of organic matter in the soil, thereby reducing water requirements •Restoration of the soil's productive capacity •Increase of of transformation of deforested areas into sustainable multiservice production systems •CO2 capture	• Intensification of deforestation for the establishment of investments in cattle or other activity that has a rapid return.	forest products from the areas • Carry out previous studies to identify the species that will give an economic return that will allow obtaining short, medium and long term benefits.
		• Impact: price expectations for products that do not take into account the market price fluctuations can cause an increasing marginalization of the activity	• Promoting the establishment of value chains responding to market needs and facilitating the commercialization of products on local and international markets		of biodiversity due to bad practices when establishing and managing productive systems • Risk: Introduction of species that are not adapted to the environmental conditions has a negative effect on the expected yield per hectare	• Establishment of environmental and agroecological conditions for investment in production •The promotion of native agricultural species that are naturally adapted to the environment helps to increase crop yields

		•Risk: lack of consensus in decision-making processes between small and medium-sized producers, negatively affect the management of the territory •Impact: Loss of economic and ecological value of the forest in comparison to productive systems .	• Clear selection criteria are publicized and made accessible to all potential beneficiaries • Dissemination and training on decision-making and participation in programs •Lists of benefitted areas to avoid conflicts among farmers •Implementation of farm management tools for the land-use planning and sustainable management of economic activities. •Mechanism of Communication Strengthening widely publicized		• Risk: Increased erosion due to inadequate soil management • Risk: Contamination of soils and water due to inadequate management of fertilizers, herbicides and pesticides. •Risk: Soil salinization due to irrigation • Risk: Sedimentation of water resources	• Training farmers on the implementation of biological pest control systems • Design of handbooks and materials for application of best practices in the management of agrochemicals • Training on best practices to optimize use of water resources and on sustainable soil management •Training on efficient irrigation systems; in zoning plans, stipulate the protection of riparian forests
Tabla 20 *2c Commercial reforestation of already deforested land*						
• Establishment of a new area of 10,000 hectares of forest plantations (2,000 ha/year), whose location will depend on the investor's criteria, but it will be facilitated by PRONicaribe.	• Creation of conditions to increase national and foreign private investment. • Generation of jobs in tree nurseries	• Risk: Conflicts within communities on the distribution of benefits obtained through the payments of timber and non-timer resources in the territory	• Mechanism for Communication Strengthening is widely publicized	• CO2 capture • Establishment of biological corridors in degraded areas	• Risk: Increased illegal felling and rise in forest wildfires • Risk: Deforestation in natural forests to establish tree-lined perennial crops and forest plantations, thereby affecting biodiversity • Risk: Soil and water contamination due to inadequate management of fertilizers, herbicides and pesticides	• Regulation and control of activities deteriorating the environment, on the basis of applicable laws • Enforcement of Laws no. 217 and 462 • Guaranteeing a minimum of 30 trees per hectare as seed sources, when predominance of broadleaf species is lower than 20% and its average height is 7 m. • The felling of seed sources will take place when natural regeneration has been

					•Risk: Increased soil aireation intensifies soil erosion •Risk: Soil compaction •Risk: Loss of natural soil microbiota	established with an average height of 4 m. • Listing of forest species of biological importance for the generation of specific habitats for native fauna
					•Impact: air pollution due to earth removal	-The application of technical regulation for sustainable management of tropical broadleaf and coniferous forests is controlled.
					•Impact: Loss of ecosystem services due to low biodiversity levels	•Controls in zoning to ensure conservation of areas of biological interest
					• Risk: Limitations to access natural resources due to loss of biodiversity and the use of the territory	Analysis of community livelihoods to guarantee that programs and projects do not negatively affect the communities' food culture and food security
Tabla 21 ***Strategic line 3: Increased employment outside farms due to the promotion of "green" agroindustry and forestry investments***						
Tabla 22 This intervention focuses on the strengthening of /PRONicaribe, the Nicaraguan government's successful investment promotion program. This intervention has the characteristics of an enabling condition as well as of a direct intervention aimed at reducing deforestation; the proposals are related to activities 2a, 2b and 2c.						
Tabla 23 ***Strategic line 4: Improvement of institutional enabling conditions for the improvement of forest conservation, more sustainable production and greater institutional capacities to monitor and control tundesired use of the land and natural resources.***						
Tabla 24 The strategic line of institutional enabling conditions is directed towards overcoming institutional and other barriers to forest conservation, and sustainable production and land use, and will not in itself directly reduce emissions. This strategic line is reflected in activities 1a, 1b, 1c, 2a, 2b, 2c and 3; consequently, the risks and impacts have already been analyzed.						

14.2 Description of arrangements to provide information on safeguards during ER Program implementation

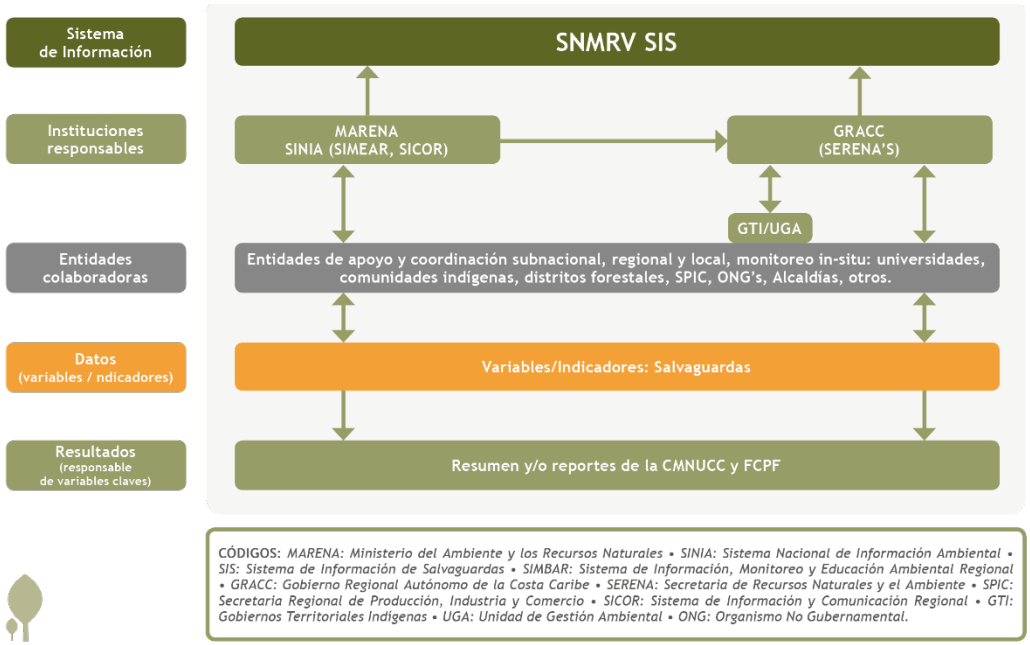
MARENA, as the lead ER Program institution will be the Nicaraguan state entity charged with providing official information regarding the approach to and compliance with the safeguards, establishing for them collaborative agreements with the institutions that will participate in monitoring safeguard indicators.

MARENA, through the National System of Monitoring, Reporting, and Verification, via the Safeguards Sub-System, will monitor safeguard compliance, in alliance with the Regional, Territorial, and Municipal Governments. The design of the System of Safeguard Information (SSI) is underway since August 2016; SSI is an integral part of the National System of Monitoring, Reporting, and Verification (SNMRV) of the Emissions Reduction Program. The SSI will permit the reporting of compliance of the environmental and social safeguards. Additionally, it will facilitate a framework of indicators for monitoring the compliance of safeguards at the national, sub-national, and community levels.

The principal objective of the National System of Safeguard Information (SSI), is to provide and manage the information regarding safeguard implementation and compliance during the implementation of the ERPD, in agreement with the legal framework of Nicaragua. The SSI will generate summaries or reports required by the UNFCCC for the monitoring of the compliance of the activated safeguards. The first report on compliance with the UNFCCC safeguards is contemplated in January, 2019.

Figure. 48 shows the structure for the SSI defined in sessions of the MRV and SESA working groups. In Table. 90, indicators for the monitoring of compliance of the safeguards during the implementation of the Emissions Reduction Program are presented.

Figure. 48 Structure of the Safeguard Information System.



For monitoring and reporting on compliance with the Environmental and Social Standards during the ER Program execution, indicators have been defined, which will be monitored by a Safeguards Commission that will operate at the central level and in each Autonomous Region of the Caribbean coast. Likewise, this Commission will follow up on the Mechanism of Feedback, Attention and Resolution of Complaints and will watch over the quality of the information in the SIS. See indicators in Table. 90

Table. 90 Indicators for the monitoring of compliance of the safeguards during the implementation of the Emissions Reduction Program

ESS	Indicators	Responsible	Cycle Period
EES 1: Evaluation and Management of Environmental and Social Risks and Impacts.	1. Number of Environmental Impact Evaluations approved. 2. Surface area of projects that implement Environmental Impact Evaluations (EIE)	MARENA Direction of Environmental Quality.	Annual
EAS 2: Work and labor conditions	2. Number of contracts made	**Tabla 25** MARENA – ENDE-REDD+ Program, Regional Governments	Annual

ESS 3: Efficiency in the Use of Resources and Prevention and Management of Pollution.	3. Chemical Waste: volume of waste chemicals expired by type of product. Pesticide waste (COP1), pesticide waste (NO COP). 4. Loss and gain in forest in the Biosphere Reserve BOSAWAS and in the Biological Reserve Indio Maiz, by core zone and buffer zone.	MARENA General Direction of Environmental Quality and Regional --- MARENA ENDE-REDD+ Program.	Annual
ESS 4: Community Health and Safety	5.		
ESS 5: Acquisition of Lands, Restrictions on Land Use, and Involuntary Resettlement.	6. Number of Environmental Impact Evaluations that require involuntary resettlement. 7. Number of Joint Management Plans of Protected Areas.	Regional Governments	Annual
ESS 6: Conservation of Biodiversity and Sustainable Management of Living Natural Resources.	8. State of management in the protected areas (variables: Protected Areas with Management Plans; Quantity of Park Guards in Protected Areas; Public financing executed in Protected Areas). ----- 9. Use of Natural Resources in Protected Areas (variables: Quantity of Protected Areas with Perennial Crops such as Coffee and Cacao; Cultivated area with Coffee and Cacao in the Protected Areas). ---- 10. Threatened Species: Birds. -------- 11. Area of Biological Corridors.	MARENA Direction of Natural Heritage ---- INETER Direction of Land Use ---- MARENA Direction of Biodiversity -------- INETER Direction of Land Use	Annual Annual

ESS 7: Indigenous Peoples / Local Communities	12. Consultations conducted 13. Strengthening the capacities of indigenous and Afro-descendant peoples.	Regional Government (SERENA and SEPLAN) ---- INAFOR and MARENA	Annual
ESS 8: Cultural Heritage:	14. Historic sites identified in the implementation of the interventions.	National Institute of Culture (INC), in coordination with Regional Governments and the ITG.	Annual
ESS 9: Financial Intermediaries	15. Available amount for the activities of the ER Program 16. Number of clients who have received credit		Annual
ESS 10: Participation of Interested Parties, Disclosure of Information.	17. Number of participants - men, women, indigenous, youth. 18. Number of suggestions received and attended in the Feedback and Grievance Redress Mechanism.	MARENA, National System of Environmental Indicators (SINIA).	Annual

14.3 Description of the Feedback and Grievance Redress Mechanism (FGRM) in place and possible actions to improve it

The process of broad stakeholder participation in support of the preparation and execution of the ENDE-REDD+, requires adequate opportunities to raise questions and receive answers to concerns or complaints about the effects of interventions. Therefore, a mechanism was created that strengthens communication with ENDE-REDD+ stakeholders. Which is called the "Feedback and Grievance Redress Mechanism".

The general objective of the Mechanism is to present different options for the reception of and response to requests for information, questions, complaints and petitions by stakeholders with regards to the design and execution of ENDE-REDD+ and ERPD, taking into account that in both programs there are sensitive aspects such as the Distribution of Benefits and the compliance with the Environmental and Social Standards.

Legal foundation for the Feedback and Grievance Redress Mechanism

The Mechanism for Communication Strengthening includes the procedures that the Nicaraguan government contemplates in order to provide answers and adequate solutions to requests for citizen information, the reception of complaints, and suggestions. The Mechanism is based on the following normative instruments:

The Nicaraguan Political Constitution establishes the right for Nicaraguans to present duly supported complaints. Article 2 states: ”National sovereignty resides in the people who exercise it by means of democratic procedures, deciding and participating freely in the establishment and improvement of the nation's economic, political, and social system”.

Article 52 of the Political Constitution states that “Citizens have the right, individually or collectively, to petition, denounce irregularities and constructively criticize the Powers of the State or to any authority, to obtain a quick resolution or response and to have the result communicated in the time period established by the law.”

Law 475 on Citizen Participation and Law 621 on Access to Political Information, both published in the Official Gazette No. 241 on December 19, 2003. Through the latter, public information offices were created, where citizens exercise their right to receive information. Law 217, the General Law on the Environment and Natural Resources, also supports this objective, as it states in Article 2. “Every person can participate as a citizen in the promotion of administrative, civil or penal actions against those who infringe the present law”[89].

For the design of the mechanism, similar experiences within MARENA were taken into account. At present, the mechanisms for complaints related to MARENA activities and the exercise of autonomy in the Autonomous Regions of the Caribbean Coast will form the basis of the MCS. These experiences are being systematized, and a more in-depth analysis of the procedures involved is contemplated. This study will conclude in June, 2018. Progress of this study is presented below.

Institutional experiences

- Administrative appeals: refers to the citizens’ right to appeal any act or omission by the public administration that may result in grievances. This right is regulated by national laws and can be exercised by any citizen, by presenting the appeal to the administrative instance causing the grievance, or before the Supreme Court of Justice.

- The Human Rights Ombudsperson’s Office is a State entity at the service of citizens to “contribute, together with national institutions, the State, Government and Organized

89 http://legislacion.asamblea.gob.ni/SILEG/Gacetas.nsf/15a7e7ceb5efa9c6062576eb0060b321/fc2f67348416ae2306257c74005c504e/$FILE/2014-01-17-%20Texto%20de%20Ley%20No%20217,%20Ley%20general%20del%20medio%20ambiente%20con%20reformas%20incorporadas.pdf

Society, to guarantee, within the state of law, the safety of persons and human rights, observing their compliance by public administration agencies, as a contribution to a free and just society". This institution has a web link for the reception of complaints: http://www.pddh.gob.ni/?page_id=183

- MARENA and INAFOR have procedures in place for the reception of and response to complaints, which can be presented by any citizen or organization. Proceedings start with the presentation of the complaint in written form to MARENA or INAFOR offices, stating the place and incident. Once received by the regional or departmental delegate, an inter-institutional commission is convoked, which determines whether the case is worthy of a site inspection or visit in order to obtain *in situ* knowledge of the incident. The Inter-institutional Commission presents the report and the necessary measures to be taken; the latter may consist of sanctions or fines. This process is expeditious, with a time limit of 7 to 30 days, depending on the distances and circumstances involved.

- In addition, on its webpage MARENA has a form that allows stakeholders to comment and present proposals; the responsibility for this platform lies with the Public Information Office (OAIP): **http://www.marena.gob.ni/index.php/contactenos**

- On the other hand, the Attorney General's Office[90] is the institution representing the State in legal matters. Its functions include "supervise that the performance of state officials and employees are in accordance with the law". It has installed a series of complaint boxes throughout the country at mayor's offices and state institutions. These boxes are located in visible and accessible places and can be used by any person. Their contents are reviewed once a month by a central government official, and proposals are reported to the Office of the President of the Republic.

- The Regional Government of the Northern Caribbean Coast is in the process of designing a computer-based instrument to follow-up on stakeholders´ satisfaction (or dissatisfaction) with projects and programs. To this end, the establishment of a web link where protagonists can present their grievances is planned.

- The complaint procedures defined by the projects financed through the World Bank or IADB were analyzed. Among these mechanisms, the use of dedicated telephone numbers was highlighted.

Objective

[90] https://www.poderjudicial.gob.ni/pjupload/spenal/pdf/2001_ley03.pdf

An accessible mechanism with capacity for rapid and effective response has been created to resolve the suggestions, grievances, and petitions of the stakeholders. Its specific objectives are the following:

- Provide inputs in order to improve the results of the ER Program and to contribute to social audits.
- Reduce or avoid the generation of conflicts by receiving and responding to complaints and suggestions.
- Contribute to the performance evaluation of the distribution of benefits.

The Feedback and Grievance Redress Mechanism is governed by the following Principles:

- **Respect for the Common Good:** based on the concept that the Earth and Humanity form a single, complex and sacred entity.
- **Respect and promotion of the worldview of indigenous peoples:** that land, water, and forests are a source of life, provide food and medicine, and are the place for the exercise of life and culture.
- **Accessibility**: The different options for accessing the Mechanism will strengthen the ability of stakeholder to participate in the dialogue on reducing deforestation and forest degradation.
- **Transparency:** Publically accessible information will be provided on the themes and issues attended by the Mechanism.
- **Legitimacy**: The Mechanism of Strengthening of Communication with ENDE-REDD+ legitimizes the process while also helping assure the social and environmental security provided by safeguards and strengthening governance.
- **Equity**: Due to differences in opportunities to participate in the construction of public policies and the sharing of the benefits of development projects, the Mechanism emphasizes less advantaged groups, such as indigenous and Afro-descendant peoples and women.

The Communication Strengthening Mechanism is oriented towards all ENDE-REDD+ and ER Program stakeholders, including community and indigenous territory leaders, families, rural producers, forest conservation women and youth groups, farmers, and the general population who are involved in efforts to reduce emissions from deforestation and forest degradation.

Pathways are created so that all the information can be concentrated in a single centralized site or database. The design of the system is composed of inward and outward flows of information.

The MCS has been designed so that difficulties of access, long distances from population centers, or the absence of cell phone signal or the internet do not limit the stakeholders´ ability to express their concerns, recommendations, disagreements, or complaints, given that it integrates a variety of traditional and non-traditional channels for the reception, attention, and feedback of

complaints. An explanatory diagram of the proposed channels for receiving complaints is shown in Figure. 51

The Mechanism of Feedback, Attention and Resolution of Complaints is described as a system with inputs and outputs~~. In~~ in which the points of entry for communication between the stakeholders and the instances that will give attention, response and follow-up to the proposals, complaints or suggestions are:

i. The Whitas, Síndicos, and women leaders of the indigenous and Afro-descendant peoples, and forest rangers [4] will be trained regarding the functioning of the Mechanism for Communication Strengthening with ENDE-REDD+ so that they can subsequently replicate it in their communities. In this regard, capacities of a network of 80 leaders of the Indigenous Territorial Governments (36 from the RACCN, 20 from the RACCS, 12 from the Special Regime of Upper Wangki, and 12 from PI-PCN) will be strengthened relative to safeguards and the use of the website.

ii. Assemblies: During assemblies held to strengthen capacities or dialogue within the ENDE-REDD+ framework, a suggestion box will be installed to receive comments or suggestions. When complaints about ENDE-REDD+ are presented during community or ITG meetings, they will be recorded in the minutes of the meeting and entered into the website of the System of Information on Safeguards and the location and date of the assembly will be noted.

iii. Suggestion boxes in institutional offices: This tool has been widely accepted by the community members, especially in the Autonomous Region of the South Caribbean Coast, who consider the Emissions Reduction Program to be of great importance. The suggestion boxes consist of a regular-sized, labeled, and sealed box. The gradual installation of suggestion boxes for ENDE-REDD+ the ER Program is foreseen, first in the offices of MARENA, INAFOR, the Central Government, the Autonomous Regions, ITG, and finally in the municipal offices. Before installing the boxes, agreements in principle or coordination that will formalize their placement and assure their safe-keeping will be established. In the case of the autonomous regions, these agreements will be facilitated by the Regional Governments. MARENA will be responsible for the placement of the boxes and the reports to the central registry of SSI in the System of Monitoring, Registering, and Verification.

iv. Electronic access (website): ENDE-REDD+ has a link placed on the MARENA website, in which is located a tab “Contact us” to receive suggestions and grievances from the stakeholders who enjoy internet access by telephone or computer. Currently, this access is not feasible for the most remote communities. For this reason, a parallel system has

been incorporated through WhatsApp, given that this system is more widely used and reaches almost all locations.

In describing Feedback and Grievance Redress Mechanism as a system with inputs and outputs, we have the following:

a) Inputs

Suggestion boxes, assemblies, meetings, and direct suggestions: These are received by a leader: The original and Afro-descendant Peoples of the Caribbean Coast have a structure of leaders defined by their own customs; by agreement with the Regional Government, a leader from each ITG must be reported to the System. We have visualized that for the case of the PI-PCN, the leaders will be defined by the authorities of the Indigenous People connected to a project or program in ENDE-REDD+. The leaders, according to their own customs, will receive suggestions from the community members, for them the system will permit two actions:

- Enter suggestions: the data for each leader will be registered in the system previously to permit the creation of a password for the entry of data. The design will avoid as much as is possible the use of typing, maximizing the use of menus to select options with a click.
- Follow up on the status of the suggestions: once entered into the system, the suggestion will proceed through four stages: i)correspond; ii)received; iii)in process; iv)attended

Webpage tab: in the menu on the webpage of ENDE-REDD+, the tab “Contact us” is found, which is the connection for any stakeholder or citizen interested in ENDE-REDD+ or in the Emissions Reduction Program.
To enter, one must identify oneself and provide an email address to receive a response. All the stakeholders who introduce suggestions will receive an immediate, automatic notification that the suggestion has been received and that in a maximum period of 30 days a response will be provided.

Figure. 49 Screenshot ENDE-REDD + web page

Table. 91 Form for the Feedback, Attention, and Resolution of Grievances Mechanism.

Complete name*		Identification*:
Email*		Telephone
Department/Region * -Select-	Municipality -Select-	Community -Select-
Describe your suggestion		

a) Outputs

Automatic notification from the webpage: the system will automatically generate from the webpage a notification that the provided suggestion has been received, which will be mailed directly to the email address given by the stakeholder. In this notification, the stakeholder will be informed that in no more than one month, a response will be given to the suggestion.

Once the suggestion has been entered into the system, a notification will be generated for SERENA and the territorial coordinator of ENDE-REDD+, and three additional contacts from the central level in MARENA (ENDE-REDD+ Social Specialist, Project Coordinator, and responsible

party of the Office of Communication of Citizen Power –or who will be assigned from the authorities of the Ministry).

Email: Through this medium, the regional, departmental, or national inter-institutional commission will send a response to the stakeholder or to the leader regarding the manner in which the suggestion has been attended. In this sense, it must be stated that the leaders of ITG in the Caribbean Coast all use email accounts.

The leaders will have direct access to the system, with a password for them to enter and introduce the requests and grievances. Just as in the case of the contact discussed above, they will also receive automatic notification of the suggestions they have introduced.

WhatsApp: This is a medium which facilitates communication which unfortunately does not connect directly to the Grievance Mechanism, but it is a technological resource that is quite widely used locally and permits communication in real time. The indigenous leaders stated that they would create a group with community leaders. In each geographic area[91], a Whatsapp group will be formed, administered by SERENA, composed of the leaders, SERENA, and the regional coordinator and ENDE-REDD+ social specialist.

The process that the suggestions will encounter in general is among three.

- Correspond / not correspond
- In process
- Attended

Correspond / Not Correspond: The regional ENDE-REDD+ coordinator, in harmony with the Inter-institutional Commission, will define the first status assigned to the suggestions. When "not correspond" is the response, a correspondence to the stakeholder or leader must be prepared which presents why the suggestion does not correspond to the ENDE-REDD+ and it should re-direct the suggestion to the proper institution, so that the suggestion be attended by the proper instances.

When a suggestion is classified "correspond", the ENDE-REDD+ coordinator in the region will pass it on to the system to the status "in process".

In Process: Here time is required for the corresponding actions, from the meeting of the Inter-institutional Commission, field visits when necessary and elaboration of the response.

Once the appropriate response has been decided for the suggestion, presentation, complaint, or petition, the regional coordinator will prepare a correspondence to the stakeholder or

[91] This refers to the Autonomous Region of the North Caribbean Coast (RACCN); Autonomous Region of the South Caribbean Coast (RACCS); Special Development Regime Upper Wangki and Bocay; and the Central Pacific North (PCN).

leader, and once approval has been obtained, the Inter-institutional Commission will mail the response, in this way attending the presentation.

Response procedure

It is thought that the main assertions or complaints originate due to lack of information, lack of public announcements or invitations to activities, non-compliance of deadlines of agreements or for the delivery of goods or benefits. In order to respond to proposals, the Inter-Institutional Commissions for forest and environmental management that operate in the Autonomous Regions and departments will participate, or they will be formed where required. These Commissions will meet once a month to review the reports from the MCS, analyze them and prepare a report for the MARENA. All proposals will be registered on SINIA´s central server and on the respective Regional and Departmental Nodes. The Regional Nodes of the Caribbean Coast, SIMEAR and SICOR, will support the reception of information by establishing links with the Program's website.

For attention to the presentations there will be participation of the Inter-institutional Commissions that work in the Autonomous Regions and departments for the forest and environmental Management, or will be formed wherever it is required. This commission will meet once per month to review the presentations received through the Mechanism, to analyze them and to develop an overall report for the national monitoring entity to the Environmental and Social Standards of the ENDE-REDD+ / MARENA Program.

All statements, complaints or complaints received in the suggestion boxes, emails, and in the reports of the indigenous leaders and in the assemblies will be registered through the leaders and will be stored in a data base which will permit the standardization of follow-up and reports. The same format presented in Table 90 will be utilized.

A diagram with the response procedures is shown in Figure 40. The process begins with the classification of the cases received into two broad categories: i. correspondence with ENDE-REDD+ and ii. no correspondence with ENDE-REDD+. In the case of no correspondence, the complaints or suggestions will be sent to the appropriate institutions and the author of the complaint or suggestion will be notified regarding the referral. In the case of correspondence, the complaint or suggestion will be classified in one of the following 4 categories:

I. Environmental incidents: incidents with potential impacts on natural resources and the environment (wildfires, floods, landslides, logging, deforestation, among others).

II. Program commitments: comments on the application of the protocols established for the implementation of the program, i.e. Annual Operational Plan, trainings, technical assistance, intervention activities, monitoring and follow-up, and quantitative and qualitative assessment tools.

III. Compliance with Safeguards and Plans for Distribution of Benefits: comments related to non-compliance with safeguards and the ESMF (Indigenous and Afro-descendant Peoples' Plan, Involuntary Resettlement, amounts, periods and uses of benefits).

IV. Institutional performance: comments requests related to institutional performance or inter-institutional coordination related with the achievement of the targets established in annual operating plans

The attention of categories I and II include verification or inspection in the field, which will be carried out by the Interinstitutional Commission. Once the inspection has been carried out, the Interinstitutional Commission will analyze the findings and decide which institution should proceed (according to the institutional competence) and how to manage the response to the problem. Findings will be reported to stakeholders via the means they provide: cell phone numbers, emails or physical addresses.

Attention to categories III and IV will be carried out by the corresponding commission. The commission will review the cases and decide how to respond to the presentation. These findings will be reported to the stakeholders via cell numbers, physical addresses, or emails. The response time limit will be no more than 30 days.

At the national level, an Inter-institutional Commission will be established, chaired by MARENA; the Secretariat of the Caribbean Coast, and MHCP. The function of this commission will be to follow up on the reports regarding the functioning of the MCS, propose adjustments, and inform the Superior Directorate of MARENA and Regional Governments of the Caribbean Coast (as appropriate). The national commission will meet ordinarily every three months or in an extraordinary manner at the request of one of its parties. Each meeting must be officially sent to MARENA's senior management and will serve as the basis for the annual review report on safeguards.

At the regional and departmental levels, a commission will be formed, chaired by MARENA and integrated by the Regional Government, ITGs, INAFOR and PGR, which will follow up on the proposals presented through the different access points. The departmental or regional commission that receives a suggestion or complaint must determine the institution that will address the issue (institutional agreement). The deadline to attend and respond to the approach or complaint will be no more than 30 days.

All the information generated with this Mechanism for Communication Strengthening will be used to adjust the process of design and implementation of ENDE-REDD+, improve the execution of the Plan for Distribution of Benefits, and compliance with the Environmental and Social Standards.

The implementation of the Mechanism of Feedback, Attention and Resolution of Complaints, will begin its operation and will be the starting point for its report, with the installation of a) National

Commissions and b) Regional Commissions; these commissions will be installed in the second quarter of 2019.

Figure. 50 Communication channels for complaints and suggestions

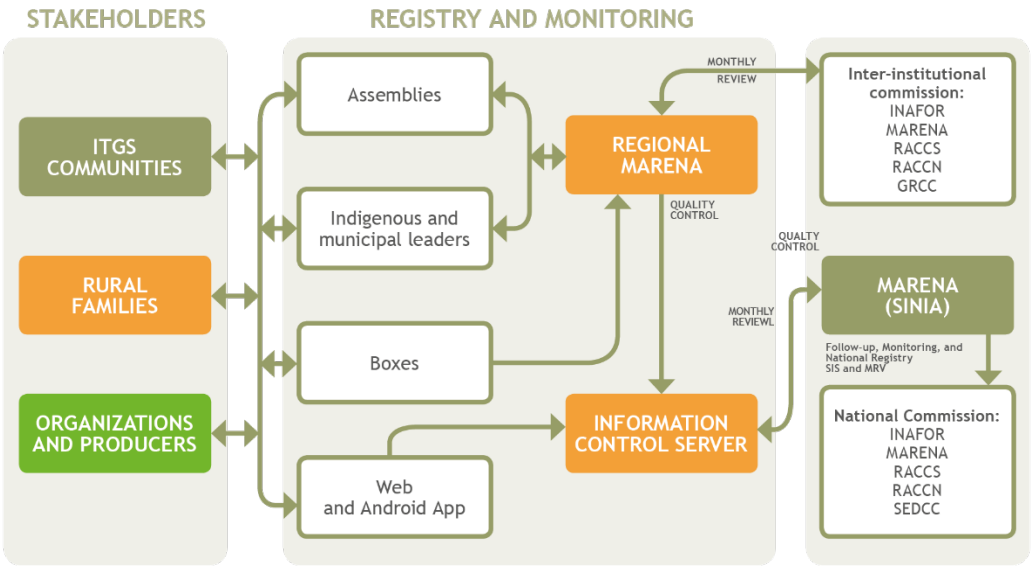
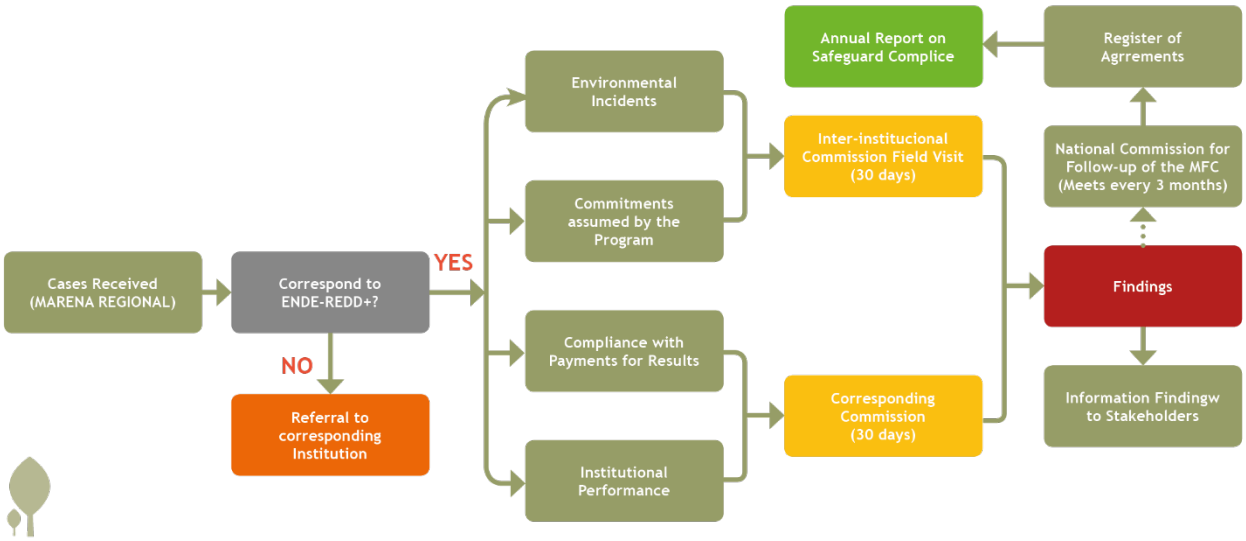


Figure. 51 Procedures for responding to complaints and suggestions.



15. Arrangements for the Distribution of Benefits

15.1 Benefit sharing approach

Nicaragua has advanced in the preparation of a mechanism of benefits distribution that provides the Payments for Results to the actors who contribute to sustainable forest management, care for Mother Earth, and reduction of emissions from deforestation and forest degradation, and with this, strengthen the sustainable human development in the carbon accounting area of the Emissions Reduction Program.

The objectives of the distribution of benefits are:

i. Recognize the achievements of the actors and motivate them to take actions that contribute to the reduction of deforestation and forest degradation and to increase the restoration of plant cover.
ii. Strengthen the sustainability of the Program to improve the capacities of the actors and the administration of the available resources to be utilized in the activities that address the factors in deforestation and in management and protection of forest resources.
iii. Have access to resources that strengthen regional capacities, local governance in general, and forestry governance in particular, in so doing to widen the abilities of the actors to improve the use, profitability, and conservation of their natural resources.

The GRUN has decided that in the distribution of benefits a high priority will be given to the original and Afro-descendant peoples, and to small- and medium- scale producers. The governmental entities at different levels will receive a percentage of the resources for administration, management, and monitoring, with the objective to assure the sustainability of the Program. Nicaragua has prepared an advanced document for the Distribution of Benefits.

The Emissions Reduction Program will have positive impacts in the area of accounting and in the government entities responsible for its administration. This chapter will refer to the benefits to be distributed with resources of the Pay for Results derived from the verified emissions reductions.
Between April 2017 and April 2018, different work groups formulated and reviewed the principles of distribution of benefits for the Program (especially Group 2, planning; see Figure 1, Structure of Governance of ENDE REDD+):

- **Agreement with the legal and public policy frameworks**. The distribution of benefits mechanism will be based on the PNDH, the Development Strategy and Plan for the Caribbean Coast and Upper Wangki Bocay, which seek to promote regional and territorial plans focused on the reduction of the advance of the agricultural frontier and to promote productive models that co-exist with sustainable forest management.

- **Joint responsibility** is one of the fundamental principles underlying the development model of the Caribbean Coast, where the autonomous institutions of RACCN and RACCS and the traditional forms of self-government have individual and collective responsibilities and commitments in the exercise of rights and obligations in public, community, territorial, and regional affairs.
- **Well-being ("*buen vivir*") and the common good of the ancestral peoples in the Caribbean Coast,** is based on collective rights and community benefits, and is founded in respect, harmony, and equilibrium with Mother Earth, promoting a culture of well-being and common good.
- **Focus on changes to promote sustainable production and forest management,** protection of reserve, natural resources, and the means for sustainable human development in harmony with the reduction of carbon emissions.
- **Equity.** The actions must promote full participation under equal conditions of men, women, youth and elders during the process of defining and agreeing on the benefit sharing scheme derived from the reductions of emissions from avoided deforestation and forest degradation.
- **Inter-culturality.** The changes promoted by the ER Program must consider the multiethnic, multicultural, and multilingual diversity of its beneficiaries.
- **Citizen participation.** This is the process of involvement of each of the actors, individually or collectively, with the goal to influence and participate in the management of the ER Program as part of the focus of shared responsibilities and benefits, applying Free, Prior and Informed Consent to the arrangements of the PDB.
- **Transparency.** Benefits will be distributed based on verifiable criteria and indicators at national, regional and community levels. The PDB will publish requisites, criteria, and indicators for participation in the ER Program.

15.2 Benefits to be shared

Los benefits of the Emissions Reduction Program that will be distributed to the beneficiaries are net payments generated from the verified Emissions Reductions (ERs). The raw payments are the total volum of the ERs paid in Nicaragua in agreement with bi-annual reports.

The implementation of the Emissions Reduction Program and its Benefits Distribution Plan considers operating costs, defined in the design of the ERPD (Section 6). To guarantee the viability of the Program and the mechanism of distribution of benefits, it must cover the operating costs during its implementation. Nicaragua will cover these costs during the first three years of the program once the ERs are verified. From the raw payment, the operating costs and a working capital reserve. Once the operating costs and the reserve are deducted from the raw payment, the net payments will be distributed to the elegible beneficiaries, according to Equation 1.

Equation 1. Estimation of net payments

Net Payments = Raw Payments – Operating Costs – Reserve

Types of Benefits

1. The beneficiaries will have Access to the net payments through monetary and non-monetary benefits.

- *Non-monetary benefits:* payments in goods or services oriented to investment initiatives or development plans (territorial land use plans; technical assistance; training; delivery of equipment; supplies and tools).
- *Monetary benefits*: payments in cash that will strengthen the sustainable use of forest resources, forestry governance, monitoring of forests and safeguards.

Operating costs

2. Operating costs include the expenses related to administrative, technical, and financial management; trusts; forest cover monitoring (emissions, land use), and monitoring of environmental and social Standards including a feedback mechanism and attention to grievances and complaints; and the benefits distribution plan.

3. Operating costs are estimated at 5% of the raw payment, equivalent to US $ 538,000 yearly (Table 89). Nicaragua must cover these costs until the year 2022. (See Section 6 of the ERPD).

Table. 92 Operating Costs PDB

Operating costs of the ERPD and PDB	**Description**	Estimated costs (US $ / year)
Financial and operating administrative personnel (fiduciary entity)	Coordinator; legal advisor; finance and accounting; procurement	109,600
MRV technical personnel	Experts in forest monitoring, satellite image interpretation, computer programming, GG monitoring	108,000.00
Safeguard team (2 specialists - social, legal)	Experts in safeguards (gender, social and legal)	50,400.00
Mecanismo de retroalimentación, atención y resolución de quejas	Working sessions will take place with the protagonists (at least 3 per year in each region).	40,000.00
Safeguards and Biodiversity Monitoring	Field visits to evaluate compliance with safeguards in the development plans and	**Tabla 26** 30,000.00

	updating of the biodiversity baseline at selected points.	
Implementation of communication publicity plan	For the purpose of providing information and promoting values, radio and television programmes, as well as printed materials, will be produced, and there will be events (workshops, celebrations) and communication via social networks	50,000.00
Auditing		10,000.00
Trust administration cost		140,000.00
Total		538,000.00

Working reserve

The working capital reserve is a mechanism through which 5% of the ER payments are committed for the occasion of low program performance. These funds will be utilized to pay posible beneficiaries that will have reduced deforestation in an effective manner in their área, in the occurrence of low overall performance of the Program.

15.3Beneficiaries

The GRUN has targeted the ERPD in the Autonomous Regions of the Caribbean Coast (RACC) and the Special Development Regime Area of the Upper Wangki and Bocay, which includes the Biosphere BOSAWAS and Indio Maiz reserves, given the high percentage of existing forests in the accounting área and in restitution of the rights to the original and Afro-descendant peoples who have conserved their forests.

The proposed beneficiaries are key actors in the dynamic to reduce deforestation and forest degradation, and as such in the Emissions Reduction Program interventions. The Plan for Distribution of Benefits will establish general guidelines and a methodology for distribution of benefits on the community and individual levels for which this flow of funds toward the benefiaries will have an effect in their capacities and strategies for better land-use and forest resource management.

15.4Beneficiary categories

The beneficiaries of these payments will be those who contribute to the reduction of emissions in the Emissions Reduction Program and who fulfill the criteria of elegibility established in the Plan for Distribution of Benefits. The follow beneficiaries are included:

- Territories and communities of the original and Afro-descendant Peoples, congregated in 23 territories in the RACC and in the AWB[92].

[92] The original Peoples: Mayangna, Miskitus, Rama, Ulwas and the Afro-descendents: Creoles and Garífunas.

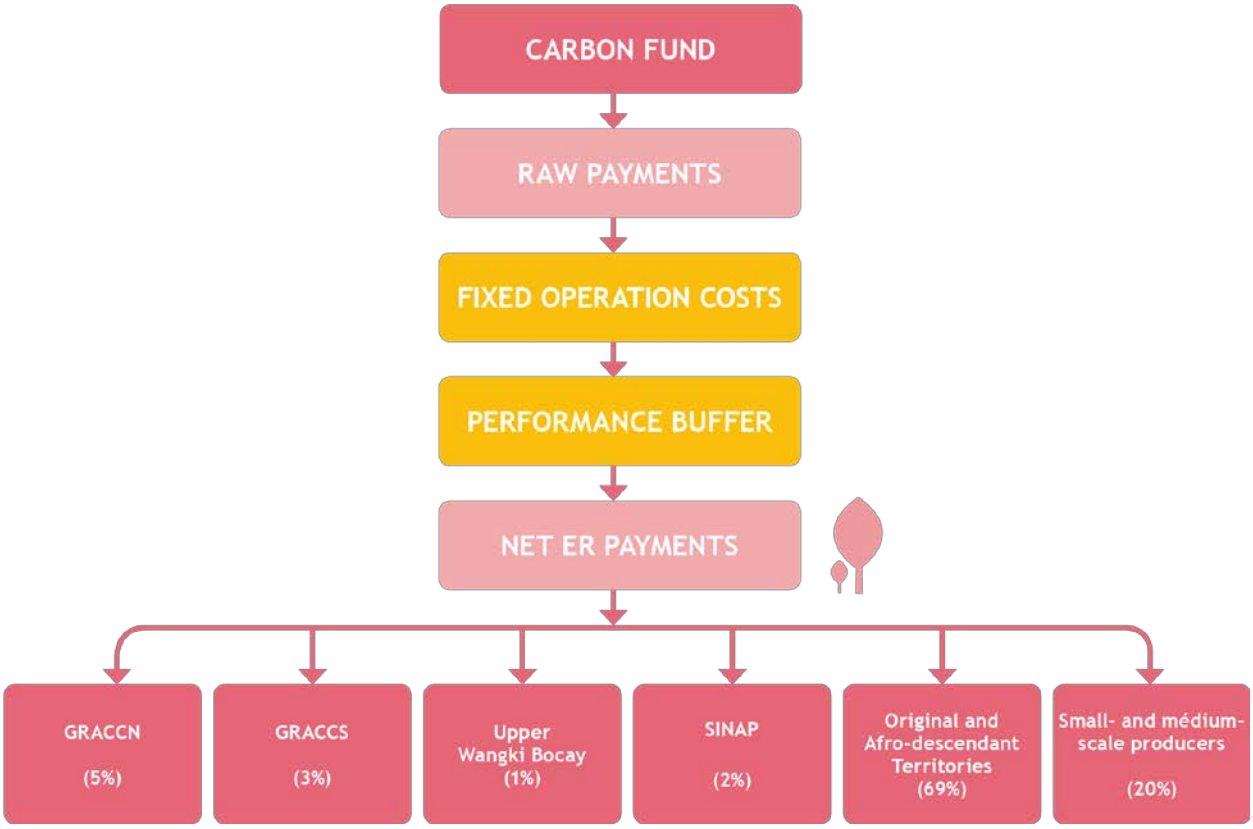
- Small- and médium-scale producers in the accounting área for the ER Program, located in the priority áreas.
- Regional Autonomous Governments of the North Caribbean Coast (GRACCN) and South Caribbean Coast (GRACCS).
- Special Development Regime of the Upper Wangky and Bocay (AWB).
- National Protected Areas System (SINAP).

Distribution of benefits to the beneficiaries

The net payments will be shared among the beneficiaries, following the illustration in Figure 45, which notes the following:

- Five per cent of the net payments will be distributed to GRACCN;
- Three per cent of the net payments will be distributed to GRACCS;
- One per cent of the net payments will be distributed to the AWB Special Zone, covering the territories Mayangna Sauni Bu, Miskitu Indian Tasbaika Kum, and Kipla Sait Tasbaika;
- Two per cent of the net payments will be transferred to SINAP;
- Sixty-nine per cent of the net payments will be distributed to the 23 territories and communities of the original and Afro-descendent Peoples;
- Twenty per cent of the net payments will be distributed to small- and médium-scale producers in the priority áreas.

Figure. 52 Proportion of the net payments to the beneficiaries



The benefits to be distributed are described below. There are two categories of benefits: monetary, and non-monetary:

i. The resources that are to be distributed to the beneficiaries will be channeled through the fiduciary entity.

ii. The resources of the payment for results distributed to the communities and territories of the original and Afro-descendant Peoples will be utilized for the financing of community development works and services and the strengthening of community and/or forestry governance, with the objective to improve the quality of life and increase the value of the forests.

The original and Afro-descendant communities will determine the final use of the resources they receive through the traditional dynamics of assembly of their groups, assuring inclusión participation and equity.

iii. The benefits to small- and mdium-scale producers will be channeled in two ways, through investment instruments (trusts for the promotion of agroforestry and silvopastoral systems) , and directly to small- and médium-scale producers who are not organized.

iv. The payments that the governmental entities will recieve will be subject to the same transparency requirements as the benefits distributed to the indigenous and Afro-descendant communities and to small- and médium-scale producers.

The Plan for Distribution of Benefits includes criteria for elegibility and the forms of distribution for the beneficiaries.

The GRUN currently is working on a financing strategy for the investment phase, in which are contemplated enabling actions for institutional strengthening that will contribute to the sustainability of the Emissions Reduction Program through improved forest management and monitoring and direct investment in activities that promote sustainable forest use, natural regeneration, and forestry governance.

The proportion in which the benefits of the Program are distributed to the beneficiaries is at 90 % of the resources for payments for results are distributed to the beneficiaries. In the case of the original Peoples and the small- and médium-scale producers, the interventions proposed in the Emissions Reduction Program were taken into account, in which activities are defined by area and type of beneficiary.

Based on this, 77 % of the ER will be generated for the original and Afro-descendant Peoples, and the remaining 23 % for the small- and medium-scale producers. See Table 1. Then, the distribution of net payments is estimated utilizing Equation 2.

Equation 2: Distribution percentage of payments by beneficiary[93]

$$\%\ Net\ Payments = (\%\ ER\ significance) * 90$$

The distribution of payments to the actos is as follows: 69 % distributed in the indigenous and Afro-descendant territories; 20 % for the private producers; and11 % for the territorial actors that accompany and assure emissions reductions in the accounting area. See Figure 53.

Table. 93 Significance of the ERs by beneficiary

Beneficiary	Intervention	ERs / $MTCO_2$	% Significance ERs
IT	Community forest management	5.91	77%
	Forestry governance	0.89	
	Reforestation brigades	0.71	

[93] Of the 100% of the net payments, 10 % was assigned to the actors accompanying and assuring the ERs; the remaining 90% is distributed among the IT and private producers.

	Natural regeneration	0.95	
Private Producers	Silvopastoral systems	1.18	23%
	Agroforestry systems	1.18	
	Commercial reforestation	0.18	
Total		11	100%

Table. 94 Benefits and beneficiaries of the ER Program

Proposed proportion[94]		Beneficiaries	Resource use	Benefits distribution criterion
90%	69%	Original and Afro-descendant communities and territories	Financing community development plans	*Emissions reduction and increase in carbon stocks*
	20%	Producers	Financin for sustainable intensive production	
	11%	National, regional, and territorial government entities	Contribute to the implementation of the ER activities in the regions.	

Both the Emissions Reduction Program and the Plan for distrubution of benefits will contribute to reduce poverty and improve the quality of life in the 303 communities of the original and Afro-descendant Peoples of the ethnicities Miskito, Mayangna, Creole, Garifuna, Rama, Ulwa, and Mestizo, in 23 territories, who have lived ancestrally in the forests and who have legal rights to the land in the accounting area.

15.5 Description of the institutional arrangements for the distribution of benefits

The institutional arrangements for the distribution of benefits are framed by the Governance Structure that has been designed for the ENDE- REDD+ (see Figure 1, Governance Structure of ENDE REDD+). Group 1 (political-strategic) has approval functions at the highest level and orientation toward the development vision for the country. Group 2 (planning) is in charge of the technical tasks and development of contents, and maintaining connection with Group 3 (dialogue and implementation).

[94] Only per centages are used given that emissions reduction verification will define the specific payments for results.

The key aspects of the benefits distribution scheme are being developed in Group 2, coordinated by MARENA, and discussed and approved in Group 1. MARENA, as a leader entity in the Emissions Reduction Program, will coordinate the integration of a technical team for the Distribution of Benefits, composed of MHVP, GRACC-SERENA, and SDCC. The Government will make an Inter-institutional Committee that will have, among other responsibilities, the norms for the Trust for transparency and fairness of the DB.

For the distribution of benefits, six principal functions have been identified, which give rise to an institutional arrangement, specific for its implementation, which will be reviewed as part of the advanced draft for the Plan for Distribution of Benefits:

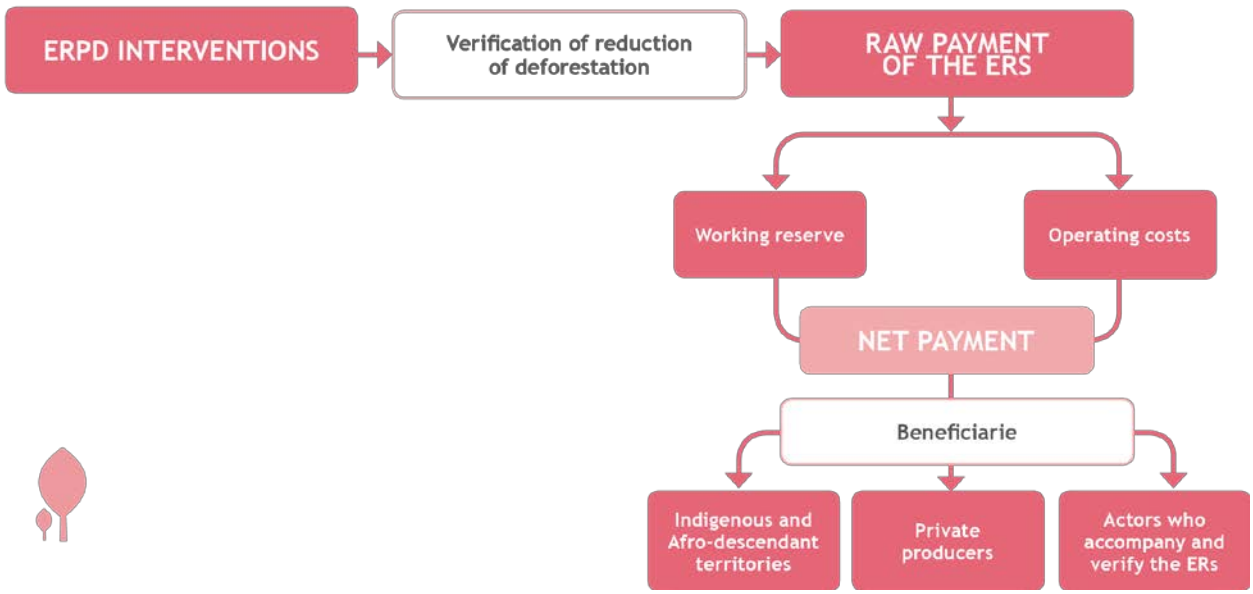
Table. 95 Institutional functions and responsibilities in the distribution of benefits

Functions	Responsible entities
1. Monitoring of emissions reduction and carbon stocks increase.	**Tabla 27** MRV System, MARENA, INAFOR, INETER
2. Calculation of distribution of benefits on a regional level, based on the monitoring results.	MARENA and the technical team of the Distribution of Benefits (Group 2)
3. Process of distribution of benefits to the communities (original and Afro-descendant Peoples), based on criteria and indicators previously designed, consulted, and published (to be included in the final version of the Plan of Distribution of Benefits).	Technical committee of the trust entity, MARENA, and the Distribution of Benefits technical team (Group 2)
4. Calculation of benefits for small- and medium-scale producers.	MARENA and Distribution of Benefits technical team (Group 2)
5. Distribuction of benefits (transfer of resources) to small- and medium-scale producers.	Technical committee of the trust entity, MARENA, and the Distribution of Benefits technical team (Group 2)
6. Monitoring and reporting of resource use derived from the distribution of benefits (information from beneficiaries and verification through third parties).	Fiduciary / administrative entity, Regional Governments of the North and South Caribbean Coast, and the local trusts

	(silvopastoral and agroforestry)

The fund flow scheme for the distribution of benefits is shown in the following figure.

Figure. 53 Scheme for distribution of benefits.



A transfer will be made on the national level for the total of resources for payments for results to a national fiduciary entity that will administer the resources. The entity will have the responsibilities of executing the distribution of funds to the defined beneficiaries. The fiduciary entity is an administrator of resources, in other words it will make the transactions of distribution of benefits that take into account the methodology given for this purpose. The calculation of the distribution of resources will be communicated by MARENA and the distribution of resources technical team, after reviewing the plan with Group 1 and tie final beneficiaries.

The implementation of the flow of funds will require the assurance that the fiduciary entity has sufficient capacity to comply with the fiduciary standards and the activity in practice. Group 1 will coordinate the evaluation (required diligence) to support the selection of the fiduciary entity and to assure the most suitable institutional design, financial instruments, policies, and procedures in decision-maing, payments, transparency, and rendering accounts, in such manner that will cover all the key elements of fiduciary responsibility and safeguards in the management of the resources.

With respect to the report of results of the Plan of Distribution of Benefits, the report of emissions reduction of the Program will include an annex on the development of the distribution of benefits

in the country. It will also include an external review with an independent third party for the producers of distribution of benefits. The fiduciary / administrative entity will participate in the corresponding areas of its competence, in the provision of inputs and information for the process of monitoring and reports of the results of the distribution of benefits.

15.6Flow of funds on the local level

The central fiduciary / administrative entity will perform the distribution of benefits on the local level to the indigenous and Afro-descendant communities and territories, as well as to the organized and not-organized small- and medium-scale producers. The entity will deliver the benefits directly to the Program beneficiaries.

The fiduciary / administrative entity will receive from MARENA the assignations and proportions to distribute to each community/territory and actor. These calculations will be executed based on the contribution of each area to emissions reduction and to increase in carbon stocks, based on a previously designed and consulted methodology.

The indigenous and Afro-descendant communities will develop a process of selection of investment priorities that will point along their own historic paths and local development needs. The GRUN has as its focus to promote autonomous and collective decision-making and to not limit or place any conditions on the elegible investments in the communities.

Each community, in accordance with its mechanisms of assembly, will define the resources to be invested in areas susch as health, eduction, road and highway improvement, and others (see the following section for more details on the process of investment priority selection on the community level).

Figure. 54 Process of delivery of benefits on the community level.

15.7 Criteria for the distribution of benefits

The original and Afro-descendant Peoples and the small- and medium-scale producers have been prioritized in the development policies and plans of the GRUN, as well as in the fundamental definitions for the distribution of benefits of this Program. Based on the defined principles for this mechanism (see the beginning of this section), the distribution of benefits will be performed fundamentally under the following criteria:

1. CO_2 Emissions Reduction
   Community Forest Management
   Plans for Management, control, regulation, increasing awareness, green production
   Increase and improvement in the carbon stocks
   Natural regeneration, forest enrichment planting
   Agroforestry and Silvopastoral Systems
   Multipurpose Forestry Plantations
2. Conservation of the stocks of CO_2
   Management Plans
   Conservation Plans

During the implementation of the ERPD, INETER will construct and update biannually maps of gound cover with high-resolution images (RapidEye). The generated information will permit monitoring of the spatial distribution of deforestation and increases in cover generated in the indigenous and Afro-descendant territories and the private areas (see Section 9 for a detailed description of the MRV).

The spatial distribution of deforestation and the increases in cover generated in the indigenous and Afro-descendant territories and private areas will permit an assignation of amounts to be distributed proportional to the contributions of the indigenous and Afro-descendant territories and communities as well as of the small- and medium-scale producers.

The Emissions Reduction Program will formalize the assignment of rights regarding the transfer of carbon titles. The actors in the Program, through the signing of subsidiary agreements, transfer to the State the titling of the emissions. The negotiation, consulting and signing process for the subsidiary agreements will be performed prior to the signing of the Reduction of Emissions Payment Agreement (ERPA). The subsidiary agreements will be made on regional, territorial, and individual levels with the beneficiary actors in the Program and will be conducted under process of prior, informed, and free consent.

MARENA will sign subisidiary agreements with the potential beneficiaries for the transfer of the titling of carbon. These subsidiary agreements will include the distribution of potential benefits for the signing parties.

In the territories of the original and Afro-descendant Peoples, this process will be conducted in the following manner:

- The agreements must be approved by the corresponding community / territorial assemblies.
- The Regional Governments will approve the agreements (RACCS and RACCN).
- In the case of Upper Wangki and Bocay, their respective assemblies will review and sign the agreements.
- The agreements will be signed by MARENA, the Territorial Government, the Regional Government and the Municipal Government.

In the case of small- and medium-scale producers, agreements will be negotiated and signed among the producer groups or organizations in the productive sectors and MARENA. The mechanism for Communication Strengthening will offer options for the reception of and response to requests for information, suggestions, complaints, and grievances, on the part of the interested parties on the design and execution of the Emissions Reduction Program (see Annex 14) and the distribution of benefits derived from it. For the assurance of ample participation of the original and Afro-descendant Peoples andto guarantee the respect of their local knowledge and rights in the context of the distribution of benefits, the ER Program will take into consideration the REDD+ safeguards of the CMNUCC, principally those referring to forest and to original and Afro-descendant Peoples (see Section 14).

15.8Distribution of benefits on the community level

The distribution of benefits will have a collective focus that will promote the common good and will have a positive impact in the lifestyles of the indigenous and Afro-descendant Peoples. In this sense, the resources for payment for results will not be distributed in cash, but rather in the form of public or collective goods and services in the communities and territories. The decisions regarding investments will be made by each community, in the framework of its governance structures and along the principles and guidelines of equitability, inclusion, and transparencia.

The communities and territories are legally recognized in the Laws 445 and 28 in Nicaragua, and they posses their own local governance structures. The communal assembly is defined as the meeting of the community members gathered together to make decisions on issues of community interest, in accord with their own customs and traditions. The legal, administrative, and governmental representation of the communities is conducted by community leaders, elected in communal assembly.[95]

In the framework of the dynamic of communal and territorial assemblies, priorities will be assigned for investments to be performed with the resources from the payment for results. Previous experiences of non-monetary payments for services have been documented in the indigenous and Afro-descendant communities, for utilization of natural resources, where the communities made decisions to invests in the following catergories in their assemblies:

Maintenance and construction of highways.

- Reparation and maintenance of bridges.
- Reparation of schools, churches, health posts.
- Social help, for instance scholarships for high school and higher education.
- Travel assistance for patients in the case of health emergencies.
- Community center construction.

It is expected that, in addition to these categories, the communities would include governance strengthening and forest utilization, nonetheless, the Program does not limit the eligible themes for financing. The Program will define in agreement with the communities, the basic characteristics that must be met to fulfill the community process of investment priority selection. The decision-making process on the community level must observe the following items, that will be discussed in detail in a methodology for the distribution of benefits on the local level:

1. Guarantee the participation in equality of conditions for all the interest groups of the community.

[95] Sistematization of the lessons learned from forest and environmental management with the indigenous peoples. Project of support in preparation of an emissions reduction strategy relative to deforestation and forest degradation. (ENDE-REDD+). June 2017. Pp. 24-26

2. Guarantee the selection of investment priorities occur through transparent, collective procedures.
3. Ensure documentation in the community decisions.
4. Promote continuity in the community participation beyond the selection of investment priorities. That is, to promore the community involvement in the surveillance of the budgeting exercise and in the quality of the delivered goods and services from the fiduciary / administrative entity

During this process, the communities will have at their disposal tools within the Mechanism of Strengthening of Communication with ENDE-REDD+, to provide assistance in the case of inconformities. The key elements oof the methodology to prioritize investments on the community level were developed based on the autonomy norms and in the experiences of the indigenous and Afro-descendant communities and their governance dynamics.

15.9 Distribution of benefits for small- and medium-scale producers

With respect to the private beneficiaries, that is the small- and medium-scale producers, the distribution of benefits will have two routes. The first is through investment instruments in silvopastoral and agroforestry instruments (trust), which group producers to promote productive intensification. The MRV system will emit a report on forest cover that corresponds to the geographic are in which the producers associated with each instrument. The national fiduciary entity will transfer the corresponding resources to the investment instrument. The investment instruments will define if individual projects are financed or if a collective focus is taken and the resources will then be destined to collective-use interventions for its members.

The distribution of benefits to small- and medium-scale producers who are not organized will be designed at a later date, as part of the advanced draft of the Plan for Distribution of Benefits, so that the function of technical validation and the administrative route to follow for these producers can be identified.

15.10 Process of detailed design and consultation

In November, 2017, a path for the design, consultation, and approval of the Plan for Distribution of Benefits was outlined collectively. The principal actors in this process were: the technical team from MARENA/ENDE-REDD+, SDCC, CONADETI RACCN, CONADETI RACCS, GRACCN, CRACCN, GRACCS, MHCP, SERENA RACCS and RACCN[96]. The direction of the work was updated in accordance with the advances that were produced in the process of design and consultation. This Section presents the latest phases in the development of the advanced draft of the Plan for Distribution of Benefits.

[96] Work session minutes. Group 2. 10 November, 2017.

15.11 Salvaguardas y Sistema de Información de Salvaguardas

The PDB must comply with the safeguards defined by the Cancún Convention, which determine that all REDD+ activities must take place "in accordance with" REDD+ safeguards. These are as follows:

a) Complementarity of the measures with the national forest program objectives and the international conventions and agreements on the matter.
b) Transparency and efficacy of the national forest governance structures, taking into account national legislation and sovereignty.
c) Respect for the knowledge and rights of indigenous peoples and members of local communities.
d) Full and effective participation of stakeholders, in particular indigenous peoples and local communities.
e) The compatibility of these measures with the conservation of natural forests and biological diversity.
f) Actions to deal with the risk of reversals.
g) Actions by which to reduce the displacement of emissions.

In order to ensure compliance with the environmental and social aspects of the implementation of the PDB, and in accordance with the principles of REDD+ implementation in the context of the UNFCCC, a mechanism has been designed for following up on and monitoring environmental and social indicators, so as to be in a position to report on progress made in the ER Program. It has has been incorporated to a Safeguards Information System which in turn will be aligned with the safeguard instruments adopted in the framework of projects financed by the World Bank. These are derived from Social and Environmental Standards and can be summed up in four basic instruments: Environmental and Social Evaluation; Commitment Plan; Participation and Consultation Plan; and the Feedback and Grievance Redress Mechanism.

In order to improve and facilitate the resolution of concerns and complaints that may emerge regarding the PDB and ER Program in a timely fashion, a Feedback and Grievance Redress Mechanism has been designed which is accessible and inclusive. It is built to receive and act upon complaints and suggestions for improvement, and facilitates their solution in an early stage.

The mechanism is keyed toward all protagonists in the accounting area and even outside it, and includes community leaders, indigenous and afrodescendant territories; families and producers living in rural areas; groups of women and youth organized to protect the forests; farmers and cattle-ranchers and the population at large which is involved in emissions-reduction efforts.

A Safeguards Information System (SIS) has been designed that will provide information on how the safeguards are treated and respected during the implementation of the ER Program. It will complement the Feedback Mecanism, in order to ensure improvements in implementation.

The SIS has been linked to the National Environmental Information System (SINIA), which in turn is based on the General Environmental and Natural Resources Law (Law 217, articles 30 and 31). In addition, SINIA has entered into agreements for collaboration with different entities for the generation of information, among them INAFOR, SINAPRED, MAG, BCN, INETER, INIDE, the mayor's offices, indigenous communities and other non-governmental institutions, such as universities.

Supervisory activities will take place on the ground each year, in order to verify the degree of compliance with contractual obligations related to the implementation of the safeguards. The Measurement, Rreporting and Verification (MRV) system will process data and generate semesterly reports, which will be sent to stakeholders at both national and international level.

It is expected there will be external audits every two years, to be carried out by a consultant accredited by MARENA.

15.12 Consultations

Summary of consultations carried out

The ER Program preparations have served to strengthen the process of preparing the National Emissions Reduction Strategy regarding Deforestation and Forest Degradation (ENDE-REDD+) during the four-year period from 2014-2018. A total of 87 activities took place with working group 3, with the participation of community members and leaders of originary and afrodescendant peoples, farmers, women's and youth organizations who promote the care of Mother Earth, associations of forest regents, communicators, members of the Nicaraguan Army and the National Police, as well as technicians from partner institutions such as MEDCCA, INAFOR and regional governments.

The country has special laws that regulate environmental management and the various procedures by which to participate in decision-making. These have favoured the participatory preparation of the PDB. Progress has been achieved on the design of a model for forging alliances, embarking upon dialogue and achieving consensus, with broad-based participation from stakeholders and aligned with the procedures outlined in criterion 31 of the FCPF's

methodological framework (FCPF, 2016a), which calls upon a preparation / readiness process that is "consultative, transparent and participatory."

There have been (i) two meeings with representatives of Working Group 1, with representatives from MARENA, SDCC, MEFCCA, INAFOR, GRACC, GTI and the WB, in order to determine that the benefit should directly reach the communities of originary people and small farmers; ii) 17 sessions with ITGs, at which ERPD progress was presented, including the criteria they must comply with to help reach emissions reductions and thus be in a position to opt fpr benefits, and the DB mechanism; iii) four sessions with Working Group 2, for technical review of the PDB; iv) 12 sessions on the Benefits Distrubution Mechanism, at which the RACCN ITGs presented the actions they are taking in their indigenous territories and communities, as well as the benefits they expect to obtain from the Emissions Reduction Program and their most pertinent commitments, related to forest conservation http://www.marena.gob.ni/Enderedd/wpcontent/uploads/MemoriasOrganizados/Componente1/2019/2.pdf

At these events there was participation by 246 leaders from 17 territorial governments in the RACCN, of which 26% were women. The main objectives of the sessions were to analyse the criteria they must meet to achieve reductions and thus opt for benefits through the DB mechanism. There follows a summary.

Table. 96 Summary of the consultation process – synthesis of proposals put forth

Communities and theme	Result/comments
Territories of originary peoples in RACCN	**Tabla 28** 17 ITGs: Tasba Pri, Karata, Yahbra, Prizu Auhya Un, Waupisa, Tawira; Tuahka. Matumbak, Sauni As, P. Awala, MS. Bas, Awala Lupia, Wanki Maya. Li Lamni, Li Aubra, Tasba Raya and AMASAU
Tabla 29 Challenges to implementation of PDB	**Tabla 30** The benefits must be distributed according to the outcomes of the MRV activities. The benefits must be distributed in a transparent and impartial manner. Distribution must be free of politics, and not be conditioned. It as a right we have earned, we are the only ones who have preserved the forests, the benefits should be greater. In order to be able too opt for benefits, we will start territorial planning with or without the assistance of the national or regional government. Benefits should be monetary and direct.

Consultation Plan

Taking into account that the ER programme will have implications for the entire Caribbean coast area, the BOSAWAS biosphere reserve and the Indio-Maíz biological reserve, and that 50% of the territory is communally owned land belonging to the Miskitu, Mayangna, Ulwa, Rama, Creole and Garifuna peoples, spread across 23 indigenous and afrodescendant territories, the consultations will take place in two spaces: that of originary and afrodescendant peoples and that of farmers, social / environmental organisations, communicators and university campuses.

In the case of originary and afrodescendant peoples, it must be ensured that in all 23 territories there is free, prior and informed consent, as per the Statute of Autonomy of the Caribbean Coast and its enabling regulations (Law 28), the Law of Communal Property of the Originary Peoples and Ethnic Communities of the Autonomous Regions of the Caribbean Coast of Nicaragua and the Bocay, Coco, Indio and Maíz Rivers (Law 445) and ILO Convention 169.

- The GRACC will ensure compliance with the time terms established by the CLPI. The preconsultation and consultation stages will be complied with, as will the principles on which the consultations are based. These are as follows: good faith, prior consultation, felixibility, transparency, exclusivity, interculturality, timely and exhaustive information, confidentiality, distribution of benefits, reasonable time terms and equality.
- During the preconsultation stage, there will be visits or work sessions with the ITGs, which have the function of providing organized information that is culturally appropriate and provided a priori. Each indigenous territory has received – and will continue to receive – relevant information regarding the ER Program and the Benefits Distribution Plan.
- The sessions will be held showing maps and an Executive Summary of the Programme. Technicians from the ITGs will be present and can advise their leaders. It will be ensured thar communal governments are present at these territorial sessions. The conclusions reached and concerns expressed will be written down and then read back to those present at the end of the work session.
- The consultation phase will take place with participation by the corresponding communal, territorial and regional governments.

In order to ensure broad-based participation by small and medium farmers, forestland owners, social and environmental organizations, communicators and universities:

- There will be meetings with existing entities which seek conciliation, such as the RACCN Forest and Environment Consultative Committee, the RACCS Regional

Technical Committee, and farmers and their associations, for the purpose of presenting the ER Program objectives and options for designing the Benefits Distribution Plan.

- An Executive Summary will be written up, which can be delivered in digital form or as a hard copy. Either way, recipients must issue a receipt acknowledging delivery.
- It will be explained to each beneficiary that they may use the MARENA / ENDE REDD+ web page to introduce observations / concerns or bring these personally and in writing to the SERENA or MARENA offices.

15.13 Communication

A dissemination plan will be drawn up for the ER Program and the PDB, which will have for its goal to ensure that the stakeholders learn about the scope of the ER Program and the role which each of them has in reducing deforestation. The communications process will take place using a multisectoral approach which seeks to involve all stakeholders: originary and afrodescendant peoples, small and medium farmers, universities, regional and national government institutions, communications media, social organisations and the public at large.

Messages will be prepared tailored to the sector with which communication is to be established, for example:
Topic: Prevention of deforestation and forest degradation, aimed at farmers.
Loc 1. Climate change is one of the main environmental challenges we currently face.
Loc. 2. During the past 150 years there has been an increase in world temperature. This has affected the climate, agriculture, biodiversity and increased the occurrence of natural disasters.
Loc. 1. The evidence shows that Nicaragua is one of the countries in Central America with the highest vulnerability to the negative effects of climate change. This means we must develop strategies to reduce its impact on our communities.
Loc. 2. By taking care of our forests and reducing deforestation we will contribute to reducing the effects of greenhouse gases such as CO^2, which lead to climate change. In any case, forests provide us with oxygen, food, shadow and, above all, life-giving water.
Loc. 1. To prevent deforestation is everyone's responsibility.
Loc. 2. Let us organize and support the work already underway to care for and protect our forests.
Loc. 2. This is a message from the Ministry of the Environment and Natural Resources, MARENA, working through the Program to Reduce Deforestation and Forest Dgradation, ENDE-REDD+.
Loc. 1. The regional government and the Caribbean Coast Development Secretariat.
Loc. 2. Government of Reconciliation and National Unity.

The means of communication available will be radio spots on community and municipal radio stations; printed material; posters, roll-ups and pamphlets; a web page; electronic dissemination via the partner's, the government's and the World Bank's portals; bulletins which can be sent to partners and other stakeholdes regarding progress made in the implementation of the RE Program; events; workshops with the media to keep them informed; socialization at schools and universities, in particular on days celebrating environmental and cultural events, such as the Environment Week and the celebration of autonomy. The media will be encouraged to cover any activities, in order to generate news.

16. Non-Carbon Benefits

16.1 Outline of potential non-carbon benefits and identification of priority non-carbon benefits

The Emissions Reduction Program has the potential to produce multiple benefits related to improved rural livelihoods, employment, the mitigation of climate change, increased climate resilience of human populations, the protection and recuperation of watersheds, and the conservation of biodiversity.

Within this context, Nicaragua has selected biodiversity and off-farm employment in the accounting area as priority environmental and socioeconomic co-benefits, due to their importance in the National Human Development Plan and considering the existing private and institutional capacity for their monitoring. Taken together, these two indicators reflect the "health" of natural and human economic ecosystems, both within indigenous and Afrodescendant territories, which are characterized by high biological diversity, but also high levels of poverty and lack of employment, as well as outside these territories, where agricultural productivity is linked to biodiversity and where the creation of off-farm employment opportunities for poor, marginal farmers is contemplated to be an indirect, but important, measure for reducing deforestation. The biodiversity indicator also integrates the effects of climate change as well as watershed protection and management. Taken together, these indicators serve as a measure of the effectiveness of the Program in promoting "green" or sustainable development.

The subject of biodiversity and its loss has been raised by local stakeholders during the consultation workshops and sessions of the SESA working group. These stakeholders have expressed the importance of monitoring biodiversity due to their concern regarding the reduction of useful species important for subsistence and their habitats. As part of their worldview, they consider that these changes in the patterns of biodiversity are related to ecosystem level changes associated with rainfall and natural habitat degradation. Various interventions contemplated by the ER Program are expected to improve biodiversity

conservation, including natural regeneration, social and commercial reforestation, and improved forest conservation and governance in the indigenous territories.

On the other hand, the selection of off-farm employment as an important non-carbon benefit is based on its importance as a cross-cutting element within the National Plan of Human Development as well as government policies aimed at the integrated development of the Caribbean Coast. The promotion of forestry and agroindustrial investments and commercial reforestation are expected to contribute to this indicator. In turn, the generation of off-farm employment will help reduce deforestation by reducing the need of poor famers to continue exploiting natural capital in order to assure their well-being.

Within this context of integrated, sustainable development, special attention will be paid to organized women´s conservation organizations and youth groups in the indigenous and Afrosecendant territories due to their active role in the ER Program´s dialogue and participation process as well as their future potential to promote community forestry management practices that create employment while conserving biodiversity. Women´s organizations will receive special attention for activities related to training and leadership strengthening, while youth groups will be targeted by awareness campaigns in schools as well as conservation field days.

16.2 Approach for providing information on priority Non-Carbon benefits

Avian biodiversity will be used as an indicator of overall biodiversity, since variations in avian species diversity and abundance are related to the structure and diversity of habitats and landscapes. The design and implementation of avian monitoring will be carried out in collaboration with the General Directorate of Natural Heritage and Biodiversity of MARENA, which at present is the focal point for the UNFCCC Convention on Biological Diversity.

A baseline will be established by sampling 10% of the national forest inventory´s 371 permanent plots (37 plots). These plots will be strategically chosen based on their importance for conservation and the areas of implementation of the project. Biodiversity information will be collected by MARENA forest rangers whose capacities will be strengthened via 4 training sessions (2 in the RACCN and 2 in the RACCS) related to avian monitoring. The information collected will be triangulated with information from the analysis of satellite imagery in order to relate biodiversity to patterns of land degradation, conservation, and biological corridors.

Monitoring will be performed on a semester basis. The forest rangers will tabulate information related to location, species encountered, and number of sighting per species in Excel data bases. This information will be sent to the Information Monitoring and Regional Environmental Education System of the Biodiversity Directorate of MARENA for subsequent analysis. The results will be published in the National System for Environmental Information (SINIA) platform of MARENA.

This information will be complemented with that from 28 avian monitoring stations of the Biodiversity Directorate of MARENA, which will supply data on the abundance and richness of indicator species, as well as migrants and threatened species identified by the International Union for the Conservation of Nature (IUCN).

Data gathering methods will consist of:

- Captures
- Sampling along linear transects and points
- Quadrants and plots
- Analysis of satellite imagery

Three possible variables that may be monitored, taking into account their cost, technical capacity needed, and replicability at the national level, include:

- Avifauna diversity and abundance.
- Presence or absence of indicator species of pristine and intervened forests.
- Vegetation index, based on the analysis of satellite imagery. The satellite images will be provided annually by INETER, and will be processed by MARENA.

With regards to the creation of off-farm employment, indicators being considered are:

- The creation of jobs in forestry and agroindustrial businesses in the accounting area, and
- The number of workers in the forestry and agroindustrial sectors in the accounting area who are registered in the Nicaraguan Institute of Social Security (INSS).

In the former, the PRONicaribe investment promotion program, through its PRONicaribe regional office, will provide direct and indirect employment data related to the establishment of new businesses in the accounting area. This information will be provided to MARENA on an annual basis under a formal cooperative agreement. The results will be published on SINIA´s website and will be available to the general public.

In the case of employment data originating with the INSS, the Central Bank of Nicaragua has monthly registers of the actives participants in the Social Security system which can be used to prepare annual estimates of the number of workers in the forestry and agroindustrial sectors.

It is anticipated that the final design of the indicators and their monitoring will incorporate inputs from the consultations that will be carried out during 2018.

17. Certificates of Emission Reductions

17.1 Authorization of the ER Program

In this section we evaluate Nicaragua's capacity to transfer emissions reduction titles (ERTs) and the government entity's authority to transfer ERTs and sign agreements with carbon rights title holders.

Authorization

For the transfer of emission reduction title to the Carbon Fund, the government of Nicaragua authorizes the Ministry of the Environment and Natural Resources (MARENA) to sign the emissions reduction certificates.

Contact person	María José Corea Pérez
Title	Minister, Ministry of the Environment and Natural Resources
Address	Managua, Nicaragua. Carretera Norte Km 12 1/2, frente a la Zona Franca
Telephone	(505) 22631273
Email	
Website	www.marena.gob.ni
Reference to decrees, laws or other types of decisions identified by this national authority within the ER-P.	National legislation establishes the competencies and responsibilities of MARENA as the governing body for the country's environmental policy. It is also the competent entity as regards compliance with international agreements concerning the environment. The Law of Organization, Competencies and Procedures of the Executive Branch (Law 290, published in *La Gaceta*, the official government newspaper, No. 103 of 3 June 1998 and reformed via Law 864, published in *La Gaceta* No. 91 of 20 May 2014) regulates the functions and competencies of state ministries. The current Minister of MARENA was appointed via Presidential Agreement 06-

	2018 , published in *La Gaceta* No. 08 of 11 January 2018. In the context of the REDD+ Program, intended to fight climate change and poverty in Nicaragua, Presidential Agreement No. 21-2018 authorizes MARENA as the negotiating entity for the signing of Emissions Reductions Transfers to the FCPF Carbon Fund, and to sign agreements with potential title holders. before the FCPF Carbon Fund. This Presidential Agreement was published in *La Gaceta*, official government publication, No. 16, 23 January 2018.

17.2Transfer of Title to ERs

State capacity to transfer ERTs

Presidential Agreement No. 21-2018 authorized MARENA, as the negotiating entity before the Carbon Fund, to sign ER title transfers (see Annex 12). In accordance with Nicaraguan law, MARENA is the government institution charged with implementing public environmental policy; furthermore, it is the governing body responsible for environmental management, the administration of protected areas, and complying with international environmental conventions. MARENA also coordinates the ENDE-REDD+ and ERDP Programs together with other government institutions.

As the signatory institution representing Nicaragua, MARENA signed the Letter of Intent with the International Bank for Reconstruction and Development regarding the REDD+ Program to fight climate change and poverty in Nicaragua, which was signed in January 2016. The ER Program considers that the emissions reductions, whose titles will be transferred to the Carbon Fund, will originate in an accounting area comprised of both communal and private property (private lands, collective land belonging to indigenous peoples, land belonging to associations, etc.).

Legal recognition of emissions reductions

In Nicaragua, the right to carbon as such is not regulated. Nonetheless, the political Constitution and national laws recognize property and natural resource rights, particularly those of landowners (individuals, individual associated producers, and indigenous, Afrodescendants peoples, etc.), as well as the communal rights of indigenous and Afro

descendant peoples who have been traditionally protected and managed the forest, forest lands, and all that they contain.

The political Constitution of Nicaragua, in Article 102, recognizes that natural resources are a national heritage. The preservation of the environment and the conservation, development, and rational use of the natural resources corresponds to the State, which can enter into contracts for the rational exploitation of these resources, when in the national interest, under transparent and public processes. Within this constitutional regimen, the State is responsible for the control of natural resources over and above the interests of individuals, establishing limits and regulations for their management and harvest in accordance with special laws.

Based on these constitutional precepts, the special laws contain regulations related to land and forest rights. For example, Law No. 462 on the forest sector, establishes in Article 2 that "to the proprietor of the land, corresponds the dominion of forest resources and their derived benefits correspondes to the land owner", and Law No. 28, the Autonomy Statute of the Autonomous Regions of the Caribbean Coast, establishes in Article 36 that "communal property is composed of the lands, waters, and forests that have traditionally belonged to the Communities of the Caribbean Coast…"

In relation to the titled good, forest rights form part of the property of the land or soil, thus land owners also enjoy right to forest resources and therefore, the services generated by forests. In the transfer of emissions reductions to the Carbon Fund, these benefits to rights holders will be defined (see Section 15).

The ownership of the REs is associated with the ownership of the land. The Attorney General of the Republic (PGR) in its opinion noted that the law No 462 "Law on Conservation, Development and Sustainable Development of the Forest Sector" and Law No. 217 "General Law on the Environment and Natural Resources" contains elements sufficient regulations, to determine that the holder of the carbon emission reductions, are the legitimate owners of the buildings where the forest resource that generates said environmental services

Transfer of ownership

In the transfer of emissions reductions from deforestation and forest degradation, the country will recognize forest and land rights, and therefore, the possible owners of these rights, such as natural persons, legal entities, indigenous and Afrodescendant peoples, producers, etc., who are involved with the reduction of emissions by avoided deforestation and the restoration of degraded areas through natural forest regeneration.

At present, the country is preparing the conditions for the negotiations with rights holders. Prior to the signing of the ERPA, details of the acgreement will be negotiated with participants in the ER Program. The process of formalizing these agreements will be

undertaken as part of the formal process contemplated by the Benefit Distribution Mechanism, which has identified two groups of agreements having particular characteristics:

(i) Agreements signed with the 23 indigensous and Afrodescendant territories in the RACCS, RACCN, and Alto Wangki and Bocay. These agreements will be inter-instiutional in nature and will be signed by each legal representative of the indigenous and Afrodescendant territories and the respective regional and municipal governments. Seventy-seven per cent (77%) of the Program's ERPAs are of this kind

(ii) Agreements signed with producer organizations, as representatives of individual producers in the accounting area. Twenty-three (23%) of the Program's ERPAs are of this kind.

The arrangements for the transfer of ER titles will take into account the following elements: the different rights associated with communal and private property, the responsibilities and obligations of the parties involved, the scope of the monitoring, reporting, and verification sytem and procedures, and consultation processes in the indigenous and Afrodescendant territories as contemplated under Las 445, and in the other sectors in compliance with the Law of Citizen Participation and the governance model based on allances, dialague, and sonsensus.

Finally, the amount of ERs to be transferred will depend on the area which is under a transfer agreement. MARENA can transfer to the Carbon Fund that portion of the ERs for which a legal agreement has been signed with the owner. Considering that the monitoring of benefit distribution in the indigenous territories and private land take place separately, the ER transfers will reflect the percentage of territory (indigenous or private) which are under agreement with MARENA.

Thus, if it were the case that contracts are entered into with landowners who represent, say, 80% of privately owned land, the Program implementing entity would claim and transfer 80% of the ERs produced. The remaining 20% would not be transferrable.

The total amount of transferrable ERs reflects the sum of transferrable ERS from both types of territory. It should be noted that it is foreseen that all indigenous and Afrodescendant territories will enter into transfer agreements with MARENA, for a full 100% of their territories. Taken together, they represent 77% of the potential for emissions reductions. Private producers represent the remaining 23% of the ERS produced in the accounting area.

It is also worth pointing out that non-transferrable ERs will be placed in a reserve. However, the Office of the Attorney General will be consulted again, to explore the possibility of a legal solution that would allow for transferring the ownership of these ERs to the government. This is the case because it is thought that ERs are produced by involvement on the part of the owner, but also due to government actions.

17.3Transferability of the ownership rights of Carbon

The ownership of the ERs is associated with land property rights. In its finding, the Office of the Attorney General noted that the Forestry Sector Conservation, Promotion and Sustainable Development Law (Law 462) and the Environmental and Natural Resources Law (Law 217) contain sufficient elements and regulatory definitions to determine that the owners of the carbon emissions reductions are those who legitimately own the real estate on which the forest resource is located that generates the aforementioned environmental services.

MARENA is the ER Programme implementing agency. According to Presidential Agreement nr. 21-2018, MARENA, in the name and in representation of the government of the Republic of Nicaragua, is authorised to "be the negotiating entity that signs the Emissions Reduction Transfer of the REDD+ Program to Fight Climate Change and Poverty in Nicaragua with the FCPF. It is also authorised to sign the agreements reached on emissions reductions payments with owners."

18. Data Management and Registry Systems

18.1 Participation under other GHG initiatives

Currently Nicaragua does not have an ER program or project in the carbon accounting area aimed at reducing greenhouse gas emissions through REDD+ activities. However, it should be mentioned that there have been small projects outside the accounting area, located in the North-Central region of the country, that have ventured into the carbon market based on reforestation for the purpose of providing environmental services.

Up to 2015, 346,767 tons of CO2 had been captured under the CommuniTree Carbon Program initiative (Plan Vivo). This initiative does not jeopardize or entail a risk of double payment or double accounting, since it lies outside of the area ERPA accounting area.

18.2 Management and data registration systems intended to avoid multiple ER claims

In accordance with criteria 37 and 38 of the FCPF Methodological Framework, the ERP requires a series of arrangements to avoid double accounting, double selling and multiple claims to an ER Title. Any ERs from REDD+ activities under the ER Program sold and transferred to the Carbon Fund will not be used again by any entity for sale, public relations, compliance or any other purpose. For this purpose, Nicaragua has made a decision to implement and maintain its own comprehensive national REDD+ Program and Projects Data Management System as a Registry System of REDD+ initiatives at national level.

The DMS (Data Management System) will be a database with the following attributes or minimum requirements regarding information on REDD+ initiatives, programs or projects:

i) The entities that holds title of ERs;
ii) The date of registration;
iii) Life Period for the initiative;
iv) Geographic boundaries of the initiatives, programs or projects, including names and geographic location of communities, organizations or other beneficiaries that will benefit from the ERP, to avoid that they claim benefits from more than one source.
v) Details of REDD+ activities and carbon sinks included;
vi) The reference level used;
vii) Expected ER volume generated (ex-ante estimation).

Other information that is expected to be collected and managed is related to the volumes of ERs reported and verified, the status, class and type of ER and the ERs titles emitted and transferred in each monitoring event for each REDD+ initiative. The information of the System will be made publicly available on the internet (in Spanish), on a platform that will be managed by MARENA. The Consultancy in charge of the design of this system will prepare a document defining administrative procedures for the registry of the REDD+ initiatives. The operations will be audited periodically by an independent third party. The DMS will be used to inform emission reductions generated under the REDD+ National Strategy framework of Nicaragua, focused in this particular case on the Emissions Reduction Program that is linked to the FCPF Carbon Fund and all the REDD+ initiatives at national level.

The DMS will guarantee transparency and appropriate documentation of the emission reductions generated by the projects and programs, providing support to the system in order to avoid double accounting and double selling issues, and to show the public, in a transparent manner, that environmental benefits in relation to emission reductions or greenhouse gas absorptions are generated and not being claimed more than once.

For the proper functioning of the DMS, solutions appropriate to the national circumstances will be analysed and developed, taking into consideration the principles and regulations associated with ER ownership, the specific nature of the ERs for each REDD+ activity, the relationship with the strategic REDD+ options and actions identified at a national level, and the link between the ERP and any REDD+ or forestry projects that have voluntary market standard certifications (VCS, MDL and Plan Vivo, among others).

The DMS will be established in a server or data center that will allow access and use in a functional and secure way and includes different user categories and profiles with access rules that are agreed upon with the stakeholders. A public access profile will be created with access to information in Spanish. The minimum requirements of the system will be

determined with the objective of complying with all the requirements, conditions, practices and regulations associated with the system.

The DMS will guarantee online access at any time and from any place. As such, the following conditions will be taken into consideration:

i) Security measures, including the necessary rules that ensure differentiated access according to user profiles;
ii) Information security for the data of national interest;
iii) Implementation of the system in a data center or on a server with backup power; and
iv) Redundant Array of Independent Disks (RAID) support and regular incremental data backup protocols.

The spatial and alphanumeric data that has been and will be generated in the framework of REDD+ will be consolidated and standardized in the DMS. This will serve to:

i) Propose and generate protocols for standardization and homogenization of databases and information generated or in development. The proposal and protocols will be described in a detailed manual with the proposed methodology and how the system will be implemented;
ii) Design and implement applications that will enable the system to be connected with other systems that are developed now and in the future within the REDD+ framework, as well as other information generated in the ERP implementation stage for resource optimization, such as SIS, MRV, NFI, etc.;
iii) Standardize the information according to the steps described in the manual, based on standards defined by MARENA;
iv) Define a methodology to perform quality control of the procedures;
v) Establish quality control measures, scheduling and reports; and
vi) Store and back up standardized information on devices or systems suitable for this objective.

For the ERs transaction registry in response to indicator 38.1, Nicaragua has taken the decision to use the Centralized Transaction Registry System being developed by the World Bank. This centralized system will track all the transactions under the FCPF ER Program. This centralized system is in the implementation phase and will be operational in October 2019, following the principles of the MF of FCPF CF, the guidelines for establishing and managing risk mitigation mechanisms (buffer accounts) and will be flexible enough to adjust to the articles of the future ERPA. The system will be audited periodically. As of today, there is a BRD (Business Requirements Document, WB, Feb. 2019) that clarifies the roles, responsibilities, functions and operations of the Registry System, currently called CATS.

If Nicaragua decides in the future to implement its own national emission reduction transaction system, it must have clear links to the basic information of projects and programs

included in the National DMS of REDD+ Programs and Projects; ensuring that ERs are not emitted, sold or claimed by more than one entity. The registration process of REDD + initiatives in the National DMS of REDD + Programs and Projects that is currently under design, will avoid double counting of initiatives that could be developed in the future, the information will be taken into account when operating the Centralized Transaction System of the World Bank (in the event that there are matching REDD + initiatives in space / time with the FCPF CF ERP).

National Scope

- The Monitoring, Reporting and Verification (MRV) system will generate four (4) reports (1 before, 2 during, and 1 after the ERPA) regarding forest coverage and biomass, for the purpose of periodically calculating the reduction in forest emissions (see Section 9). These reports will be sent to MARENA for quality control and guaranty of the measurements taken.
- Once the quality of the measurements has been guaranteed, a report will be prepared and sent to the Ministry of Finance and Public Credit (MHCP). This report will be used to determine the distribution of program benefits and their registration with reference to the carbon accounting area.

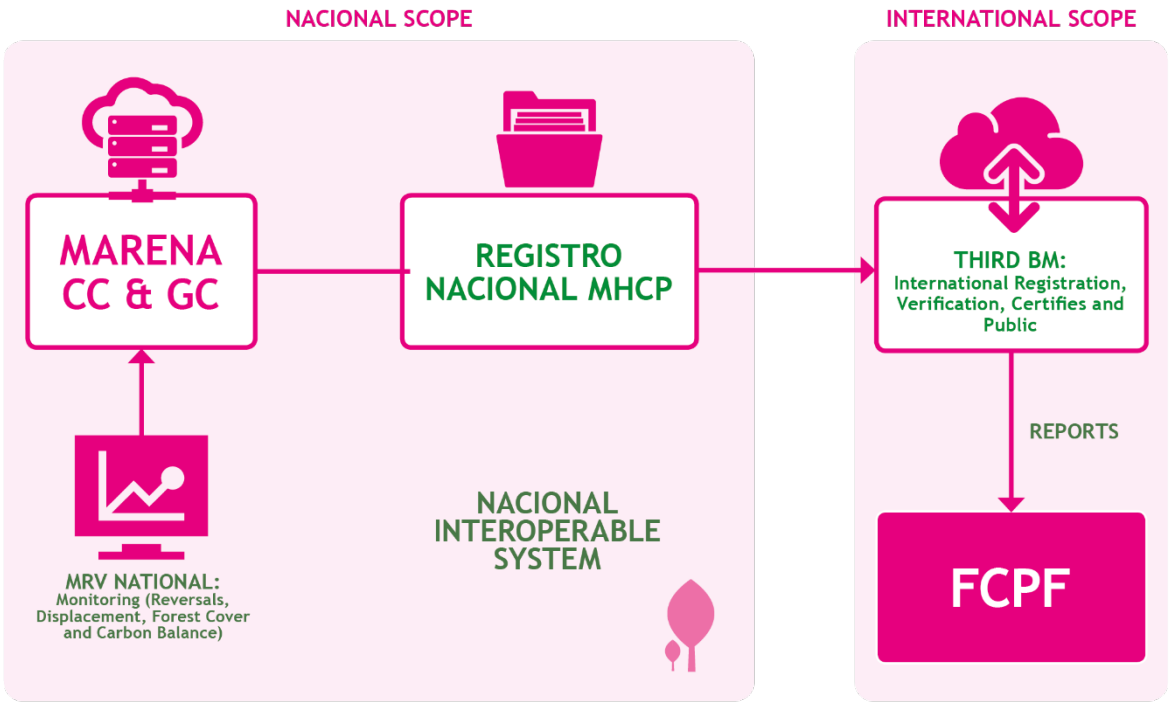
International Scope (external)

- MHCP will deliver a report to a third party charged with registering the Carbon Certificates and their verification, certification, and international publication, as well as the Final Report to the Forest Carbon Partnership Facility (FCPF).
- In order to avoid double accounting, an administrative report will be drawn up that will contain information related to emissions reductions in the ER Program accounting area. The design of this report uses a model form requesting the following information: name of land owner(s); georeferenced site coordinates; forest cover baseline; amount of carbon stored; and the annual record of changes in forest cover, The reference level used.
- At the national level, the MHCP will process information requests received from abroad related to emissions reductions, using the administrative report on results-based payments.
- The administrative report will be used as a support document during internal and external audits, including those undertaken by the Carbon Fund and the World Bank. This document will also be linked to the agreements entered upon during the Emissions Reduction Purchase Agreement (ERPA), as a legal basis of the commitments made by the parties.
- The monitoring reports issued by the system, which are sent to the Carbon Fund through the third party, will be subject to an audit, as per the terms and conditions

set forth in the ERPA. These audits may be performed by auditors designated by the Carbon Fund or some other, as yet undefined, party that is recognized by the Carbon Fund as capable of carrying out this activity.

The registration system shall be governed by the model shown below:

Figure. 55 Registration system model.



19. Annexes

Annex 1. ER Program budget

Table 1. ER Program budget

Expected use of funds	Description	Preparatory Activities		Annual Breakdown					Total
		Year 1	Year 2	Year 1	Year 2	Year 3	Year 4	Year 5	
Administration and supervision				$29,774	$29,774	$29,774	$29,774	$29,774	**$148,871**
Operation and implementation	*Early activities: Institucional coordination and alignment, studies and diagnoses, proposal preparation, implementation plans*	$195,000	$240,000						**$435,000**
	Alignment and harmonization of policies and institutios			$105,000	$80,000	$168,000	$166,000	$166,000	**$685,000**
	Public education and awareness			$221,000	$175,000	$235,000	$205,000	$80,000	**$916,000**
	Investment promotion			$961,400	$961,400	$961,400	$961,400	$961,400	**$4,807,000**
	Strengthening of application of laws, regulations, and management instruments			$630,000	$630,000	$630,000	$630,000	$630,000	**$3,150,000**
	Improvement of institutional capacities and resources					$385,000	$300,000		**$685,000**
	Land use management and governance in ITGs			$357,700	$357,700	$555,600			**$1,271,000**
	Incentive for avoided deforestation					$3,561,600		$5,342,400	**$8,904,000**
	Community forest management					$2,379,500	$343,500	$331,500	**$3,054,500**
	Silvopastoral and agroforestry technical assistance and training			$1,362,900	$1,362,900	$2,017,233	$2,017,233	$2,017,233	**$8,777,499**
	Silvopastoral trust - Credit lines & guarantees			$3,451,000	$3,451,000	$3,451,000	$3,451,000	$3,451,000	**$17,255,000**
	Natural regeneration and social reforestation					$966,667	$966,667	$966,667	**$2,900,000**
Financing costs									-
Reference Level and Monitoring System	*Registry of emission reductions*			$7,366	$7,966	$8,373	$10,554	$11,927	**$46,186**
	Capacity strengthening	$136,000		$170,500	$116,000	$20,500	$16,000	$20,500	**$479,500**
	Monitoring	$350,000		$713,900	$448,000	$713,900	$448,000	$713,900	**$3,387,700**
Benefit sharing distribution and safeguards				$0	$20,964	$22,033	$27,772	$31,388	**$102,158**
Grievance redress and feedback mechanism				$15,507	$16,771	$17,627	$22,218	$25,110	**$97,234**
Consultation and information sharing	*Improving information gathering, use, and dissemination*			$70,000	$24,000	$54,000	$24,000	$24,000	**$196,000**
	Total Costs	$681,000	$240,000	$8,096,048	$7,681,476	$16,177,206	$9,619,118	$14,802,800	**$57,297,647**
Expected sources of funds	**Description**								**Total**
Government budget	*INAFOR*			$907,700	$857,700				**$1,765,400**
	INAFOR/GRACC			$40,000	$40,000	$40,000	$40,000	$40,000	**$200,000**
	INAFOR/GTI			$30,000	$30,000	$30,000	$30,000	$30,000	**$150,000**
	INETER	$350,000		$312,400	$62,400	$312,400	$62,400	$312,400	**$1,412,000**
	INETER/INAFOR			$15,600	$15,600	$15,600	$15,600	$15,600	**$78,000**
	MAG/INETER			$18,000	$18,000	$18,000	$18,000	$18,000	**$90,000**
	MARENA (includes $662,200 from REDD+ Readiness)	$195,000	$240,000	$374,048	$259,476	$198,207	$160,318	$188,600	**$1,615,648**
	MARENA/INAFOR			$527,000	$527,000	$527,000	$527,000	$402,000	**$2,510,000**
	MARENA/INETER	$136,000		$16,000	$16,000				**$168,000**
	MEFCA			$447,000	$447,000	$447,000	$447,000	$447,000	**$2,235,000**
	MHCP			$20,000	$20,000	$20,000	$20,000	$20,000	**$100,000**
	INTA					$144,972	$144,972	$144,972	**$434,916**
Grants	*BioClima Grant*					$4,409,167	$2,256,167	$1,944,167	**$8,609,500**
Loads/Investments	*CONAGAN*			$995,900	$995,900				**$1,991,800**
	BioClima-BCIE Loan			$4,392,400	$4,392,400	$4,392,400	$4,392,400	$4,392,400	**$21,962,000**
REDD+ revenues	*FCPF*					$5,622,461	$1,505,261	$6,847,661	**$13,975,383**
	Total Revenues (before taxes)	$681,000	$240,000	$8,096,048	$7,681,476	$16,177,206	$9,619,118	$14,802,800	**$57,297,647**